

DEPARTMENT

Electrical and Electronic Engineering

PROGRAM

**B.Sc. in Electrical and Electronic Engineering (EEE)
(4 Years Program)**

Effective from January 2016

For Spring and Summer Semesters 2016 only

FACULTY

School of Science and Engineering

Southeast University

**Proposed Syllabus
of
B.Sc. in Electrical and Electronic Engineering (EEE)
(4 Years Program)**

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Degree offering Department

Name of the program: Electrical and Electronic Engineering (EEE)

Name of the Department: Electrical and Electronic Engineering

Name of the School: School of Science and Engineering

B.Sc. in Electrical and Electronic Engineering (EEE) is a 4-years program offered by the Department of Electrical and Electronic Engineering under the School of Science and Engineering of this University.

Aims and Objective

Power sector, Electronic and Telecommunication sectors are the most demanding sectors of our country. Economic and Industrial progress of the country as well as elevation of living standard of citizen are highly dependent on the advancement of these sectors. But, the country is lagging behind in this matter because still it needs of necessary number of experts & skilled people for developing these sectors to the desired level. The single subject that covers the foundation knowledge of both Power & Telecommunication fields is the 'Electrical & Electronic Engineering'.

The objective of B.Sc. in 'Electrical & Electronic Engineering' program under the department of Electrical & Electronic Engineering is to produce skilled graduate Engineers in this field who can contribute to develop country's power & telecommunication sector. The syllabus of the program is designed after comparing it with similar programs of various world famous universities so that it fits with international standard besides achieving local objectives. The subjects & course contents are made up to date by adding materials on recent developments in this field to meet the requirements of time. Special emphasis is given on the power & renewable energy related topics to meet future power crisis of the country. Sources of the generation of electricity along with its principle, technology and mechanisms are included in the syllabus. The overall goal is to produce a group of confident and skilled graduate Engineers in this field who can compete in world market as well as can meet local demands by contributing relevant sectors.

Entry Requirements

For admission in B.Sc. in Electrical and Electronic Engineering a student must have at least Second Division or minimum GPA 2.5 in both SSC & HSC Examinations or A Level in three subjects with minimum GPA 2.5 and O-Level in five subjects with minimum GPA 2.5, in the scale of A = 5, B = 4, C = 3, D = 2, & E = 1 (More than one 'E' will not be accepted). In addition, the student must have Physics, Chemistry and Mathematics in SSC/O-Level and HSC/A-level.

For Diploma Engineers with minimum Second division or minimum GPA 2.5, maximum 21 credits can be waived for Diploma Engineers as per UGC requirement.

Semester Duration and Credit definition

- **4-Years Program:**

B.Sc. in Electrical and Electronic Engineering (EEE) is a 4 years program consisting of 12 semesters. There are 3 trimesters in each academic year namely Spring (January to April), Summer (May to August) and Fall (September to December).

- **Trimester system:**

Each trimester consists of 16 weeks of which there are a minimum of 13 weeks class and rest of the weeks are reserved for examinations and other academic purposes.

- **Credit hour definition and class duration of theory courses:**

For theory courses, 1 credit represents 1 hour actual lecture time per week which results minimum 13-hours of actual class time per trimester. Minimum duration of each theory class is 1.5 hour.

- **Credit hour definition and class duration of lab courses:**

For lab courses, 1 credit represents 2 hours actual lab works per week which results minimum 26-hours of actual lab works per trimester. Minimum duration of each lab class is 2 hours.

Meaning of Course Code & Number

Each Course has a relevant course code with a four digit number. First and third digit of the number usually represents year and Semester respectively.

EEE - Electrical and Electronic Engineering Course

CSE – Computer Science and Engineering Course

ENG - English Course

PHY – Physics Course

BDS – Bangladesh Studies Course

ACT – Accounting Course

SOC – Social Science Course

ECO – Economics Course

MGT – Management Course

CHEM – Chemistry Course

MATH - Mathematics Course

MEC- Mechanical Engineering Course

For courses of EEE, code number is kept between 1011 and 4039. Other courses such as (ENG, CSE, MATH, CHEM, PHY, STAT, MEC etc.) also have relevant course code.

Degree Requirements

At least 144 credit hours must be earned to be eligible for graduation, and this must include the specified core courses and pre specified Non-credit courses. The minimum CGPA requirement for obtaining a Bachelor degree in engineering is 2.5. The following table shows detailed degree requirement for the program.

Bachelor of Science in Electrical and Electronic Engineering (EEE)

Curriculum Requirement

SL #	Description	No. of Course(s)	Total Credits
1	English Language	2	6
2	General Education	5	15
3	Basic Sciences (Theory)	2	6
4	Basic Sciences (Lab)	1	1
5	Mathematics & Statistics	5	15
6	Interdisciplinary Engineering Courses	1	3
7	Interdisciplinary Engineering Courses Lab	2	2
8	Core Courses (Theory)	19	57
9	Core Courses (Lab)	12	12
10	Research Methodology	1	3
11	Project/Internship	1	3
12	Major Elective Courses (Theory)	4	12
13	Major Elective Courses (Lab)	2	2
14	Minor Elective Courses (Theory)	2	6
15	Minor Elective Courses (Lab)	1	1
	Total:	60	144

Evaluation Process

Distribution of marks for each theory and lab course is given below:

Theory Course:

Class Attendance	05 marks
Assignment	20 marks
Exam One	25 marks
Exam Two	25 marks
Final Examination	25 marks
Total	100 marks

Lab Course:

Lab Attendance	10 marks
Assignment (Lab report)	20 marks
Lab Performance	10 marks
Term Final Examination (Experiment)	40 marks
Viva Voce	20 marks
Total	100%

Grading System

The total performance of a student in a given course is based on a scheme of continuous assessment. For theory courses this continuous assessment is made through a set of quizzes, class evaluation, midterm examination, homework and a term final examination. The assessment in laboratory/sessional courses is made through practical work during the class, lab report, exam and viva-voce.

Each course has a certain number of credits, which describes its corresponding weights. A letter grade with a specified number of grade points is awarded for each course for which a student is registered. The performance of a student is measured by both the number of credits completed satisfactorily and the weighted average of the grade point earned.

Letter grades and corresponding grade points will be awarded in accordance to the provisions shown below as prescribed by UGC.

Grade	Grade Points	Numerical Markings
A+	4.0	80% and above
A	3.75	75% to 79%
A-	3.50	70% to 74%
B+	3.25	65% to 69%
B	3.0	60% to 64%
B-	2.75	55% to 59%
C+	2.50	50% to 54%
C	2.25	45% to 49%
D	2.0	40% to 44%
F	0.00	Below 40%
I	-	Incomplete
S	-	Satisfactory (non credit courses)
U	-	Unsatisfactory (non credit courses)

Category of Courses

1. ENGLISH LANGUAGE:			2×3 = 6 Credits
Course Code	Course Title	Credits	Prerequisite(s)
ENG1001	Basic Composition	Non-Credit	Nil
ENG1002	Intermediate Composition	3	ENG-1001
ENG1021	English for Engineers	3	ENG-1002

2. GENERAL EDUCATION: (Any 5 Course)			5×3 = 15 Credits
Course Code	Course Title	Credits	Prerequisite(s)
BDS1011	Bangladesh Studies	3	Nil
ACT1021	Introduction to Accounting	3	Nil
SOC1031	Introduction to Sociology	3	Nil
MGT2011	Introduction to Business & Management	3	Nil
ECO2021	Principle of Economics	3	Nil
SOC2031	Engineering Ethics	3	Nil

3. BASIC SCIENCES			(2×3) Credits Theory + (1×1) Credits Lab = 07 Credits
Course Code	Course Title	Credits	Prerequisite(s)
PHY1031	Advanced Physics	3	Nil
PHY1034	Physics Lab (Based on Basic Physics)	1	Nil
CHEM1031	Chemistry	3	Nil

4. MATHEMATICS & STATISTICS			5×3 = 15 Credits
Course Code	Course Title	Credits	Prerequisite(s)
MATH1034	Differential & Integral Calculus	3	Nil
MATH1035	Ordinary Differential Equations and Partial Differential Equation	3	MATH-1034
MATH2014	Complex Variables and Transforms	3	MATH-1035
MATH2015	Linear Algebra & Vector Analysis	3	MATH-2014
STAT2012	Statistical Methods and Probability	3	Nil

5. INTERDISCIPLINARY ENGINEERING COURSES			(1×3)Theory +(2×1)Lab= 5 Credits
Course Code	Course Title	Credits	Prerequisite(s)
CSE1032	Numerical Methods	1	MATH 1024, CSE1011
MEC1001	Engineering Drawing	1	Nil
MEC2011	Mechanical Engineering Fundamentals	3	PHY-1031

6. CORE COURSS: (19×3) Credits Theory + (12×1) Credits lab + 6 Credits Project & Thesis = 75 Credits			
Course Code	Course Title	Credits	Prerequisite(s)
CSE1011	Programming Language I (C)	3	Nil
CSE1012	Programming Language I (C) Lab	1	Nil
CSE3013	Microprocessor Design & Assembly Language Programming	3	EEE2013, EEE2014
CSE3014	Microprocessor Design & Assembly Language Programming Lab	1	EEE2013, EEE2014
EEE1021	Electrical Circuits I	3	Nil
EEE1031	Electrical Circuits II	3	EEE-1021
EEE1032	Electrical Circuits Lab	1	EEE-1021, EEE-1031
EEE2011	Electronic Devices I	3	EEE-1031, EEE-1032
EEE2012	Electronic Devices I Lab	1	EEE-1031, EEE-1032
EEE2013	Digital Electronics	3	EEE-2011
EEE2014	Digital Electronics Lab	1	EEE-2011
EEE2043	Electronic Devices II	3	EEE-2011
EEE2044	Electronic Devices II Lab	1	EEE-2011
EEE2046	Circuit Simulation Lab	1	EEE-2043, EEE-2044
EEE2023	Analog & Digital Communication	3	MATH-2014, EEE-2011
EEE2031	Power System-I	3	EEE-2037, EEE-2038
EEE2032	Power System-I Lab	1	EEE-2037, EEE-2038
EEE2035	Energy Conversion-I	3	EEE-1031
EEE2037	Energy Conversion-II	3	EEE-2035
EEE2038	Energy Conversion Lab	1	EEE-2035, EEE-2037
EEE3015	Engineering Electromagnetic	3	PHY-1031, MATH-2015
EEE3021	Signals and Systems	3	MATH2014, EEE-1031
EEE 3027	Electrical Properties of Materials	3	PHY1031 EEE2011, MATH 2015
EEE3025	Semiconductor Devices	3	EEE-2043, PHY 1031, STAT-2012
EEE4000	Research Methodology	3	After completion of 120 credit hours
EEE4055/EEE 4056	Project/Internship	3	EEE4000
EEE-4011	Control System	3	MATH-2015, EEE-2037, EEE-2038
EEE-4013	Digital Signal Processing	3	EEE-3021
EEE-4014	Digital Signal Processing Lab	1	EEE-3021
EEE-4017	Power Plant Engineering	3	EEE-2031
EEE-4021	Microwave Engineering	3	EEE-3015
ETE-4026	Communication Engineering Lab	1	EEE-4021
EEE2042	Electrical Services Design	1	EEE1031

7. Area of Concentration

Following two groups represent the subjects of two major fields. One needs to take four courses with two associated labs from the group of chosen major field and two courses with one associated lab from other group as minor.

(14 Credits (4×3 + 2×1) from major group and 7 credits (2×3 + 1×1) from minor groups)

GROUP-1: Electronics and Communication Group (Any three courses with two associated Lab)

7.1 ELECTRONICS and COMMUNICATION GROUP: (3×3) Credits Theory + (2×1) Credits Lab = 11 Credits			
Course Code	Course Title	Credits	Prerequisite(s)
EEE 2025	Measurement & Instrumentation	3	EEE 2011
EEE 2026	Measurement & Instrumentation Lab	1	EEE 2011
ICE3035	Data Communication and Networking	3	ICE2015
EEE 3029	Semiconductor Processing and Fabrication Technology	3	EEE 2043, EEE 2044,
EEE-3031	Telecommunication Engineering	3	EEE-2023, EEE3021,
EEE 3035	Optoelectronic Devices	3	EEE 2011, EEE2043
EEE-3037	Mobile Communication	3	EEE-2023
EEE-3039	Satellite Communication	3	EEE-2023
EEE-4023	Optical Fiber Communication	3	EEE-2023
EEE-4024	Optical Fiber Communication Lab	1	EEE-2023
EEE 4025	VLSI Design	3	EEE 2013, EEE 2043
EEE 4026	VLSI Design Lab	1	EEE 2013, EEE 2043
EEE 4027	Robotics	3	EEE 4011
EEE 4029	Biomedical Engineering	3	EEE 4013, EEE 4014

GROUP-2: Power Group (Any three courses with two associated Lab)

7.2 POWER GROUP: (3×3) Credits Theory + (2×1) Credits Lab = 11 Credits			
Course Code	Course Title	Credits	Prerequisite(s)
EEE 2033	Power System-II	3	EEE 2031, EEE 2032
EEE 3011	Power Electronics and drives	3	EEE 2043, EEE 2044
EEE 3012	Power Electronics and drives Lab	1	EEE 2043, EEE 2044
EEE 3017	Power System Operation and Control	3	EEE 2031, EEE 2032
EEE 3018	Power System Operation and Control Lab	1	EEE 2031, EEE 2032
EEE 3023	Power System protection	3	EEE 2031, EEE 2032
EEE 3024	Power System protection Lab	1	EEE 2031, EEE 2032
EEE 4019	Renewable Energy	3	EEE 2037, EEE 2038
EEE 4033	High Voltage Engineering	3	EEE 2037, EEE 2038

Semester view of Courses (EEE)

Semester 1

SI No.	Course Code	Course Title	Prerequisite(s)	Credit(s)
1	ENG 1001	Basic Composition	Nil	0
2	BDS 1011	Bangladesh Studies	Nil	3
1	CHEM 1031	Chemistry	Nil	3
4	MATH 1034	Differential & Integral Calculus	Nil	3
5	SOC-2031	Engineering Ethics	Nil	3
Subtotal:				12

Semester 2

SI No.	Course Code	Course Title	Prerequisite(s)	Credit(s)
1	ENG 1002	Intermediate Composition	ENG 1001	3
2	PHY 1031	Advanced Physics	Nil	3
3	PHY 1034 ^[1]	Physics Lab	Nil	1
4	MATH 1035	Ordinary Differential Equations and Partial Differential Equation	MATH 1034	3
5	EEE 1021	Electrical Circuits I	Nil	3
Subtotal:				13

[1]-PHY-1031 & PHY-1034 may be allowed to take in the same semester

Semester 3

SI No.	Course Code	Course Title	Prerequisite(s)	Credit(s)
1	CSE 1011	Programming Language I (C)	Nil	3
2	CSE 1012	Programming Language I (C) Lab	Nil	1
3	MATH 2014	Complex Variables and Transforms (Laplace & Fourier)	MATH 1035	3
4	EEE 1031	Electrical Circuits II	EEE 1021	3
5	EEE 1032 ^[2]	Electrical Circuits II Lab	EEE 1021, EEE 1031	1
6	MEC 1001	Engineering Drawing	Nil	1
Subtotal:				12

[2]-EEE-1031 & EEE-1032 may be allowed to take in the same semester

Semester 4

SI No.	Course Code	Course Title	Prerequisite(s)	Credit(s)
1	CSE 1031	Numerical Methods	CSE1011, MATH1034	1
2	MATH 2015	Linear Algebra	MATH 2014	3
3	ECO-2021	Principle of Economics	Nil	3
4	EEE 2011	Electronic Devices and Circuits I	EEE 1031, EEE 1032	3
5	EEE 2012	Electronic Devices and Circuits I Lab	EEE 1031, EEE 1032	1
6	ENG 1021	English for Engineers	ENG 1002	3
Subtotal:				14

Semester 5

SI No.	Course Code	Course Title	Prerequisite(s)	Credit(s)
1	MEC-2011	Mechanical Engineering Fundamentals	PHY 1031	3
2	STAT 2012	Statistical Methods and Probability	Nil	3
3	EEE 2043	Electronic Devices and Circuits-II	EEE 2011	3
4	EEE 2044 ^[3]	Electronic Devices and Circuits II Lab	EEE 2011, EEE 2021	1
5	MGT 2011	Introduction to Business & Management	Nil	3
Subtotal:				13

[3]-EEE-2043 & EEE-2044 may be allowed to take in the same semester

Semester 6

SI No.	Course Code	Course Title	Prerequisite(s)	Credit(s)
1	EEE 3021	Signals & Systems	MATH2014, EEE 1031	3
2	EEE 2023	Analog & Digital Communication	EEE 2011, MATH 2014	3
3	EEE 2013	Digital Electronics	EEE 2011	3
4	EEE 2014	Digital Electronics Lab	EEE 2011	1
5	EEE 2035	Energy Conversion-I	EEE 1031	3
Subtotal:				13

Semester 7

SI No.	Course Code	Course Title	Prerequisite(s)	Credit(s)
1	EEE2042	Electrical Service Design	EEE 1031	1
2	EEE 3025	Semiconductor Devices	EEE 2043	3
3	CSE3013	Microprocessor Design & Assembly Language Programming	EEE2013, EEE2014	3
4	CSE3014	Microprocessor Design & Assembly Language Programming Lab	EEE2013, EEE2014	1
5	EEE 2037	Energy Conversion-II	EEE 2035	3
6	EEE 2038 ^[4]	Energy Conversion Lab	EEE 2035, EEE 2037	1
Subtotal:				12

[4]-EEE-2037 & EEE-2038 may be allowed to take in the same semester

Semester 8

SI No.	Course Code	Course Title	Prerequisite(s)	Credit(s)
1	EEE 2031	Power System-I	EEE 2037 EEE 2038	3
2	EEE 2032	Power System-I Lab	EEE 2037 EEE 2038	1
3	EEE 3015	Engineering Electromagnetic	PHY 1031, MATH 2015	3
2	EEE 3027	Electrical Properties of Material	EEE 2043	3
5	**Elective I	Any Lab included course from major group		3
6	**Elective I Lab	Associated Lab		1
Subtotal:				14

Semester 9

SI No.	Course Code	Course Title	Prerequisite(s)	Credit(s)
1	**Elective II	Any Lab included course from major group		3
2	**Elective-II Lab	Associated Lab		1
3	EEE 4013	Digital Signal Processing	EEE 3021	3
4	EEE 4014	Digital Signal Processing Lab	EEE 3021	1
4	EEE 4021	Microwave Engineering	EEE 3015	3
6	**Elective III	Any course from major group		3
Subtotal:				14

Semester 10

SI No.	Course Code	Course Title	Prerequisite(s)	Credit(s)
1	ACT 1021	Introduction to Accounting	Nil	3
2	EEE 4011	Control System	MATH-2015, EEE-2037, EEE-2038	3
3	EEE 2046	Circuit Simulation Lab	EEE 2043, EEE 2044	1
5	EEE 4017	Power Plant Engineering	EEE 2031	3
5	ETE 4026	Communication Engineering Lab	EEE 4021	1
6	**Elective V	Any course from minor group		3
Subtotal:				14

Semester 11

SI No.	Course Code	Course Title	Prerequisite(s)	Credit(s)
1	EEE 4000	Research Methodology	After completion of 120 credit hours	3
2	**Elective IV	Any course from major group		3
3	**Elective VI Lab	Associated Lab		1
4	**Elective VI	Any Lab associated course from minor group		3
Subtotal:				10

Semester 12

SI No.	Course Code	Course Title	Prerequisite(s)	Credit(s)
1	EEE 4055/ EEE 4056	Project/ Internship	EEE4000	3
Subtotal:				3

** Any course selected from the list of Elective Courses as major or minor.

*** Project can be taken by a group of maximum three students and Thesis must be taken by single student with higher grade of GPA.

GROUP-1: Electronics and Communication Group (Any four courses of which two courses must include Lab if this group is a major group/ any two courses of which one course must include lab if this group is a minor group)

ELECTRONICS and COMMUNICATION GROUP: For Major group: (4×3) Credits Theory + (2×1) Credits Lab = 14 Credits/ For Minor group: (2×3) Credits Theory + (1×1) Credits Lab = 7 Credits			
Course Code	Course Title	Credits	Prerequisite(s)
EEE 2025	Measurement & Instrumentation	3	EEE 2011
EEE 2026	Measurement & Instrumentation Lab	1	EEE 2011
ICE3035	Data Communication and Networking	3	ICE2015
EEE 3029	Semiconductor Processing and Fabrication Technology	3	EEE 2043, EEE 2044,
EEE-3031	Telecommunication Engineering	3	EEE-2023, EEE3021,
EEE 3035	Optoelectronic Devices	3	EEE 2011, EEE2043
EEE-3037	Mobile Communication	3	EEE-2023
EEE-3039	Satellite Communication	3	EEE-2023
EEE-4023	Optical Fiber Communication	3	EEE-2023
EEE-4024	Optical Fiber Communication Lab	1	EEE-2023
EEE 4025	VLSI Design	3	EEE 2013, EEE 2043
EEE 4026	VLSI Design Lab	1	EEE 2013, EEE 2043
EEE 4027	Robotics	3	EEE 4011
EEE 4029	Biomedical Signals and Systems	3	EEE 4013, EEE 4014

GROUP-2: Power Group (Any four courses of which two courses must include Lab if this group is a major group/ any two courses of which one course must include lab if this group is a minor group)

POWER GROUP: For Major group: (4×3) Credits Theory + (2×1) Credits Lab = 14 Credits/ For Minor group: (2×3) Credits Theory + (1×1) Credits Lab = 7 Credits			
Course Code	Course Title	Credits	Prerequisite(s)
EEE 2033	Power System-II	3	EEE 2031, EEE 2032
EEE 3011	Power Electronics and drives	3	EEE 2043, EEE 2044
EEE 3012	Power Electronics and drives Lab	1	EEE 2043, EEE 2044
EEE 3017	Power System Operation and Control	3	EEE 2031, EEE 2032
EEE 3018	Power System Operation and Control Lab	1	EEE 2031, EEE 2032
EEE 3023	Power System protection	3	EEE 2031, EEE 2032
EEE 3024	Power System protection Lab	1	EEE 2031, EEE 2032
EEE 4019	Renewable Energy	3	EEE 2037, EEE 2038
EEE 4033	High Voltage Engineering	3	EEE 2037, EEE 2038

**Detailed Syllabus
of
B.Sc. in Electrical and Electronic Engineering (EEE)**

ENGLISH LANGUAGE

ENG 1001: BASIC COMPOSITION

CREDITS: 3 CREDITS

PREREQUISITE(S): Nil

TOPICS:

General discussion: Introduction, various approaches to learning English.

Grammar: Tense, Right form of verbs, Voice, Narration, article, preposition, subject-verb agreement, clause, conditional and sentence structure, Transformation of Sentences.

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

Reading Skill: Discussion readability, scan and skin reading, generating ideas through purposive reading, reading of selected stories

Writing Skill: Principles of effective writing; Organization, planning and development of writing; Composition, précis writing, amplification

General strategies for the writing process: Generating ideas, identifying audiences and purposes, construction arguments, stating problems, drafting and finalizing

Listening Skill: The phonemic systems and correct English pronunciation

Speaking Skill: Practicing dialogue; Story telling; Oral skills including communicative expressions for personal identification, life at home, giving advice and opinion, instruction and directions, requests, complains, apologies, describing people and places, narrating events.

RECOMMENDED BOOK(S):

1. [Text] A Practical English Grammar - A. J. Thomson V. Martinet
2. [Ref 1] How to Write Reports and Proposals - Patrick Forsyth

ENG 1002: INTERMEDIATE COMPOSITION

CREDITS: 3 CREDITS

PREREQUISITE(S): ENG 1001

TOPICS:

Grammar: Modals, Conditionals, Phrasal verbs, Transitional words,

Guided Writing: Comprehension.

Creative Writing: Essay-Cause & Effect, Compare & Contrast types.

Assignment: Project work & Demonstration (Posters)

RECOMMENDED BOOK(S):

- 1 [Text] Intermediate Composition Study Pack, Dept. of English, Southeast University
2. [Text] English Skills with Readings, Sixth Edition- John Langan

ENG 1021: ENGLISH FOR ENGINEERS

CREDITS: 3 CREDITS

PREREQUISITE(S): ENG 1002

TOPICS:

Discussion on common terms related to Electronics, Electricity, Communication Engineering and Computer system, Report writing, Formal presentation, Business Communication, Dialogue writing, Technology based essay writing.

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

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

Effective oral presentation: Academic Presentations, preparation and styles of presentation.

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

RECOMMENDED BOOK(S):

1. [Text] A Practical English Grammar - A. J. Thomson V. Martinet
2. [Ref 1] How to Write Reports and Proposals - Patrick Forsyth

GENERAL EDUCATION COURSES

BDS 1011: BANGLADESH STUDIES

CREDITS: 3 CREDITS

PREREQUISITE(S): Nil

TOPICS:

History, geography, topology, demographic data, natural resources, cultural values, customs, natural disasters, economic statistics and facts of Bangladesh

RECOMMENDED BOOK(S):

1. [Ref 1] Banglapedia: National encyclopedia of Bangladesh – Sirajul Islam
2. [Ref 2] Of Blood and Fire: The untold story of Bangladesh's War of Independence – Jahanara Imam

ACT-1021: INTRODUCTION TO ACCOUNTING

CREDITS: 3 CREDITS

PREREQUISITE(S): Nil

TOPICS:

Financial Accounting: Objectives and importance of accounting, accounting as an information system, computerized systems and applications in accounting, recording system – double entry mechanism, accounts and their classification, accounting equation, accounting cycle, journal, ledger, trial balance, preparation of financial statements considering adjusting and closing entries, accounting concepts and conventions.

Cost & Management Accounting: Cost concepts and classification, overhead cost – meaning and classification, distribution of overhead cost, overhead recovery method, job order costing, preparation of job cost sheet and quotation price, inventory valuation, absorption costing and marginal/variable costing technique, cost-volume-profit analysis, contribution-margin approach, sensitivity analysis. Short term investment decisions – relevant and differential cost analysis, long term investment decisions – capital budgeting, various techniques of evolution of capital investment

RECOMMENDED BOOK(S):

1. [Text] Accounting Principle – Weygandt, Kieso and Kimmel
2. [Ref 1] Accounting Theory – Ahmed Riahi Belkaoui
3. [Ref 2] Fundamentals of Accounting Principles – Pyle and Larson

SOC 1031: INTRODUCTION TO SOCIOLOGY

CREDITS: 3 CREDITS

PREREQUISITE(S): Nil

TOPICS:

Introduction: Society, Science and Technology- an overview; Scientific Study of Society; Social Elements, Society, Community, Association and Institution; Mode of Production and Society Industrial Revolution, Development of Capitalism.

Culture and Socialization: Culture; Elements of Culture; Technology and Culture; Cultural Lag; Socialization and Personality; Family; Crime and Deviance; Social Control. Technology, Society and Development; Industrialization and Development; Development and Dependency Theory; Sustainable Development; Development and Foreign Borrowing; Technology Transfer and Globalization, Modernity and Environment; Problem and Prospects

Pre-industrial, Industrial and Post-industrial Society: Common Features of Industrial Society; Development and Types of Social Inequality in Industrial Society; Poverty, Technology and Society; Social Stratification and Social Mobility; Rural and Urban Life, and their Evaluation.

Population and Society: Society and Population; Fertility. Mortality and Migration; Science, Technology and Human Migration; Theories of Population Growth-Demographic Transition Theory, Malthusian Population Theory; Optimum Population Theory; Population Policy

RECOMMENDED BOOK(S):

1. [Text] Introduction to Sociology (Paperback)- Anthony Giddens, Mitchell Duneier
2. [Ref 1] Introduction to Sociology - Henry L. Tischler

MGT 2011: INTRODUCTION TO BUSINESS AND MANAGEMENT

CREDITS: 3 CREDITS

PREREQUISITE(S): Nil

TOPICS:

Concepts of Business, its components, classifications, importance, national and international business, group dynamics and leadership in business and non-businesses organizations.

Introduction to the components of management in information system and their integration for managerial control and decision support. Principle and process of management, types of management, Management in Engineering.

RECOMMENDED BOOK(S):

1. [Text] Introduction to Business - Jeff Madura
2. [Ref 1] Enterprise Planning and Development: small business and enterprise start-up survival and growth - David Butler
3. [Ref 2] Management Information system: An organizational perspective-D. Bodly, A. Boonstra & G. Kennedy.

ECO 2021: PRINCIPLE OF ECONOMICS

CREDITS: 3 CREDITS

PREREQUISITE(S): Nil

TOPICS:

Definition of economics, economics and engineering, principles of economics. Introduction to various economic systems – capitalist, command and mixed economy, fundamental economic problems and mechanisms through which these problems can be solved, theory of demand and supply and their elasticities, theory of consumer behavior, cardinal and ordinal approaches of utility analysis, price determination, nature of an economic theory, applicability of economic theories to the problems of developing countries, indifference curve techniques, theory of production, production function, types of productivity, rational region of production of an engineering firm, concepts of market and market structure, cost analysis and cost function, small and large scale production, optimization, theory of distribution, use of derivatives in economics, maximization and minimization of economic functions, relationship among total, marginal and average concepts. Micro-Economics: Savings, investment, employment, national income analysis, inflation, monetary policy, fiscal policy and trade policy with reference to Bangladesh, economics and development and planning.

RECOMMENDED BOOK(S):

1. [Text] Economics - Samuelson, P.
2. [Ref 1] Principles of Economics - Lipsey, R. G.
3. [Ref 2] Macroeconomics - Darnbusch, R.

SOC 2031: ENGINEERING ETHICS

CREDITS: 3 CREDITS

PREREQUISITE(S): Nil

TOPICS:

Definition and scopes of Ethics, Different branches of Ethics, Social change and the emergence of new technologies, History and development of Engineering Ethics, Science and Technology- necessity and application, Study of Ethics in Engineering. Applied Ethics in engineering

Human qualities of an engineer, Obligation of an engineer to the clients, Attitude of an engineer to other engineers, Measures to be taken in order to improve the quality of engineering profession

Ethical Expectations: Employers and Employees; inter-professional relationship: Professional Organization- maintaining a commitment of Ethical standards. Desired characteristics of a professional code, Institutionalization of Ethical conduct

RECOMMENDED BOOK(S):

1. [Text] Engineering Ethics - M. Govindarajan
2. [Ref 1] Ethics in Engineering Practice and Research - Caroline Whitbeck

BASIC SCIENCES

PHY 1031: ADVANCED PHYSICS

CREDITS: 3 CREDITS

PREREQUISITE(S): Nil

TOPICS:

Particle Properties of Waves: Electromagnetic wave, Blackbody Radiation, Photoelectric effect, What is Light, X-Rays, X-Ray Diffraction, Compton Effect, Pair Production, Photons and Gravity.

Wave Properties of Particles: De Broglie Waves, Describing a Wave, Phase and Group Velocities, Particle Diffraction, Particle in a Box, Uncertainty Principle-1 & 2.

Atomic Structure: Nuclear Atom, Electric Orbits, Atomic Spectra, Bohr Atom, Energy Levels and Spectra.

Quantum Mechanics: Quantum Mechanics, The Wave Equation, Schrodinger's Equation-Time Dependent Form, Expectation Values, Schrodinger's Equation: Steady-state Form, Particle in a Box, Finite Potential Well, Tunnel Effect, Harmonic Oscillator.

Nuclear Structure: Nuclear Composition, Some Nuclear properties, Stable Nuclei, Binding energy, Liquid Drop Model, Shell Model, Meson Theory of Nuclear forces.

Nuclear Transformation: Radio Active decay, half life, Radioactive series, Alpha decay, Beta decay, Gamma decay, nuclear Reactions, Nuclear Fission, Nuclear reactors

Thermodynamics: Heat and work- the first law of thermodynamics and its applications; Kinetic Theory of gases- Kinetic interpretation of temperature, specific heats of ideal gases, equipartition of energy, mean free path, Maxwell's distribution of molecular speeds, reversible and irreversible processes, Carnot's cycle, second law thermodynamics, Carnot's theorem, entropy, Thermodynamic functions, Maxwell relations, Clausius and Clapeyron equation.

RECOMMENDED BOOK(S):

1. [Text] Concepts of Modern Physics – Arthur Beiser
2. [Ref 2] Properties of Matters - Brijlal & Subrahmanyam
3. [Ref 3] Heat & Thermodynamics - Brijlal & Subrahmanyam

PHY 1034: PHYSICS LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): NIL

TOPICS: Laboratory Work based on Basic Physics

CHEM 1031: CHEMISTRY

CREDITS: 3 CREDITS

PREREQUISITE(S): Nil

TOPICS:

Atomic Structure, quantum numbers, electronic configuration, periodic table, Properties and uses of noble gases, Different types of chemical bonds and their properties. Molecular structures of compounds, Selective organic reactions

Different types of solutions and their compositions. Phase rule, phase diagram of monocomponent system. Properties of dilute solutions, Thermo Chemistry, chemical kinetics, chemical equilibria, Ionization of water and pH concept, Electrical properties of solution

RECOMMENDED BOOK(S):

1. [Text] Essentials of Physical Chemistry – Bhal, Arun and G.D. Tuli.
2. [Ref 1] A Textbook of Physical Chemistry – K. L. Kapoor.
3. [Ref 2] A Textbook of Physical Chemistry – A. S. negi, S.C. Anand.

MATHEMATICS AND STATISTICS

MATH 1034: DIFFERENTIAL AND INTEGRAL CALCULUS

CREDITS: 3 Credits

PREREQUISITE(S): Nil

TOPICS:

Differential Calculus: Limits, continuity and differentiability, successive differentiation of various types of functions, Leibnitz's theorem, Mean-value theorem in finite and infinite forms, Lagrange's form of remainders, Cauchy's form of remainder, expansion of functions, evaluation of indeterminate forms by L'Hospital's rule, partial differentiation, Tangent and Normal, Subtangent and Subnormal in Cartesian and Polar coordinates, maximum and minimum values of functions of single variable, points of inflexion, curvature – radius of curvature, centre of curvature, asymptotes, curve tracing.

Integral Calculus: Definitions of Integration, integrations by methods of substitutions, integration by parts, standard integrals, integration by the method of successive reduction, definite integrals and its properties and use in summing series, Walli's formula, Improper integrals, Beta function & Gamma function, area under a plane curve in Cartesian and polar coordinates, area of the region enclosed by two curves in Cartesian and Polar coordinates: Arc lengths of curves in Cartesian and Polar coordinates, parametric and pedal equations, intrinsic equations, volume of solids of revolutions, volume of hollow solids of revolution by shell method, area of surface of revolution, Jacobian, multiple integrals and its applications.

RECOMMENDED BOOK(S):

1. [Text] Calculus: A New Horizon - Anton, H.
2. [Ref 1] Integral Calculus - Das, B. C. & Mukherjee, B. N.
3. [Ref 2] Differential Calculus - Das, B. C. & Mukherjee, B. N.

MATH 1035: ORDINARY DIFFERENTIAL EQUATIONS & PARTIAL DIFFERENTIAL EQUATIONS

CREDITS: 3 Credits

PREREQUISITE(S): MATH 1034

TOPICS:

ODE: Degree and order of ordinary differential equations: formation of differential equations, solution of first order differential equations by various methods, solution of first order higher degree ordinary differential equations, solution of general linear equations of second and higher orders with constant coefficients, solution of homogeneous linear equations and its applications, solution of differential equations of higher order when dependent and independent variables are absent, solution of differential equations by the method of factorization of operators.

PDE: Four rules for solving simultaneous equations, Lagrange's method of solving PDE of order one. Integral surfaces passing through a given curve, non-linear PDE of

order one (complete, particular, singular and general integrals). Standard forms, Charpit's method, second order PDE, its nomenclature and classification to canonical, parabolic, elliptic, hyperbolic, solution by separation of variables, linear PDE with constant coefficients.

RECOMMENDED BOOK(S):

1. [Text] Differential Equations - Sharma, B.
2. [Ref 1] An Elementary Treatise on differential Equations and their Applications - Piaggio, H. T

MATH 2014: COMPLEX VARIABLES AND TRANSFORMS (LAPLACE AND FOURIER)

CREDITS: 3 Credits

PREREQUISITE(S): MATH 1035

TOPICS:

Complex Variables: complex number system, general function of a complex variable, limits and continuity of a function of a complex variable and related theorems, complex differentiation, the Cauchy-Riemann equation, mapping by elementary functions, line integral of a complex function, Cauchy's Integral Theorem and formula, Liouville's theorem, Taylor's theorem, Laurent's theorem, Singular points, Residue, Cauchy's Residue Theorem, evaluation of Residues, Contour integration, conformal mapping.

Laplace Transforms: Laplace transforms of some elementary functions, sufficient conditions for existence of Laplace Transforms, inverse Laplace transforms, Laplace transforms of derivatives, the unit step function, periodic function, some special theorems on Laplace transforms, partial fractions, solutions of differential equations.

Fourier Transforms: Real and complex form of Fourier series, finite transforms, Fourier Integral, Fourier transforms and their uses in solving boundary value problems of wave equations.

RECOMMENDED BOOK(S):

1. [Text] Complex Variables and Applications - Brown, J. W.
2. [Ref 1] Schaum's Outline Series: Theory and Problems of Complex Variables - Spiegel, M. R.
3. [Ref 2] Schaum's Outline Series: Theory and Problems of Laplace Transforms - Spiegel, M. R.
4. [Ref 3] Schaum's Outline of Fourier Analysis with Applications to Boundary Value Problems - Spiegel, M. R.

MATH 2015: LINEAR ALGEBRA AND VECTOR ANALYSIS

CREDITS: 3 Credits

PREREQUISITE(S): MATH 2014

TOPICS:

System of linear equations (homogeneous and nonhomogeneous) and their solutions. Applications of system linear equations in real life problems.

Definition and properties of vector space, subspaces, Linear combination of vectors, Linear dependence and independence of vectors, basis and dimension, linear transformations, kernel and image of a linear transformation(LT), definition and properties, linear operator matrix, matrix representation of linear transformations, change of basis, Eigenvalues and eigenvectors, Diagonalization, Cayley-Hamilton theorem and its application.

Vectors in plane and space, equality of vectors, addition and subtraction of vectors, scalar vector product of two vectors

Triple scalar product. Applications of vectors to geometry (vector equation of straight lines, planes, areas and volumes)

RECOMMENDED BOOK(S):

1. [Text] Elementary Linear Algebra - Anton, H. & Rorres, C.
2. [Ref 1] Linear Algebra - Hadley, G.
3. [Ref 3] Theory and Problems of Statistics - Ayres, F.
4. [Ref 5] Schaum's Outline of Linear Algebra - Lipschutz, S.

STAT 2012: STATISTICAL METHODS AND PROBABILITY

CREDITS: 3 Credits

PREREQUISITE(S): Nil

TOPICS:

Data and variables, central tendency, dispersion, skewness, kurtosis, probability, random variables, probability distributions, mathematical expectation and moment generating functions, joint & marginal distributions, stochastic independence, central limit theorem, concepts of Sampling & its various methods, design of an experiment & analysis of variance, concepts of estimation, methods of estimation, hypothesis testing & inference. Concepts of Sample Survey & its various methods- S.R.S; St.R.S. Systematic Sampling & Multi stage Sampling. Analysis of variance- One way, Two way & Three way Classification. Design of an experiment-CRD, RBD,LSD & Fractorial Experiment. Concepts of estimation- Criteria of a good estimator, Point estimation- Method of Moment, Least square, MLE, Min. Chai-square & Bayes Estimator. Interval Estimation-Confidence Interval, Feducial interval. Large & small Sample Test of significance & Hypothesis Testing. Non-Parametric Test.

RECOMMENDED BOOK(S):

1. [Text] Introduction to Statistics and Probability - Islam, M. N.
2. [Ref 1] Schaum's Outline Series of Statistics - Spiegel, M. R. & Stephens, L. J.

3. [Ref 2] Mathematical Statistics - Saxena, H. C. & Kapoor, V. K.
4. [Ref 3] Fundamentals of Statistics - Gupata, M. K. & Kapoor, V. K.

INTERDISCIPLINARY ENGINEERING COURSES

CSE 1032: NUMERICAL METHODS

CREDITS: 1 CREDIT

PREREQUISITE(S): MATH1024, CSE 1011

TOPICS:

Representations of integers, floating-point numbers, arithmetic operations on big integers, errors and accuracy, propagation of errors, introduction to root-finding, bisection method, method of false position, Newton-Raphson method, Secant method, solving system of linear equations, Gaussian elimination, pitfalls of Gaussian elimination technique, techniques for improvement, computing determinants, forward and backward differences, divided differences, Taylor series, Newton's divided difference and interpolating polynomials, Lagrange's interpolating polynomials, Left endpoint, right endpoint, midpoint approximation, Trapezoidal rule, Simpson's 1/3 rule.

RECOMMENDED BOOK(S):

1. [Text] Numerical Methods for Engineers - S. C. Chapra and R. P. Canale
2. [Ref 1] Numerical Methods for Scientists and Engineers - R. Hamming.

MEC 1001: ENGINEERING DRAWING

CREDITS: 1 CREDIT

PREREQUISITE(S): Nil

TOPICS:

Course Objective: To equip the students with the basic knowledge and skills of engineering drawing and its application in practical scenario. The students will also be introduced to some popular commercial CAD packages.

Course Contents:

Types of line and usage, dimensioning, lettering, orthographic 1st angle projection, sheet planning, orthographic 3rd angle projection, introduction of computer aided drawing, isometric projection, sectional drawing and assembly drawing. The course consists of scale drawing only. Drawing sheets will be prepared on drawing board and using computer software. Electrical circuit drawing, Electrical and Electronics CAD's industrial wiring/drawing. Introduction to computer-aided design tools such as AutoCAD, OrCAD, and PCAD; computer-aided drafting principles and practices;

engineering drawing fundamentals using AutoCAD; drawing of electrical machinery and layouts of electronic assemblies; design and layout of circuit boards using software (PCAD or OrCAD)

RECOMMENDED BOOK(S):

1. Tutorial Guide to AutoCAD by Shawna Lockhart, Latest Edition, Prentice Hall.
2. Introduction to PSpice using OrCAD for Circuits and Electronics by Muhammad H. Rashid, Latest Edition, Prentice Hall.
3. First year Engineering Drawing by A.C Parkinson, Latest Edition.
4. Illustrated AutoCAD by T.W. Berghauser and P.L. Scrive, BPB, Latest Edition.
5. Mastering AutoCAD 2010.

MEC 2011: MECHANICAL ENGINEERING FUNDAMENTALS

CREDITS: 3 CREDITS

PREREQUISITE(S): PHY-1021

TOPICS:

Introduction to sources of energy: Steam generating units with accessories and mountings; steam turbines. Introduction to internal combustion engines and their cycles, gas turbines, Refrigeration and air conditioning: applications; refrigerants, different refrigeration methods, Fluid machinery: impulse and reaction turbines; centrifugal pumps, fans, blowers and compressors, Basics of conduction and convection: critical thickness of insulation. general layout and principles, steam turbine: construction & operation, gas turbine: construction and operation, combined cycle gas turbine.

RECOMMENDED BOOK(S):

1. [Text] Fundamentals of Mechanical Engineering --G. S. Sawhney
2. [Ref 1] Air Conditioning and Refrigeration – T. Hossain

CORE COURSES

CSE1011: PROGRAMMING LANGUAGE C/C++

CREDITS: 3 CREDITS

PREREQUISITE(S): Nil

TOPICS:

Introduction to computers, representation of data, input/output system, C character set, identifier and keyword, symbolic constants, operators and expressions, input/output functions in C, format strings, if-else statement, loops – for loop, while loop, do-while loop, solving different types of problems using loops such as drawing pyramid and other numeric patterns, functions – defining a function, how to call a function, function prototype, recursion, Storage class – global, local, static and

register variable, arrays – addressing in one dimensional array and two dimensional array, sorting – bubble and selection sort, pointers – pointer to pointer to integer, pointer arithmetic, array and pointer, passing address of a variable to a function, dynamic memory allocation, structures – introduction to structure.

RECOMMENDED BOOK(S):

1. [Text] Programming with C (Schaum's outline series) - B. S. Gottfried
2. [Ref 1] C Programming Language - Brian W. Kernighan and Dennis M. Ritchie
3. [Ref 2] Teach Yourself C - H. Schildt

CSE 1012: PROGRAMMING LANGUAGE – LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): Nil

TOPICS: Laboratory Work based on CSE1012

CSE 3013: MICROPROCESSOR SYSTEM DESIGN

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2013, EEE 2014

TOPICS:

Introduction to 8-bit, 16-bit, and 32-bit microprocessor – architecture, addressing modes, instruction set, interrupts, multi-tasking and virtual memory – memory interface, bus interface, arithmetic co-processor, Microcontrollers, integrating microprocessors with interfacing chips.

RECOMMENDED BOOK(S):

1. [Text] The Intel Microprocessors – Barry B. Brey
2. [Ref 1] Microprocessors and Microcomputers: Hardware and Software – Tocci and Ambrosio,
3. [Ref 2] Microcomputer Systems: 8086/8088 Family - Liu, Y. & Gibson, G. A.
4. [Ref 3] Microprocessor – Rafiquzzaman

EEE 3014: MICROPROCESSOR SYSTEM DESIGN LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 2013, EEE 2014

TOPICS: Laboratory Works based on CSE 3013

EEE 1021: ELECTRICAL CIRCUITS– I

CREDITS: 3 CREDITS

PREREQUISITE(S): Nil

TOPICS:

Units, DC sources, Resistance and Conductance, Ohm's law, Power and Energy, Series and parallel circuits, Series-Parallel Networks; Methods of analysis: Mesh

analysis, Node analysis and other methods of analysis; Kirchhoff's laws, Y-delta transformation; Circuit theorems: Superposition Theorem, Norton's Theorem, Thevenin's Theorem, Millman's Theorem Capacitors, Magnetic circuits, Inductors, R-C and R-L circuits with DC excitation.

RECOMMENDED BOOK(S):

1. [Text] Introductory Circuit Analysis - Boylestad R.L
2. [Ref 1] Fundamentals of Electric Circuits - Alexander & Sadiku

EEE 1031: ELECTRICAL CIRCUITS – II

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 1021

TOPICS:

Alternating current - AC quantities, Sinusoidal alternating waveforms, Phasors, AC circuit analysis - RC, RL, RLC series and parallel circuits, Series-parallel ac networks, Power and power factors, Network theorems, Dependent sources, Resonance and Q-factors, Poly-phase systems – balanced and unbalanced, Coupled circuits, introduction to filters.

RECOMMENDED BOOK(S):

1. [Text] Introductory Circuit Analysis - Boylestad R.L
2. [Ref 1] Fundamentals of Electric Circuits - Alexander & Sadiku

EEE 1032: ELECTRICAL CIRCUITS LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE-1021,EEE-1031

TOPICS: Laboratory Works based on EEE-1021

EEE 2011: ELECTRONIC DEVICES-I

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 1031, EEE 1032

TOPICS:

Introduction to semiconductors, Intrinsic and extrinsic semiconductors, p-type and n-type semiconductors, Drift current and diffusion current in semiconductors. The p-n junction diode: The p-n junction, Formation of depletion layer and junction or Barrier potential in a p-n junction, p-n junctions under forward and reverse biases, Junction Breakdown-Zener and Avalanche breakdown, the p-n junction diode, The ideal diode and real diode, Load line analysis of diode circuits, graphical analysis of diode circuits, equivalent circuits and frequency response, diode applications –Ideal rectifier concept, half and full wave rectifier circuits, Voltage doublers, Clipping and clamping circuits, characteristics of different types of diodes - zener, tunnel, schottky and photo diodes, Zener diode voltage regulator, Zener diode voltage regulator, Bipolar Junction Transistors (BJT): Bipolar junction transistor-Construction and Operation, I-V characteristics, Amplifying action, Common-base (CB), Common-collector (CC) and

Common-emitter (CE) configurations, Thermal runaway and stability factor of a transistor, Input, output and current transfer characteristics of CB, CC and CE configuration of transistors, Different methods of transistor biasing, Darlington pair, Load Line (AC and DC), BJTs at low frequencies - hybrid model, h-parameters, small signal analysis of BJT amplifiers, high input impedance circuits.

RECOMMENDED BOOK(S):

1. [Text] Electronic Circuits Theory - Boylested, R. L.
2. [Ref 1] Electronic Circuits Theory - Bell, David A.
3. [Ref 2] Integrated Electronics: Analog and Digital Circuits Systems - Millman, J.
4. [Ref 3] Basic Electronics and Linear circuits - Bhargava, N. N.
5. [Ref 4] Electronic Principles - Malvino, A. P.

EEE 2012: ELECTRONIC DEVICES -I LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 1031, EEE 1032

TOPICS: Laboratory Works based on EEE-2011

EEE 2013: DIGITAL ELECTRONICS

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2011

TOPICS:

Number System, Digital logic: Boolean algebra, De Morgan's Theorems, logic gates and their truth tables, canonical forms, combinational logic circuits, minimization techniques; Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and demultiplexers; Combinational circuit design; Flip-flops, race around problems; Counters: asynchronous counters, synchronous counters and their applications; Memory and Programmable Logic design; Synchronous and asynchronous logic design; State diagram, Mealy and Moore machines; State minimizations and assignments; Pulse mode logic; Fundamental mode design.

RECOMMENDED BOOK(S):

1. [Text] Digital Design - Mano, M. M.
2. [Ref 1] Digital Design: A Pragmatic Approach - Johnson, E. L. & Karim, M. A
3. [Ref 2] Digital Logic Design - Tocci

EEE 2014: DIGITAL ELECTRONICS LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 2011

TOPICS: Laboratory Work based on EEE 2013

EEE 2043: ELECTRONIC DEVICES -II

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2011

TOPICS:

Field effect transistors (FET): Types of FET, Construction, principles of operation, characteristic curve, Channel conductivity, Channel ohmic and pinch-off region, characteristic parameter of the FET, MOSFET- depletion and enhancement type, n- and p- channels, Biasing arrangements, Basic FET amplifiers. Use of FET as voltage controlled switches and resistors, feedback amplifiers with different topologies, stability, frequency compensation, Oscillators, Multi-vibrators, Introduction to IC technology.

Introduction to operational amplifiers (OP AMP): Difference amplifier, Signal generators: Basic principle of sinusoidal oscillation, Op-Amp RC oscillators, LC and crystal oscillators. Power Amplifiers: Classification of output stages, class A, B and AB output stages, Ideal OP-AMP, Practical OP-AMP, Frequency response and noise of an OP-AMP, Bandwidth and other practical limitation of OPAMP, Inverting and Non-inverting amplifier, Linear applications of OP-AMP, The Comparator, Differentiator, Integrator, Instrumentation amplifier, CMMR, Active Filters, Low pass, High pass and Band pass Filters using op-amps, positive and negative feedback, Feedback amplifiers, Different kinds of Oscillators, Timer-555, VCO-566, Binary counter.

RECOMMENDED BOOK(S):

1. [Text] Electronic Circuits Theory - Boylested, R. L.
2. [Ref 1] Electronic Circuits Theory - Bell, David A.
3. [Ref 2] Electronic Principles - Malvino, A. P.
4. [Ref 3] Op-amps & Linear Integrated Circuits - Coughlin, R. F.
5. [Ref 4] Op-amps & Linear Integrated Circuits - Gayakwad R.L

EEE2044: ELECTRONIC DEVICES - II LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 2011

TOPICS: Laboratory Works based on EEE 2043

EEE 2046: CIRCUIT SIMULATION LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 2043, EEE 2044

TOPICS: Introduction to PSPICE circuit simulator, transient analysis, AC analysis. Introduction of semiconductor device in PSPICE, Concept of BJT, JFET, MOSFET in PSPICE, Application of OP-AMP, active filter.

EEE 2015: ANALOG & DIGITAL COMMUNICATION SYSTEMS

CREDITS: 3 CREDITS

PREREQUISITE(S): MATH-2014,EEE-2011

TOPICS:

Overview of communication systems: Basic principles, fundamental elements, system limitations. Noise: Source, characteristics of various types of noise, Information theory: Measure of information, source encoding, channel capacity, Communication systems: Analog and digital. amplitude modulation- introduction, double side band, single side band, vestigial side band, quadrature; envelope and synchronous detection; angle modulation- frequency modulation (FM) and phase modulation (PM), demodulation of FM and PM. Pulse modulation: Sampling- sampling theorem, Nyquist criterion, pulse code modulation (PCM), differential PCM, demodulation of PCM; delta modulation (DM)- principle, adaptive DM; Digital modulation: Amplitude-shift keying- principle, ON-OFF keying, bandwidth requirements, detection, noise performance; phase-shift keying (PSK)- principle, bandwidth requirements, detection, differential PSK, Quadrature PSK, noise performance; frequency-shift keying (FSK)- principle, continuous and discontinuous phase FSK, minimum-shift keying, bandwidth requirements, detection of FSK. Multiplexing: Time-division multiplexing (TDM), frequency-division multiplexing (FDM), multiple-access network- time-division multiple-access (TDMA), frequency-division multiple access (FDMA); code-division multiple-access (CDMA). Communication system design: design parameters, channel selection criteria and performance simulation.

RECOMMENDED BOOK(S):

1. [Text] Modern Digital and Analog Communication Systems - Lathi, B. P.
2. [Ref 1] Communication Systems - Haykin, S.

EEE 2031: POWER SYSTEM – I

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2037, EEE 2038

TOPICS:

Network representation: Single line and reactance diagram of power system and per unit. Load flow: Gauss- Siedel and Newton Raphson Methods. Fault analysis: Short circuit current and reactance of a synchronous machine. Symmetrical fault calculation methods: symmetrical components, sequence networks and unsymmetrical fault calculation. Stability: swing equation, power angle equation, equal area criterion, multi-machine system, step by step solution of swing equation, Factors affecting stability.

RECOMMENDED BOOK(S):

1. [Text] Elements of Power System Analysis – Willaim D. Stevenson, Jr.
2. [Ref] Power System Analysis- Hadi Sadat.

EEE 2032: POWER SYSTEM – I LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 2037, EEE 2038

TOPICS: Laboratory Works based on EEE 2031

EEE 2035: ENERGY CONVERSION – I

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 1031

TOPICS:

Transformer: Construction, Principle of operation, Ideal transformer- transformation ratio, no-load and load vector diagrams, equivalent circuit, Voltage regulation, Ratings, short circuit and open circuit tests, Introduction to 3-phase transformer. Three phase induction motor: Construction, Principle of operation, Rotating magnetic field, equivalent circuit, vector diagram, torque-speed characteristics, effect of changing rotor resistance and reactance on torque-speed curves, motor torque and developed rotor power, no-load test, blocked rotor test, starting and braking and speed control. Single phase induction motor: Theory of operation, equivalent circuit and starting.

RECOMMENDED BOOK(S):

1. [Text] Electric Machinery Fundamentals - Stephen J. Chapman
2. [Ref 1] Electric Machines: Theory, Operating Applications, and Controls. - Charles I Hubert

EEE 2037: ENERGY CONVERSION – II

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2035

TOPICS:

Synchronous Generator: excitation systems, equivalent circuit, vector diagrams at different loads, factors affecting voltage regulation, synchronous impedance, synchronous impedance method of predicting voltage regulation and its limitations. Parallel operation: Necessary conditions, synchronizing, circulating current and vector diagram. Synchronous motor: Operation, effect of loading under different excitation condition, effect of changing excitation, V-curves and starting. DC generator: Types, no-load voltage characteristics, build-up of a self excited shunt generator, critical field resistance, load-voltage characteristic, effect of speed on no-load and load characteristics and voltage regulation. DC motor: Torque, counter emf, speed, torque-speed characteristics, starting and speed regulation. Introduction to wind turbine generators Construction and basic characteristics of solar cells.

RECOMMENDED BOOK(S):

1. [Text] Electric Machinery Fundamentals - Stephen J. Chapman
2. [Ref 1] Electric Machines: Theory, Operating Applications, and Controls. - Charles I Hubert

EEE 2038: ENERGY CONVERSION LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 2035, EEE 2037

TOPICS: Laboratory Works based on EEE-2035 and EEE 2037

EEE-3015: ENGINEERING ELECTROMAGNETICS

CREDITS: 3 CREDITS

PREREQUISITE(S): PHY-1031, MATH 2015

TOPICS:

Static electric field: Postulates of electrostatics, Gauss's law and its application, electric potential due to charge distribution, conductors and dielectrics in static electric field, flux density- boundary conditions; capacitance- electrostatic energy and forces, energy in terms of field equations, capacitance calculation of different geometries; boundary value problems- Poisson's and Laplace's equations in different co-ordinate systems. Steady electric current: Ohm's law, continuity equation, Joule's law, resistance calculation. Biot-Savart's law, Ampere's law and applications. Boundary conditions for magnetic field, magnetic energy, magnetic forces, torque and inductance of different geometries. Time varying fields and Maxwell's equations: Faraday's law of electromagnetic induction, Maxwell's equations - differential and integral forms, boundary conditions, potential functions; time harmonic fields and Poynting theorem. Plane electromagnetic wave: plane wave in loss less media- Doppler effect, transverse electromagnetic wave, polarization of plane wave; plane wave in lossy media- low-loss dielectrics, good conductors; group velocity, instantaneous and average power densities, normal and oblique incidence of plane waves at plane boundaries for different polarization.

RECOMMENDED BOOK(S):

1. [Text] Engineering Electromagnetics – Jr. Hayt and H. William
2. [Ref 1] Field and Wave Electromagnetics – I. Chiang
3. [Ref 2] Fields and Waves in Communication Electronics - Simon Ramo, John R. Whinnery, Theodore Van Duzer

EEE 3021: SIGNALS AND SYSTEMS

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 1031, MATH 2014

TOPICS:

Representing signals: Introduction to signal, Continuous-Time and Discrete –Time signals, analog and Digital signal, Sampling of analog signal and Sampling theorem, Real and Complex signals, Deterministic and random signals, Even and Odd signals, Periodic and Non-periodic signals, Energy and power signals, Transformation of the independent variable, Elementary signals, Basic operation on signals. Systems: Input-Output description of a system, Classification of Continuous-Time systems, Linear

time-Invariant systems, properties of LTI systems, Block diagram representation of Discrete-Time systems, Interconnection of Discrete-Time systems, System described by Differential Equations, Solutions of system differential equations, Fourier series: Fourier series representation of continuous time signals, Properties of Fourier series, applications of Fourier series. Fourier Transform: The Continuous time Fourier Transform and properties of Fourier Transform, Application of Fourier Transform. Discrete time Fourier Transform DTFT- convolution, modulation and other properties of DTFT.

RECOMMENDED BOOK(S):

1. [Text] Signals and systems- Alan V. Oppenheim
2. [Ref 1] Scham's Outlines of Theory and Problems of Signals and Systems - HweiP.Hsu
3. [Ref 2] Digital Signal Processing, principles, Algorithms, and applications - John G. Proakis & Dimitries G. Manolakis
4. [Ref 3] Continuous and Discrete Signals and Systems - Samir S. Soliman & Mandyam D. Srinath

EEE 3027: ELECTRICAL PROPERTIES OF MATERIALS

CREDITS: 3 CREDITS

PREREQUISITE(S): PHY 1031, EEE 2011, MATH 2015

TOPICS:

Crystal structures: Types of crystals, lattice and basis, Bravais lattice and Miller indices. Classical theory of electrical and thermal conduction: Scattering, mobility and resistivity, temperature dependence of metal resistivity, Mathiessen's rule, Hall Effect and thermal conductivity. Band theory of solids: Band theory from molecular orbital, Bloch theorem, Kronig-Penny model, effective mass, density-of-states. Carrier statistics: Maxwell-Boltzmann and Fermi-Dirac distributions, Fermi energy. Modern theory of metals: Determination of Fermi energy and average energy of electrons, classical and quantum mechanical calculation of specific heat. Dielectric properties of materials: Dielectric constant, polarization- electronic, ionic and orientational; internal field, Clausius-Mosotti equation, spontaneous polarization, frequency dependence of dielectric constant, dielectric loss and piezoelectricity. Magnetic properties of materials: Magnetic moment, magnetization and relative permittivity, different types of magnetic materials, origin of ferromagnetism and magnetic domains. Introduction to superconductivity: Zero resistance and Meissner effect, Type I and Type II superconductors and critical current density.

RECOMMENDED BOOK(S):

1. [Text] Electrical Properties of Materials - L. Solymar & D. Walsh.
2. [Ref.1] Electrical Properties of Materials - Rolf E. Hummel

EEE 3025: SEMICONDUCTOR DEVICES

CREDITS: 3 CREDITS

PREREQUISITE(S): PHY 1031, EEE 2043, STAT-2012

TOPICS:

Semiconductors in equilibrium: Energy bands, intrinsic and extrinsic semiconductors, Fermi levels, electron and hole concentrations, temperature dependence of carrier concentrations and invariance of Fermi level. Carrier transport processes and excess carriers: Drift and diffusion, generation and recombination of excess carriers, built-in-field, Einstein relations, continuity and diffusion equations for holes and electrons and quasi-Fermi level. PN junction: Basic structure, equilibrium conditions, contact potential, equilibrium Fermi level, space charge, non-equilibrium condition, forward and reverse bias, carrier injection, minority and majority carrier currents, transient and AC conditions, time variation of stored charge, reverse recovery transient and capacitance. Bipolar Junction Transistor: Basic principle of pnp and npn transistors, emitter efficiency, base transport factor and current gain, diffusion equation in the base, terminal currents, coupled-diode model and charge control analysis, Ebers-Moll equations and circuit synthesis. Metal-semiconductor junction: Energy band diagram of metal semiconductor junctions, rectifying and ohmic contacts. MOS structure: MOS capacitor, energy band diagrams and flat band voltage, threshold voltage and control of threshold voltage, static C-V characteristics, qualitative theory of MOSFET operation, body effect and current-voltage relationship of a MOSFET. Junction Field-Effect-Transistor: Introduction, qualitative theory of operation, pinch-off voltage and current-voltage relationship.

RECOMMENDED BOOK(S):

1. [Text] Solid State Electronic Devices – Ben G. Streetman
2. [Ref 1] Semiconductor Physics and Devices - D. Neamen
3. [Ref 2] Semiconductor Devices, Physics and Technology- J. Wiley and Sons - S. M. Sze

ICE 4000: RESEARCH METHODOLOGY

CREDITS: 3 CREDITS

PREREQUISITE(S): ICE 4013, ICE 4015, After completion of 134 credits hours.

TOPICS:

Study of problems in the field of Electrical and Electronic Engineering. A student needs to select a suitable topic of his/her interest or supervisors may display a list of Research Project/Thesis.

EEE 4055: PROJECT/INTERNSHIP

CREDITS: 6 CREDITS

PREREQUISITE(S): After Successful completion of 120 CREDITS

TOPICS:

A Student may also do his/her internship works in an industry or in a company related to electrical and electronic engineering as decided by the department or by the student himself/herself. Also he/she may do a project work in if internship works are not available in any industry or company.

EEE 4011: CONTROL SYSTEMS

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2043, EEE 2044, MATH2015

TOPICS:

Introduction to control systems: Open-loop and Closed-loop control systems, State variables, Writing system differential equation, transfer function, block diagram, Simulation Diagram, signal flow graph (SFG) , Mechanical translation systems, Mechanical Rotational systems, Speed control and Position control of DC servomotor, Solution of differential equations, standard inputs to control systems, Steady-state response and Transient response. Feedback control system: Closed loop systems, Overall transfer function, parameter sensitivity, transient characteristics of control systems, effect of additional pole and zero on the system response and system types and steady state error. Stability of control system and Routh stability criterion, Analysis of feedback control system: Root locus method and frequency response method. Design of feedback control system: Controllability and observability, root locus, frequency response and state variable methods. Digital control systems: introduction, sampled data systems, stability analysis in Z-domain.

RECOMMENDED BOOK(S):

1. [Text] Linear Control System Analysis and Design, Conventional and Modern - John J. D’Azzo & Constantine H. Houpis
2. [Ref 1] Modern Control Systems - Richard C. Dorf
3. [Ref 2] Control Engineering - C.C. Bissel

EEE 4013: DIGITAL SIGNAL PROCESSING

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 3021

TOPICS:

Introduction to digital signals and digital signal processing, A/D conversion, sampling theorem, Illustration of aliasing, analysis of Discrete-Time Linear-Time-Invariant (LTI) systems, Resolution of Discrete-Time signals into impulse, Convolution and correlation, Introduction to Laplace transform, properties of Laplace transform, Z-transform, Concept of Pole and Zero, Frequency domain representation of discrete-time systems and signals, Discrete Fourier series and discrete Fourier transform (DFT), computation of the DFT, Signal flow graph representation of digital networks. Introduction to random signals and probability, Filter structure for IIR and FIR filters, Adaptive filters and its applications. Introduction to speech and Image processing.

RECOMMENDED BOOK(S):

1. [Text] Digital Signal Processing, principles, Algorithms, and applications - John G. Proakis & Dimitries G. Manolakis
2. [Ref 1] Theory and Application of Digital processing - L.R. Rabiner & B. Gold
3. [Ref 2] Digital Signal Processing - S.K.Mitra
4. [Ref 3] Voice processing - G.E. Pelton
5. [Ref 4] Digital Image Processing - R.C. Gonzalez
6. [Ref 5] The Image Processing handbook - J.C. Russ

EEE 4014: DIGITAL SIGNAL PROCESSING LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 3021

TOPICS: Laboratory Work based on EEE 4013

EEE 4017: POWER PLANT ENGINEERING

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2031

TOPICS:

Power plants: general layout and principles, steam turbine: construction & operation, gas turbine: construction and operation, combined cycle gas turbine
Selection of location: Technical, economical and environmental factors. Load forecasting, Load factor calculation. Hydro based power plant, Nuclear Plant: principle of Nuclear plant, components of a nuclear plant and operation. Future scopes of generating Electrical power, Power plant instrumentation.

Generation scheduling: Deterministic and probabilistic. Electricity tariff: formulation and types.

RECOMMENDED BOOK(S):

1. [Text] Power Plant Engineering, - P. K. Nag
2. [Ref 1] Power Plant Engineering. - Larry Drball.

EEE 4021: MICROWAVE ENGINEERING

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 3015

TOPICS:

VHF, UHF and microwave frequency ranges. Transmission line, Smith chart, impedance transformation and matching. Waveguides: parallel plane, rectangular, co-axial, Waveguide components, cavities and resonators. Microwave tubes: transit time and velocity modulation, Klystron, multi cavity klystron, reflex klystron, oscillator, Magnetron, TWT, Backward wave oscillators (BWO). Introduction to solid state microwave devices. Radiation: Dipole and its analysis, radiation pattern, description of different types of antennas. Introduction to antenna arrays and their design.

RECOMMENDED BOOK(S):

[Text] Fields and Waves in Communication Electronics - Simon Ramo, John R. Whinnery, Theodore Van Duzer
[Ref 1] Microwave Devices and Circuits – Samuel Y. Liao.

EEE 4026: COMMUNICATION ENGINEERING LAB

CREDITS : 1 CREDIT

PREREQUISITE(S): EEE 2023

TOPICS: Laboratory Works based on EEE 4021, EEE 2023

EEE 2042: ELECTRICAL SERVICES DESIGN

CREDITS : 1 CREDIT

PREREQUISITE(S): EEE 1031

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

RECOMMENDED BOOK(S):

[Text] Fields and Waves in Communication Electronics - Simon Ramo, John R. Whinnery, Theodore Van Duzer
[Ref 1] Microwave Devices and Circuits – Samuel Y. Liao.

ELECTIVE COURSES

1. ELECTRONICS AND COMMUNICATION GROUP

EEE 2025: MEASUREMENT AND INSTRUMENTATIONS

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2011

TOPICS:

Measuring instrument: PMMC, Ammeters & Voltmeters. Current & Potential transformers, Extension of instrument range. Measurement of resistance: Wheatstone bridge, Kelvin Bridge, Voltmeter Ammeter method .Mega ohm meter. Measurement of capacitance and inductance, Localization of cable faults: Murray and varley loop test, capacitance test method, blavier's test. Transducers: Potentiometer, strain gauge, thermistor, thermocouple, resistive transducer, capacitive, inductive, linear variable differential transformer, piezoelectric, Selection of transducer, application of transducers for measuring temperature, pressure flow, level and strain. Signal conditioning: block diagram of DC and AC signal conditioning systems, data acquisition and conversion system, Instrumentation amplifier, Introduction to telemetering system. Electronic measuring instrument: DVM, CRO, frequency and phase measurement.

RECOMMENDED BOOK(S):

1. [Text] Electrical and Electronic Measurements and Instrumentation - A.K. Sawhney
2. [Ref 1] Electrical Instrument and Measuring Technique – Cooper

EEE 2026: MEASUREMENT AND INSTRUMENTATIONS LAB

CREDITS : 1 CREDIT

PREREQUISITE(S): EEE 2011

TOPICS: Laboratory Works based on EEE 2025

EEE 3029: SEMICONDUCTOR PROCESSING AND FABRICATION TECHNOLOGY

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2043, EEE2044

TOPICS:

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.

RECOMMENDED BOOK(S):

1. [Text] Fundamentals of semiconductor Fabrication – S. May Gary
2. [Ref1] Plasma Etching in semiconductor Fabrication – R. A. Morgan

EEE 3031: TELECOMMUNICATION ENGINEERING

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2023, EEE 3021

TOPICS:

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

RECOMMENDED BOOK(S):

1. [Text] Digital Telephony – John C. Bellamy
2. [Ref 1] Telecommunication Switching Systems And Networks-Viswanathan Thiagarajan

EEE 3035: OPTOELECTRONIC DEVICES

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2011, EEE 2043

TOPICS:

Fundamental of Optical physics, Optical properties in semiconductor: Direct and indirect band-gap materials, radiative and non-radiative recombination, optical absorption, photo-generated excess carriers, minority carrier life time, luminescence and quantum efficiency in radiation. Properties of light: Particle and wave nature of light, polarization, interference, diffraction and blackbody radiation. Light emitting diode (LED): Principles, materials for visible and infrared LED, internal and external efficiency, loss mechanism, structure and coupling to optical fibers. Stimulated emission and light amplification: Spontaneous and stimulated emission, Einstein relations, population inversion, absorption of radiation, optical feedback and

threshold conditions. Semiconductor Lasers: Population inversion in degenerate semiconductors, laser cavity, operating wavelength, threshold current density, power output, hetero-junction lasers, optical and electrical confinement. Introduction to quantum well lasers. Photo-detectors: Photoconductors, junction photo-detectors, PIN detectors, avalanche photodiodes and phototransistors. Solar cells: Solar energy and spectrum, silicon and Schottkey solar cells. Modulation of light: Phase and amplitude modulation, electro-optic effect, acousto-optic effect and magneto-optic devices, Introduction to integrated optics, Introduction to optical fiber.

RECOMMENDED BOOK(S):

[Text] Optoelectronic Devices - J. W Wilson

[Ref 1] Semiconductor physics - S.M. Sze.

[Ref 2] Optical fiber communication - John Senior

EEE 3037: MOBILE COMMUNICATION

CREDITS: 3 CREDITS

REREQUISITE(S): EEE 2023

TOPICS:

Cellular Mobile Telephone system , Cellular Topology, Analog vs. digital access, Network Components, Network Signaling, Data traffic, Frequency division multiple access (FDMA), Time division Multiple Access (TDMA), Code division Multiple access (CDMA), Cell Planning, Cellular Digital Packet Data(CDPD), Short Message Service , GPRS, EDGE, Wireless application protocol (WAP), Global System for Mobile communication, CDMA technology, Roaming, Third Generation Mobile Services.

RECOMMENDED BOOK(S):

1. [Text] Mobile Communication 2nd & 3rd generation cellular system. - Raymond Steeb & Lazos Hanzo.
2. [Ref 1] Wireless Communication. - Theodore S. Rappaport
3. [Ref 2] Mobile Communication Engineering - William C. Y. Lee.

EEE 3039: SATELLITE COMMUNICATION

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2023

TOPICS: Introduction to Wireless Communication, Basic Wireless Theory, Components of a Radio System, Design of a Radio System, Understanding Standards and its necessity, Radio Frequency Spectrum, Infrared Networking Structures, Infrared WLAN, IrDA, Bluetooth, Low Speed WLAN, High Speed WLAN, WLAN Security, WiFi and WiMax. Introduction to communication using satellite, GEO, MEO and LEO satellites, Kepler's law and orbital mechanics, satellite launching, Frequency spectra and band, Satellite subsystems, Satellite transponder, earth stations, earth station antenna, satellite link analysis, VSAT network, Satellite communication for Internet, Mobile satellite communications, Multiple Access Techniques: TDMA, FDMA and CDMA, Introduction to ISDN, B-ISDN.

RECOMMENDED BOOK(S):

1. [Text] Satellite Communications - Timothy Pratt.
2. [Ref 1] Satellite Communications - Dennis Roddy

EEE 4023: OPTICAL FIBER COMMUNICATION

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2023

TOPICS:

Introduction to optical properties of light, Light propagation through optical fiber: Ray optics theory and mode theory. Optical fibers: Types and characteristics, modes of propagation, transmission characteristics, fiber joints and fiber couplers, waveguide analysis. Optical sources: Light Emitting Diode (LED) and semiconductor laser diode (SLD), Operational principles, characteristic curves, optical transmitter design using LED/SLD, Transmission limitations: Chromatic dispersion, nonlinear refraction, four wave mixing and laser phase noises, Optical Amplifiers: laser and fiber amplifiers, applications and limitation, Photo-detectors: P-i-N and avalanche photo detectors, Optical Modulation and detection schemes, direct and coherent detection receiver, Multi-channel optical system: Frequency division multiplexing, wavelength division multiplexing and co-channel interference, Optical data transmission in LAN, design of fiber-optic systems, optical networks.

RECOMMENDED BOOK(S):

1. [Text] Optical fiber Communication (Principles and practice) - John.M.Senior
2. [Ref 1] Optical fiber Communication - Agarwall

EEE 4024: OPTICAL FIBER COMMUNICATION LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 2023

TOPICS: Laboratory Works based on EEE 4023

EEE 4027: ROBOTICS

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 4011

TOPICS:

Spatial Descriptions, Direct Kinematics- the arm equation, Inverse Kinematics- solving the arm equation, Jacobian's Dynamics, Motion Planning and Trajectory Generation, Position and Force Control, Manipulator Design, task planning.

RECOMMENDED BOOK(S):

1. [Text] Robotics Demystified - Edwin Wise
2. [Ref 1] Robot Mechanisms and Mechanical Devices Illustrated - Paul Sandin
3. [Ref 2] Concise Encyclopedia of Robotics - Stan Gibilisco

EEE 4029: BIOMEDICAL ENGINEERING

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 4013, EEE 4014

TOPICS:

The human body: an overview, forms of mammalian cells, bioelectricity, Electroconduction system of the heart, bioelectric amplifiers: carrier amplifiers, optically coupled amplifiers, current loading type isolation amplifiers, chopper amplifiers, differential chopper amplifiers. Electrocardiograph (ECG): waveform, ECG preamplifiers, defibrillator. Blood pressure measurements and electronic manometry

Pressure transducers, pressure amplifiers, Systolic, diastolic and mean detector circuits, practical problem in pressure monitoring, Blood flow measurements: plethysmography, electromagnetic flow meter, Phonocardiography, vector cardiography, cardioverter and pacemakers. Measurement of human brain parameters: cerebral angiography, cronical X-ray, brain scans. Tomography & Ultrasonogram, Electro-encephalography (EEG): electrode, frequency bands, EEG patterns and EEG preamplifiers, ICU/CCU central monitoring system.

Advance Topics:

Genetic Engineering, Bio-Technology, Food-irradiation, Gene Therapy, Nano-applications in Biomedical Engineering.

RECOMMENDED BOOK(S):

1. [Text] Introduction to Biomedical Engineering - John Denis Enderle & Joseph D Bronzino
2. [Ref.1] Signals and Systems in Biomedical Engineering - Suresh R Devasahayam.

EEE 4025: VLSI DESIGN

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2013, EEE 2043

TOPICS:

VLSI technology: terminologies and trends, MOS transistor characteristics and equations, MOS fabrication process, nMOS & CMOS inverters: dc & transient characteristics, pass transistor & pass gates, Derivation of drain-to source current (I_{ds}), I_{ds} VS V_{ds} , Pull-up to pull down ratio, CMOS & nMOS design Style, Stick Diagrams, CMOS layout and design rules: λ -based design rule. Complex CMOS gates: NAND, NOR, EXclusive OR, Resistance & Capacitance estimation and Modeling, raise time and fall time calculation of gate capacitance, Scaling & scaling factor of different parameters. Signal propagation delay, noise margin and power consumption, Interconnect, BiCMOS circuits. CMOS building blocks: adders, counters, multipliers and barrel shifters, Parity generator, Data paths, memory structures: Dynamic RAM cells, PLAs and FPGAs, VLSI testing: objectives & strategies.

RECOMMENDED BOOK(S):

1. [Text] Basic VLSI design - Douglas A. Pucknell, Kamran Eshraghian,
2. [Ref 1] Design of VLSI systems: A practical introduction - Linda, E. M. Brackenbury

EEE 4026: VLSI DESIGN LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 2013, EEE 2043

TOPICS: Laboratory Works based on EEE 4025

2. POWER GROUP

EEE 2033: POWER SYSTEM II

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE2031, EEE 2032

TOPICS:

Structure of electric power system: Different operating voltages of generation, transmission and distribution – advantage of higher operating voltage for AC transmission. Parameters of resistance, inductance and capacitance calculations. Single and three phase transmission lines : Single and double circuits - solid, stranded and bundled conductors - symmetrical and unsymmetrical spacing. Transposition of lines concepts of GMR and GMD. Skin and proximity effects - interference with neighboring communication circuits. Corona discharge characteristics. Transmission line classification: Short line, medium line and long line, equivalent circuits, Ferranti effect, surge impedance, voltage regulation and transmission efficiency. Classification of insulators for transmission and distribution purpose – voltage distribution in insulator string and grading - improvement of string efficiency. Underground cables: Constructional features of LT and HT cables – insulation resistance, capacitance, dielectric stress and grading – $\tan \delta$ and power loss - thermal characteristics. Bus-bar arrangements: Substation bus schemes, single bus, double bus with double breaker, double bus with single breaker, main and transfer bus, ring bus, breaker-and-a-half with two main buses, double bus-bar with bypass isolators. Importance of earthing in a substation. Qualitative treatment to neutral grounding and earthing practices in substations. Feeders, distributors and service mains. DC distributor :2-wire and 3-wire, radial and ring main distribution. AC distribution: Single phase and three phase 4-wire distribution.

RECOMMENDED BOOK(S):

1. [Text] Principles of Power System – V.K. Mehta
2. [Ref. 1] Electrical Power Distribution and Transmission. - Luces M. Faulkenberry
3. [Ref 2] Power system analysis - John Grainger & William Stevenson.

EEE 3011: POWER ELECTRONICS AND DRIVES

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2043, EEE2044

TOPICS:

Power semiconductor switches and triggering devices: BJT, MOSFET, SCR, IGBT, GTO, TRIAC, UJT and DIAC. Rectifiers: Uncontrolled and controlled single phase and three phase. Regulated power supplies: Linear-series and shunt, switching buck, buckboost, boost and Cuk regulators. AC voltage controllers: single and three phase. Choppers. DC motor control. Single phase cycloconverter. Inverters: Single phase and three phase voltage and current source. AC motor control. Stepper motor control. Resonance inverters. Pulse width modulation control of static converters.

RECOMMENDED BOOK(S):

1. [Text] Power Electronics - Rashid, H.R
2. [Ref 1] Industrial Electronics & Robotics – C. A Schuler, William L McNamee
3. [Ref 2] Electronic Circuits Theory - Boylested, R. L.
4. [Ref 3] Electronic Circuits Theory - Bell, David A.

EEE 3012: POWER ELECTRONICS AND DRIVES LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 2043, EEE2044

TOPICS: Laboratory Works based on EEE2044

EEE 3017: POWER SYSTEM OPERATION AND CONTROL

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2031, EEE 2032

TOPICS:

Principles of power system operation: SCADA, conventional and competitive environment, Unit commitment, static security analysis, state estimation, optimal power flow, automatic generation control, and dynamic security analysis. Optimal Asset Replacement and Network Expansion Methodologies, Optimising Network Security, Security Analysis of Interdependence between Electricity Networks, Enhancement of Power System Stability, Measurement-based power system security management.

RECOMMENDED BOOK(S):

1. [Text] Power System Stability and Control - Prabha Kundur
2. [Ref 1] Power system operations and control - S. Kumar

EEE 3018: POWER SYSTEM OPERATION AND CONTROL LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 2031, EEE 2032

TOPICS: Laboratory Works based on EEE 3017

EEE 3023: POWER SYSTEM PROTECTION

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2031, EEE 2032

TOPICS:

Purpose of power system protection. Criteria for detecting faults: over current, differential current, difference of phase angles, over and under voltages, power direction, symmetrical components of current and voltages, impedance, frequency and temperature. Instrument transformers: CT and PT. Electromechanical, electronic and digital Relays: basic modules, over current, differential, distance and directional. Trip circuits. Unit protection schemes: Generator, transformer, motor, bus bar, transmission and distribution lines. Miniature circuit breakers and fuses. Circuit breakers: Principle of arc extinction, selection criteria and ratings of circuit breakers, types - air, oil, SF₆ and vacuum.

RECOMMENDED BOOK(S):

1. [Text] Power System Protection – Paul M. Anderson
2. [Ref 1] Electrical Power System Protection – C. Chirstopoulos and A. Wright

EEE 3024: POWER SYSTEM PROTECTION LAB

CREDITS: 1 CREDIT

PREREQUISITE(S): EEE 2031, EEE 2032

TOPICS: Laboratory Works based on EEE 3023

EEE 4019: RENEWABLE ENERGY

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2037, EEE 2038

TOPICS:

Importance of renewable energy, sources; Statistics regarding solar radiation and wind speed; Insulation; geographical distribution, atmospheric factors, measurements; Solar cell; principle of operation, spectral response, factors affecting conversion efficiency, I-V characteristics, maximum power output; PV modules and arrays; stationary and tracking; PV systems; stand alone, battery storage, inverter interfaces with grid; Wind turbine generators; types; operational characteristics; cut-in and cut-out speed, control, grid interfacings, AC-DC -AC link.

RECOMMENDED BOOK(S):

1. [Text] Renewable Energy – Godfrey Boyle.
2. [Ref.1] Renewable Energy – J. B. Johansson.

EEE 4033: HIGH VOLTAGE ENGINEERING

CREDITS: 3 CREDITS

PREREQUISITE(S): EEE 2037, EEE 2038

TOPICS:

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

RECOMMENDED BOOK(S):

1. [Text] High Voltage Engineering Fundamentals - J. Kuffel, E. kuffel & W S Zaengl.
2. [Ref.1] High Voltage Engineering - M. S. Naidu.