Dhaka International University

Faculty of Science and Engineering

Department

of

Electrical , Electronics and Telecommunication Engineering (EETE)

Syllabus

for

Four Year Bachelor of Science and Engineering

in

Electrical, Electronics and Telecommunication Engineering (EETE)

(Revised and Effective from Fall-2015)

Dhaka International University
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Preface

Electrical, Electronics and Telecommunication Engineering (EETE) education today has entered a transitional phase. An EETE curriculum around the globe is experiencing increasing specialization. On the other hand, diversity of EETE education is also increasingly underscoring its multi-disciplinary nature. Over the last decade, the traditional role played by an electrical and electronic engineer has changed quite significantly. Today's employers require electrical, electronic and telecommunication engineers with excellent communication skills along with awareness about environmental and safely issues. There are huge demands for electrical, electronic and telecommunication workers but the supply of technically competent professionals in Bangladesh is not meeting the demand. The new B.Sc. in Electrical, Electronic and Telecommunication Engineering degree program at Dhaka International University (DIU) is aimed to produce graduates to meet that demand. Increasing the ethical and moral standards of the engineers is also getting higher priority in the industry and communication technology sector.

The prime objective of Dhaka International University is to offer high quality education at undergraduate and graduate levels in coherence with the needs of the Society of the 21st century. The course and curricula are redesigned to enable young people to pursue higher studies of professional destination. The aim of the university is not only just to go through the examination, but also to train them to become productive members of the society.

The whole world is heavily dependent on electrical, electronic and telecommunication engineering. Our society cannot keep aloof from the modern technology and we are becoming rapidly dependent on Electrical, Electronic and Telecommunication. We have to equip our young children so as to face the challenge of the 21st century. Dhaka International University has designed 4 years undergraduate program in electrical, electronic and telecommunication engineering to meet these challenges and to provide opportunity to develop professional skills in this field. This program of the study will also provide the basic electrical and telecommunication engineering, communication technology together with basic science, mathematics, language, economics, accounting, business management etc.

Examination and Grading System

The letter Grade: The total performance of a student in a given course is based on a scheme of continuous of continuous assessment. For theory courses this continuous assessment is made through assessment is also made through Mid-term Examination and Semester Final Examination. For assessment in laboratory courses Laboratory class tests/quiz will be taken in addition to laboratory viva. Laboratory class test/quiz is a vital component. These will be taken before Mid-term examination and also before Final examination. Performance of the student at work during the practical classes will also account for during laboratory hours. Each course has a certain number of credits, which describes its corresponding weight ages. A letter grade with a specified number of grade points is awarded in each course for which a student is registered. A student's performance is measured by the measured by the number of credits completed satisfactorily and by the weighted average of the grade points earned. A minimum grade point average (GPA) is essential for satisfactory progress. Total 145 credits have to be acquired in order to qualify for the degree. Letter grades and corresponding grade points will be awarded in accordance to the provisions shown below:

Grade	Grade Points	Numerical Markings
A+	4.0	80% and above
A	3.75	75% to below 80%
A-	3.50	70% to below 75%
B+	3.25	65% to below 65%
B	3.00	60% to below 65%
B-	2.75	55% to below 55%
C+	2.50	50% to below 55%
C	2.25	45% to below 50%
D	2.00	40% to below 45%
F	0.00	below 40%
X	-	Continuation (For project/thesis)

For grades: If a student gets F grade this will remain in his/her grade sheet/transcript but he/she will be allowed to retake the course/reappear in the examination. A student shall not be allowed to retake more than 2 courses.

Distribution of Marks

Marks distribution of each theory course is as follows:

1. Attendance	5%
2. Behavior	5%
3. Class Performance	10%
4. Assignment	10%
5. Mid-term Exam	20%
6 Course Final Exam	50%
Total	100%

Marks distribution of each lab course is as follows:

1. Attendance & Behavior	20%
2. Class Performance & Assignment	20%
3. Lab Final Exam	40%
4. Viva-voce	20%
Total	100%

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

90% and above	100%
85% to less than 90%	90%
80% to less than 85%	80%
75% to less than 80%	70%
70% to less than 75%	60%
65% to less than 70%	50
60% to less than 65%	40%
Below 60%	0%

Eligibility for Admission

This section describes the necessary requirements for a student to get admission in Dhaka International University. The later section describes the application procedure for the admission.
Admission Requirement

1. The minimum GPA shall be 2.5 in both SSC & HSC/ Diploma in Engineering with Physics and Mathematics. An applicant must submit his/her certificates and mark-sheets during the application.

2. For ‘O’ level & ‘A’ level systems and applicant must have completed 6 papers in ‘A’ level and 6 papers in ‘O’ level. In the ‘A’ level the student must have completed at least 2 papers of Physics, 2 papers of Chemistry and 2 papers of Mathematics, minimum average GPA of

combined ‘O’ level & ‘A’ level shall be ‘C’. An applicant must submit his/her certificates and mark sheets during the application.

3. For applications from foreign countries equivalent standard shall be maintained. The applicant must have completed Physics, Chemistry and mathematics in the 12^{th} level.

Application Procedure

Application form is available in the Admission Office of the University. The completed Application form must be submitted to the Admission Office with the following documents:

- ❑ Attested copies of all academic certificates and marks sheets.
- ❑ Two copies of Passport-size & two copies of Stamp-size colored photographs.
- ❑ A certificate for break of study in case of irregular students.

Total Credits and Duration

These courses are to be completed within 12 semesters in 4 years. Total credits will be 145. It is mentioned that the students who have completed the 4 (four) years in Diploma program in the area (or related area) of EETE under the Technical Education Board are also eligible for admission under this program. In this regard they may be given some course waiver (12 credits).

Academic Session

In each year there are three academic sessions / semesters, which are as follows:

Semester	**Duration**
Spring	January – April
Summer	May – August
Fall	September – December

Each semester is of 17 (seventeen) weeks duration of which 14 (fourteen) weeks will be utilized for academic activities, 01(one) week for preparatory work and 02(two) weeks for Mid-term and Semester Final Examinations. There will be a preparatory leave of two days before the final examination.

Project Evaluation

Project & thesis work on B.Sc. in EETE is carried out for 8 months in the 11^{th}, 12^{th} Semesters. A group of 4-6 students works for one project & thesis under one supervisor. They take project & thesis works in the different fields of EETE available in the Department. After completion of the project & thesis work the students submit the project & thesis report to the Department after fully reviewed & signed by the supervisor. A panel of Examiners comprising of one External Examiner from a recognized University and three Internal Examiners conduct the defense of the project & thesis work. The students individually present their project & thesis work in front of the panel of the Examiners. Total of 200 marks are allocated for the project & thesis work, out of which 100 marks are allocated for project & thesis defense and remaining 100 marks are allocated for project & thesis report along with other activities. The distribution of marks is as follows:

Part-I Evaluation by Supervisor

Sl. No.	Parameters to be considered	Marks
1	Project /Thesis/Internee work	40
2	Project/Thesis/Internee paper	20
3	Project/Thesis/Internee pre-defense	20
4	Viva-voce	20
	Total	100

Part-II Evaluation Committee

The evaluation committee comprises of one external examiner from a recognized university and two internal faculty members.

Sl. No.	Parameters to be considered	Marks
1	Presentation of the project by individual students	30
2	Project Report	30
3	Viva-voce	40
	Total	100

Selection of Major Special Area

After successful completion of first 3 (three) years i.e. after 9 (nine) semester, a student will have the opportunity to choose any one of the following as his / her major special area:

(i) Electrical & Electronics Engineering (EEE)

(ii) Electronics & Telecommunications Engineering (ETE)

The students will get their bachelor degree in Electrical, Electronics & Telecommunication Engineering (EETE) with major in EEE or major in ETE.

Degree Requirements

Minimum CGPA for graduation is as follows:
Passing CGPA shall not be less than 2.50
Student who fails to maintain this minimum rate of progress may be placed on academic probation.

Course Requirements for the undergraduate study of Electrical, Electronics, and Telecommunication Engineering.

Introduction: The list of courses offered to the undergraduate students of Electrical, Electronics and Telecommunication Engineering (EETE) are categorized into core course and Elective courses. Some of the core courses are offered by the Department of EETE and other Departments offer some of these. Elective courses are grouped into Electrical, Electronics and Telecommunication Engineering. Students have the flexibility to choose subjects from amongst the Elective Course, subject to the availability of facilities.

Core Courses: The students have to complete all the core courses listed below:

List of Core Courses-EETE

Sl. No.	Course Number	Course Name	Credits
1.	EETE-121	Electrical Circuits-I	3
2.	EETE-122	Electrical Circuits- I Lab	1
3.	EETE-131	Electrical Circuits-II	3
4.	EETE-132	Electrical Circuits-II Lab	1
5.	EETE-211	Electronics-I	3
6.	EETE-212	Electronics-I Lab	1
7.	EETE-215	Engineering Drawing	1
8.	EETE-221	Electrical Machines-I	3
9.	EETE-222	Electrical Machines-I Lab	1
10.	EETE-223	Electronics-II	3
11.	EETE-224	Electronics-II Lab	1
12.	EETE-231	Digital Electronics	3
13.	EETE-232	Digital Electronics Lab	1
14.	EETE-233	Semiconductor Materials & Devices	3
15.	EETE-235	Electrical Machines-II	3
16.	EETE-236	Electrical Machines-II Lab	1
17.	EETE-311	Microprocessors & Micro Controllers	3
18.	EETE-312	Microprocessors & Micro Controllers Lab	1
19.	EETE-313	Signals & Systems	3
20.	EETE-321	Digital Signal Processing	3
21.	EETE-322	Digital Signal Processing Lab	1
22.	EETE-323	Fundamental of Communication Engineering	3
23.	EETE-324	Fundamental of Communication Engineering Lab	1
24.	EETE-325	Electromagnetic Fields & Waves	3
25.	EETE-327	Transmission & Distribution of Electric Power	3
26.	EETE-331	Power Electronics	3
27.	EETE-332	Power Electronics Lab	1
28.	EETE-333	Instrumentation & Measurement	3
29.	EETE-334	Instrumentation & Measurement Lab	1
30.	EETE-335	Control Systems	3
31.	EETE-336	Control Systems Lab	1
32.	EETE-411	Microwave & Antenna Engineering	3
33.	EETE-412	Microwave & Antenna Engineering Laboratory	1
34.	EETE-413	Renewable Energy Technology	3
35.	EETE-415	Power System Analysis	3
36.	EETE-421	Power Stations	3
37.	EETE-433	Project and Thesis	6
		Total Credits	**84**

List of Core Courses Science & Humanities

Sl. No.	Course Number	Course Name	Credits
1.	HUM-111	Bangladesh Studies	3
2.	HUM-112	Fundamentals of Management	3
3.	HUM-113	World Civilization	3
4.	HUM-121	Basic English	3
5.	HUM-131	Communicative English	3
6.	HUM-221	Financial & Managerial Accounting	3
7.	MATH-121	Math-I (Linear Algebra & Co-ordinate Geometry)	3
8.	MATH-131	Math-II (Differential & Integral Calculus)	3
9.	MATH-211	Math-III (Statistical Methods & Probability)	3
10.	MATH-221	Math-IV (Differential Equations & Vector Analysis)	3
11.	MATH-231	Math-V (Complex Variables & Transforms (Laplace & Fourier))	3
12.	PHY-121	Physics-I (Waves & Oscillation, Optics, Heat & Thermodynamics)	3
13.	PHY-131	Physics-II (Electricity & Magnetism, Modern Physics, Mechanics)	3
14.	PHY-132	Physics-II Laboratory	1
15.	CHEM-311	Chemistry	3
16.	CHEM-312	Chemistry Laboratory	1
		Total Credits	**44**

List of Core Courses Interdisciplinary Engineering

Course Number	Course Name	Credits
CSE-111	Computer Fundamentals	3
CSE-211	Structured Programming	3
CSE-212	Structured Programming Laboratory	1
	Total Credits	**7**

Technical Elective Courses

I. Elective-I (One Course) for Major in Electrical and Electronics

Course Number	Course Name	Credits
EETE-441	Switchgear & Protection	3
EETE-443	Basic Mechanical Engineering	3
	Total Credits	**3**

I. Elective-I (One Course) for Major in Electronics and Telecommunication

Course Number	Course Name	Credits
EETE-451	Digital Communication	3
EETE-453	Mobile Cellular Communication	3
EETE-455	Information Theory & Coding	3
	Total Credits	**3**

II. Elective-II (One Course) for Major in Electrical and Electronics

Course Number	Course Name	Credits
EETE-461	VLSI	3
EETE-462	VLSI Laboratory	1
EETE-463	Devices and IC Fabrication Technology	3
EETE-465	Advanced Electronics	3
EETE-467	Biomedical Engineering	3

	Total Credits	**3 or 4**

II. Elective-II (One Course) for Major in Electronics and Telecommunication

Course Number	Course Name	Credits
EETE-471	Radio & TV Engineering & Broadcasting	3
EETE-472	Radio & TV Engineering & Broadcasting Laboratory	1
EETE-473	Satellite Communication	3
EETE-475	High Speed & Broadband Networks	3
EETE-477	Radar Systems Design, Analysis & Application	3
	Total Credits	**3 or 4**

III. Elective-III (One Course) for Major in Electrical and Electronics

Course Number	Course Name	Credits
EETE-481	High Voltage Engineering	3
EETE-483	Renewable Energy Technology	3
EETE-485	VHDL Modeling and Logic Synthesis	3
EETE-486	VHDL Modeling and Logic Synthesis Laboratory	1
EETE-487	Optoelectronic Devices	3
EETE-488	Optoelectronic Devices Laboratory	1
	Total Credits	**3 or 4**

III. Elective-III (One Course) for Major in Electronics and Telecommunication

Course Number	Course Name	Credits
EETE-491	Optical Fiber Communication	3
EETE-492	Optical Fiber Communication Laboratory	1
EETE-493	Telecommunication Switching System	3
EETE-494	Telecommunication Switching System Laboratory	1
EETE-495	Random Signal Processing	3
EETE-497	Communication and Signal Processing	3
EETE-498	Communication and Signal Processing Laboratory	1
	Total Credits	**3 or 4**

Note: The present course contains 3 Elective groups. Each student should take one course from each Elective Group. Out of these, at least one course should have one practical.

1. Credits for core courses (EETE) = 84
2. Credits for Core Courses of Science & Humanities = 44
3. Credits for Interdisciplinary Core Courses = 7
4. Credits for Technical Elective Course (EETE) = 10

Grand Total Credits = 145

Semester Wise Distribution of Course and Credits

1st Semester

Course Number	Course Title	Credit
CSE-111	Computer Fundamentals	3
HUM-111	Bangladesh Studies	3
HUM-112	Fundamentals of Management	3
HUM-113	World Civilization	3
		Total Credits= 12

2nd Semester

Course Number	Course Title	Credit
EETE-121	Electrical circuits-I	3
EETE-122	Electrical circuits-I Laboratory	1
PHY-121	Physics-I (Waves & Oscillation, Optics, Heat & Thermodynamics)	3
MAT-121	Math-I (Linear Algebra & Co-ordinate Geometry)	3
HUM-121	Basic English	3
		Total Credits=13

3rd Semester

Course Number	Course Title	Credit
EETE-131	Electrical Circuits-II	3
EETE-132	Electrical Circuits-II Laboratory	1
PHY-131	Physics-II (Electricity, Magnetism, Modern Physics, Mechanics)	3
PHY-132	Physics-II Laboratory	1
MAT-131	Math-II (Differential & Integral Calculus)	3
HUM-131	Communicative English	3
		Total Credit= 14

4th Semester

Course Number	Course Title	Credit
EETE-211	Electronics-I	3
EETE-212	Electronics-I Laboratory	1
EETE-215	Engineering Drawing	3
CSE-211	Structured Programming	1
CSE-212	Structured Programming Lab	1
MAT-211	Math- III (Statistics & Probability)	3
		Total Credit=12

5th Semester

Course Number	Course Title	Credit
EETE-221	Electrical Machines-I	3
EETE-222	Electrical Machines-I Laboratory	1
EETE-223	Electronics-II	3
EETE-224	Electronics-II Laboratory	1
MAT-221	Math-IV (Differential Equations & Vector Analysis)	3
HUM-221	Financial & Managerial Accounting	3
		Total Credit=14

6th Semester

Course Number	Course Title	Credit
EETE-231	Digital Electronics	3
EETE-232	Digital Electronics Laboratory	1
EETE-233	Semiconductor Materials & Devices	3
EETE-235	Electrical Machines-II	3
EETE-236	Electrical Machines-II Laboratory	1
MAT-231	Math-V (Complex Variables & Transforms (Laplace, Fourier & Z))	3
		Total Credit=14

7th Semester

Course Number	Course Title	Credit
EETE-311	Microprocessors & Micro Controllers	3
EETE-312	Microprocessors & Micro Controllers Laboratory	1
EETE-313	Signals & Systems	3
CHM-311	Chemistry	3
CHM-312	Chemistry Laboratory	1
		Total Credit=11

8th Semester

Course Number	Course Title	Credit
EETE-321	Digital Signal Processing	3
EETE-322	Digital Signal Processing Laboratory	1
EETE-323	Fundamental of Communication Engineering	3
EETE-324	Fundamental of Communication Engineering Laboratory	1
EETE-325	Electromagnetic Fields and Waves	3
EETE-327	Transmission and Distribution of Electric Power	3
		Total Credit=14

9th Semester

Course Number	Course Title	Credit
EETE-331	Power Electronics	3
EETE-332	Power Electronics Laboratory	1
EETE-333	Instrumentation and Measurement	3
EETE-334	Instrumentation and Measurement Laboratory	1
EETE-335	Control Systems	3
EETE-336	Control Systems Laboratory	1
		Total Credit=12

10th Semester

Course Number	Course Title	Credit
EETE-411	Microwave & Antenna Engineering	3
EETE-412	Microwave & Antenna Engineering Laboratory	1
EETE-413	Renewable Energy Technology	3
EETE-415	Power System Analysis	3
		Total Credit=10

11th Semester

Course Number	Course Title	Credit
EETE-421	Power Stations	3
EEE/ETE-	Elective-I	3
EEE/ETE-	Elective-II	3
EEE/ETE-	Elective-II Laboratory	1
EETE-433	Project and Thesis	0
		Total Credit=9 or 10

12th Semester

Course Number	Course Title	Credit
EEE/ETE-	Elective-III	3
EEE/ETE-	Elective-III Laboratory	1
EETE-433	Project and Thesis	6
		Total Credit=9 or 10

Note: Students will take only “One theory course with one practical” either from Elective II or Elective-III. Accordingly credits will be decided. But total credit will be 145.

Details of Course Contents

The details of Course Contents are given below. The figure within the bracket [--] at the end of the title of the course denotes the credit allocated to the course, which is followed by credit hour. The Symbols / Abbreviations used in the course contents as course materials carry their usual meanings.

HUM-111: Bangladesh Studies [3.00]

Credit Hours 3

Ancient geography of Bengal. Physical features and characteristics of Ancient lapanadas-. The Pala rule in Bengal-Formation and development of Bengali Language and culture. Sens rule and the Muslim conquest of Bengal-the growth of Muslim Society-Religious tolerance and confliets, syneretistie tradition- classes and social structure. Independent Sultanate in Bengal. The golden period of the Sultanate-special features. Bengal under the Mughals (1576-1765), establishment of Mughal rule in Bengal, Shaista Khan-contact with the West. Establishment of British rule in Bengal-socio-economic changes under the colonical rule introduction of Zamindari system resistance in to the colonical rule, the reform movements, English education and its impact.

Development in Bengal, 1858-1905. Growth of Nationalism and the formation of Indian National Congress. The creation of the new province of East Bengal and Assam (1905). Political development from 1906 – 1947. Establishment of the Muslim League. The Bengal Pact (1923).
Autonomous Bengal (1917-1947). The communal problem and the Lahore resolution of 1940, political development of the subcontinent 1940-47. Indian Independence and the partition of the subcontinent and Division of Bengal (1947).

East Bengal / East Pakistan History from 1947-1971.

Language Movement, 1952.United Front and the fall of the Muslim League. The rule of Ayub Khan. Disparity between the two regions. The 1965 War and the movement for regional autonomy.. Rule of Yahiya Khan and the failure of Pakistan.. Bangladesh War of Independence, 1971. Bangladesh 1971-onwards.

Socio-economic profile of Bangladesh, agriculture, industry, service sector, demographic patterns, social aid and physical infrastructures, Social stratification and power, power structures, government and NGO activities in socio-economic development, national issues and policies and changing society of Bangladesh .

References:

1. A.F. Salahuddin Ahmed & Bazlul Mobin Chowdhury, Bangladesh: National Cultures and Heritage: An Introductory Reader.
2. R.C. Majumdar, The History of Bengal (Vol.1 &Vol.2).
3. Banglapedia, 2003, Asiatic Society of Bangladesh.
4. Khan, Md. Shamsul Kabir, Bangladesh Arthaniti.
5. A.M Chowdhury and Fakrul Alam, "Bangladesh on the Threshold of the Twenty-First Century", Asiatic Society of Bangladesh, 2002.

6. M.M Akash, "Poverty Reduction & Strategy: What, Why & for Whom" in Asit Biswas et.al.(ed) Contemporary Issues in Development.
7. Ali Akbar Khan : Discovery of Bangladesh

HUM-112: Principles of Management [3.00]

Credit Hours 3

Concepts and meaning of Business Management, Review of management, principles and theories, Functions of business management, planning, organizing, staffing, motivating and controlling, Different techniques of management and social responsibility. Management process, board of directors' functions and responsibilities.

Evolution, Management function, Organization and environment, Theory and structure, Co-ordination, Span of control, Authority delegation, groups, Committee and task force, Manpower planning, Scope, importance, need hierarchy, motivation, job redesign, leadership, participation management, training, performance appraisal, wages and incentives, informal groups, organizational change and conflict, Elements of costs of products depreciation, break-even analysis, investment analysis, benefit cost analysis.

References:

1. Heinz Weihrich, Harold Koontz; Management: A Global Perspective, McGraw-Hill Education (Asia); 11th Edition, July 2004
2. Md. Rofiuddin, A. A. Khan; Labour & Industrial Laws of Bangladesh, Khoshroz Kitab Mahal, 2003
3. William J Stevenson; Introduction to Management Science, McGraw-Hill/Irwin; 1st Edition, 1998
4. Arun Kumar Sen; Commercial and industrial law, World Press; 9th Edition, 1970
5. George R. Terry Ph.D, Dr. John F. Mee, Dr. Edward Reighard; Principals Of Management - Publisher: Richard D. Irwin, Inc.; 6th Edition, 1953

HUM-113: World Civilization [3.00]

Credit hour 3

Introduction: History, culture and civilization.

Mesopotaminan Civilization: Natural conditions, characteristics of Sumerian civilization, Achievements of Babylonian civilization.

Ancient Egypt: History of Natural conditions, Achievements.

Persian Civilization : Contributions, Assessment
Ancient India: History of Indus valley civilization, History of Aryan civilization.
Ancient China: Characteristics, Philosophy and religion.
Classical Civilization: Ancient Greece, Natural conditions and characteristics, contributions.
Classical Civilization :Ancient Rome. Natural conditions and characteristics.
Islamic Civilization.
Medieval European Civilization: Feudalism, Rise of Christianity and Crusade.
Renaissance: Search for a New World: Character, Achievements
Industrial Revolutions; Rise of Modern Capitalism: Background and major inventions, Effects
French Revolution: Departure from Despotism. Background, causes and nature, Major events, significance.
War and Peace: World Wars and Quest for peace

References:

1. E.M. Burns and Philip Ralph: World Civilizations
2. Wallbank and Taylor: Civilization; Past, Present and Future.

HUM-121: Basic English [3.00]
Credit hour 3

General discussion: Introduction, various approaches to learning English.

Grammatical Problem: construction of sentences, grammatical errors, sentence variety and style, conditionals, vocabulary and diction.

Reading Skill: Principles of effective writing, organization planning and development of writing, composition, precis writing, amplification.

Writing Skill: Principles of effective writing, organization, planning and development of writing, composition, precis writing, amplification.

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

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

Listening skill: The phonemic systems and correct English pronunciation.

Speaking Skill: Practicing dialogue, storytelling, Effective oral presentation.

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

References:

1. Ahsanul Haque, Serajul Islam chowdhury & M. Shamsuddoha; Prose of Our Time; Nawroze Kitabistan Banglabazar, New market.

2. S.M Amanullah; A Guide to correct speech; Ikkar, New circular Road, Banglabazar.
3. R.C. Sharma & Krishna Mohan; Business correspondence and report writing; Tata McGraw-Hill Publishing company Ltd.
4. Lynn quitman Troyka; Simon Schusten & Handbook, Prentice Hall of India Private Ltd.

HUM-131: Communicative English [3.00]

Credit hour 3

Communication: Language and communication, difference between speech and writing, distinct features of speech, distinct features of writing. Writing skills, selection of topic, limiting the topic, thesis statement, developing the thesis, introductory development, transitional and concluding paragraphs, linguistic unity, coherence and cohesion, descriptive, narrative, and expository and arguments writing, technical writing, scientific and technical subjects; formal and informal writings; formal writings reports, handbooks, manuals, letters, memorandum, notices, agenda, minutes, common errors to be avoided, oral skills, production skills; typical sounds, stress, intonation and rhythmic patterns; interactional skills ; formal speech patterns, informal speech patterns, interpersonal communication on different occasions, oral interaction activity; dialogue and conversation, sharing information, presentation of reports, public speaking, discussions, negotiating skills, rhetorical or expressive devices, conversation of verbal to non-verbal and of non-verbal to verbal forms, focuses on generating ideas, drafting, planning, revising, editing and writing further drafts. It also covers the topics like; report writing, formal letter writing, generating an essay and preparing an assignment or a term paper with bibliography, footnotes and appendix.

References:

1. Marcella Frank: Writing As Thinking- A Guided Process Approach, Prentice Hall.
2. Martin Bygatic: Speaking, Oxford University Press
3. Geoffrey Leech, Jan Svartvik: A Communicative Grammar of English, Pearson ESL.
4. Sidney Greenbaum, Randolph Quirk:A Student's Grammar of the English Language, AddisonWesley Publishing Company.
5. S. M. Amanullah; A Guide to Correct Speech.

HUM-221: Financial and Managerial Accounting [3.00]

Credit hour 3

Financial Accounting: Objectives and importance of accounting, branches of accounting, accounting as an information system, computerized system and application in accounting. Recording systems: Double entry mechanism, accounts and their classification, accounting equation, accounting cycle journal, ledger, trial balance. Preparation of financial statements considering adjusting and closing entries. Accounting concepts and conventions. Financial statements analysis and interpretation; Ration analysis tests for profitability, liquidity, solvency and overall measure.

Costs and Management Accounting: Cost concept and classification. Segregation and mixed costs. Overhear costs: Meaning and classification, allocation of overhead cost, overhear recovery method. Job order costing: Preparation of job cost sheet and quotation price. Inventory valuation: Absorption costing and variable costing technique. Cost volume profit analysis: Meaning, breakeven analysis, contribution margin approach, sensitivity analysis. Short term investment decision: Relevant and differential cost analysis, Linear programming. Long term investment decision: Capital budgeting, various techniques of

evaluation of capital investment, investment appraisal under uncertainty, risk management, capital rationing. Concept of working capital, need for working capital, management of cash, stock debtors.

References:

1. Garrison & Noreen; Managerial Accounting, Irwin McGraw-Hill.
2. Harmenson; Principles of Accounting, Irwin McGraw-Hill.
3. Ainsworth; Introduction to Accounting, Irwin McGraw-Hill.
4. Meigns, Williams, haka and Bettner; Accounting, Irwin McGraw-Hill.
5. Larson; Financial Accounting Principles, Irwin McGraw- Hill.

MAT-121: Math-I (Linear Algebra & Co-ordinate Geometry) [3.00]

Credit hour 3

Linear Algebra: Matrix, Different types of matrix, Algebra of matrices, Cofactor, Determinant, Adjoint matrix, Inverse of matrix, Elementary row operations, Row echelon and reduced row echelon matrix, Systems of linear equations, Rank and nullity of matrix, Vector space and subspaces, Linear combination, Linear dependence and independence of vectors, Basis and dimension, Eigen values and Eigen vectors, Matrix polynomials and characteristic equation of matrix, Cayley Hamilton's theorem, Linear transformation.

Co-ordinate Geometry: Two Dimensional co-ordinate geometry; Change of axes. Transformation of co-ordinates, pair of straight lines and general equation of second degree for different types of curves, three dimensional co-ordinate geometry System of co-ordinates; direction cosines, equations of planes and lines.

References:

1. Howard Anton; Elementary Linear Algebra, Wiley; 10th Edition, 2010
2. Seymour Lipschutz, Marc Lipson; Schaum's Outline of Linear Algebra, McGraw-Hill; 4th Edition, 2008
3. Md. Abdur Rahman; Linear Algebra with Applications.
4. Luther Pfahler Eisenhart; Coordinate Geometry, Dover Publications, 2005
5. Barnett Rich; Schaum's Outline of Principles and Problems of Plane Geometry with Coordinate Geometry, McGraw-Hill,1967
6. Chatterjee, P. N.; Coordinate Geometry

MAT-131: Math-II (Differential & Integral Calculus) [3.00]

Credit hour 3

Differential Calculus: Sets of real numbers, Intervals, Absolute value, Functions, Domain & range, Parametric equations, various types of functions, Graph of functions, Limit, L Hospital's rule, Indeterminate forms, Continuity, Differentiability of function, Derivative, geometric interpretation of derivative and tangent line, Derivatives of various types of functions, Chain rule, Implicit differentiation, Successive differentiation, Liebnitz's theorem. Maximum and minimum problem, Tangent and normal to a curve, Rolle's theorem and mean-value theorem, Taylor series and Maclaurin series, Partial derivatives of function of two or more variables, Euler's theorem,

Integral Calculus: Methods of integration by substitution, integration by parts, by reduction. Definite integral, Beta and Gamma function, Rectification, Area under curves, Volumes and areas of surfaces of solid by revolution.

References:

1. Richard Courant, Edward James McShane, Sam Sloan; Differential and Integral Calculus, Ishi Press, 2010
2. Richard Courant, Edward James McShane; Differential and Integral Calculus, Ishi Press, 2010
3. Richard Bronson, Gabriel Costa; Schaum's Outline of Differential Equations, McGraw-Hill; 3rd Edition, 2009
4. B. C.; B. N. Mukherjee Das; Integral Calculus Including Differential Equations, U. N. Dhur & Sons, 1938
5. Howard Anton; Calculus, Cliffs Notes Inc., 2003
6. Md. Abdul Matin; Differential Calculus, Sugandha Publications, 2nd Edition, 1999
7. Md. Abdul Matin; Integral Calculus; Sugandha Publications, 2nd Edition, 1999

MAT -211: Math-III (Statistics & Probability) [3.00]

Credit hour 3

Probability: Sets and probability, Conditional probability, independent and dependent events, Addition law, multiplication law, Mathematical expectation, Random variable and its probability distribution, Discrete and continuous random variable, Binomial distribution and normal distribution.

Statistics: Treatment of grouped sampled data, mean, median, mode, quartile, variance, standard deviation, correlation, regression, tests of hypothesis.

References:

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers; Probability & Statistics for Engineers & Scientists, Prentice Hall; 8th Edition, 2006
2. M. Nurul Islam, An Introduction to Statistics and Probability.
3. A.K.M. Sirajul Hoq, Probability An Introduction.
4. M.P. Gupta & S.P. Gupta; Business Statistics Sultan, Chand & Sons.

MAT-221: Math-IV (Differential Equations & Vector Analysis) [3.00]

Credit hour 3

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

Vector Analysis: Multiple products of vectors, Linear dependence and independence of vectors. Differentiation and integration of vectors together with elementary applications, Line, surface, and volume integrals. Gradient of a scalar function, divergence and curl of a vector function, various formulae. Integral forms of gradient, divergence and curl. Divergence theorem. Stokes, theorem and Gauss's theorem.

References:

1. Richard Bronson, Gabriel Costa; Schaum's Outline of Differential Equations, McGraw-Hill; 3rd Edition, 2009
2. William E. Boyce, Richard C. DiPrima; Elementary Differential Equations, Wiley; 9th Edition, 2008
3. Earl A. Coddington; An Introduction to Ordinary Differential Equations, Dover Publications,

Unabridged Edition, 1989
4. Murray Spiegel, Seymour Lipschutz; Schaum's Outline of Vector Analysis, McGraw-Hill; 2nd Edition 2009
5. Harry F. Davis, Arthur David Snider; Introduction to Vector Analysis, William C Brown Pub, 7th Revised Edition, 1995

MAT-231: Math-V (Complex Variables & Transforms (Laplace, Fourier & Z)) [3.00]

Credit hour 3

Complex Variable: Complex number system, general functions of a complex variable, limits and continuity of a function of complex variable and related theorems, differentiation of complex valued function and the Cauchy-Riemann equations, infinite series, convergence and uniform convergence. Line integral of a complex function, Cauchy integral formula, Taylor's and Laurent's theorem, Singular points, Residue, Cauchy's residue theorem.

Fourier Analysis: Fourier series, Change of intervals, complete form of Fourier series, Double Fourier series, Fourier Sine and Cosine series, Dirichlet's conditions, Parseval's formula, Fourier integral, Finite Fourier Sine and Cosine transforms, Infinite Fourier Sine and Cosine transforms, Complete form of Fourier integral and Fourier transforms, Convoluting and convolution theorem, Parseval identity, Relation between Fourier and Laplace transform.

Laplace Transform: Definition, Laplace transforms of some elementary functions. Sufficient conditions for existence of Laplace transform. Inverse Laplace transforms. Laplace transforms of derivatives, the unit step function and periodic function. Some special theorem on Laplace transforms. Solutions of differential equations by Laplace transform. Evaluation of improper integrals.

Z-Transformation: Introduction to Z-transformation, properties, transfer function, poles and zeros and inverse Z-transform. Correlation: circular convolution, auto-correlation and cross correlation, bi-linear Z-transformation.

References:

1. M. W. McLachlan; Complex Variable Theory and Transform Calculus: With Technical Applications, Cambridge University Press; 2nd Edition, 2011
2. Murray Spiegel, Seymour Lipschutz, John Schiller; Schaum's Outline of Complex Variables, McGraw-Hill; 2nd Edition, 2009
3. James Ward Brown; Complex Variables & Applications, Mcgraw Hill Higher Education, 8th Revised Edition, 2008
4. Wilbur R. LePage; Complex Variables and the Laplace Transform for Engineer, Dover Publications, 2010
5. David V. Widder; The Laplace Transform, Dover Publications, 2010
6. Murray Spiegel; Schaum's Outline of Laplace Transforms, McGraw-Hill; 1st Edition, 1965
7. Elias M. Stein, Rami Shakarchi; Fourier Analysis: An Introduction, Princeton University Press, 2003
8. T. W. Körner; Fourier Analysis Publisher, Cambridge University Press, 1989
9. Md. Abdur Rahman**,** Mathematical Methods Vol. II.

PHY-121: Physics-I (Waves and Oscillation, Optics, Heat and Thermodynamics) [3.00]
Credit hour 3

Waves and Oscillation: Differential equation of simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillation, spring mass system, torsional pendulum; two body oscillation, reduced mass, damped oscillation, forced oscillation, resonance, progressive wave, power and intensity of wave, stationary wave, group and phase velocities.

Optics: Defects of images, spherical aberration, a stigmatism, coma, distortion, curvature, chromatic aberration. Theories of light, interference of light, Young's double slit experiment, displacement of fringes and its uses, Fresnel bi-prism, interference in thin films, Newton's rings, interferometers, Diffraction: diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit and N slits, diffraction grating, polarization, production and analysis of polarized lights, Brewster's law, Malus law, polarization by double refraction, Nicol prism, optical activity, Polarimeters.

Heat and 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, equi-partition of energy, mean free path, Maxwell's distribution of molecular speeds, reversible and irreversible processes, Carnot's cycle, second law thermodynamics, Carnots theorem, entropy, thermodynamic function, Maxwell relations, Clausius and Clapeyron equation.

References:
1. N. Subrahmanyan & Brij Lal; Sound, Vikas Publishing House Private Ltd.
2. N. Subrahmanyam & Brij Lal;Waves and Oscillations, Vikas Publishing House Private Ltd.
3. N. Subrahmanymand Brij Lal; Heat and Thermodynamics, S. chand & Company Ltd.
4. N. Subrahmanyamand Brij Lal; A text book of Optics, S. chand & Company Ltd.
5. Jen Kins & E. White; Fundamentals of Optics, McGraw Hill Book Company.
6. Halliday, resnick & Walker; Fundamentals of Physics, john wiley & sons Inc.

PHY-131: Physics-II (Electricity and Magnetism, Modern Physics and Mechanics) [3.00]
Credit hour 3

Electricity and Magnetism: Electric charge and Coulomb's law, Electric field, concept of electric flux and the Gauss's law- some application of Gauss's law, Gauss's law in vector form, Electric potential, relation between electric field and electric potential, capacitance and dielectrics, gradient, Laplace's and Poisson's equation, Current, Current density, resistivity, the magnetic field, Ampere's law, Biot-Savart's law and their applications, Laws of electromagnetic induction-Maxwell's equation.

Modern Physics: Galilean relativity and Einstein's special theory of relativity; Lorentz transformation equation, Length contraction, time dilation and mass energy relation, photoelectric effect, Wave nature of electron, Heisenberg uncertainty principle, Compton effect, De Broglie matter waves and its success in explaining Bohr's theory, Pauli's exclusion principle. Schrödinger's equation & solutions. Constituents of atomic nucleus, Nuclear binding energy, different types of radio activity, radio active decay law, Nuclear reactions, nuclear fission, nuclear fusion, atomic power plant.

Mechanics: Linear momentum of a particle, linear momentum of a system of particles, conservation of linear momentum, some appliation of momentum principle; angular momentum of a particle, angular momentum of a system of particles, Kepler's law of planetary motion, the law of universal Gravitation, the motion of planets and satellites, introductory quantum mechanics, wave function, uncertainty

principle, postulates, Schrodinger time independent equation, expectation value, Probability, Particle in a zero potential, calculation of energy.

References:

1. Arthur Beiser; Perspective of Modern Physics, McGraw Hill.
2. Arthur Beiser; Concept of Modern Physics, Tata mcGraw-Hill.
3. M. Ali Omar; Elementary Solid State Physics, Pearson Education.
4. Charles Kittle; Introducation to Solid State Physics, John Wiley & Sons, Inc.
5. Halliday, Resnick & Walker; Fundamentals of Physics, John Wiley & Sons Inc.
6. David Halliday & Robert Resnick; Physics Part-I, Wiley Eastern Ltd & New Age int. Ltd.
7. David Halliday & Robert Resnick; Physics Part-II, Wiley Eastern Ltd & New Age Int.

PHY-132: Physics II Laboratory [1.00]

Credit hour 2

Laboratory experiments based on PHY-131

CHM-311: Chemistry [3.00]

Credit hour 3

Atomic structure: Bohr atomic model, wave nature of electrons, Heisenberg uncertainty principle, Schrödinger equation, quantum numbers, Pauli exclusion principle, Afbau principle, Hund's rule, electronic configuration.

Periodic Table: Periodic Law; s, p, d, and f-block elements, ionization potential, electronegativity, electron affinity, ionic radii, diagonal relationship. Metals, semimetals, metalloids, nonmetals, and their properties.

Noble gases: Occurrences, properties and uses.

Chemical bonding: (a) Strong bond: Ionic bond, covalent bond, metallic bond and their properties. (b) Weak bond: Hydrogen bond, Vander Waal's force.

Oxidation-reduction: Charge concept, electronic concept, oxidizing agent, reducing agent, oxidation number, balancing oxidation-reduction equation.

Acid-bases: Brönsted concept, Lewis concept, ionization of water and pH, titration curve, indicators, buffer, Handerson equation.

State of matter: Solid, liquid, gas and their properties.

Gas laws: Boyle's law, Charle's law. Avogardo's law, ideal gas equation, ideal gas, real gas, Vander Waal's equation and kinetic theory of gases

Solutions: Types of solutions, units of solution concentration, collegative properties, Raoult's law, elevation of boiling point, depression of freezing point, osmotic pressure and solubility of gases.

Phase rule: Definition, phase rule of water and carbon-dioxide.

Thermodynamics: 1st law, 2nd law, 3rd law and their applications, enthalpy, entropy, Hesse's law.

Chemical kinematics: Rate law, rate equation, order of a reaction, first order reaction, half cycle.

Chemical equilibrium: Equilibrium, mass action law, equilibrium constant.

Electrochemistry: Resistance, conductance, equivalent conductance, Faraday' law, electrode and electrolytic cell.

Selective organic reactions: Alkane, alkene, alkyne, aromatic compound, alcohol, aldehyde, keytone, and amines.

References:

1. Haque & Nawab: Principles of Physical Chemistry; Students' Publications.
2. P. W. Atkins: Physical Chemistry P. W. Atkins; Oxford University Press.
3. M. Ahmed et al.: Organic Chemistry

CHM-312: Chemistry Laboratory [1.00]

Credit hour 2

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

References:

Practical Chemistry-Haque & Mian; Students' Publication.

CSE-111: Computer Fundamentals [3.00]

Credit hour 3

Introduction to Computers: Computer basics, Components of a computer system, Importance and limitations of computers, Classification of computer (based on purpose, signals, capacity), History of computers, Computer generations. **Microcomputer System:** Microcomputer basics, PC and PC clones, Hardware organizations of microcomputer, Bus architecture, Motherboard and its components, Adapter boards. **Input and Output Devices:** I/O operations and interfaces, Keyboard, Reading devices, Pointing devices, Scanning devices, Monitor, Printer, Plotters, Voice output system. **Microprocessors:** Functions of microprocessors, Organization of a microprocessor, Arithmetic logic unit, Control unit, Classification based on generations, Classification based on characteristics, RISC versus CISC, Special processors. **Memory Organization:** Classification of memory, General properties of memory devices, Memory hierarchies, Read only memory, Random access memory, Cache memory, Secondary memory: Floppy disk, Hard disk, Optical disk, Comparisons of primary memory and secondary memory. **Computer Software:** Software, Classification of software, Commercial software, Freeware, Advantages of package programs, popular package programs, Programming languages, High level languages. **System Software and Operating System:** System software, The role of BIOS, Language translators, Text editor, The tasks of an OS, OS characteristics, Types of OS, Linux, UNIX, MS DOS, Windows. **Database Concepts:** Basic Concepts, Database software, database structures, Database management system, Benefits and limitations of database management. **Computer Networks and the Internet:** Introduction to computer network, Network terminologies, LAN topology, Transmission media, General characteristics of WAN, Bandwidth, Communication over telephone lines, Evolution of the internet, Internet services, Internet address, Electronic mail, The world wide web, introduction to some protocols. **IT Applications:** Concepts and applications of IT, Multimedia hardware and software, Compression and decompression, Electronic Commerce, Access control, Security, Privacy. Introduction to the security of computer network, Computer and its impact on society.

References:

1. Gary B. Shelly, Steven M. Freund, Misty E. Vermaat; Introduction to Computers, Course Technology; 8th Edition, 2010
2. Ron White, Timothy Edward Downs; How Computers Work, Que, 9th Edition, 2007
3. Peter Norton; Introduction to Computers, Career Education; 6th Edition, 2004
4. Winn L Rosch; Hardware Bible, Que, 6th Edition, 2003
5. Peter Norton, Scott Clark; New Inside the PC, Sams,1st Edition, 2002

CSE-211: Structured Programming [3.00]

Credit hour 3

Introduction to Computer Programming, problem solving techniques, algorithm specification and development. Programming style, debugging and testing, documentation. Program design methodologies, structured and modular program designs.

Programming Languages and Paradigms: Classification, assembler and translators source and object programs. Structured language, Procedural and non-procedural programming, modular programming, object oriented programming.

Programming Language in C: Data types, operators and Conversions, statements, control structures, array, pointers and strings, functions, preprocessor, arrays of pointers, structure, union and bit-field, external files.

History of C, Structure of C Program, Identifiers and keywords, Data types, Variable declaration, Expression, Statement, Operators, Library functions, Data input and output functions, Control statements, Function, Recursion, Automatic, External & Static variable. Array, Pointer, Structure and Unions, Data files, some additional features of C.

Advanced data types, access modifiers, storage class specifiers, type conversion in assignments, function type modifiers, pointer to function.

References:

1. K. N. King; C Programming: A Modern Approach, W. W. Norton & Company; 2nd Edition, 2008
2. Behrouz A. Forouzan, Richard F. Gilberg; Computer Science: A Structured Programming Approach Using C, Course Technology; 3rd Edition, 2006
3. Paul J. Deitel; C How to Program, Prentice Hall, 5th Edition, 2006
4. Stephen G. Kochan; Programming in C, Sams, 3rd Edition, 2004
5. Herbert Schildt; C: The Complete Reference, McGraw-Hill Osborne Media, 4th Edition, 2000
6. Balagurusamy; Programming in ANSI C, McGraw-Hill Education, 2nd Edition,1994
7. Greg Perry; Absolute Beginner's Guide to C, Sams, 2nd Edition,1994
8. Brian W. Kernighan, Dennis M. Ritchie; C Programming Language, Prentice Hall, 2nd Edition, 1988

CSE-212: Structured Programming Laboratory [1.00]
Credit hour 2

Laboratory experiments based on CSE-231

EETE 121 Electrical Circuits I [3.00]
Credit Hours 3

Circuit variables and elements: voltage, current, power, energy, independent and dependent sources, resistance.

Basic laws: Ohm's law, Kirchhoff's current and voltage laws.

Simple resistive circuits: series and parallel circuits, voltage and current division, wye-delta transformation. Techniques of circuit analysis: nodal and mesh analysis including supernode and supermesh.

D. C Network theorems: Source transformation, Thevenin's theorem, Norton's theorem and superposition theorem with applications in circuits having independent and dependent sources, maximum power transfer theorem and reciprocity theorem.

Energy storage elements: Inductors and capacitors, series parallel combination of inductors and capacitors.

Responses of RL and RC circuits: natural and step responses.

Magnetic quantities and variables: flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density, magnetization curve.

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

References:
1. R.L. Boylestad, Introductory Circuit Analysis; Pretice Hall of India Private Ltd.
2. James. W. Nilson, Introductory circuits for Electrical & Computer Engineering; Prentice Hall of India private Ltd.
3. Fitzgerald, Basic Electrical Engineering: McGraw-Hill International.
4. Mary Atwater, Electricity and Magnetism; McGraw-Hill.
5. - Robert P. Ward, Introduction to Electrical Engineering; Prentice Hall of India Private Ltd.
6. Richard C. Dorf & James A. Svoboda, Introduction to Electric Circuits; John Wiley & Sons Inc.

EETE 122 Electrical Circuits I Laboratory [1.00]
Credit Hours 2

Laboratory experiments based on EETE-121

EETE 131 Electrical Circuits II [3.00]
Credit Hours 3

Sinusoidal functions: instantaneous current, voltage, power effective current and voltage, average power, phasors and complex quantities, impedance, real and reactive power, power factor.

Analysis of single phase AC circuits: series and parallel RL, RC and RLC circuits, nodal and mesh analysis, application of network theorems in AC circuits, circuits with non-sinusoidal excitations, transients in AC circuits passive filters.

Resonance in AC circuits: series and parallel resonance. Magnetically coupled circuits.

Analysis of three phase circuits: three phase supply, balanced and unbalanced circuits, and power calculations.

References:
1. Russell M Kerchner and George F Corcoran, Alternating Current Circuits-; John Wiley & Sons.
2. R L Boylestad, Introductory Circuit Analysis; Prentice Hall of India Private Ltd.
3. B L Theraja and A K Theraja, A text Book of Electrical Technology; S. Chand & Company Ltd.
4. James. W. Nilson, Introductory Circuits for Electrical & Computer Engineering; Prentice Hall of India Private Ltd.
5. Fitzgerald, Basic Electrical Engineering; McGraw-Hill International.

EETE 132 Electrical Circuits II Laboratory [1.00]
Credit Hours 2
Laboratory experiments based on EETE-131

EETE 211 Electronics-I [3.00]
Credit Hours 3

Atomic Structure: Study of Bohr's atomic model for the purpose of understanding the problems facing the electronic world, energy levels, energy bands in solids.

Semiconductors Physics: Bonds, effect of temperature, hole current, intrinsic and extrinsic semiconductor, current flow in biasing conditions.

P-N Junction : Fundamentals of Semiconductors diodes, Formation of P and N type Semiconductors, Doping, P-N junction under forward and reverse bias, resistance of semiconductor diode, diode currents, V-I characteristics, Ideal diode, Equivalent circuit of diode, Breakdown of diodes.
Practical Usages of Diodes: Half-wave and full-wave rectifier, Bridge rectifier, Zener diode as a voltage regulator, Clipper, Clamper, Voltage multiplier, peak detector, Characteristics of different types of diodes: Tunnel diode, Schottky diode and photo diode.

Bipolar Junction Transistor: Introduction to BJT, Polarity concepts of BJT, Transistor biasing rule, Transistor currents and their relation, CC, CE and CB model and their interrelations, Amplification factor, Thermal runaway, DC and AC load line, Operating point, DC and AC equivalent circuit of transistors.

Transistor Amplifier Circuits: Small signal low frequency model of BJT, Analysis of CE, CC and CB amplifier model, configuration, h-parameter of transistor, Transistor hybrid model, Input resistance, output resistance, Voltage gain, current gain, Emitter follower, Cascading transistor amplifiers, Miller's Theorem, Common-emitter amplifier with an emitter resistance, simplified hybrid model.

Field Effect Transistor: Introduction to FET, Classification and construction, Biasing of FET devices, Operation of JFET, Pinch-off voltage, Drain characteristics, Transfer characteristics, Small-signal JFET parameters, FET amplifier analysis, FET as a voltage-controlled device and FET applications.

Introduction to High Frequency Amplifiers: Common source JFET amplifiers, Common drain JFET amplifiers and it's equivalent circuit at high frequency, Hybrid-(model, Single-stage CE amplifier analysis, Y-parameter model.

References:

1. R.T. Paynter, Introductory Electronic Devices and Circuits, 4th Ed., New Jersey: Prentice Hall, 1989
2. Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory.
3. Sedra and Smith, Microelectronic Circuits
4. B. L. Theraja, A. K Theraja, A textbook of Electrical Technology, Vol. – IV.

EETE 212 Electronics-I Laboratory [1.00]

Credit Hours 2

Laboratory experiments based on EETE-211

EETE 215: Engineering Drawing [1.00]

Credit Hours 2

Drawing Instruments and their uses; First and third angle projections; Orthographic drawings; Isomeric views; Missing lines and views; Sectional views and conventional practices; Auxiliary views; Use of computer in preparing drawings. AUTOCAD.

EETE 221 Electrical Machines-I [3.00]

Credit Hours 3

DC Generators: Principles, Construction, The functions of Commutator and Brush, Classifications of DC Generators, Armature and Stator windings, voltage build up, Armature reactions and commutation, performance and testing.

DC Motors: Construction, operation, types, torque-speed characteristics, and methods of speed control.

Transformers: Single phase transformer, principle, construction, cooling, vector diagrams, voltage regulations, equivalent circuits, losses and efficiency. Three phase Transformers, Principle, construction harmonies, losses and efficiency.

References:

1. B.L Thereja, A Textbook of Electrical Technology, Third Edition, S. Chand & Company Limited, New Delhi.
2. Stephen Chapman: Electric Machinery Fundamentals, 5th Edition.

EETE 222 Electrical Machines-1 Laboratory [1.00]

Credit Hours 2

Laboratory experiments based on EETE-203

EETE 223: Electronics – II [3.00]

Credit Hours 3

Operational amplifiers : Introduction to operational amplifiers, inverting and non-inverting amplifier, phase inverter, scale changer, integrating and differentiating circuits, adder of summing amplifier, voltage to current and current to voltage converters, voltage follower, electronic analog computation, capacitors, differential instrumentation and bridge amplifiers, ac performance of operational amplifiers, bandwidth, common-mode-rejection ratio, slew rate, noise and frequency compensation, AC and DC performance.

Comparators and converters: Square-wave generator, Triangle-wave generator, saw tooth generator, zero crossing detector, Schmitt Triggers.

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

Feedback amplifiers: Classification, feedback concept, effect of feedback on transfer gain, loop gain, amplifier characteristics, types of feedback, negative feedback amplifiers and their applications.

Oscillators: General principles of oscillation, Barkhausen Criterion, Phase-Shift Oscillator, Wien-Bridge Oscillator, LC Oscillators, Crystal Oscillators.

Un-tuned power amplifiers: class A, class B, class C amplifiers.

References:

1. Robert F. Coughlin, Operational Amplifier and Linear Circuits, 6th Ed., Prentice-Hall , 2006
2. Millman & Halkias, Integrated Electronics, 2nd Ed., McGraw-Hill, 1971.
3. R.T. Paynter, Introductory Electronic Devices and Circuits, 4th Ed., New Jersey: Prentice Hall, 1989.
4. Millman & Taub, Pulse, Digital, and Switching Waveforms, McGraw-Hill, 1965.
5. S. Franco, Design with Operational Amplifiers and Analog Integrated Circuits, McGraw-Hill, 1988.
6. T. L. Floyd, Digital Fundamental.
7. J. Millman, Pulse, Digital and Switching Waveform.
8. Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory.

EETE 212: Electronics II Lab [1.00]

Credit Hours 2

Laboratory works based on EETE 211

EETE 231 Digital Electronics [3.00]
Credit Hours 3

Number Systems: Representation of Numbers in different bases, Addition, Subtraction in **different bases; Base Complement, Subtraction using Complements; Binary Multiplication and** Division.

Binary Codes: Different Code System, Boolean Algebra, Various Gates, Sum of products and Product of Sums, Maxterm, Minterm, Standard and Canonical forms and other Logical Operations.

Simplification of Boolean functions: Karnaugh map method; Tabular method of simplification.

Implementation of Logic Circuit using various Gates: NOR, NAND, AND, OR, INVERT Implementation. Diode Logic Gates, Transistor Switches, Transistor Gates, MOS Gates, Logic Families: TTL, ECL, IIL and CMOS logic with operation details.

Combination Logic Circuits: Design procedure; Adder, Subtract or, Code Converters, Parity bit Checker etc., Analysis of combinational Circuits and its Truth Table, Encoder, Decoder, Multiplexer, De-multiplexer, ROM and PLA.

Flip-Flops: SR, JK, Master Slave, T & D type Flip Flops and their Truth Tables.
Arithmetic Circuits: The half adder and full adders; parallel adders; IC parallel adders; The 2's complement addition and subtraction; The BCD adder; Binary multiplier.

Sequential Circuits: Introduction to Sequential Circuits, Analysis and Synthesis of Synchronous Sequential Circuits.

Counters: Classification, Synchronous and Asynchronous counter design and analysis, Ring Counter, Johnson Counter, Counters with any MOD numbers, Decoding a counter. Shift registers, Frequency counter, digital clock.

Registers: Classifications, Shift Register, Transfer Registers, Circular Registers and their Applications, Registers with Parallel Load.

Memory Devices: Semiconductor memory technologies, ROM architecture, timing and types of ROM, EPROM, ROM applications, RAM architecture, static and dynamic RAM, DRAM a structure, operation and refreshing. Expanding word size and capacity, Magnetic bubble and CCD memories.

Converters: Digital to Analog (D/A), Analog to Digital (A/D) Converters and their Applications.

References:
1. M. Morris Mano, Digital Design., 3rd ed., Prentice Hall
2. R. P. Jain, Modern Digital Electronics.
3. Malvino, Brown, Digital Computer Electronics.
4. Tocci, Digital System.

EETE 232 Digital Electronics Laboratory [1.00]
Credit Hours 2

Laboratory experiments based on EETE-231

EETE 233: Semiconductor Materials & Devices [3.00]

Credit Hours 3

Crystal Structure and growth of semiconductors: Crystal structure, Energy bands, Carrier Concentration at thermal equilibrium, Calculation of Fermi-level, carrier transport phenomena, Recombination process. Cubic lattices, Planes and directions, the diamond lattice, Growth of Single crystal ingots, method, growth of epitaxial layers.
P-N Junction Diodes: Boundary conditions, Minority carrier distribution, Ideal PN junction current, small signal model of the PN junction, Generation-recombination currents. The Tunnel Diode. The PN junction solar cell, photo-didoes.

Two-Port Network Parameters / Hybrid Parameters: Characterization of linear two-port networks. Commonly used two-port parameters , e.g. h-parameters, y-parameters, g-parameters and z-parameters.

Bipolar transistor: Solution of the diffusion equation in the base region, Evaluation of the terminal currents, Approximations of the terminal currents, Drift in the base region, Avalanche breakdown.

Field effect transistor: The ideal MOS capacitor, Effect of real surfaces- work function difference, interface charge, Threshold voltage, MOS capacitance voltage analysis.

Optoelectronic devices: Current and voltage in an illuminated junction, Solar cells, Photo detectors, Noise and bandwidth of photo detectors, Light emitting materials, Population inversion of a junction, Emission spectra for pn junction lasers, The basic semiconductor laser.
Integrated circuits : Elements and Fabrication of Integrated circuits.

References:

1. Adel S. Sedra and Kenneth C. Smith: Microelectronic Circuits; Oxford University Press, New York, 2004.
2. Donald A. Neamen: Semiconductor Physics and Devices-Basic Priciples;McGraw-Hill Publishing Company Ltd., 2003.
3. Robert F. Pierret :Semiconductor Device Fundamentals; Pearson Education,Inc.,2011.
4. S.M. Sze: Physics of Semiconductor Devices; Second Edition, John Wiley & Sons

EETE 235: Electrical Machines-II [3.00]
Credit Hours 3

Synchronous generators: Construction, excitation systems; salient poles and non-salient poles, armature and field cores, cooling air gap flux, regulation, vector diagrams, losses and efficiency, transient

conditions, Parallel operation, load sharing. Armature reaction in synchronous generator. Two reaction analysis and concept of direct axis and quadrate axis reactance.

Transient performance of rotating machines. Fundamentals of electromechanical energy conversions, energy storage. Generalized performance equations of machines. Interconnected
System of synchronous machines, Starting of synchronous control requirements. DC and AC motor control by traditional methods and by using SCRs.

Electrical Braking of DC and AC Motors, Eddy Current Brakes.
Amplidyne, Metadynes, Synchronous Converters, Static Power Converters Electrical Machine Design, Design factor, design principles, Transformer Design, Design of Small Single Phase transformers, Design of single phase Induction Motors.

Induction Motor: Construction, principles of 3 phase Induction Motor, equivalent circuits, speed-torque relations, Tests, losses and efficiency, circle diagram.
Synchronous Motor: Theory of operation, vector diagrams, V-curves, Test, losses efficiency and starting.

Special Machine: . Stepper Motor Principle, Variable Resistance Stepper Motor. Hysteresis Motor, Servo Motor.

References:

1. S K Bhattacharya, Electrical Machines, Second Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. B.L Thereja, A Textbook of Electrical Technology, Third Edition, S. Chand & Company Limited, New Delhi.
3. Rosenblatt, Friedman, Direct and Alternating Current Machinery, Second Edition, CBS Publishers & Distributors, New Delhi.

EETE-236: Electrical Machines – II Laboratory [1.00]

Credit Hours 2

Laboratory experiments based on EETE- 221

EETE-311: Microprocessors and Micro controllers [3.00]

Credit Hours 3

Microprocessors and Micro computers. Evolution of microprocessors.Microprocessor applications. Architecture of a general purpose Microprocessor and its operation. Common instruction types, addressing modes.

Intel 8086 Microprocessor: Internal architecture, resistor structure, programming model, addressing modes, instruction set, assembly language programming, condition tests, stacks branches, control signals, IO port organization and accessing, Interrupts and interrupt handling. System design using 8086. An overview of Pentium and alpha RISC processors. Architectural overview of Intel Family of General Purpose Processor. Cache Memory, TLB Structure.
Memory Management in Intel 80 x 86 Family: Segmentation, Real Mode Memory Management: Segmentation and segmented to physical address translation, segment warp around, protected mode

memory management: Segmentation and virtual addressing, segment selection, segment descriptor tables, segment descriptors, Intel 80 386 and 80486 segment register formats. Paged Memory Operation, Page Directory and Page tables, page table address translation. Linear to physical address translation.

Interrupts and exception in Intel 80 x 86 family of processor: Types of Interrupts , Maskable and non-maskable interrupts, exception classes and processor defined exceptions. Interrupts in real mode and protected mode. Interrupt descriptor tables, Interrupt Gates and Trap Gates, Task Gates. Interrupt priorities.

Input and Output : IO address spaces, port organization, memory mapped IO, Handshaking IO instructions, memory mapped IO in protected mode, protection issues in Intel 80 x 86 family-privilege levels.

References:

1. N.Senthil Kumar, M. Saravanan,S. Jeevananthan: Microprocessors and Microcontrollers, Oxford University Press, USA.
2. Barry B. Brey: Intel Microprocessors, Prentice Hall.
3. John Crisp: Introduction to Microprocessors and Microcontrollers, Newnes 2004.

EETE-312: Microprocessors and Micro Controllers Laboratory [1.00]

Credit Hours 2

Laboratory experiments based on EETE-311

EETE 313: Signals and Systems [3.00]

Credit Hours 3

Classification of signals and systems: signals-classification, basic operation on signals, elementary signals, and representation of signals using impulse function, systems- classification. Properties of Linear Time Invariant (LTI) systems: Linearity causality, time invariance, memory, stability, invertibility.Time domain analysis of LTI systems :Differential equations- system representation, order of the system, solution techniques, zero state and zero input response, system properties ,impulse response-convolution integral, determination of system properties; state variable-basic concept, state equation and time domain solution. Frequency domain analysis of LTI systems: Fourier series – properties, harmonic representation, and system response, frequency response of LTI system; Fourier transformation –properties, system transfer function; system response and distortion-less systems. Application of time and frequency domain analyses: solution of analog electrical and mechanical systems, amplitude modulation and demodulation, time division and frequency division multiplexing. Laplace transformation: properties, inverse transform, solution of system equation, system transfer function, system stability and frequency response and application.

References:

1. Samir S. Soliman: Continuous and Discrete Signals and Systems
2. Alan V. Oppenheim, Alan S.Willsky : Signals and Systems, 2nd Edition,
3. Nasser Kehtarnavaz: Digital Signal Processing System,
4. John G. Proakis, Dimitris G. Manolakis : Digital Signal Processing,

EETE-321: Digital Signal Processing [3.00]

Credit Hours 3

Discrete Time Signals and Systems: Discrete-time signals, Discrete-time systems, Linear Time-Invariant systems and their properties, Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems, Fourier transform of discrete sequences, Discrete time processing of continuous signals.

Z-Transform and Its Applications: Definition of z-transform, Region of Convergence, Properties of z-Transform, Inversion of the z-Transform, Analysis of Linear Time-Invariant Systems in the z-Domain.

Structure of Discrete Time Systems: Block diagram representation of constant coefficient difference equations, IIR and FIR systems and their basic structures, Stability of discrete time systems.

Discrete-Time Fourier Analysis: Discrete Fourier Transform (DFT) and its properties, Inverse Discrete Fourier Transform, Linear Convolution using Discrete Fourier Transform, Fast Fourier Transform (FFT), Decimation in time and Decimation in frequency.

IIR Filter Design and Applications: Impulse Invariant and Bilinear Transformation Methods, Spectral Transformation Technique for HP, BP, and BS Filter Design, Direct Design of IIR Filter, Finite Word Length Effects, Application examples.

FIR Filter Design and Applications: FIR Filter Design by Fourier Approximation, Gibb's Phenomenon, FIR Filter Design by Frequency Sampling Method, Discrete Wavelet Transform, Application examples.

Power Spectrum Estimation: Use of DFT in Spectrum Estimation, Non-parametric Methods of Power Spectrum Estimation; Bartlett Method, Welch Method, Parameter Methods for Power Spectrum Estimation; Linear prediction, AR, MA and ARMA Methods.

DSP Algorithms: Custom VLSI, DSP Processors and FPGA Based Implementation, Fixed point Processors (ex: TMS 320c54x), Floating Point Processors (ex: TMS 320c6x, ADSP SHARC).

Image Processing: 2D & 3D image formation, representation in pixel and transform domains, reconstruction from projections and interpolation, human visual system, stochastic models for images, enhancement and restoration techniques in spatial and frequency domains, image processing in color space, morphological filters, multi-resolution image processing, image compression techniques and standards, segmentation for edge detection and texture analysis, pattern classification, image watermarking, registration and fusion, emerging applications of image.

References:

1. J.G. Proakis & D.G. Manolakis, Introduction to Digital Signal Processing, Maxwell Macmillan, 1988.
2. Allen V. Oppenheim & Ranald W. Schafer: Discrete-Time Signals & Systems, Prentice Hall.
3. Prokis, Manolakis, Digital Signal Processing.

4. Lonnie C. Ludeman, Fundamentals of Digital Signal Processing, John Wiley and Sons.

EETE 322: Digital Signal Processing Laboratory [1.00]
Credit Hours 2
Laboratory works based on EETE 321

EETE 323 Fundamental of Communication Engineering [3.00]
Credit Hours 3

Overview of Communication System and Simple Telephone Circuit: communication system block diagram, communication system parameters, switching network, classifications of switching network, basic telephone circuit and types.

Analog Modulation Techniques: amplitude modulation, advantages and disadvantages of AM, single side-band modulation, double side-band suppressed carrier modulation, frequency modulation, narrow band FM and wide band FM.

Voice Digitization and Digital Modulation Techniques: pulse amplitude modulation, Nyquist sampling theorem, forldover distortion, pulse code modulation, quantization, quantization error, companding, differential pulse code modulation, delta modulation, amplitude shift keying, frequency shift keying, minimum-shift keying, gaussian minimum-shift keying, phase shift keying, quadrature amplitude modulation.

Multiplexing: frequency division multiplexing, time division multiplexing, wavelength-division multiplexing, analogue and digital hierarchy.

Multiple Access:multiple-access network – time-division multiple access, frequency-division multiple access, code-division multiple access (CDMA), spread spectrum multiplexing, coding techniques and constraints of CDMA.

Switching Mechanisms: switching and classifications, space division switching, single and multistage switching, time division switching and types.

Data communications over PSTN: switching mechanisms for data transfer, asynchronous transfer mode, SDH, SONET. Telephone modem and types, digital subscriber line and types, discrete multi-tone techniques.

Teletraffic Theory: traffic parameters, loss and delay system, grade of service and blocking probability.

Radio wave propagation: effects of ionosphere and earth's curvature.
Optical fiber communication system: advantage and disadvantages of fiber-optic, operation range and construction, principle of operation, electrical to optical and optical to electrical transducer, optical amplifier.

Cellular mobile communication: cell, cluster, frequency reuse, channel assignment, interference, GSM, GSM architecture, IS-95 and features, GPRS, EDGE,WCDMA, HSPA and LTE.

Satellite Communication: satellite orbits, types, bands of satellite, transponder, earth station, LEO satellite and types, iridium system, global star system, difference between satellite and terrestrial communication. Radar and its applications.

References:

1. T Vishwanathan, Telecommunication Switching Systems and Networks –9th Edition , Prentice Hall

2. Bellamy, John Wiley & Sons, Digital Telephony –3rd Edition

3. Louis E Frenzel, Communication Electronics – 3rd Edition, McGraw-Hill Publishing Ltd.

4. Behrouz A Forouzan, Data Communications and Networking – 3rd/4th Edition, McGraw-Hill Publishing Ltd.

5. Simon Haykin, John Wiley & Sons, Communication Systems – 4th Edition,

EETE 324: Fundamental of Communication Engineering Laboratory [1.00]

Credit Hours 2

Laboratory works based on EETE 323

EETE 325: Electromagnetic Fields and Waves [3.00]

Credit Hours 3

Electrostatics: Coulomb's Law, force, electric field intensity, electrical flux density. Gauss's theorem with application, electrostatic potential, boundary conditions, method of images, Laplace's and Poisson's equations, energy of an electrostatic system, conductor and dielectrics.

Magnetostatics: Concept of magnetic field, Ampere's Law, Biot-Savart law, vector magnetic potential, energy of magnetostatic system, mechanical forces and torques in electric and magnetic fields, Curvilinear co-ordinates, rectangular, cylindrical and spherical co-ordinates, solutions to static field problems. Graphical field mapping with applications, solution to Laplace's equations, rectangular, cylindrical and spherical harmonics with applications.

Maxwell's equations: Their derivations, continuity of charges, concepts of displacement current. Boundary conditions for time-varying systems. Potentials used with varying charges and currents. Retarded potentials, Maxwell's equations in different coordinate systems, Faraday's Law of Induction, the conservation of charge and the incompleteness of Ampere's Law. Maxwell's equations and Lorentz force law.

Relation between circuit theory and field theory: Circuit concepts and the derivation from the field equations. High frequency circuit concepts, circuit radiation resistance. Skin effect and circuit impedance. Concept of good and perfect conductors and dielectrics. Current distribution in various types of conductors, depth of penetration, internal impedance, power loss, calculation of inductance and capacitance.

Plane Electromagnetic Waves: Propagation of plane wave in lossless and lossy media, Polarization of plane wave, Flow of EM power and Poynting vector.

Transmission Line: High Frequency transmission lines, impedance matching technique and application.

References:

1. D. K. Cheng, Field and Wave Electromagnetics, Addison Wesley, 1989.
2. William H. Hyat Jr., Engineering Electro Magnetic.
3. S. Rammo, Fields and Waves in Communication Engineering.
4. S. V. Marshall, R. E. DuBroff, G. G. Skitek, Electromagnetic Concepts and Applications, Prentice Hall, 1996.
5. K. D. Prasad, Antenna and Wave Propagation.

EETE-327: Transmission and Distribution of Electrical Power [3.00]

Credit Hours 3

Inductance of transmission lines: Flex linkage, Inductance due to internal flux, Inductance of single phage two wire lines, Flux linkage of one conductor in a group, Inductance of composite conductor lines, GMD examples; 3 phase lines with equlateral field; potential difference between points due to a charge, Capacitance of a two-wire line. Group of charged conductors. Capacitances of 3 phase lines with equlateral and with unsymmetrical spacing. Effect of earth, parallel circuit lines. Resistance and skin effect. Resistance and temperature, skin effects, influence on resistance, use of table, current and voltage relation on a transmission line, T and pi-representation, exact solution. Equivalent circuit of a long line. Mechanical characteristics of transmission line; Sag and stress analysis; Wind and ice loading, supports at different evaluation conditions at crection; effect of temperature changes. Generalized line constant; General line equation at erection; effect of temperature changes.Generalized line constant; General line euqtion in terms of A,B,C,D constants. Relation between constants, charts of line constants, constants of combined networks, measurement of line constants. Circle Diagrams: Reveiving end and sending end power circle diagrams. Voltage and power factor control in transmission systems. Tap changing Transformers; on load tap changing. Inductance regulatros. Moving coil regulators; Boosting transformers. Power factor control; static condensers; synchronous condenser. Insulators for overhead lines; types of insulators, their construction and performance. Potential distribution in a string of insulators, string efficiency. Methods of equalizaed potential distribution; special types of insulators, testing of insulators. Insulted cables, cables
Versus overhead lines, insulating materials Electrostatic stress grading. Three core cables; dielectric losses and heating.Modern development; oil filled and gas filled cables. Measurement of capacitance Cable testing. Introduction to transmission line protection over current relay and time grading, reverse power relays. Differential protection Distant relays. Distrubution: Distributor calculation, ring mains and interconnections.

References:

1. William D. Stevenson, Jr., Elements of Power System Analysis
2. B.R. Gupta, Power System Analysis & Design
3. V.K. Metha,Principles of Power System,
4. Hadi Sadat, Power System Analysis,
5. D.P. Kothari. I.J Nagrath, Modern Power System Analysis,

EETE 331: Power Electronics [3.00]

Credit Hours 3

Overview of Power Semiconductor Switches: Power diodes, Power MOSFET, SCR, DIAC,TRIAC, IGBT, GTO, UJT, UJT Relaxation Oscillator, Programmable UJT (PUT); PUT Relaxation Oscillator,

Shockley diode, Silicon Unilateral Switch (SUS), Silicon Bilateral Switch (SBS), Asymmetrical AC trigger devices.

Phase Control Converters: Single Phase and Three Phase, Semi and Full Converters. DC to DC Converters, Step-up & Step-down Choppers, Thyristor Chopper Circuits.

Switch-Mode DC-AC Inverters: Pulse-Width Modulation, Single-Phase Inverters, Three-Phase Inverters, Effect of Blanking Time on Output Voltage in PWM Inverters.
Resonant Converters: Classification of Resonant Converters, Basic Concepts, Load-Resonant Converters, Resonant-Switch Converters.

Power Supply Applications: Switching Power Supplies, Electrical Isolation, Protection Circuits, Power Supply Specification, Power Line Disturbances, Power Conditioners, Uninterruptible Power Supplies.

References:

1. Muhammad H. Rashid, Power electronics : circuits, devices, and applications, 2nd ed., Englewood Cliffs, N.J., Prentice Hall, 1993
2. John G. Kassakian, Martin F. Schlecht, and George C. Verghese, Principles of Power Electronics, Addision Wesley, 1991
3. M. Fisher, Power Electronics, PWS-KENT Publishing Company, 1991
4. T.J. Maloney: Modern Industrial Electronics, 3rd Ed., New Jersey: Prentice-Hall, 1996
5. T.J. Maloney, Industrial Solid-State Electronics: Devices and Systems, New Jersey: Prentice Hall, 1986.

EETE 332: Power Electronics Laboratory [1.00]

Credit Hours 2

Laboratory works based on EETE 331.

EETE 333: Instrumentation and Measurement [3.00]

Credit Hours 3

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

Basic elements of dc and ac signal conditioning: Instrumentation amplifier, noise and source of noise, noise elimination compensation, A/D and D/A converters, sample and hold circuits.

Data Transmission and Telemetry: Methods of data transmission, dc/ac telemetry system and digital data transmission. Recording and display devices. Data acquisition system and microprocessor applications in instrumentation.

Measuring instruments : Classification of measuring instruments. Ammeter, Voltmeter, wattmeter, AVO meter, Energy meter, Amperehour meter.

Instrumentation : Extension of instrument range. Use of C.T. and P.T and calculation of their burden, Instrumentation of substation.

Measurement of non-electrical quantities: Transducer. Measurement of temperature, pressure, displacement, velocity, acceleration. Strain gauge and their applications.

References:

1.A. K. Sawhney, A Course on Electrical and Electronic Measurements & Instrumentation, Dhanpat Rai & Cor.
2. Harries K. Forrest, Measurement & Instrumentation.
3. M.M.S..Anand: Electronic Instruments and Instrumentation Technology,Prentice-Hall,India
4.AD. Halfrick and W.D. Cooper: Modern Electric Instrumentation and Measurement Techniques, Prentice-Hall of India.
5. R. Morrison: Noise and Other Interfering Signals, John Wiley & Sons.
6. J. Minkoff: Signals, Noise and Active Sensors, John Wiley & Sons.

EETE 334: Instrumentation and Measurements Laboratory [1.00]
Credit Hours 2

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 333. In the second part, students will design simple systems using the principles learned in EEE 333.

EETE-335: Control Systems [3.00]
Credit Hours 3

Introduction to Control systems: linear time invariant systems, feedback control, terminologies and practical examples.

Mathematical Modeling: differential equation, transfer function, state space and discrete forms, inter transformations, modeling of servo and familiar systems.

Response: time domain specifications, unit step response for first and second order systems, damped response, solution of state equation.

System Description: block diagram, signal flow graph, reduction, Mason's rule.

Stability: poles and zeros, eigen values, Routh's criterion.

Steady state performance: system types with examples, steady state error and static error coefficient.

Root locus: construction rules, dominant poles, stability analysis. Bode plots: log magnitude and phase angle characteristics, gain and phase margins, experimental determination of transfer function. Nyquist criterion. Design with on-off, P, PI, PD, and PID, controllers, lag-lead compensation, state variable feedback and pole placement.

Introduction to digital control: Fuzzy logic and neural network controllers, stability analysis in Z-domain.

References:

1. Norman S. Nise, Control System Engineering, Wiley, 6 th Edition.
2. Nagrath, M. Gopal, Control System Engineering, New Age International Publishers, 4 th Edition
3. Richard C. Dorf, Robert H. Bishop, Modern Control System, Prentice Hall, 12 th Edition
4. J.J. D' Azzo, C.H. Houpis, Feedback Control System Analysis and Synthesis.

EETE-336: Control Systems Laboratory [1.00]

Credit Hours 2

Laboratory experiments based on EETE-335

EETE-411: Microwave & Antenna Engineering [3.00]

Credit Hours 3

Analysis of H.F transmission lines (lossless and lossy). Different types of Modern Transmission lines,smith chart and its applications, Impedance matching techniques and applications. Guided E.M. waves, Parallel plane and Retangular waveguides, cavity resonator.

Antennas and radiation,small current element antena, Long straight antena, Radiation patterns and gain. Frequency Independent and Logperiodic antennas, Antenna arrays: Broadside and Endfire array, Phasescanning of Antennas arrays.

Transit time effects, Velocity modulation, Microwave tubes: Klystron amplifier, Multicavity Klystron amplifier, Reflex Klystron oscillator, Magnetron oscillator, Travelling Wave Tube Amplifier (TWTA), Backward Wve Oscillator (BWO).

References:

1. Simon Ramo, John R. Whinnery, Theodore Van Duzer; Fields and Waves in Communication Engineering.
2. David M. Pozer, Microwave Engineering, Wiley Text Books; 2nd edition, ISBN: 0471170968
3. S.Y. Liao, Microwave Devices and Circuits, Prentice-Hall inc. New Jersey, USA.

EETE-412: Microwave & Antenna Engineering Laboratory [1.00]

Credit Hours 2

Laboratory experiments based on EETE-411

EETE-413: Renewable Energy Technology [3.00]

Credit Hours 3

Energy system: Renewable and Non-renewable energy.

Renewable energy technology: **Introduction:** Necessity of photovoltaic energy conversion, characteristics of sunlight.

Physics of photo-volttics: Introduction, Interaction of light, separation and collection of carriers, efficiency, influence of illumination on efficiency.
Solar cell materials: Mono-crystalline Si, Amorphous Si, Hetero-junction and thin films cell.

Technology of cells: introduction, Production of Si, Si solar cell fabrication, cell fabrication, Assembling and encapsulation of solar cells.

Characterization of solar cells: Determination of solar cell parameters, efficiency measurements, module controls.

Photovoltaic module operation: Standard module, series parallel connection of cells, Hot spot formation.

Photovoltaic system: Global radiation, storage in PV system, Stand alone PV system, System without battery, DC to AC conversion.

Other renewable energy: Biomass, Source of biomass, Wind power, Wind power system, Transmission, Generation and control, wind mill, water power, Tidal power. Ocean Energy.

References:

1. Van Overstracten, Physics, Technology and Use of Photovoltaic.
2. J.A Duffie, Solar Engineering of Thermal Process.
3. G.D Rai, Solar Energy Utilization.
4. Fisk and Anderson, Introduction to Solar Technology.
5. Magal, Solar Power Engineering.
6. M.A Green, Solar Cell

EETE-415: Power System Analysis [3.00]
Credit Hours 3

System modeling: Power network representations, per unit system of calculations, changing the base of per unit quantities, per unit impedances in single phase transformer and three phase transformer circuits, per unit impedance in three winding transformers, on-line diagram, impedance and reactance diagram, advantages and disadvantages of per unit computations.

Symmetrical three phase faults: Short circuit currents and the reactance of synchronous machines, internal voltage of loaded machines under transient conditions, bus impedance matrix in fault calculations, bus impedance matrix equivalent network, percentage reactance and short circuit MVA.

Symmetrical components: Symmetrical components of unsymmetrical phasors, sequence impedances and sequence networks, sequence networks of unloaded generators, positive and negative sequence networks, zero-sequence networks.

Unsymmetrical faults: Unsymmetrical short circuits on an unloaded generators, single line-to - ground faults, line-to-line faults, double line-to-ground faults, unsymmetrical faults of power systems.

Network calculations: Node equation, matrix partitioning, node equation by matrix algebra, bus admittance and impedance matrices, modification of an existing bus impedance matrix, direct determination of bus impedance matrix.

Load flow solution and control: Classification of buses, specification of bus voltage-power etc, Gauss-Seidel method and Newton-Raphson method of load flow solutions, some principles of load flow control.

Power system stability: The stability problem of power system, swing equation, power angle equation, equal area criterion of stability.

References:

1. John Grainger, Jr. William Stevenson: Power System Analysis
2. Hadi Saadat: Power System Analysis, 3rd Edition
3. J. Duncan Glover, Mulukutla Sarma, Thomas Overbye: Power System Analysis and Design
4. Ashfaq Husain: Electrical Power System

EETE-421: Power Stations [3.00]
Credit Hours 3

Load curves: demand factor, diversity factor, LDC, energy load curve, load factor, capacity factor and plant factor. General considerations for choice between private and utility generation, selection of type, site, size and number of units.

Thermal Power Stations: heat rate, incremental heat rate, efficiency, capacity scheduling, load division betweenunits within a plant. General layout of a power plant. Hydropower plant; basic operation, various types. Nuclear power station: comparison with conventional plants, basic components, chain reaction, reactor types, shielding. Coordination of thermal, hydro energy limited and nuclear plant operation. Energy tariff: desirable characteristics, types, tariff in Bangladesh.

References:

1. William A.Vopat; Power Station Engineering & Economy, Tata McGraw-Hill Publishers Company Ltd.
2. Singh S.N; Electric Power Generation, Transmission and Distribution –Prentice Hall of India.
3. Behie R. Gungor; Power System –Technology Publications.
4. Ashfiq Husain; Electrical Power System –CBS Publications & Distributions.
5. V. K. Mehta; Principle of Power System- S. Chand & Company Ltd.

6. L.L Grigsby; Electric Power Engineering Handbook- CRC Press.

EETE-433: Project or Thesis [6.00]

Design, study, investigation and development of an electrical or electronic circuit, useful equipment, appliance involving latest state-of-art technology ending with a thesis. The thesis will contain a detailed report on the project work done.

Alternatively, it can be a theoretical study invlving some review, analytical development, development of a software and may be a development leading to a reasarch work in turn leading to publication of a research paper on a topic of current interest. A thesis write up is necessary.

The work will be carried individually or by a group of two students under the direct supervision of an experienced teacher of the department. And will be compledted within two semesters.
The thesis must be prepared following the guidelines provided by the department.

EETE-441: Switchgear & Protection [3.00]
Credit Hours 3

Switchgear and its different components. Basic reviews on fault current and overload current
Circuit Breaker: Function of circuit breaker. Transient Recovery voltage. Derivation of TRV, effects of TRV on fault clearing process.
Different types of Circuit Breaker: Air Circuit Breaker, Air Blast Circuit Breaker, Oil Circuit Breaker, SF6 gas insulated Circuit Breaker, Vacuum circuit Breaker, Miniature Circuit Breaker and Molded Case Circuit Breaker. Other components in fault clearing process:
Isolator, Lightening Arrester, Capacitor voltage divider, fuses.
Breaking and making of a circuit during maintenance process.
Protective Relays: Function of relay, Basic operation and requirements of a good relay. Types of Relays:-Electromagnetic attraction: Attracted armature type relay, Solenoid type relay, balanced beam type relay, attracted armature type relay:-Shaded pole structure, Double winding structure, Induction Cup Structure. Over current relays: -Inverse time relays with definite minimum time (IDMT). Others type relay:- Reactance Relay, Distance relay, Differential Relay, Percentage Biased Differential relay. Relay Coordination:- Time graded scheme, Current Graded Scheme and Combination of time and current graded scheme. Different Protection Schemes:- Transformer Protection, Generator Protection, Motor Protection and Earth Fault Protection Scheme.

References:
1. Woods, Power System Operation and Control.
2. B. Ravindranath, M. Chander, Power System Protection and Switchgear.
3. Shunil S. Raw, Switch Gear and Power System Protection.

EETE-443: Basic Mechanical Engineering [3.00]
Credit Hours 3

Introduction to source of energy: Steam generating units with accessories and mountings; steam turbines; formation and properties of steam; performance of steam boilers; entropy of steam; thermodynamic vapor cycle.

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.

References:

1. R.S. Khurmi; A textbook of Mechanical Technology (Thermal Engineering)
2. Prof. Paul D. Ronney; Basics of mechanical engineering
3. John Bird and Carl Ross; Mechanical Engineering Principles

EETE-451: Digital Communication [3.00]

Credit Hours 3

Introductory Concept: Introduction to digital signal and system, spectra and Bandwidth. Random processes; mean, correlation, and covariance functions; power spectral density; Energy Spectral density, Gaussian process; Different types of line coding techniques; Additive white Gaussian noise (AWGN) model of a channel.

A/D conversion & quantization: PCM, Log PCM, DPCM, ADPCM, DM, ADM and LPC.

Signal Space Analysis: Geometric representation of signals; Schwartz inequality; Gram-Schmidt orthogonalization procedure; Conversion of the continuous AWGN channel into a vector channel; Likelihood functions; Maximum likelihood decoding; Correlation receiver; Probability of error.

Baseband Signal Transmission: Matched filter and its properties; Error rate due to noise; Inter-symbol interference; Nyquist's criterion for distortionless baseband binary transmission, Data regeneration and clock Recovery.

Passband Signal Transmission: Digital Modulation and Demodulation**,** Passband transmission model; Binary phase shift keying (PSK); Quadriphase-shift keying (QPSK); M-ary phase shift keying; Binary frequency shift keying (FSK); M-ary quadrature amplitude modulation (QAM); Minimum phase shift keying (MSK).

Multicarrier Modulation: Idea of multicarrier modulation and orthogonal frequency division multiplexing (OFDM)

Spread Spectrum Communication: Pseudo-noise sequence; A notion of spread spectrum; Direct sequence spread spectrum (DSSS); Frequency-hop spread spectrum (FHSS).

References:

1. Simon Haykin; Communication Systems, 4th Edition
2. B. P. Lathi; Modern Digital and Analog Communication System, 3rd Edition
3. John C. Proakis; Digital Communications, 4th Edition

EETE-453: Mobile Cellular Communication [3.00]
Credit Hours 3

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: Principles of GSM (physical layer source/channel coding, modulation, equalisation, etc; timing structure of GSM; OSI layers/GSM specifications and network aspects); introduction to GSM evolution for data communications (GPRS and EDGE); basic principles of DS/CDMA systems (e.g. Qualcomm's IS-95 – channelisation, long and short PN codes and Walsh sequences, power control, correlator design, Rake receiver, etc); introduction to W-CDMA third generation systems (UMTS/UTRA) and beyond 3G systems.

Third Generation Wireless Standards: Convergence; UMTS; IMT-2000; CDMA2000; W-CDMA; UWC-136; Network layer standards.
Evolution of Transport Technologies: TDM; Frame Relay; ATM; IP.
Call Processing and Intelligent Services Over Wireless Networks: Signaling; Roaming and mobility management; Route optimization; Wireless Intelligent Networking (WIN); Databases; Protocols; Security and billing issues.
Performance, Traffic Engineering, and Network Design: Traffic engineering for air interface and transport networks; performance issues and analysis for voice quality, call set up and hand-offs; Capacity planning; Factors affecting economical network designs.

References:

1. C. Y. Lee and William; Mobile Cellular Telecommunications, McGraw Hill, 2nd Edition, 2001
2. Mischa Schwartz; Mobile Wireless Communications, Cambridge Univ. Press, UK, 4th

Edition, 2005.

3. Theodore S Rappaport; Wireless Communication Principles and Practice, Pearson Education, 2nd Edition, 2002
4. Mobile Communication Hand Book, IEEE Press, 2nd Edition, 2002
5. Lawrence Harte, 3G Wireless Demystified, McGraw Hill Publications. 2000
6. Kaveh Pahlavan and Prashant Krishnamurthy, Principles of Wireless Networks, PHI.2000

EETE-455: Information Theory and Coding [3.00]

Credit Hours 3

Information Theory: Measure of Information - information sources, information content of a discrete memoryless source, information content of a symbol, average information or entropy, information rate; Discrete Memoryless Channels – Channel representation, channel matrix, special channels; Mutual Information – Conditional and joint entropies, mutual information; Channel Capacity – Channel capacity per symbol, channel capacity per second, capacities of special channels; Additive White Gaussian Noise Channel – Differential entropy, additive white Gaussian noise channel; Source Coding – Code length and code efficiency, source coding theorem, classification of codes, Kraft inequality; Huffman coding, Lempel-Zip coding.

Error Control Coding: Channel Coding – Channel coding, channel coding theorem; Block Codes; Linear Block Codes – Binary field, linear codes, Hamming weight and distance, minimum distance, error detection and correction capabilities, generator matrix, parity-check matrix, syndrome decoding; Cyclic Codes – Definition, code polynomials, generator polynomial, parity-check polynomial, syndrome polynomial, implementation, generator matrix, special cyclic codes; Convolutional Codes – Connection diagram, impulse response of the encoder, polynomial representation, state representation and state diagram, the tree diagram, the Trellis diagram; Decoding of Convolutional Codes – Distance properties of convolutional codes, maximum likelyhood decoding, the Viterbi decoding algorithm.

References:

1. Hwei Hsu; Analog and Digital Communications, Schaum's Outlines, 2 nd Edition.

2. Simon Haykin; Communication Systems, 4th Edition.

3. Ranjan Bose. Information Theory & Coding and Cryptography.

EETE-461: VLSI [3.00]

Credit Hours 3

VLSI technology: Top down design approach, technology trends and design styles. Review of MOS transistor theory: Threshold voltage, body effect, I-V equations and characteristics, latch-up problems, NMOS inverter, CMOS inverter, pass-transistor and transmission gates. CMOS circuit characteristics and performance estimation: Resistance, capacitance, rise and fall times, delay, gate transistor sizing and power consumption. CMOS circuit and logic design: Layout design rules and physical design of simple logic gates. CMOS subsystem design: Adders, multiplier and memory system, arithmetic logic unit. Programmable logic arrays. I/O systems. VLSI testing.

References:

1. D. Bricius; Introduction to VLSI, McGraw-Hill International.
2. C.K. Wong; An Introduction to VLSI Physical Design- McGraw-Hill Higher Education.
3. Douglas A. Pucknell; Basic VLSI Design, Prentice Hall of India Private Ltd.

EETE-462: VLSI Laboratory [1.00]

Credit Hours 2

Laboratory experiments based on EETE-461

EETE-463: Devices and IC Fabrication Technology [3.00]

Credit Hours 3

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. Grwoth and depositon 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 lilicon on insulator devices. Testing, bonding and packaging.

References:

1. D. Bricius; Introduction to VLSI, McGraw-Hill International.
2. C.K. Wong; An Introduction to VLSI Physical Design- McGraw-Hill Higher Education.
3. Douglas A. Pucknell; Basic VLSI Design, Prentice Hall of India Private Ltd.

EETE-465: Advanced Electronics [3.00]

Credit Hours 3

Modeling of electronic devices and analysis of non-linear circuits. Physical electronics of semiconductor junction and MOS devices. Relation of electrical behaviour to internal physical processes; development of circuit models; understanding limitation of models. Application of incremental and large-signal techniques for analyzing circuits containing nonlinear devices. Analysis of bipolar and field effect transistor circuits with examples chosen from single-ended and differential amplifiers, logic and intergrated circuits.

Optical process in semiconductors: Rediative and non-radiative recombination, opticalabsorption, luminescence.

Light Emitting Diodes: Variable and infrared LED, Principle, Material, Construction.
Photo Detetors: Photoconductor, Junction Photodicode, P-I-N Photodiode, avalanche photodiode.
Phototronsistor: Solar cell, si solar cell, thin Film solar cell, interostructural solar cell.

References:

1. Ben Streetman: Solid State Electronic Devices, 6th Edition
2. Donald A. Neamen: Semiconductor Physics and Devices-Basic Priciples; McGraw-Hill Publishing Company Ltd., 2003.

EETE-467: Biomedical Engineering [3.00]

Credit Hours 3

Human body: Cells and physichological systems. Bio electricity: genesis and characteristics. Measurement of bi-signals: Ethical issues, transducers, amplifiers and filters. Electrocardiogram: electrocardiography, phono cardiograph, vector cardiograph, analysis and interpretation of cardiac signals, cardiac pacemakers and defibrillator. Blood pressure: systolic, diastolic mean systolic, diastolic mean pressure, electronic manometer, detector circuits and practical problems in pressure monitoring. Blood flow measurement: Plethymography and electromagnetic flow meter. Measurement and interpretation: electroencephalogram, cerebral angiograph and cronical X-ray. Brain scans. Electromayogram (EGM). Tomograph: Positron emission tomography and computer tomography. Magnetic resonance imaging. Ultra sonogram.patient monitoring system and medical telemetry. Effect of electromagnetic fields on human body.

References:

1. John Enderle and Joseph Bronzino: Introduction to Biomedical Engineering, 3rd Edition

EETE-471: Radio & TV Engineering and Broadcasting [3.00]

Credit Hours 3

Functional Block Diagram of Radio Systems: Block diagram of Radio Receivers and their functional analysis, AM and FM receivers, Performance of AM and FM receivers in terms of tracking, selectivity, stability and fidelity.

Amplifier and other Circuits: Valve and transistor amplifiers at Audio and Radio frequencies, gain-bandwidth product and frequency response; Problems of matching, amplitude, phase and frequency distortion, Class B and Class C amplifiers, negative feedback, AFC, AGC, Choice of intermediate frequencies, IF amplifiers, AM and FM detectors, Foster-Seely Discriminator.

Radio Broadcasting: Conventional FM broadcasting, Long, Medium and Short wave radio transmitters, Antenna Design, Studio Design. MPEG, and MP3 audio layers, Digital Audio broadcasting.

Television Engineering:

Fundamentals of TV System: TV Systems, TV Standards, Theory and Methods of Scanning, Interlace Scanning, Bandwidth, TV Camera and Picture Tubes, Signal Generation, Horizontal, vertical section, Monochrome TV Transmitter Block Diagram, Principles of AM and FM Transmitter, Positive and Negative Modulation, Monochrome TV Receiver Block Diagram. Monochrome TV Picture Tube, Video Detector, Video Section, Contrast Control Methods, Video Amplifier Transistor Circuits, Sync Separation Circuit, Transistor VHF Tuner, Video IF Section, Practical Video IF Circuit. Low B+ Supply, Discrete circuit realization.

Color TV: Different Types Color Picture Tubes, Color TV Receiver Block Diagram, Color Reproduction Circuits and Color Matrix, Color Killer Circuit, ICs used in Color TV Receivers, Remote Control Circuits, Digital HDTV, Color Camera Systems and Picture Tubes.

TV Broadcasting: Analog TV transmission (NTSC, PAL, SECUM), NICAM audio, MPEG transmission layer, Orthogonal Frequency Division Multiplexing ,TV Transmitting and Receiving antennas, Design of TV Studio, TV Booster, Digital TV and Multimedia applications, Satellite Broadcasting Home TV System, Cable TV System.
Project: Designing and Implementation of Radio receiver, Radio Transmitter etc.

References:

1. Bernad Groub, Basic Television and Video Systems.
2. G. K. Mithal, Radio Engineering.
3. Bernard Grob, Basic Television Principles and Servicing.
4. Gulati, Television Engineering.

EETE-472: Radio & TV Engineering and Broadcasting Laboratory [1.00]

Credit Hours 2

Laboratory experiments based on EETE-471

EETE 473: Satellite Communications [3.00]

Credit Hours 3

The Basic Concepts of Satellite Communications: The Evolution of satellite communication. Advantages of satellite communication. The rudimentary principles of satellite communication. Satellite frequency bands, frequency re-use, transmission and multiplexing, Atmosphere and atmospheric layers, space. Satellite orbits, altitude, apogee and perigee, satellite axes (roll, pitch, yaw), azimuth, elevation angle, look angle, slant range sub-satellite point. laws governing satellite motion (Kepler's law) , sun-synchronous, geo-synchronous, geo-stationary orbit, elliptical orbit, , satellite foot-print, satellite relay systems. geostationary satellites, non-geostationary constellations, satellite subsystems.

Segments of a Satellite Mission: Earth segments- programme office, mission management and control centre, processing and archiving facilities, user interface, system components ,location, Launch vehicle segment. Available launch vehicles, launch vehicle selection . launch vehicle mass and volume constrains. Space Transportation System(STS). Space segment- satellite energy source, power

generation and distribution, stabilization sub-system, thrust sub- system, temperature control system, transponders, antennae sub-system telemetry-tracking-command sub-system, communication payloads.

Station keeping Satellite power supply system: The basic ideas, general consideration of power generation, solar array, batteries, power failure, eclipse and its effects on communication satellite.

Satellite Information Systems: One-to-one information transfer; one-to-many information system; many-to-one information system.

Satellite antenna: Types of antenna used on satellites. Basic relationships in satellite antenna. Satellite antenna patterns and coverage zones. Satellite antenna in practice. earth station antenna and their types.

Very small aperture terminal (VSAT) networks: VSAT technologies, VSAT system overview, network configurations, VSAT protocols, VSAT system design, VSAT antenna, VSAT regulation, advantages and applications of VSAT system.
Mobile communication through satellite : MSAT network concept, statistics of mobile propagation, land mobile satellite propagation : channel models, mobile satellite services, mobile satellite system parameters, network availability, network capacity, system design objectives, CDMA MSAT networks.

Digital satellite communications: Pulse code modulation, Low-rate encoding, Time-Division Multiplexing, Digital speech interpolation. modulation. Error correction, multiple access, Interfaces with terrestrial network.

Space Environment and Its Effects on Communication Satellite: Gravitational fields of Earth, Moon and Sun. vacuum, thermal radiation (solar, terrestrial, cosmic) terrestrial magnetic field. Effects of the space environment (mechanical field, thermal effects, effects on the materials).

Satellite Multiple Access Techniques: Types of multiple access. FDMA,TDMA, CDMA, SDMA, Transponder assignment modes.

Satellite Networks and its Categories : One-way link. Broadcast networks. Links between two earth stations. Multiple access. Multibeam satellite networks. Multibeam regenerative systems. LEO,MEO,GEO.

Launching and Positioning of Geostationary Satellite: Placing the satellite in orbit, launching vehicles, general principles, different trajectory/orbital stages. Assigned orbital activities-such as orbit maintenance, attitude maintenance, thermal management, power management, battery maintenance, payload operations, software requirement.

Interference: Microwave Interference in Satellite communication. Uplink-downlink.

Satellite Link Concepts: Satellite link attributes, link analysis, concept of noise temperature, analog link design, digital link design, calculation of signal to noise ratio.

References:

1. Tri T. Ha, Digital Satellite Communications, McGraw-Hill
2. G.B. Bleazard, Introducing Satellite Communications, NCC Publications
3. B.R. Elbert, Introduction to Satellite Communications, Artech House
4. K.N. Raja Rao, Fundamental of Satellite Communications, EEE
5. Edward Binkowski, Satellite Information Systems, G.K. Hall Publsheres
6. G. Maral and M. Bousquet, Satellite Communications Systems, John Wiley

EETE-475: High Speed and Broadband Networks [3.00]

Credit Hours 3

Introduction: Description of broadband networks, evolution of networks from circuit-switched telephony through packet switched LANs, and WANs. Requirements for high-speed networking at end systems and intermediate systems, operational and management issues. Review of OSI reference model.

Local Area Networks: LAN basics: topologies, media, access schemes, and protocol architectures, Logical Link Control Ethernet: 10 Mbps CSMA/CD LANs, switched Ethernet, Fast Ethernet, and Gigabit Ethernet, performance issues. Token ring and token bus LANs, priority schemes, performance issues. FDDI networks, physical and MAC protocols, performance. Wireless LANs, infrared, spread spectrum, and microwave based LANs.

Metropolitan Area Networks: Fibre Channel: media, architecture, framing protocol, classes of service, flow control mechanism Distributed Queue Dual Bus: topology, services, queued and pre-arbitrated access, bandwidth management.

Internetworking: Bridges, routers, and gateways. Bridge operation, spanning tree algorithms, source routing. Router operation, distance vector and link state algorithms, routing protocols.

TCP/IP and Internet: TCP/IP protocol architecture and services. IP operation, addressing and sub-netting, ICMP, and ARP. TCP and UDP. Application layer protocols. Internet routing. IP multicasting. IPv6. Internet architectures and protocols for supporting voice, fax, and video.

Frame Relay: Frame Relay: protocol architecture, UNI, call control, congestion control. Multiprotocol encapsulation, Voice over Frame Relay, NNI, multicasting.

ATM Architecture and Protocols: Basic concepts: services, protocol layers, cell, virtual path, virtual channel, VPC, VCC, service categories and QoS parameters. Physical Layer: functions, PDH, FDDI, and SDH alternatives. ATM Layer: functions and protocol operation. AAL: functions, AAL types, operational details of each type. ATM Interfaces: public and private UNI and NNI, DXI, user plane, control plane, and management plane functions.

ATM Switching and Signaling: ATM switching requirements. ATM switch architectures: input module, output module, switch fabric, queuing and buffering options. ATM signaling: SAAL, BISUP, Q.2931, PNNI.

ATM Traffic Management, Congestion Control, and Traffic Engineering: Traffic contract, QoS classes and parameters, traffic descriptors and tolerances, leaky bucket algorithm. Usage/Network parameter control, priority control, traffic shaping, connection admission control, resource management. Congestion control categories, congestion management, congestion avoidance, tagging, blocking, widow-based, rate-based, and credit-based flow controls, congestion recovery. Traffic source models, performance of buffering methods, performance of CBR and VBR.

Additional Topics: IP over SONET, Frame relay, and ATM. Multiprotocol over ATM, Multiprotocol Label Switching.

References:

1. Mike Sexton and Andy Reid: Broadband Networking: ATM, SDH and SONET, Artech House Publishers, Norwood, MA.
2. D.Minoli: Broadband Network Analysis and Design, Artech House.
3. R.O.Onvural: Asynchronous Transfer Mode Networks, Artech House.
4. R.O.Onvural: Asynchronous Transfer Mode Networks, Performance Issues, Artech House.
5. L.G.Cuthbert, J.C.sapanel: ATM, IEE.
6. P. Bocker; ISDN The Integrated Service Digital Network, Springer-Verlag.
7. Martin de Prycker Ellis Horwood: Asynchronous Transfer Mode, Solution for Broadband ISDN, 2nd edition,
8. Rainer Handel, Manfred N. Huber, Stefan Schroder: ATM Networks: Concepts, Protocols, Applications, Addison-Wesley.
9. Thomas M. Chen, Stephen S. Liu: ATM switching systems, Artech House.
10. Mischa Schwartz, Broadband Integrated Networks, Hardcover Published.
11. Mischa Schwartz, Telecommunication Networks : Protocols, Modeling, and Analysis, Hardcover Published
12. Mischa Schwartz, Computer-Communication Network Design and Analysis, Published. John Willy and Sons, New York.

EETE-477: Radar Systems Design, Analysis and Application [3.00]

Credit Hours 3

Introduction: Rudimentary vision of Radar. Evolution of Radar Developments, The Radar Equation, Basic System Parameters, Radar Block Diagram and Operation, Radar Displays, Radar Frequency Bands, Radar Applications. Classifications of radars.

CW and FM Radar: The Doppler Effect, CW Radar, FM-CW Radar, Multiple Frequency CW Radar, Waveform Analysis, Design Considerations of FM-CW systems.

MTI and Pulse Doppler Radar: MTI Radar, Pulse Doppler Radar, Delay Line Canceler, Staggered Pulse Repetition Frequencies, Range-Gated Doppler Filters, Design Considerations of MTI Systems.

Tracking Radar: Tracking Radar, Sequential Scanning, Mono-pulse Tracking, Error Analysis of Angle Measurement.

Introduction to Satellite Tracking Radars. **Radar Targets:** Scattering Properties, Concept of Radar Cross Section, (RCS)Polarization Scattering Matrix, Complex Targets Models.

Theory of Detection and Parameter Estimation: Statistical Decision Theory, Detection of Signals in Noise, Matched Filter Design, Signal Fluctuation Statistics, Estimation of Random Variable Parameters, Transmitter Signal Waveform design.

Radar Clutter Analysis: Introduction to Radar Clutter, Geometry of Surface Clutter, Geometry of Volume Clutter, Statistics of Clutter Amplitude, Land and Sea Clutter, Angel Echoes, Surface scattering patterns.

Design Methodology of a Typical Radar System: Design Objectives, System Configurations, System Block Diagram, Signal Flow, System Development, Radar Transmitters, Radar Antennas and its functions, Radar Receivers, Low-Noise Front-Ends, Data Acquisition Unit, Calibrations, Performance Analysis, Test and Measurement.

Satellite based Radar Technology: Concepts of radar imaging, scattering properties of imaging radars, Satellite tracking radars, techniques of Synthetic Aperture Radar (SAR) image generation, techniques of Side-Looking Airborne Radar (SLAR), techniques of Real Aperture Radar (RAR) system. Applications of imaging radar.

References:

1. M.I. Skolnik, Introduction to Radar Systems, McGraw-Hill, International Edition, 1981,
2. H.R. Raemer, Radar Systems Principles, CRC Press, Inc., 1997.
3. R.S. Berkowitz, Modern Radar - Analysis, Evaluation, and System Design, John Wiley & Sons, 1965.
4. F.E. Nathanson, J.P.Reilly, M.N.Cohen, Radar Design Principles, McGraw-Hill, 2nd Edition, 1991.
5. S.A. Hovanessian, Radar System Design and Analysis, Artech House, 1984.

EETE-481: High Voltage Engineering [3.00]

Credit Hours 3

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.

References:

1. S. Raw, Switch gear and power system protection.
2. Naidu, High voltage Engineering.

EETE-485: VHDL Modeling and Logic Synthesis [3.00]

Credit Hours 3

Introduction to Very-high-speed-IC Hardware Description Language (VHDL)**,** Basic VHDL constructs. Design of combinational logic (adders, multipliers, comparators, multiplexers/de-multiplexers, Arithmatic Logic Units (ALUs) etc. and sequential logic (flip-flops, registers, shift registers, random number generators, counters, Finite State Machine (FSMs)etc. with behavioral VHDL descriptions. Use of an industrial Electronic Design Automation (EDA) tool for functional and post-route simulations, logic synthesis and automatic place and route. Writing test-benches . Design of FSMs . Converting algorithms to hardware using Algorithmic State Machine (ASM) charts and top-down design methodologies with Complex Programable Logic Devices (CPLD) and Field Programmable Gate Arrays (FPGA) as target technologies. Emphasis on FSM design techniques. Controller-datapath partitioning. Algorithrims that describe data-path elements. Microcontrollers. Design of simple and Reduced Instruction Set Computing (RISC) processors. pipelining.

References:

1. D.J.Smith and A.L.Madison: A Practical Guide for Designing, Synthesizing and Simulating ASICs and FPGAs using VHDL or Verlilog; Doone Publications, USA.
2. M.G. Arnold: Verilog Digital Computer Design;Upper Saddle River, NJ, Prentice Hall, USA.
3. M.D. Ciletti: Advanced Digital Design with Verilog HDL; Prentice Hall.
4. S. Palnitkar: Verilog HDL-A Guide to Digital Design and Synthesis;Prentice Hall, Mountain View, CA, USA.
5. Shahriyar Rizvi: A Methodology for Identical Post-Synthesis Operation of Explicit and Implicit FSMs, VDM Verlag.

EETE-486: VHDL Modeling and Logic Synthesis Laboratory [2.00]

Credit Hours 2

Laboratory experiments based on EEE-433

EETE-487: Optoelectronic Devices [3.00]

Credit Hours 3

Wave nature of light: Fiber communications, Wave front, phase velocity, Group velocity, Maxwell's wave equation, Effects of a dispersive medium, Snell's law, Total internal reflection, Fresnel's equation, evanescent waves, Diffraction and gratings.

Dielectric waveguide: Optical fibers, Symmetric planar dielectric slab waveguide, modal and waveguide dispersion in the planar waveguide, step index fiber, numerical aperture, dispersion in single mode fibers, Bit-rate, electrical and optical bandwidth, the graded index optical fiber, attenuation in optical fibers.

Semiconductor science and LEDs: Semiconductor Concepts and Energy Bands, Direct and Indirect Band-gap Semiconductors, pn Junction Principles, The pn Junction Band Diagram, Light Emitting Diodes, LED Materials, Heterojunction High Intensity LEDs, LED Characteristics, LEDs for Optical Fiber Communications.

Stimulated emission devices Laser: Stimulated Emission and Photon Amplification, Principle of the LASER Diode, Heterostructure LASER Diodes, Elementary LASER Diode Characteristics, Steady State Semiconductor Rate Equation, Light Emitters for Optical Fiber Communication, Single Frequency Solid

State LASERs, Quantum Well Devices, Vertical Cavity Surface Emitting LASERs (VCSELs), Optical LASER Amplifiers, Holography.

Photodetectors: Principle of pn junction photodiode, Ramo's theorem and external photocurrent, absorption coefficient and photodiode material, quantum efficiency, pin and avalanche photodiodes, heterojunction photodiode, photo translator, noise in photodiodes.

References:

1. Safa O. Kasap; Optoelectronics and Photonics (Principles and practices)
2. Larry A. Coldren, Scott W. Corzine; Diode Lasers and Photonic Integrated Circuits

EETE-488: Optoelectronic Devices Laboratory [1.00]

Credit Hours 2

Laboratory experiments based on EETE-487

EETE-491: Optical Fiber Communication [3.00]

Credit Hours 3

Introduction: Rudimentary ideas and its importance in modern communication arena, Why use light for communication system? Chronological development of optical fibers. Comparisons between optical communication and copper wire systems.

Mode theory for optical fiber wave guide: Wave guide theory. Mode theory for circular wave guide. Step index fibers. Graded index fibers. Cutoff wavelength. Numeric Aperture. Power distribution, WKBJ analysis. Propagation and leakage modes.

Transmission characteristics of optical fibers: Attenuation. Material absorption loss, scattering loss, fiber bend loss, dispersion.

Optical cables, joints and couplers: Preparation of optical fibers, cable design, fiber alignment, splices, connectors and couplers.

Optical sources: Laser: Basic operating concepts. Semiconductor injection laser: structure and characteristics. Basic operating principle, Structure and characteristics of LED.

Optical detector: Device types. Detection principles. Quantum efficiency. Responsivity. Semiconductor photodiodes with and without internal gain.

Receiver Performance Considerations: Noise: Thermal, Dark current, Quantum, Digital signaling and Analogue transmission quantum noise. Receiver noise.

Optical Amplification: Optical Amplifiers: semiconductor laser amplifier and fiber amplifier.

Integrated Optics: Planar wave guides, Some integrated optical devices: beam splitter, directional couplers, switches, modulators, filters, injection lasers, polarization transformers and frequency translator. Optoelectronics integration. Optical bistability and digital optics.

Optical fiber communication systems: Intensity modulation. Digital and analogue systems. Systems design considerations. Power Budget and Rise Time Approach. Coherent detection. Basic system and detection principles. Applications and future development of optical fiber system.

Multichannel Light wave Systems: Optical multiplexing schemes: Optical time division multiplexing (OTDM), Optical frequency division multiplexing (OFDM), wavelength division multiplexing (WDM), Optical Code division multiple-access (OCDMA), subcarrier multiplexing

(SCM); WDM components : WDM multi/demultiplexers, add-and drop multiplexers (ADM), star couplers, Optical cross-connects, wavelength converters; performance analysis of multi-channel systems; Crosstalk in multi-channel systems : linear and nonlinear crosstalk; WDM systems with cascaded optical amplifiers, Dispersion management schemes for cascaded optical amplifier systems, Design of WDM transmission systems, Field trials.

Free space Optical Links: The atmospheric optical channel, effect of atmosphere on optical beams, effect of atmosphere on direct detection receivers, heterodyning over atmospheric channel, optical inter-satellite links.

Optical Networks: Network topology : ring, star, bus and mesh networks, Evolution of WDM networks; Network building blocks; Optical local area network (LAN), wide area network (WAN); Broadcast and select optical networks : single hop and multi hop networks, experimental WDM networks; Wavelength routed optical networks : routing and wavelength assignment, network performance with and without wavelength converters.

Future Trends in Optical Fiber Communications: Solitons, fundamental and higher order solitons, soliton amplification, soliton based communication systems, WDM transmission systems with solitons : effects of soliton jitter, soliton interactions; soliton system design.

References:

1. John. M. Senior; Optical Fiber Communications: Principles and Practice, Prentice Hall, 2nd Edition, 1993.
2. Henry Zanger and Cynthia Zanger; Fiber Optics: Communications and Other Applications, Booknews Inc..
3. Gerd Keiser; Optical Fiber Communications.
4. Govind P. Agrawal; Fiber-Optic Communication Systems.
5. Subir Kumar Sarkar; Optical Fiber and Fiber Optic Communication.
6. D.K.Mynbaev and L.L.Scheiner; Fiber-Optic Communications Technology.

EETE-492: Optical Fiber Communication Laboratory [1.00]

Credit Hours 2

Laboratory experiments based on EETE-491

EETE-493: Telecommunication Switching System [3.00]

Credit Hours 3

Evolution of telecommunication switching and circuits: Evolution of Public Switched Telecommunication Networks Strowger exchange, Crossbar exchange, Stored programme exchange. Digital exchange – Basic Telecommunication equipment – Telephone handset, Hybrid circuit, Echo suppressors and cancellors, PCM coders, Modems and Relays.

Electronic switching: Circuit Switching, Message switching, Centralized stored programme switching, Time switching, Spare switching, Combination switching – Digital switching system hardware configuration, Switching system software, Organization, Switching system call processing software, Hardware software integration.

Telecommunication signaling and traffic: Channel associated signaling, Common channel signaling, SS7 signaling protocol, SS7 protocol architecture, Concept of Telecommunication traffic, Grade of service, Modeling switching systems, Blocking models and Delay systems.

Integrated digital networks: Subscriber loop characteristics, Local access wire line and wire less PCM / TDM carrier standards transmission line codes, Digital multiplexing techniques, Synchronous, Asynchronous, Plesiocronous multiplexing techniques, SONET / SDH, Integrated Digital Network (IDN) environment – Principles of Integrated Services Digital Network (ISDN) – Cellular Mobile Communication Principles.

References:

1. Viswanathan, Telecommunication Switching System and Networks, Prentice Hall, 1994.
2. B. Forouzan, Introduction to Data Communication and Networking, McGraw-Hill, 1998.
3. L.S. Lawton, Integrated Digital Networks, Galgotta Publication Pvt. Ltd., New Delhi, 1996.
4. Syed R. Ali, Digital Switching Systems, McGraw-Hill Inc., New York, 1997.

EETE-494: Telecommunication Engineering Laboratory [1.00]
Credit Hours 2

Laboratory experiments based on EETE-493

EETE-495: Random Signals Processing [3.00]
Credit Hours 3

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 function. Process measurements. Gaussian and Poisson random Processes. Noise models Stationarity and Ergodicity. Spectral Estimation. Correlation and power spectrum. Cross pectral densities. Response of linear systems to random inputs. Introduction to discrete time processes, mean-square error estimation, Detection and linear filtering.

References:
1. Papuolis; Probability, Random variables and stochastic Processes, McGraw-Hill Higher Education.
2. Edward R.Dougherty; Random Processes for Image, Prentice Hall of India Private Ltd.
3. Henry Stark & John W. Woods; Probability and Random Processes, Pearson Education.

EETE-497: Communication & Signal Processing [3.00]
Credit Hours 3

Brief Review: Multimedia signalprocessing (Compression,interpolation), communication (Modulation,coding, detetion) and basic cryptographic tools (threats and attacks, encryption, authentication). Data hiding for info security and protection.

Theory and practice of multimedia communcations: rate-distortion theory and techniques. Scalable coding, joint source-channel approach, and error resilient communication.

Putting Communication and info. Security together: multimedia cncryption and authentication with computing and communication friendly characteristics.
Selected topic: Video and audio streaming, standardization efforts for digitalrights management.

References:

1. M-T sun and A.R. Rlebman (ed); Compressed video over Networks, signal processing
2. I.Cox,M.Millor, Digital Watermarking, Morgan Kaufman publisher, 2001

EETE-498: Communication & Signal Processing Laboratory [1.00]

Credit Hours 2

Laboratory experiments based on EETE-497