CURRICULUM

B.Sc. in Electrical & Electronic Engineering

DEPARTMENT OF
ELECTRICAL & ELECTRONIC
ENGINEERING

UNIVERSITY OF ASIA PACIFIC

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UNIVERSITY OF ASIA PACIFIC

Department of Electrical and Electronic Engineering

Curriculum (B.Sc. in Electrical and Electronic Engineering)

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INTRODUCTION

University of Asia Pacific (UAP), established in 1996, has clearly defined mission and vision. The mission is to provide quality education and produce qualified graduates to fulfill the present and future needs of the country. In this regard, UAP has eight well established disciplines in different field with dedicated faculties and staffs. UAP is continuously striving to provide quality education to crate an efficient future workforce for Bangladesh. With this aim, the Department of Electrical & Electronics Engineering (EEE) started its journey back in year 2004 at the UAP. University Grants Commission (UGC) has accorded permission to UAP to start the operation of the Department of Electrical and Electronics Engineering (EEE) after reviewing the faculty strength, accommodation and library facilities.

UAP is committed to its mission to produce quality world-class graduates from all its departments. The department of Electrical & Electronic Engineering is one of the oldest and established department in the country. To meet the demands of this expanding and exciting branch of engineering, UAP has introduced modern curricula, which have been approved by the University Grants Commission (UGC). The prescribed curriculum takes the students through basics of 'Electrical Engineering' in the first year, 'Electronics and Computers' in the second year, 'Digital Signal Processing', 'Communication and Power System Analysis' in the third year, 'VLSI', 'Mobile Cellular Communication' and 'Power Plant Engineering' in the fourth year. The Curricula also include study of English, Mathematics, Accounting, Managements and Computer Skills to make the graduates fully developed for the real world needs. The graduates of the Department of Electrical & Electronics Engineering from the UAP can expect fulfilling and rewarding carrer in the coming years. Job opportunities for the graduates exist in industries engaged in product development and manufacture, in Power Generation, Transmission and Distributions, in State Telephone and Communication authorities, in Mobile Phone Companies, in Biomedical fields, in Military works, in IC design and Manufacture house and related Research and Development cells. It is not enough for the university to provide only a high quality learning environment for its students, it is also essential that the student taking these courses realize that they will not only be the standard bearers of the university, but also at the forefront of technology with great expectation from the peers and the populace to deliver what is expected from a quality engineer. This realization gives the students that they will use their stay at this university to equip themselves with necessary skills to shine in life and make the university proud.

The EEE department started its journey in Fall 2004 semester with an enrollment of few students only. The number of students of the department is gradually increasing in every semester and at present the department has more than 700 students. The department of EEE has been operating to conduct classes, to look after its students and to develop further infrastructure expected by a reputed university. At present the department consists of a large number of well qualified and experienced faculty members. Further addition is expected in the near future. The journey to become an eminent place of learning is inspiring and exciting. The whole faculties share these excitements and are working to make the department truly a center of excellence.

1.1 VISION

The vision of Electrical and Electronic Engineering Department at University of Asia Pacific is to reach at an educational excellence in full compliance to the international standards of quality assurance.

The Department will produce quality graduates capable of taking the challenges of the rapidly changing field of Electrical and Electronic Engineering as well as capable of making significant contribution to individual and societal empowerment.

1.2 MISSION

The mission of the Department of Electrical and Electronic Engineering at University of Asia Pacific is,

Mission-1: to provide quality education at an affordable cost in the areas of Electrical and Electronic engineering.

Mission-2: to enhance the competitiveness of our graduates in the job market and contribute to the economic, scientific and social development of the country.

Mission-3: to maintain a positive academic environment that promotes excellence in learning and research through constructive interaction between students, faculty, industry and community.

Mission-4: to utilize the available resources to instill latest technical knowledge and research capabilities that encourage critical thinking, problem solving skills and ethical responsibility as well as develop students' verbal and written communication skills.

1.3 PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Program Educational Objectives (PEOs) are intended to prepare graduates professionally eligible after completion of their graduation. The purpose of PEOs are to prepare graduates to possess the ability to :

PEO-1: Apply their Engineering knowledge and up-to-date skills to assume positions of technical leadership to perform professional work in the field of Electrical and Electronic Engineering either individually or with interdisciplinary teams.

PEO-2: Pursue their career through post-graduate education or professional activity and engage themselves in independent and life-long learning in the broadest context of technological change.

PEO-3: Develop Electrical and Electronic Engineering solutions, maintaining high ethical standard and considering design criteria, realistic constraints, economic, environmental and social impact of the solutions.

PEO-4: Work either individually or through interdisciplinary teams and communicate effectively using graphic, verbal and written techniques to explain and defend their solutions to technical and non-technical audiences.

1.4 MAPPING BETWEEN MISSION VS PEOs

PEOs	Mission-1	Mission-2	Mission-3	Mission-4
PEO 1	√	√		√
PEO 2			√	√
PEO 3		√		√
PEO 4			√	√

1.5 PROGRAM OUTCOMES (POs)

Program outcomes are mainly focused on developing the students in terms of skills, knowledge and behavior during their graduation period. There are 12 POs for the engineering students which are listed below.

POs	Knowledge	Description
PO 1	**Engineering Knowledge**	Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem Analysis**	Identify, formulate, research literature and analyze complex engineering problems searching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	**Design/ development of solutions**	Design solutions for complex engineering problems and design systems, components and processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO 4	**Investigation**	Conduct investigations of complex problems using research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO 5	**Modern Tool Usage**	Create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modeling of complex engineering activities with an understanding of the limitations.
PO 6	**The Engineer and Society**	Apply reasoning informed by contextual knowledge to assess the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

POs	Knowledge	Description
PO 7	**Environment and Sustainability**	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
PO 8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 9	**Individual and Team work**	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO 10	**Communication**	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO 11	**Project Management and Finance**	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and multidisciplinary environments.
PO 12	**Lifelong learning**	Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context to technological change.

1.6 MAPPING BETWEEN PEOs VS POs

POs	Knowledge	PEO 1	PEO 2	PEO 3	PEO 4
PO 1	Engineering Knowledge	√			
PO 2	Problem Analysis		√		
PO 3	Design/ development of solutions	√		√	
PO 4	Investigation		√		
PO 5	Modern Tool Usage	√	√		
PO 6	The Engineer and Society			√	
PO 7	Environment and Sustain-ability			√	
PO 8	Ethics			√	
PO 9	Individual and Team work				√
PO 10	Communication				√
PO 11	Project Management and Finance				√
PO 12	Lifelong learning		√		√

UAP RULES & REGULATIONS

2.1 ACADEMIC RULES

To meet the growing technological challenges confronting the nation and the world as a whole, University of Asia Pacific has designed the curricula and syllabi of the subjects offered in the undergraduate courses accordingly. The curricula and syllabi are relevant to the current needs, and are responsive to the emerging challenges. The rules and regulations for undergraduate curricula through course system are applicable for all students.

SEMESTER SYSTEM

There are two semesters- Fall and Spring Semester in an academic year. In addition to these two regular semesters, there may be a short semester (Summer) in the intervening period between the end of Spring Semester and commencement of Fall Semester.

Regular Semester	
Classes	15 Weeks
Recess before examination	1 Week
Semester final examination	2 Weeks
Total	18 Weeks
Summer Semester	
Intensive Classes	7 Weeks
Semester final examination	1 Week
Total	8 Weeks

2.1.1 Course Pattern and Credit Structure

The entire undergraduate program contains a set of theoretical and laboratory courses, field-work, design and project/thesis work.

ASSIGNMENT OF CREDITS:

Theoretical Courses: One lecture per week per semester is equivalent to one credit. Thus, a three (3) credit hour course has three (3) lectures per week throughout the semester.
Laboratory/Field/Design/Project/Thesis Work: Credits for laboratory/field work or design work usually is half of the class hours per week per semester. Credits are also assigned to project and thesis work completed by the students. The amount of credits assigned to each of these may vary from discipline to discipline.

TYPE OF COURSES:

Core Courses: In each discipline a number of compulsory courses are identified as core courses, which form the nucleus of the bachelor degree program.

Optional Courses: Apart form the core courses students need to complete a number of courses, which are optional in nature. Hence students may have some choices in selecting courses from a specific group or a number of courses.

2.2 REGISTRATION PROCESS

FOR THE SECOND AND SUBSEQUENT SEMESTER

A student is normally required to earn at least 15 credits (out of 17.5 to 20 credits) in a semester. At the end of each semester, the students will be classified into one of the following three categories:

Category 1:
Students, who have passed all the courses prescribed for the semester and have no backlog of courses. A student of Category-1 is eligible for registration in all courses prescribed for the next or following semesters.

Category 2:
Students, who have earned at least 15 credits in a semester but do not belong to Category 1. These students are advised to take at least one course less in the following semester than those offered for students of Category 1, subject to the condition that, they will register for such backlog courses as prescribed by the respective adviser.

Category 3:
Students, who have failed to earn 15 credits in a semester belong to this category. Students of this category are advised to take at least two courses less in the following semester than those offered for students of Category -1 subject to the registration for a minimum of 15 credits and maximum 24 credit hours. However, they are required to register for such backlog courses as would be prescribed by the adviser.

2.3 GRADING SYSTEM

The total performance of a student in a given course is based on a scheme of continuous assessments. For theoretical courses this continuous assessment is made through homework, assignments, attendance, quizzes etc., a mid semester and a semester final examination of two/three hours duration. The distribution of marks for a given course is as follows:

Assessment	30%
Mid Semester	20%
Final Exam	50%
Total	**100%**

The assessment in laboratory/field work courses is made by observing the student in the respective lab classes and also by taking viva-voce and quizzes.

Each course has a letter grade equivalent to a certain number of grade points. Letter grades and their corresponding grade points are as follows:

Percentage of Marks	Letter Grade	Grade Point
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00
Incomplete Works	I	––
Satisfactory	S	––
Exempted	E	––

Grade 'F': If a student fails to achieve at least 40% marks in a course, s/he will get `F' grade in that course. Besides, absence in final examination at the end of each academic semester will also result in `F' grade.

**Grade `E':** A student transferred to UAP from another university/academic institution will earn `E' grades in the courses exempted at UAP.

**Grade `I':** Grade `I' may be given to a candidate when s/he fails to appear at the semester final examinations only for reasons beyond her/his control. Grade `I' shall be converted to the actual grade obtained by the students when available by the following semester. Otherwise grade `I' shall be converted to an `F' grade and the student has to re-register for the particular course.

**Grade `S':** Grade `S' is given when a course, according to the syllabus, is extended to two consecutive semesters and grade `S' is given in the first semester to mean satisfactory progression.

GPA CALCULATION

A student's performance is measured by the number of credits that he/she has completed satisfactorily and the weighted average of the grade points that he/she has maintained. A minimum GPA is required to be maintained for satisfactory progress and a minimum number of earned credits should be acquired in:

$$GPA = \frac{\sum(GradePoints \times Credits)}{\sum Credits}$$

Where grade points are points against letter grades A+, A, A-, B+, B, B-, C+, C, D and F. Credits are only for those courses attempted at this university.

ATTENDANCE

All students are expected to attend classes regularly. University of Asia Pacific believes that regular attendance is essential for effective learning. A student is required to attend at least 70% of all the classes held in every course in order to sit for the final examination.

ABSENCE DURING SEMESTER

A student shall not be absent in quizzes, tests, mid semester examinations etc., during the semester. Such absence will naturally lead to reduction in points/marks, which shall count towards the final grade. Absence in the final examination held at the end of each academic semester will result in F grades.

PERFORMANCE EVALUATION

The performance of a student will be evaluated in terms of semester GPA and cumulative grade point average (CGPA), which is the grade point average for the semesters under consideration. A candidate will be awarded a degree with honors if his/her CGPA is 3.75 or above. A student will be considered to be making normal progress towards a degree if his/her CGPA for all work attempted is 2.25 or better and is in good standing with the university.
Students who fail to maintain this minimum rate of progress will fail to be in good standing. Such circumstances may prevail under one or more of the following conditions:

- ✓ Semester GPA falls below 2.25,
- ✓ Cumulative GPA falls below 2.25.
- ✓ Earned credits fall below 15 times the number of semesters studied.

CONDUCT AND DISCIPLINE

A student should conform to the highest standard of discipline and shall be herself/himself within and outside the premises of the university in a manner befitting the student of a university of national importance. He/She shall show due courtesy and consideration to the teachers and other employees of the university and render sincere co-operation to his/her fellow students. The students should also pay due attention and courtesy to the visitors.

2.4 EXAMINATION RULES

2.4.1 RE-EXAMINATION OR RE-SCRUTINIZATION OF ANSWER SCRIPTS

Re-examination of final examination answer scripts may be permissible. A candidate can apply for re-examination of any answer script of final examination to the Controller of Examinations through their advisor and the head of the department on payment of Tk 200/- (Tk. Two Hundred) only per script within 7 (seven) working days from the publication of final results. No such application shall be entertained after the mentioned time. No such re- examination is allowed for practical/sessional courses. While re-examining such answer scripts the examiner will re- examine the scripts thoroughly and will award a grade, which will be treated as final.

2.4.2 RULES FOR REPEAT EXAMINATION

A student would be allowed to appear at the Repeat Examination in case s/he fails in three theory courses or less but not exceeding 10 credit hours. The results of Repeat Examinations would be published within three weeks from the date of publication of the results of the Semester Final Examination concerned. The department would arrange such Repeat Examinations. Candidates willing to appear at such Repeat Examinations must apply to the respective heads of departments through the advisors stating their willingness to appear at the said examination with the receipt of payment @ Tk 3000/- per course within five working days after the semester final results are published.

Repeat Examinations on theory courses would be held on 50 percent of marks for each course and the marks for Class Assessment and Mid Semester Examination would be carried. There shall be no repeat examinations for sessional courses. The maximum grade to be obtained by a student in a repeat examination would be 'B' (equivalent to 60%). The following grading system would be followed in the repeat examination

Numeric Grade	Letter Grade	Grade Point
60% and above	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00

Any student who fails to successfully complete any sessional course has to repeat that course in the following semester.

2.4.3 PROVISIONS FOR IMPROVEMENT OF GRADES:

Category – A

1. The Provision for Improvement of grades applies to those only who obtained a grade C or lower in any course. Such candidates may be allowed to improve their grades by surrendering the earlier grade obtained by him/her.

2. For grade improvement purpose, a student will be allowed to repeat a maximum of four courses.

3. For availing such provision of grade improvement, a candidate shall apply to the Controller of Examinations through the Head of the Department concerned with a fee @ Tk. 5000/- (Tk. Five Thousand) only per credit hour. A student may apply for such provision any time during his/her study period in the university but not beyond two weeks after the publication of his/her final semester results.

Category – B

1. A Cumulative Grade Point Average (CGPA) of minimum 2.25 is required for graduation. A candidate whose CGPA is bellow 2.25 shall have to increase his/her CGPA to the minimum requirement within two consecutive semesters failing which s/he shall be placed under academic probation.

2. Candidates requiring to increase their CGPA under this category (Category - B) shall apply to the Controller of Examinations through the head of the department concerned with a payment of @ Tk. 3000/- (Tk. Three Thousand) per credit hour.

2.5 ADVISING SYSTEM

Department of Electrical and Electronic Engineering has a strong student advisory system. One advisor will normally be appointed for a group of students by the concerned department. The advisors usually performs the following responsibilities:

1. Maintain regularly scheduled office hours for academic advising as needed throughout the semester.
2. Assists the students in selection of courses on a short-term and long-term basis.
3. Monitor advisees' academic progress as well as behavior, manner in the campus and initiate contact with advisees those are failing to progress satisfactorily.
4. Inform students the changes in academic policy, rules and curriculum in the university.
5. For students with excellent academic background and for needy students, advisor recommends to the higher authority for financial assistance.

STUDENTS' RESPONSIBILITIES IN CONNECTION WITH ADVISING

1. To participate in all scheduled pre-enrollment and orientation programs for incoming students at university.
2. To prepare in advance for academic advising meetings. Map out courses they want and need to take for their degree and present it to their concerned advisor.
3. To make and honor academic advising appointments.
4. To make advisor aware of any special needs or problems encounter at UAP. Concerned advisor is there to guide students through any problems that may hinder their academic success and continued enrollment in the following semester. Advisors are equipped with a plethora of resources to help the students.
5. To know academic policies, procedures, and regulations such as withdrawal, repeat & improvement examination, retakes, academic probation/dismissal, financial aid, etc.
6. To know degree requirements and remain informed about changes in their curriculum. Map out a plan of action for academic career and review it with concerned advisor.
7. To make the effort to get to know the advisor personally. The better they know one another, the more comfortable they will be.

UNDERGRADUATE COURSES

SUMMARY OF UNDERGRADUATE COURSES

The undergraduate students of different years of the Department of Electrical and Electronic Engineering have to follow the course schedule given below. The letter prefix in any course number indicates the discipline/subject offering the course viz. ENG for English Language, HSS for Humanities and Social Science, Business, Management Studies, Language etc., PHY for Physics, MTH for Mathematics, ME for Mechanical Engineering and EEE for Electrical and Electronic Engineering. The first digit in the number indicates the year/level for which the course is intended; the second digit is assigned by the department and the last digit, if odd, indicates a theory course and if even, indicates a laboratory course.

3.1 CORE COURSES

First Year First Semester

Course No.	Course Title	Credits
HSS 101	English	3.0
HSS 111	Bangladesh Studies	4.0
PHY 101	Physics I	3.0
MTH 101	Differential and Integral Calculus	4.0
EEE 101	Electrical Circuits I	3.0
PHY 102	Physics I Sessional	1.5
EEE 102	Electrical Circuits I Sessional	1.5
HSS 102	English Language Sessional	1.0
	Total:	21.0

First Year Second Semester

Course No.	Course Title	Credits
PHY 103	Physics II	2.0
MTH 103	Differential Equations and Matrix	3.0
EEE 103	Electrical Circuits II	4.0
EEE 105	Computer Programming	3.0
ECN 101	Economics	2.0
EEE 104	Electrical Circuits II Sessional	1.5
EEE 106	Computer Programming Sessional	1.5
CE 100	Engineering Drawing Sessional	1.5
	Total:	18.5

Second Year First Semester

Course No.	Course Title	Credits
ACN 201	Accounting	2.0
MTH 201	Coordinate Geometry and Vector Analysis	3.0
EEE 201	Electronic Circuits I	3.0
EEE 203	Electrical Machines I	3.0
ME 201	Fundamentals of Mechanical Engineering	3.0
EEE 202	Electronic Circuits I Sessional	1.5
EEE 204	Electrical Machines I Sessional	1.5
	Total:	17.0

Second Year Second Semester

Course No.	Course Title	Credits
MTH 203	Transformations and Partial Differential Equation	3.0
EEE 205	Electronic Circuits II	3.0
EEE 207	Electrical Machines II	3.0
EEE 209	Digital Electronics	4.0
EEE 200	Electrical Design and Drafting Sessional	1.5
EEE 206	Electronic Circuits II Sessional	1.5
EEE 208	Electrical Machines II Sessional	1.5
EEE 210	Digital Electronics Sessional	1.5
	Total:	19.0

Third Year First Semester

Course No.	Course Title	Credits
MTH 301	Probability and Statistics; Complex Variable and Harmonics	4.0
EEE 301	Power System Analysis I	3.0
EEE 303	Signals and Linear Systems	3.0
EEE 305	Electromagnetic Fields and Waves	3.0
EEE 307	Electrical Engineering Materials	3.0
EEE 300	Electronic Shop Sessional	1.5
EEE 302	Power System Analysis I Sessional	1.5
	Total:	19.0

Third Year Second Semester

Course No.	Course Title	Credits
HSS 303	Business Communication	2.0
EEE 309	Communication Engineering Fundamentals	3.0
EEE 311	Digital Signal Processing I	3.0
EEE 313	Microprocessor and Interfacing	3.0
EEE 317	Control Systems I	3.0
EEE 310	Communication Engineering Fundamentals Sessional	1.5
EEE 312	Digital Signal Processing I Sessional	1.5
EEE 314	Microprocessor and Interfacing Sessional	1.5
EEE 318	Control Systems I Sessional	1.5
	Total:	20.0

Fourth Year First Semester

Course No.	Course Title	Credits
IMG 401	Industrial and Operational Management	2.0
EEE 401	Energy Conversion and Special Machines	3.0
EEE ….	Interdisciplinary Option	3.0
EEE …..	Option I	3.0
EEE …..	Option II	3.0
EEE 400	Project/Thesis	2.0
EEE ….	Interdisciplinary Option Sessional	1.5
EEE…..	Option II Sessional	1.5
	Total:	19.0

Fourth Year Second Semester

Course No.	Course Title	Credits
EEE 403	Power Electronics	3.0
EEE ….	Option III	3.0
EEE …..	Option IV	3.0
EEE …..	Option V	3.0
EEE 400	Project/Thesis	4.0
EEE 404	Power Electronics Sessional	1.5
EEE ….	Option IV Sessional	1.5
	Total:	19.0

Grand Total Credits : 152.

4.2 OPTIONAL COURSES

Interdisciplinary Option

Course No.	Course Title	Credits
EEE 451	Control System II	3.00
EEE 453	Numerical Methods	3.00
EEE 455	Biomedical Electronics	3.00
EEE 457	Measurement and Instrumentation	3.00

Interdisciplinary Option Sessional

Course No.	Course Title	Credits
EEE 452	Control System II Sessional	1.50
EEE 454	Numerical Methods Sessional	1.50
EEE 456	Biomedical Electronics Sessional	1.50
EEE 458	Measurement and Instrumentation Sessional	1.50

Option I

Course No.	Course Title	Credits
EEE 411	Power Station Engineering	3.00
EEE 421	Analog Integrated Circuits	3.00
EEE 431	Digital Signal Processing II	3.00
EEE 441	Advanced Logic Design	3.00

Option II

Course No.	Course Title	Credits
EEE 413	Power System Analysis II	3.00
EEE 423	VLSI Design I	3.00
EEE 433	Microwave Engineering	3.00
EEE 443	Microprocessor System Design	3.00

Option II Sessional

Course No.	Course Title	Credits
EEE 414	Power System Analysis II Sessional	1.50
EEE 424	VLSI Design I Sessional	1.50
EEE 434	Microwave Engineering Sessional	1.50
EEE 444	Microprocessor System Design Sessional	1.50

Option III

Course No.	Course Title	Credits
EEE 415	Power Plant Engineering	3.00
EEE 425	Solid State Devices	3.00
EEE 435	Optical Fiber Communication	3.00
EEE 445	Computer Architecture	3.00

Option IV

Course No.	Course Title	Credits
EEE 417	Power System Protection	3.00
EEE 427	VLSI Design II	3.00
EEE 437	Telecommunication Engineering	3.00
CSE 447	Computer Networking	3.00

Option IV Sessional

Course No.	Course Title	Credits
EEE 418	Power System Protection Sessional	1.50
EEE 428	VLSI Design II Sessional	1.50
EEE 438	Telecommunication Engineering Sessional	1.50
CSE 448	Computer Networking Sessional	1.50

Option V

Course No.	Course Title	Credits
EEE 419	Power System Operation and Control	3.00
EEE 429	Opto-electronics	3.00
EEE 439	Mobile Cellular Communication	3.00
EEE 449	Multimedia and Internet	3.00

COURSE OUTLINE

CORE

4. CORE COURSE OUTLINE

41 FIRST YEAR FIRST SEMESTER

Course No: EEE 101
Course Title: Electrical Circuits I
Credit Hours: 3.00
DC Circuits:
Basic concepts: Voltage, current, power, energy, independent and dependent sources, resistance, Ohm's law, Kirchoff's current and voltage laws, voltage and current division rules. Equivalent Resistance: Series, parallel and series parallel combinations, wye-delta transformation. Electrical circuit analysis Techniques: Nodal and mesh analysis including supernode and supermesh. Network theorems: Source conversion, Thevenin's, Norton's and superposition theorems, maximum power transfer theorem and reciprocity theorem.

Inductors and capacitors and their series parallel combinations. Natural and step responses of RL and RC circuits:

Magnetic Circuits:
Basic concepts: Flux, permeability and reluctance, magnetic field strength, magnetomotive force (mmf), flux density, magnetization curve, Ohm's law and Ampere's circuital law. Analysis of series, parallel and series-parallel magnetic circuits.

Course No: EEE 102
Course Title: Electrical Circuits I Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 101.

4.2 FIRST YEAR SECOND SEMESTER

Course No: EEE 103
Course Title: Electrical Circuits II
Credit Hours: 4.00
Pre-requisite : EEE 101
AC quantities: Instantaneous, average and effective current, voltage and power, impedance, real and reactive power, power factor. Phasor algebra: addition, subtraction, division, multiplication, and power root. Phasor diagrams. Analysis of single-phase ac circuits: Series and parallel RL, RC and RLC circuits, nodal and mesh analysis, network theorems in ac circuits, circuits simultaneously excited by sinusoidal sources of several frequencies AC transient response of RL and RC circuits. Resonance: Series and parallel resonance, Q-factor. Magnetically coupled circuits. Analysis of poly phase systems: Poly phase systems, three phase supply, balanced and unbalanced systems and power calculation.

Course No: EEE 104
Course Title: Electrical Circuit II Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 103.

Course No: EEE 105
Course Title: Computer Programming
Credit Hours: 3.00
Computer fundamentals: Programming languages, algorithms and flow charts, number system. Structured Programming: variables, constants, operators, expressions, control statements, functions, arrays, pointers, structure, unions, user defined variables, input-output and files. Object oriented programming: classes and objects, functions and operator overloading and inheritance.

Course No: EEE 106
Course Title: Computer Programming Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 105.

4.3 SECOND YEAR FIRST SEMESTER

Course No: EEE 201
Course Title: Electronic Circuits I
Credit Hours: 3.0

Pre-requisite : EEE 101
Introduction to semiconductors: intrinsic and extrinsic. P-N junction diode as a circuit element: Operational principle, contact potential, current-voltage characteristics, simplified dc and ac models, dynamic resistance and capacitance. Diode circuits: Half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a zener diode, zener shunt regulator, clamping and clipping circuits. Bipolar junction transistor (BJT) as a circuit element: Bipolar junction transistor: current components, BJT characteristics and regions of operation, BJT as an amplifier, biasing the BJT for discrete circuits, small signal equivalent circuit models, BJT as a switch. Single stage mid-band frequency. BJT amplifier circuits: Voltage and current gain, input and output impedance of a common base, common
emitter and common collector amplifier circuits. Metal-oxide-semiconductor field-effect-transistor (MOSFET) as circuit element: structure and physical operation of an enhancement MOSFET, threshold voltage, Body effect, current- voltage characteristics of an enhancement MOSFET, biasing discrete and integrated MOS amplifier circuits, single-stage MOS amplifiers, MOSFET as a switch, CMOS inverter. Junction field-effect-transistor (JFET): Structure and physical operation of JFET, transistor characteristics, and pinch-off voltage. Differential and multistage amplifiers: Description of differential amplifiers, small-signal operation, differential and common mode gains, RC coupled mid-band frequency amplifier.

Course No: EEE 202
Course Title: Electronic Circuits I Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 201.

Course No: EEE 203
Course Title: Electrical Machines I
Credit Hours: 3.00
Pre-requisite : EEE 103
Review of magnetic field concepts, Electromechanical energy conversion fundamentals: Faraday's law of electromagnetic induction, Flemming's left hand rule and right hand rule and Lenz's law, Commutation, counter emf and comparison between generator and motor action. Transformer: Ideal transformer - transformation ratio, no-load and load vector diagrams; actual transformer - equivalent circuit, regulation, short circuit and open circuit tests; parallel operation, autotransformer and three phase transformer. Three phase induction motor: Rotating magnetic field, equivalent circuit, vector diagram, torque-speed characteristics, effect of changing rotor resistance and reactance on torque-speed curves, motor torque and developed rotor power, no-load test, blocked rotor test, starting and braking and speed control, Circle diagram.

Course No: EEE 204
Course Title: Electrical Machines I Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 203.

4.4 SECOND YEAR SECOND SEMESTER

Course No: EEE 205
Course Title: Electronic Circuits II
Credit Hours: 3.00

Pre-requisite : EEE 201
Frequency response of amplifiers: Poles, zeros and Bode plots, amplifier transfer function, techniques of determining 3 dB frequencies of amplifier circuits, frequency response of single-stage and cascode amplifiers, frequency response of differential amplifiers. Operational amplifiers (Op-Amp): Properties of ideal Op-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits, effects of finite open loop gain and bandwidth on circuit performance, logic signal operation of Op-Amp, dc imperfections. General purpose Op-Amp: DC analysis, small-signal analysis of different stages, gain, frequency response of 741 Op-Amp. Negative feedback: properties, basic topologies, feedback amplifiers with different topologies, stability, and frequency compensation. Active filters: Different types of filters and specifications, transfer functions, realization of first and second order low, high and bandpass filters using Op-Amps. Signal generators: Basic principle of sinusoidal oscillation, Op-Amp RC oscillators, LC and crystal oscillators. Power Amplifiers: Classification of output stages, class A, B and AB output stages. Tuned voltage (RF,IF) and power amplifiers (class C). Wave from generation using discrete devices: OP AMPs and other linear ICs. Astable and monostable multivibrators, Schmitt trigger. Pulse generators. Duty cycle modulation. Voltage controlled oscillators (VCO) and voltage-frequency converters.

Course No: EEE 206
Course Title: Electronic Circuits II Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 205.

Course No: EEE 207
Course Title: Electrical Machines II
Credit Hours: 3.00
Pre-requisite : EEE 203
Single phase induction motor: Theory of operation, equivalent circuit and starting. Synchronous Generator: excitation systems, armature reaction, two reaction theory, equivalent circuit, vector diagrams at different loads, factors affecting voltage regulation, synchronous impedance, synchronous impedance method of predicting voltage regulation and its limitations. Parallel operation: Necessary conditions, synchronizing, circulating current and vector diagram. Synchronous motor: Operation, effect of loading under different excitation condition, effect of changing excitation, V-curves and starting. DC generator: Types, no-load voltage characteristics, build-up of a self excited shunt generator, critical field resistance, load-voltage characteristic, effect of speed on no-load and load characteristics and voltage regulation. DC motor: Torque, counter emf, speed, torque-speed characteristics, starting and speed regulation.

Course No: EEE 208
Course Title: Electrical Machines II Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 207.

Course No: EEE 209
Course Title: Digital Electronics
Credit Hours: 4.00
Number systems and codes: number system, arithmetic, base conversion, signed number representation and computer codes. Analysis and synthesis of logic circuits: Boolean algebra, switching functions, switching circuits and combinational logic circuits. Simplification of switching functions: K maps, Quine McCluskey minimization method and Patrick's algorithm. Modular combinational circuit design: decoders, encoders, multiplexers, demultiplexers, binary arithmetic elements and comparators. Logic families: DTL, TTL, ECL, CMOS logic description, speed delay and noise immunity. Programmable logic devices: logic arrays, field programmable logic arrays, programmable read only memory and programmable array logic. Sequential devices: latches, flip-flops and timing circuits. Modular sequential logic circuits: shift registers, counters and digital fraction rate multipliers. Simple processors: simple digital system design.

Course No: EEE 210
Course Title: Digital Electronics Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 209.

Course No: EEE 200
Course Title: Electrical Design and Drafting Sessional
Credit Hours: 1.50
Safety rules, electricity rules and electricity codes. Electrical and electronic symbols. Electrical wiring, house wiring, industrial installation wiring. Insulation measurement, use of meggers. Battery charging.

4.5 THIRD YEAR FIRST SEMESTER

Course No: EEE 301
Course Title: Power Systems Analysis I
Credit Hours: 3.00
Pre-requisite : EEE 207

Line representation: Equivalent circuit of short, medium and long transmission line. Network representation: Single line and reactance diagram of power system and per unit representation. Load flow: Gauss-Seidel method. Power flow control: Tap changing transformer, phase shifting, booster and regulating transformer and shunt capacitor. Fault analysis: Short circuit current and reactance of a synchronous machine. Symmetrical fault calculation methods: symmetrical components, sequence networks and unsymmetrical fault calculation. Protection: Introduction to relays, differential protection and distance protection. Introduction to circuit breakers. Load curves: Demand factor, diversity factor, load duration curves, energy load curve, load factor, capacity factor and plant factor.

Course No: EEE 302
Course Title: Power Systems Analysis I Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 301.

Course No: EEE 303
Course Title: Signals and Linear Systems
Credit Hours: 3.00
Classification of signals and systems: signals - classification, basic operation on signals, elementary signals, 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, system response, frequency response of LTI systems; Fourier transformation- properties, system transfer function, system response and distortion-less systems. Applications of time and frequency domain 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 equations, system transfer function, system stability and frequency response and application.

Course No: EEE 305
Course Title: Electromagnetic Fields and Waves
Credit Hours: 3.00
Static electric field: Postulates of electrostatics, Coulomb's law for discrete and continuously distributed charges, Gauss's law and its application, electric potential due to charge distribution, conductors and dielectrics in static electric field, flux density - boundary conditions; capacitance - electrostatic energy and forces, energy in terms of field equations, capacitance calculation of different geometries; boundary value problems – Poisson's and Laplace's equations in different co-ordinate systems. Steady electric current: Ohm's law, continuity equation, Joule's law, resistance calculation. Static Magnetic field: Postulates of magnetostatics, Biot-Savart's law, Ampere's law and applications, vector magnetic potential, magnetic dipole, magnetization, magnetic field intensity and relative permeability, boundary conditions for magnetic field, magnetic energy, magnetic forces, torque and inductance of different geometries. Time varying fields and Maxwell's equations: Faraday's law of electromagnetic induction, Maxwell's equations - differential and integral forms, boundary conditions, potential functions; time harmonic fields and Poynting theorem. Plane electromagnetic wave: plane wave in loss less media - Doppler effect, transverse electromagnetic wave, polarization of plane wave; plane wave in lossy media – low-loss dielectrics, good conductors; group velocity, instantaneous and average power densities, normal and oblique incidence of plane waves at plane boundaries for different polarization.

Course No: EEE 307
Course Title: Electrical Engineering Materials
Credit Hours: 3.00
Crystal structures: Types of crystals, lattice and basis, Bravais lattice and Miller indices. Classical theory of electrical and thermal conduction: Scattering, mobility and resistivity, temperature dependence of metal resistivity, Mathiessen's rule, Hall effect and thermal conductivity. Introduction to quantum mechanics: Wave nature of electrons, Schrodinger's equation, one-dimensional quantum problems - infinite quantum well, potential step and potential barrier; Heisenbergs's uncertainty principle and quantum box. Band theory of solids: Band theory from molecular orbital, Bloch theorem, Kronig-Penny model, effective mass, density-of-states. Carrier statistics: Maxwell-Boltzmann and Fermi-Dirac distributions, Fermi energy. Modern theory of metals: Determination of Fermi energy and average energy of electrons, classical and quantum mechanical calculation of specific heat. Dielectric properties of materials: Dielectric constant, polarization - electronic, ionic and orientational; internal field, Clausius-Mosotti equation, spontaneous polarization, frequency dependence of dielectric constant, dielectric loss and piezoelectricity. Magnetic properties of materials: Magnetic moment, magnetization and relative permitivity, different types of magnetic materials, origin of ferromagnetism and magnetic domains. Introduction to superconductivity: Zero resistance and Meissner effect, Type I and Type II superconductors and critical current density.

Course No: EEE 300
Course Title: Electronic Shop Sessional
Credit Hours: 1.50
Radio receivers: Principles of operation, circuit tracing, fault finding by signal injection and other means, alignment. TV camera, B/W TV, colour TV. VCP and VCR. Computer hardware troubleshooting and assembling.

4.6 THIRD YEAR SECOND SEMESTER

Course No: EEE 309
Course Title: Communication Engineering Fundamentals
Credit Hours: 3.00
Overview of communication systems: Basic principles, fundamental elements, system limitations, message source, bandwidth requirements, transmission media types, bandwidth and transmission capacity. Noise: Source, characteristics of various types of noise and signal to noise ratio. Information theory: Measure of information, source encoding, error free communication over a noisy channel, channel capacity of a continuous system and channel capacity of a discrete memory less system. Communication systems: Analog and digital. Continuous wave modulation: Transmission types – base-band transmission, carrier transmission; amplitude modulation – introduction, double side band, single side band, vestigial side band, quadrature; spectral analysis of each type, envelope and synchronous detection; angle modulation – instantaneous frequency, frequency modulation (FM) and phase modulation (PM), spectral analysis, demodulation of FM and PM. Pulse modulation: Sampling – sampling theorem, Nyquist criterion, aliasing, instantaneous and natural sampling; pulse amplitude modulation - principle, bandwidth requirements; pulse code modulation (PCM) - quantization principle, quantization noise, non-uniform quantization, signal to quantization error ratio, differential PCM, demodulation of PCM; delta modulation (DM) - principle, adaptive DM; line coding – formats and bandwidths. Digital modulation: Amplitude-shift keying - principle, ON-OFF keying, bandwidth requirements, detection, noise performance; phase-shift keying (PSK) - principle, bandwidth requirements, detection, differential PSK, quadrature PSK, noise performance; frequency-shift Keying (FSK) - principle, continuous and discontinuous phase FSK, minimum-shift keying, bandwidth requirements, detection of FSK. Multiplexing: Time- division multiplexing (TDM) - principle, receiver synchronization, frame synchronization, TDM of multiple bit rate systems; frequency-division multiplexing - principle, de-multiplexing; wavelength-division multiplexing, 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. Communication system design: design parameters, channel selection criteria and performance simulation.

Course No: EEE 310
Course Title: Communication Engineering Fundamentals Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 309.

Course No: EEE 311
Course Title: Digital Signal Processing I
Credit Hours: 3.00
Introduction to digital signal processing (DSP): Discrete-time signals and systems, analog to digital conversion, impulse response, finite impulse response (FIR) and infinite impulse response (IIR) of discrete-time systems, difference equation, convolution, transient and steady state response. Discrete transformations: Discrete Fourier series, discrete-time Fourier series, discrete Fourier transform (DFT) and properties, fast Fourier transform (FFT), inverse fast Fourier transform, Z transformation - properties, transfer function, poles and zeros and inverse Z transform. Correlation: circular convolution, auto-correlation and cross correlation. Digital Filters: FIR filters - linear phase filters, specifications, design using window, optimal and frequency sampling methods; IIR filters – specifications, design using impulse invariant, bi-linear Z transformation, least-square methods and finite precision effects.

Course No: EEE 312
Course Title: Digital Signal Processing I Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 311.

Course No: EEE 313
Course Title: Microprocessor and Interfacing
Credit Hours: 3.00
Introduction to microprocessors. Intel 8086 microprocessor: Architecture, addressing modes, instruction sets, assembly language programming, system design and interrupt. Interfacing: programmable peripheral interface, programmable timer, serial communication interface, programmable interrupt controller, direct memory access, keyboard and display interface. Introduction to micro-controllers.

Course No: EEE 314
Course Title: Microprocessor and Interfacing Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 313.

Course No: EEE 317
Course Title: Control System I
Credit Hours: 3.00
Introduction to control systems. Linear system models: Transfer function, block diagram and signal flow graph (SFG). State variables: SFG to state variables, transfer function to state variable and state variable to transfer function. Feedback control system: Closed loop systems, parameter sensitivity, transient characteristics of control systems, effect of third pole and zero on the system response and system types and steady state error. Routh stability criterion. Analysis of feedback control system: Root locus method and frequency response method. Design of feedback control system: Controllability and observability, root locus, frequency response and state variable methods. Digital control systems: introduction, sampled data systems, stability analysis in Z-domain.

Course No: EEE 318
Course Title: Control System I Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 317.

4.7 FOURTH YEAR FIRST SEMESTER

Course No: EEE 401
Course Title: Energy Conversion and Special Machines
Credit Hours: 3.00
Special machines, series universal motor, permanent magnet dc motor, unipolar and bipolar brush less dc motors, stepper motor and control circuits. Reluctance and hysteresis motors with drive circuits, switched reluctance motor, electro static motor, repulsion motor, synchros and control transformers. Induction generators. Permanent magnet synchronous motors. Acyclic machines: Generators, conduction pump and induction pump. Magneto hydrodynamic generators. Direct conversion to electrical energy: Fuel Cells, thermoelectric and photovoltaics. Dynamics of electrical drives. Fundamentals of control of electrical drives. Selection of machine power rating. Construction and basic characteristics of solar cells. Introduction to wind turbine generators.

Course No: EEE 400
Course Title: Project/Thesis
Credit Hours: 2.00
Study of practical problems in the fields of electrical and electronic engineering.

4.8 FOURTH YEAR SECOND SEMESTER

Course No: EEE 403
Course Title: Power Electronics
Credit Hours: 3.00
Power semiconductor switches and triggering devices: BJT, MOSFET, SCR, IGBT, GTO, TRIAC, UJT and DIAC. Rectifiers: Uncontrolled and controlled single phase and three phase. Regulated power supplies: Linear-series and shunt, switching buck, buckboost, boost and Cuk regulators. AC voltage controllers: single and three phase. Choppers. DC motor control. Single phase cycloconverter. Inverters: Single phase and three phase voltage and current source. AC motor control. Stepper motor control. Resonance inverters. Pulse width modulation control of static converters.

Course No: EEE 404
Course Title: Power Electronics Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 403.

Course No: EEE 400
Course Title: Project/Thesis
Credit Hours: 4.00
Study of practical problems in the fields of electrical and electronic engineering.

COURSE OUTLINE

OPTIONAL

5.1 POWER SYSTEM GROUP

Course No: EEE 411
Course Title: Power Station Engineering
Credit Hours: 3.00
Power plants: General layout and principles, steam turbine, gas turbine, combined cycle gas turbine, hydro and nuclear. Selection of location: Technical, economical and environmental factors. Probabilistic approaches of load forecasting. Generation scheduling: deterministic and probabilistic. Electricity tariff: formulation and types.

Course No: EEE 413
Course Title: Power System Analysis II
Credit Hours: 3.00
Pre-requisite : EEE 301
Transmission lines and cables: Overhead and underground. Stability: Swing equation, power angle equation, equal area criterion, multi-machine system, step by step solution of swing equation, transient and steady state stability and factors effecting stability. Reactive power compensation: Theory, steady-state and dynamic VAR compensation. Generation and load modeling. Harmonics. Flexible ac transmission system. High voltage dc transmission system. Electrical power policy.

Course No: EEE 414
Course Title: Power System Analysis II Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 413.

Course No: EEE 415
Course Title: Power System Reliability
Credit Hours: 3.00
Review of probability concepts. Probability distribution: Binomial, Poisson, and Normal. Reliability concepts: Failure rate, outage, mean time to failure, series and parallel systems and redundancy. Markov process. Probabilistic generation and load models. Reliability indices: Loss of load probability and loss of energy probability. Frequency and duration. Reliability evaluation techniques of single area system.

Course No: EEE 417
Course Title: Power System Protection
Credit Hours: 3.00
Purpose of power system protection. Criteria for detecting faults: over current, differential current, difference of current phase angles, over and under voltages, power direction, symmetrical components of current and voltages, impedance, frequency and temperature. Instrument transformers: CT and PT. Electromechanical and electronic Relays: basic modules, over current, differential, distance and directional. Trip circuits. Relay schemes: Generator, transformer, motor, bus bar, transmission and distribution lines. Circuit breakers: Principle of arc extinction, selection criteria and ratings of circuit breakers, types - air, oil, SF6 and vacuum. Miniature circuit breakers for household and commercial utility use.

Course No: EEE 418
Course Title: Power System Protection Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 417.

Course No: EEE 419
Course Title: Power System Operation and Control
Credit Hours: 3.00
Principles of power system operation, operation in conventional and competitive environment, economic dispatch with non-linear and piece-wise linear cost curves, generator scheduling, static security analysis, state estimation, voltage security analysis, optimal power flow, generation control, supervisory control and data acquisition, dynamic security analysis and ancillary services.

5.2 ELECTRONICS GROUP

Course No: EEE 421
Course Title: Analog Integrated Circuits
Credit Hours: 3.00
Review of FET amplifiers: Passive and active loads and frequency limitation. Current mirror: Basic, cascode and active current mirror. Differential Amplifier: Introduction, large and small signal analysis, common mode analysis and differential amplifier with active load. Noise: Introduction to noise, types, representation in circuits, noise in single stage and differential amplifiers and bandwidth. Band-gap references: Supply voltage independent biasing, temperature independent biasing, proportional to absolute temperature current generation and constant transconductance biasing. Switch capacitor circuits: Sampling switches, switched capacitor circuits including unity gain buffer, amplifier and integrator. Phase Locked Loop (PLL): Introduction, basic PLL and charge pumped PLL.

Course No: EEE 423
Course Title: VLSI Design I
Credit Hours: 3.00
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.

Course No: EEE 424
Course Title: VLSI Design I Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 423.

Course No: EEE 425
Course Title: Solid State Devices
Credit Hours: 3.00
Semiconductors in equilibrium: Energy bands, intrinsic and extrinsic semiconductors, Fermi levels, electron and hole concentrations, temperature dependence of carrier concentrations and invariance of Fermi level. Carrier transport processes and excess carriers: Drift and diffusion, generation and recombination of excess carriers, built-in-field, Einstein relations, continuity and diffusion equations for holes and electrons and quasi-Fermi level. PN junction: Basic structure, equilibrium conditions, contact potential, equilibrium Fermi level, space charge, non-equilibrium condition, forward and reverse bias, carrier injection, minority and majority carrier currents, transient and ac conditions, time variation of stored charge, reverse recovery transient and capacitance. Bipolar junction transistor: Basic principle of pnp and npn transistors, emitter efficiency, base transport factor and current gain, diffusion equation in the base, terminal currents, coupled-diode model and charge control analysis, Ebers-Moll equations and circuit synthesis. Metal-semiconductor junction: Energy band diagram of metal semiconductor junctions, rectifying and ohmic contacts. MOS structure: MOS capacitor, energy band diagrams and flat band voltage, threshold voltage and control of threshold voltage, static C-V characteristics, qualitative theory of MOSFET operation, body effect and current-voltage relationship of a MOSFET. Junction Field-effect-transistor: Introduction, qualitative theory of operation, pinch-off voltage and current-voltage relationship.

Course No: EEE 427
Course Title: VLSI Design II
Credit Hours: 3.00
Pre- requisite : EEE 423
VLSI MOS system design: Layout extraction and verification, full and semi-full custom design styles and logical and physical positioning. Design entry tools: Schematic capture and HDL. Logic and switch level simulation. Static timing. Concepts and tools of analysis, solution techniques for floor planning, placement, global routing and detailed routing. Application specific integrated circuit design including FPGA.

Course No: EEE 428
Course Title: VLSI Design II Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 427.

Course No: EEE 429
Course Title: Optoelectronics
Credit Hours: 3.00
Optical properties in semiconductor: Direct and indirect band-gap materials, radiative and non-radiative recombination, optical absorption, photo-generated excess carriers, minority carrier life time, luminescence and quantum efficiency in radiation. Properties of light: Particle and wave nature of light, polarization, interference, diffraction and blackbody radiation. Light emitting diode (LED): Principles, materials for visible and infrared LED, internal and external efficiency, loss mechanism, structure and coupling to optical fibers. Stimulated emission and light amplification: Spontaneous and stimulated emission, Einstein relations, population inversion, absorption of radiation, optical feedback and threshold conditions. Semiconductor Lasers: Population inversion in degenerate semiconductors, laser cavity, operating wavelength, threshold current density, power output, hetero-junction lasers, optical and electrical confinement. Introduction to quantum well lasers. Photo-detectors: Photoconductors, junction photo-detectors, PIN detectors, avalanche photodiodes and phototransistors. Solar cells: Solar energy and spectrum, silicon and Schottkey solar cells. Modulation of light: Phase and amplitude modulation, electro-optic effect, acousto-optic effect and magento-optic devices. Introduction to integrated optics.

5.3 COMMUNICATION GROUP

Course No: EEE 431
Course Title: Digital Signal Processing II
Credit Hours: 3.00
Pre- requisite : EEE 311
Spectral estimation: Nonparametric methods – discrete random processes, autocorrelation sequence, periodogram; parametric method – autoregressive modeling, forward/backward linear prediction, Levinson-Durbin algorithm, minimum variance method and Eigenstructure method I and II. Adaptive signal processing: Application, equalization, interference suppression, noise cancellation, FIR filters, minimum mean-square error criterion, least mean-square algorithm and recursive least square algorithm. Multirate DSP: Interpolation and decimation, poly-phase representation and multistage implementation. Perfect reconstruction filter banks: Power symmetric, alias-free multi-channel and tree structured filter banks. Wavelets: Short time Fourier transform, wavelet transform, discrete time orthogonal wavelets and continuous time wavelet basis.

Course No: EEE 433
Course Title: Microwave Engineering
Credit Hours: 3.00
Transmission lines: Voltage and current in ideal transmission lines, reflection, transmission, standing wave, impedance transformation, Smith chart, impedance matching and lossy transmission lines. Waveguides: general formulation, modes of propagation and losses in parallel plate, rectangular and circular waveguides. Microstrips: Structures and characteristics. Rectangular resonant cavities: Energy storage, losses and Q. Radiation: Small current element, radiation resistance, radiation pattern and properties, Hertzian and halfwave dipoles. Antennas: Mono pole, horn, rhombic and parabolic reflector, array, and Yagi-Uda antenna.

Course No: EEE 434
Course Title: Microwave Engineering Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 433.

Course No: EEE 435
Course Title: Optical Fiber Communication
Credit Hours: 3.00
Introduction. Light propagation through optical fiber: Ray optics theory and mode theory. Optical fiber: Types and characteristics, transmission characteristics, fiber joints and fiber couplers. Light sources: Light emitting diodes and laser diodes. Detectors: PIN photo-detector and avalanche photo-detectors. Receiver analysis: Direct detection and coherent detection, noise and limitations. Transmission limitations: Chromatic dispersion, nonlinear refraction, four wave mixing and laser phase noises. Optical amplifier: Laser and fiber amplifiers, applications and limitations. Multi-channel optical system: Frequency division multiplexing, wavelength division multiplexing and co-channel interference.

Course No: EEE 437
Course Title: Telecommunication Engineering
Credit Hours: 3.00
Introduction: Principle, evolution, networks, exchange and international regulatory bodies. Telephone apparatus: Microphone, speakers, ringer, pulse and tone dialing mechanism, sidetone mechanism, local and central batteries and advanced features. Switching system: Introduction to analog system, digital switching systems – space division switching, blocking probability and multistage switching, time division switching and two dimensional switching. Traffic analysis: Traffic characterization, grades of service, network blocking probabilities, delay system and queuing. Modern telephone services and network: Internet telephony, facsimile, integrated services digital network, asynchronous transfer mode and intelligent networks. Introduction to cellular telephony and satellite communication.

Course No: EEE 438
Course Title: Telecommunication Engineering Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 437.

Course No: EEE 439
Course Title: Mobile Cellular Communication
Credit Hours: 3.00
Introduction: Concept, evolution and fundamentals. Analog and digital cellular systems. Cellular Radio System: Frequency reuse, co-channel interference, cell splitting and components. Mobile radio propagation: Propagation characteristics, models for radio propagation, antenna at cell site and mobile antenna. Frequency Management and Channel Assignment: Fundamentals, spectrum utilization, fundamentals of channel assignment, fixed channel assignment, non-fixed channel assignment, traffic and channel assignment. Handoffs and Dropped Calls: Reasons and types, forced handoffs, mobile assisted handoffs and dropped call rate. Diversity Techniques: Concept of diversity branch and signal paths, carrier to noise and carrier to interference ratio performance. Digital cellular systems: Global system for mobile, time division multiple access and code division multiple access.

5.4 COMPUTER GROUP

Course No: EEE 441
Course Title: Advanced Logic Design
Credit Hours: 3.00
Introduction. Design, modeling and verification of complex digital systems. Modern design methodologies for logic design. Tools for the design and testing of digital systems.

Course No: EEE 443
Course Title: Microprocessor System Design
Credit Hours: 3.00
Hardware design of 16 and 32 bit single board computers. Chip select equations for memory board design. Serial and parallel I/O interfacing. ROM and RAM. Assembly language programming, stack models, sub-routines and I/O processing.

Course No: EEE 444
Course Title: Microprocessor System Design Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 443.

Course No: EEE 445
Course Title: Computer Architecture
Credit Hours: 3.00
Structure of systems using processors. CPU organization, microprogramming, memories and input/output devices. I/O interfaces. Instruction set design and implementation. Memory hierarchies, pipelining, register transfer languages and simulation tools. Trade-off involved in design.

Course No: CSE 447
Course Title: Computer Networking
Credit Hours: 3.00
Introduction. Structure, architecture and open system interpretation reference. Standardization. Physical layer. Data communication, transmission media, digital transmission, switching, ISDN and terminal handling. Medium access sub-layer, data link layer, network layer, transport layer, session layer, presentation layer and application layer.

Course No: CSE 448
Course Title: Computer Networking Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on CSE 447.

Course No: EEE 449
Course Title: Multimedia and Internet
Credit Hours: 3.00
Multimedia: Applications, requirements, traffic generation and characterization. Audio compression. Image and video compression standards. Networking technologies and protocols and LAN technologies. Broadband services: Cable modems, hybrid fiber coax, wireless internet protocols, resource reservation protocols, differentiated services in the internet, real time transport protocol and profiles and payload formats. Audio-video conferencing standards. Internet architectures. Data conferencing standards. Real time streaming protocol.

5.5 INTERDISCIPLINARY OPTIONS

Course No: EEE 451
Course Title: Control System II
Credit Hours: 3.00
Signal conversion and processing: Digital signals and coding, data conversion and quantization, mathematical treatment of sampling process, sampling theorem and reconstruction of sampled signals. Z-transform. State variable technique: State equations of digital systems with sample and hold, state equation of digital systems, digital simulation and approximation. Solution of discrete state equations: by Z transform, state equation and transfer function, state diagrams, state plane analysis. Stability of digital control systems. Digital simulation and digital redesign. Time domain analysis. Frequency domain analysis. Controllability and observability. Optimal linear digital regulator design. Digital state observer. Microprocessor control. Introduction to Neural network and Fuzzy control. Adaptive control.

Course No: EEE 452
Course Title: Control System II Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 451.

Course No: EEE 453
Course Title: Numerical Methods
Credit Hours: 3.00
Introduction: Motivation and errors in numerical techniques. Taylor series. Finite difference calculus: Forward, backward, divided, and central difference and difference of a polynomial. Interpolation: Newton's formula, Lagranage, spline, Chebyshev and inverse. Extrapolation. Nonlinear equations: Iteration, bisection, false position, Raphson, secant and Muller's methods. Simultaneous linear algebraic equations: Cramer's rule, inversion of matrices, Gauss elimination, Gauss-Jordan method, factorization and Gauss-Siedel iteration methods. Curve Fitting: Linear and polynomial regression, fitting power, exponential and trigonometric functions. Ordinary differential equations: Initial value problem, Taylor's series method, Picard's method of successive approximation, Euler's method and Runge Kutta method. Boundary value problems. Numerical integration: general quadrature formula, trapezoidal rule and Simpson's rule. Numerical differentiation.

Course No: EEE 454
Course Title: Numerical Methods Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 453.

Course No: EEE 455
Course Title: Biomedical Electronics
Credit Hours: 3.00
Human body: Cells and physiological systems. Bioelectricity: genesis and characteristics. Measurement of bio-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 pressure, electronic manometer, detector circuits and practical problems in pressure monitoring. Blood flow measurement: Plethymography and electromagnetic flow meter. Measurement and interpretation: electroenccphalogram, cerebral angiograph and cronical X-ray. Brain scans. Electromayogram (EMG). Tomograph: Positron emission tomography and computer tomography. Magnetic resonance imaging. Ultrasonogram. Patient monitoring system and medical telemetry. Effect of electromagnetic fields on human body.

Course No: EEE 456
Course Title: Biomedical Electronics Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 455.

Course No: EEE 457
Course Title: Measurement and Instrumentation
Credit Hours: 3.00
Introduction: Applications, functional elements of a measurement system and classification of instruments. Measurement of electrical quantities: Current and voltage, power and energy measurement. Current and potential transformer. Transducers: mechanical, electrical and optical. Measurement of non-electrical quantities: Temperature, pressure, flow, level, strain, force and torque. Basic elements of dc and ac signal conditioning: Instrumentation amplifier, noise and source of noise, noise elimination compensation, function generation and linearization, A/D and D/A converters, sample and hold circuits. Data Transmission and Telemetry: Methods of data transmission, dc/ac telemetry system and digital data transmission. Recording and display devices. Data acquisition system and microprocessor applications in instrumentation.

Course No: EEE 458
Course Title: Measurement and Instrumentation Sessional
Credit Hours: 1.50
Laboratory experiments and a term project based on EEE 457.

COURSE OUTLINE

GENERAL- BASIC SCIENCE, HUMANITIES AND OTHER ENGINEERING

6.1 FIRST YEAR FIRST SEMESTER

Course No: HSS 111
Course Title: Bangladesh Studies
Credit Hours: 4.00
a) Society and Culture:
The Sociological Perspective: Definition, nature. Sociology as a scientific discipline, relation with other social sciences. Primary Concepts: Society, Community, Association, Institution, Group, Culture, Norms & Values. Social Structure and Process: Social Stratification, Social classes, Caste system, Social Mobility. Social Institutions: Family, Marriage, Economic Institutions – Property, Ownership; Political Institutions – Forms of State and Forms of Government; Local Government; Religious and Cultural Institution: Culture, Cultural diffusion and change, Bengali culture. Problems of Society, Social problems of Bangladesh. Social Change, Theories of Social Change, Social Change in Bangladesh. Urbanization process and its impact on Bangladesh Society. Ethics and Morality, Ethical issues in Bangladesh Society.

b) History of Bengal:
The land: Geographical factors, the people. Ancient Bengal: Sasanka-Rise of the Palas – the Senas. Early Medieval Bengal: Coming of the Muslims; The Independent Sultanate of Bengal - Ilyas Shahi and Hossein Shahi Bengal; Development of Bengali language and Bengali literature. Late Medieval Bengal: the establishment of Mughal rule in Bengal – the Bara Bhuiyans - Subedars and Nawabs; Coming of the Europeans; New approach in Bengal architecture. Beginning of British rule in Bengal: Battles of Plassey and Buxar; Diwani (1765); The Dual government; Permanent Settlement (1793). Nineteenth century Bengali Renaissance: areas of social and religious reforms – Raja Rammohan Roy; Ishawar Chandra Vidyasagar; Titu Meer. Partition of Bengal (1905): Its annulments(1911). Partition of Bengal (1947); Language Movement (1952); Movement for autonomy; 6-point programs. The 1970 election-military action; genocide in the then East Pakistan; The Liberation War - The emergence of Bangladesh as a sovereign independent state in 1971.

Course No: PHY 101
Course Title: Physics I
Credit Hours: 3.00
Heat and thermodynamics: Temperature, zeroth law of thermodynamics. Thermometers: constant volume, platinum resistance, thermocouple. First law of thermodynamics and its application, molar specific heats of gases, isothermal and adiabatic relations, work done by a gas. Kinetic theory of gases: explanation of gas laws, kinetic interpretation of temperature, equipartition of energy and calculation of ratio of specific heats, mean free path, Van der Waals equation of state, second law of thermodynamics: reversible and irreversible processes, Carnot cycle, efficiency, Carnot's theorem, entropy.

Structure of Matter, States of matter: solid, liquid and gas. Classification of solids: amorphous, crystalline, ceramics and polymers, atomic arrangement in solids. Different type of bonds in solids: metallic, Van der Waals, covalent and ionic bond, packing in solids, inter atomic distances and forces of equilibrium. X-ray diffraction: Bragg's law, plasticity and elasticity, distinction between metal, insulator and semiconductor.

Waves and oscillations: Simple harmonic motion, damped simple harmonic oscillation, forced oscillation, resonance, vibrations of membranes and columns, combination and composition of simple harmonic motions, Lissajous' figure. Transverse and longitudinal nature of waves, traveling and standing waves, intensity of waves, energy calculation of progressive and stationary waves. Phase velocity, group velocity, Sound waves: velocity of longitudinal waves in a gaseous medium. Doppler effect. Architectural acoustic: Sabine's formula, requisites of a good auditorium.

Physical optics: Theories of light: Huygen's principle and construction. Interference of light: Young's double slit experiment, Fresnel bi-prism, Newton's rings, interferometers, Diffraction of light: Fresnel and Fraunhoffer diffraction, diffraction by single slit, diffraction by double slit, diffraction gratings. Polarization, production and analysis of polarized light, optical activity, optics of crystals.

Course No: PHY 102
Course Title: Physics I Sessional
Credit Hours: 1.50
Laboratory experiments based on PHY 101.

Course No: MTH 101
Course Title: Differential and Integral Calculus
Credit Hours: 4.00
Differential Calculus: limit, continuity and differentiability. Successive differentiation of various types of functions. Leibnitz's theorem. Rolle's theorem. Mean value theorems. Taylor's and Maclaurin's theorems in finite and infinite forms. Lagrange's form of remainders. Cauchy's form of remainders. Expansion of functions by differentiation and integration. Evaluation of indeterminate forms by L'Hospitals rule. Partial differentiation. Euler's theorem. Tangent and normal. Subtangent and subnormal in cartesian and polar co-ordinates. Determination of

maximum and minimum values of functions and points of inflection. Applications. Curvature: radius, circle, centre and chord of curvature. Asymptotes.

Integral Calculus: Integration by the method of substitution. Standard integrals. Integration by successive reduction. Definite integrals, its properties and use in summing series. Walli's formulae. Improper integrals. Beta function and Gamma function. Area under a plane curve and area of a region enclosed by two curves in cartesian and polar co-ordinates. Volumes of solids of revolution. Volume of hollow solids of revolution by shell method. Area of surface of revolution. Jacobians. Multiple integrals with applications.

Course No: HSS 101
Course Title: English
Credit Hours: 3.00
English phonetics: the places and manners of articulation of the English sounds. Vocabulary. English grammar: construction of sentences, some grammatical problems. Comprehension. Composition of current affairs. Précis writing, report writing, commercial correspondence and tenders. Short stories written by some well-known classic writers.

Course No: HSS 102
Course Title: English Language Sessional
Credit Hours: 1.00
This course aims to give students of an international community accurate and meaningful communicating skills which will include expressions for personal identification (name, occupation, nationality, etc.); body parts; time, day, week, months and year; daily program; education and future career; entertainment; travel; postal, telephonic and telegraphic activities; health and welfare; food and drink; adjectives and comparatives and personal and formal written needs. Grammatical structures will emphasize the various tenses, and unit, articles, prepositions and adverbial particles; adverbs of manner, frequency, time and place; punctuation; model verbs; personal pronouns; affirmative; negative and question forms; possessive and possessive adjectives.
This course deals with the practical and communicative aspects of the English Language by reinforming and manipulating the sounds and grammatical patterns of the language needed in an international situation through dialogues with audio-language, audio-visual silent way and total physical response, methods and techniques involving student participation in a language laboratory with the aids of audio and video cassettes, computer games and other communicative activities.

6.2 FIRST YEAR SECOND SEMESTER

Course No: PHY 103
Course Title: Physics II
Credit Hours: 2.00
Pre- requisite : PHY 101
Electrostatics: Electric charge, Coulomb's law, Electric Forces, Electric field intensity, Electric potential and potential difference, Electric flux and electrostatic induction, Equipotential and equipotential surfaces, Gauss's theorem and its applications; calculation of electric field and flux densities. Dielectric, dielectric constant, permittivity. Capacitors: parallel plate, cylindrical and spherical. Capacitors in series and in parallel, ceramic mica and electrolytic capacitors.

Electromagnetics: Magnetic field, field strength, magnetic induction and permeability, magnetic effect of electric current. Force and torque, Ampere's law and its application, magnetizing field of a long straight conductor, a long solenoid. Law of electromagnetic induction and Lenz's law with applications, inductance and coefficient of coupling, inductance in series and in parallel and their combination, energy stored in inducts lifting power of magnets. Magnetic circuits: composite magnetic circuits, linkage, leakage and fringing flux. Hysteresis and eddy current loss.

Modern Physics: Theory of Relativity, Mass-Energy Relation, Photo Electric Effect, Quantum Theory, X-rays and X-ray Diffraction, Compton Effect, Dual Nature of Matter, Statistical Physics, Fundamentals of Solid State Physics.

Course No: MTH 103
Course Title: Differential Equations and Matrices
Credit Hours: 3.00
Pre- requisite : MTH 101
Ordinary Differential Equations: degree and order of ordinary differential equations. Formation of differential equations. Solutions 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. Solution of differential equation by the method based on the factorization of the operators. Frobenius method.

Bessel's and Legendre's differential equations.

Matrices: definition, equality, addition, subtraction, multiplication, transposition, inversion, rank. Vector Spaces and linear transformations. Eigenvalues and eigenvectors.

Course No: ECN 101
Course Title: Economics
Credit Hours: 2.00
Definition of Economics, Economics and Engineering. Principles of Economics. Micro economics: the theory of demand and supply and their elasticities. Price determination, nature of an economic theory, applicability of economic theories to the problems of developing countries. Indifference curve technique. Marginal analysis, optimization market. Production, production function, type of productivity rational region of production of an engineering firm. The Short run and Long run. Fixed cost and variable cost. Internal and external economics and diseconomics.

Macro economics: Savings, investment, national income analysis, inflation monetary policy, Fiscal policy and Trade policy with reference to Bangladesh planning in Bangladesh.

6.3 SECOND YEAR FIRST SEMESTER

Course No: ACN 201
Course Title: Accounting
Credit Hours: 2.00
Accounting and Society, Principles of Accounting, Financial Statements-General Accounting Reports, Cost in General-Objectives and Classifications, Overhead Costs-Allocation and Apportionment, Product Costing-Cost Sheet under Job Costing, Operating Costing and Process Costing System, Marginal Cost Analysis-Cost-Volume-Profit Relationship, Relevant Costs Control-Capital Budgeting, Master Budgets, Flexible Budgets and Variance Analysis.

Course No: MTH 201
Course Title: Coordinate Geometry and Vector Analysis
Credit Hours: 3.00
Coordinate Geometry: 2-Dimensional Co-ordinate Geometry: change of axes-transformation of co-ordinates, simplification of equations of curves. 3-Dimensional Co-ordinate Geometry: system of co-ordinates, distance between two points, section formula, projection, direction cosines, equations of planes and lines.

Vector Analysis: definition of vectors. Equality, addition and multiplication of vectors. Linear dependence and independence of vectors. Differentiation and integration of vectors together with elementary applications. Definitions of line, surface and volume integrals. Gradient of a scalar function, divergence and curl of a vector function. Physical Significance of gradient, divergence and curl. Various formulae. Integral forms of gradient, divergence and curl. Divergence theorem. Stoke's theorem, Green's theorem and Gauss's theorem.7.4 Second Year 7.4

6.4 SECOND YEAR SECOND SEMESTER

Course No: MTH 203
Course Title: Transformation and Partial Differential Equation
Credit Hours: 3.00
Pre- requisite : MTH 103
Transformation: Laplace Transforms: Definition; Transforms of Elementary Functions; Sufficient Conditions for Existence of Laplace Transforms; Inverse Laplace Transforms; Laplace transforms of Derivatives; Unit Step Function; Periodic Function; Some Special Theorems on Laplace Transforms; Partial Fraction; Solution of Differential Equations by Laplace Transforms; Evaluation of Improper Integrals. Fourier Analysis: Real and Complex Form; Finite Transform; Fourier Integral; Fourier Transforms and their Uses in Solving Boundary Value Problems. Introduction to Z transforms.

Partial Differential Equation: First and Second order partial differential equations. Wave equations. Particular solutions in rectangular and cylindrical coordinates with boundary and initial conditions.

6.5 THIRD YEAR FIRST SEMESTER

Course No: MTH 301
Course Title: Probability and Statistics; Complex Variable and Harmonics
Credit Hours: 4.00
Probability: Elementary probability theory and discontinuous probability distribution, e.g. binomial, Poisson and negative binomial. Continuous probability distributions, e.g. normal and exponential, characteristic of distributions. Elementary sampling theory. Estimation. Hypothesis testing, Correlation and regression analysis.

Statistics: Frequency distribution. Mean, median, mode and other measures of central tendency. standard deviation and measures of dispersion. Moments, skewness and kurtosis.
Complex Variable: complex number system. General functions of a complex variable. Limits and continuity of a function of a complex variable and related theorems. Complex differentiation and the Cauchy-Riemann equations. Infinite series. Convergence and uniform convergence. Line integral of a complex function. Cauchy integral formula. Liouville's theorem. Taylor's and Laurent's theorem. Singular points. Residue. Cauchy's residue theorem.

Harmonics: solution of Laplace's equation, cylindrical harmonics, spherical harmonics.

6.6 THIRD YEAR SECOND SEMESTER

Course No: HSS 303
Course Title: Business Communication
Credit Hours: 2.00
The project cycle, Project Proposal, Contractual Provisions, Specification writing techniques, Preparation and evaluation of bids, project evaluation, Written Communication: report writing, memoranda, letters, instructions, notices, personal filing systems etc. Oral Communication: listening skills, informal and formal meetings, Power Point, transparency based oral presentation, Audio-visual communications. Communications by various electronic media. Introduction to e-commerce. Professional ethics in Engineering.

6.7 FOURTH YEAR FIRST SEMESTER

Course No: IMG 401
Course Title: Industrial and Operational Management
Credit Hours: 2.00
Introduction, evolution, management functions, organization and environment.

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

Personnel management: scope, importance, need hierarchy, motivation, job redesign, leadership, participative management, training, performance appraisal, wages & incentives, informal groups, organizational change and conflict.
Cost & financial management: Elements of costs of products depreciation, breakeven analysis, Investment Analysis, Benefit cost analysis. Management accounting: Cost planning and control;
budget & budgetary control, Development planning process.
Marketing Management: Concepts, strategy, sales promotion, patent laws. Technology Management: Management of innovation and changes, technology life cycle.
Case studies.

COURSE OUTLINE

OTHER ENGINEERING

7.1 FIRST YEAR SECOND SEMESTER

Course No: CE 100
Course Title: Engineering Drawing Sessional
Credit Hours: 1.50
Introduction-lettering, numbering and heading; instrument and their use; sectional views and isometric views of solid geometrical figures. Plan, elevation and section of multistoried building; building services drawings; detailed drawing of lattice towers.

7.2 SECOND YEAR FIRST SEMESTER

Course No: ME 201
Course Title: Fundamentals of Mechanical Engineering
Credit Hours: 3.00
Study of fuels. Steam generation units with accessories and mountings. Study of steam generators and steam turbines. Introduction to internal combustion engines and their cycles. Study of SI engines, CI engines and gas turbines with their accessories.

Refrigeration and air conditioning with their applications. Study of different refrigeration methods, refrigerants. Refrigeration equipments: compressors, condensers, evaporators, expansion devices, other control and safety devices, psychrometrics, Study of air conditioning systems with their accessories. Types of fluid machinery. Study of impulse and reaction turbines, Pelton wheel and Kaplan turbine. Study of centrifugal and axial flow machines; pumps, fans, blowers and compressors. Study of reciprocating pumps.

COURSES OFFERED TO OTHER DEPARTMENTS

8.1 DEPARTMENT OF ARCHITECTURE:

Course No: EEE 363
Course Title: Building Service II(Electrical)
Credit Hours: 1.0
Electrical: Introduction to electrical design. Getting acquainted with problems of power supply. In large scale buildings. Presentation of electrical drawings. Electrical units and standards, electrical networks and circuit theorems Alternating current, RLC series and parallel circuits. Introduction to electrical wiring for residential, commercial and industrial Installations and buildings. Illumination and different types of lighting.

8.2 DEPARTMENT OF CIVIL ENGINEERING:

Course No: ECE 201
Course Title: Basic Electrical Engineering
Credit Hours: 3.0

D.C Circuits: Electric Current & Ohm's Law, Network Theorem, Work, Power, Energy, Magnetic Hysteresis.

A.C Circuits: AC Fundamentals, Phasor Algebra, Series AC Circuits, Parallel AC Circuits.

Course No: ECE 202
Course Title: Basic Electrical Engineering Sessional
Credit Hours: 1.5
Laboratory work based on ECE 201.

8.3 DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING:

Course No: ECE 101
Course Title: Basic Electrical Engineering
Credit Hours: 3.0
Basic Concepts: Current, voltage, emf, Ohm's law, Kirchoff's current & voltage Laws, current & voltage divider rules, types of sources, source conversion methods, equivalent resistance, star-delta conversion ; Network analysis & theorem: loop & nodal analysis, superposition Thevenin's ,Norton's & Maximum power transfer theorems; Introduction to Faraday's Law, Lenz's law, Fleming Left hand & right hand rules, Inductor & Capacitor; AC fundamentals: Amplitude, frequency, phase, power, form factor, crest factor, power factor, average value & effective value; AC analysis using phasor algebra; DC transient analysis in RL & RC circuits; Magnetic circuits :Basic concepts; concept of 3-phase system.

Course No: ECE 102
Course Title: Basic Electrical Engineering Sessional
Credit Hours: 1.5
Laboratory work based on ECE 101.

Course No: ECE 201
Course Title: Electronic devices & circuits
Credit Hours: 3.0
Introduction to serniconductors; Diode: characteristics, rectification; Zener diode: characteristics and applications; Bipolar Junction Transistor: characteristics, biasing introduction to hybrid model, ac analysis; Field Effect Transistor: Characteristics; Operational amplifier: linear applications. dc performance, ac performance; Design of Active filters: low pass, high pass and band pass; Introduction to MOSFET, Power electronics: SCR, DIAC, TRIAC, UJT & PUT.

Course No: ECE 202
Course Title: Electronic devices & circuits
Credit Hours: 1.5
Laboratory work based on ECE 201

Course No: ECE 301
Course Title: Electrical Drives & Instrumentation
Credits: 3.00
Electrical Drives: 3-s balanced and unbalanced circuit analysis, DC Generator: Principles, operations and characteristics study; DC Motor: Principles, operations and characteristics study, Transformer: Principles, operations and characteristics study, 3-s induction motor: Principles, operations and characteristics study, Stepper motor: Principles, operations and characteristics study.
Instrumentation: Transducers, Measuring instruments Ammeter, voltmeter, ohmmeter, wattmeter, and digital voltmeter

Course No: ECE 302
Course Title: Electrical Drives & Instrumentation
Credits: 1.5
Laboratory work based on ECE 301.

Course No: ECE 303
Course Title: Digital Electronics & Pulse Techniques
Credit Hours: 3.0
Digital Electronics: Basic terminology; TTL, NMOS and CMOS logic; Digital to analog converter: specifications, weighted and R-2R ladder; Analog to Digital converter: specifications, Flash, Successive Approximation, Dual-slope converters ,etc.; Memory elements: ROM, static RAM and dynamic RAM, memory expansion,
Pulse Techniques: Square, triangular and saw tooth wave generation techniques,555 timers and their applications, application of Schmitt triggers in wave shaping, application of diodes in clipping and clamping, application of inverter, chopper, rectifier, and switch mode power supply.

Course No: ECE 304
Course Title: Digital Electronics & Pulse Techniques Lab
Credit Hours: 1.50
Laboratory work based on ECE 303.

REFERENCE BOOKS

LIST OF REFERENCE BOOKS FOR EEE DEPARTMENT

EEE 101 Basic Electrical Circuits I

1. Introduction to Electrical Circuits, NILSSON, 5th ed., Addison – Wesley.
2. Introduction to Electrical Circuits, R. C. DORF, 2nd ed., 1993, John Wiley.
3. Engineering Circuit Analysis, HAYT and KEMMERLY, 5th ed., McGraw-Hill.
4. Basic Engineering Circuit Analysis, J. D. IRWIN, 4th ed., 1993, McMillan.
5. Introductory Circuit Analysis, R. L. BOYLESTED, 8th ed., McMillan.

EEE 103 Electrical Circuits II

1. Fundamentals of Electric Circuits, CHARLS K. ALEXANDER and MATTHEW N. O. SADIKU, 2nd ed., McGraw-Hill.
2. Introduction to Electrical Circuits, NILSSON, 3rd ed., Addison-Wesley.
3. Basic Engineering Circuit Analysis, J. D. IRWIN, 4th ed., 1993, McMillan.
4. Engineering Circuit Analysis, HAYT and KEMMERLY, 5th ed., McMillan-Hill.
5. Introduction to Electric Circuits, R. C. DORF, 2nd ed., 1993, John Wiley.
6. Alternating Current Circuits, R. M. KERCHNER and G. F. CORCORAN, 5th ed., Wiley Eastern Limited.

EEE 105 Computer Programming

1. Programming in C, KERNIGHAN and RITCHIE.
2. Teach Yourself C, H. SCHILDT, 2nd ed., 1994, Osborne / McGraw-Hill.
3. Teach Yourself C++, H. SCHILDT, 2nd ed., 1994, Osborne / McGraw-Hill.
4. Advanced Programming in C, HERBERT SCHILDT.

EEE 201 Electronic Circuits I

1. The Art of Electronics, P. HOROWITZ and W. HILL, 2nd ed., 1989, Cambridge University Press.
2. Microelectronic Circuits and Devices, M. N. HORENSTEIN, 1990, Prentice Hall.
3. Microelectronic Circuits, SEDRA and SMITH, 3rd ed., 1991, Saunder's College Publishing.
4. Electronic Devices and Circuits Theory, BOYLESTAD and NASHWLSKY, Prentice-Hall India Limited.

EEE 203 Electrical Machines I

1. Alternating Current Machines, A. F. PUCHSTEIN, T. C. LLOYD and A. G. CONRAD, Asia Publishing House, India.
2. A Text Book of Electrical Technology, Vol. – II, B. L. THERAJA and A. K. THERAJA, S. Chand & Company Ltd., India.
3. Direct & Alternating Current Machinery, JACK ROSENBLATT and M. HAROLD FRIEDMAN.

EEE 205 Electronic Circuits II

1. The Art of Electronics, P. HOROWITZ and W. HILL, 2nd ed., CUP, 1989.
2. Microelectronic Circuits and Devices, M. N. HORENSTEIN, 1990, Prentice Hall.
3. Operational Amplifiers and Linear Integrated Circuits, R. F. COUGHLIN and F. F. DRISCOLL, 4th ed., Prentice Hall India, 1996...
4. Operational Amplifiers with Linear Integrated Circuits, WILLIAM STANLEY.

EEE 207 Electrical Machines II

1. Electrical Machinery Fundamentals, CHAPMAN, 2nd ed., McGraw-Hill.
2. Electrical Machinery, A. E. FITZGERALD, C. KINGSLEY and S. D. UMANS, 5th ed., Mc-Graw-Hill, 1990.
3. Alternating Current Machines, A. F. PUCHSTEIN, T. C. LLOYD and A. G. CONRAD, Asia Publishing House, India.
4. A Text Book of Electrical Technology, Vol. – II, B. L. THERAJA and A. K. THERAJA, S. Chand & Company Ltd., India.

EEE 209 Digital Electronics

1. Digital Design, M. M. MANO, 2nd ed., 1991, Prentice Hall.
2. Digital Design Principles and Practices, J. F. WAKERLY, 1990, Prentice Hall.
3. Digital Systems Principles and Applications, RONALD J. TOCCI, NEAL S. WIDMER, 8th ed., Prentice Hall, India.

EEE 200 Electrical Designs and Drafting

1. Electrical wiring, estimation and costing , S.L. UPPAL
2. A Text Book of Electrical Technology, B. L. THERAJA and A. K. THERAJA, S. Chand & Company Ltd., India.

EEE 301 Power System Analysis I

1. Elements of Power System Analysis, W. D. STEVENSON JR., 4th ed., McGraw-Hill.
2. Modern Power System Analysis, I. J. NAGRATH and D. P. KOTHARI, TATA McGraw-Hill Publishing Company Limited, New Delhi.
3. Principles of Power System, V. K. MEHTA, S. Chad and Co., 2nd ed., 1987

EEE 303 Signals and Linear Systems

1. Signals and Linear Systems, R. A. GABEL and R. A. ROBERTS, 3rd ed., 1987, John Wiley.
2. Signals and Systems, A. V. OPPENHEIM, A. S. WILLSKY and I. T. YOUNG, 1984, Prentice Hall Ltd.
3. Signals and Systems and Transforms, PHILIPS and PARR, 1995, Prentice Hall.
4. Signals and Systems, ZIEMER, TRANTER and FANIN, 3rd ed., 1993, Prentice Hall / McMillan.
5. Signals and Systems, A. D. POULARIKAS and S. SEELY, 3rd ed., PWS-Kent Publishing Co.

EEE 305 Electromagnetic Fields and Waves

1. Fields and Waves in Communication Electronics, 3rd ed., S. RAMO, J. R. WHINNERY and T. VANDUZER, 1994, John Wiley.
2. Field and Wave Electromagnetics, D. K. CHENG, 2nd ed., Addison Wesley.
3. Elements of Engineering Electromagnetics, 3rd ed., N. RAO, Prentice Hall.

EEE 307 Electrical Engineering Material

1. Electrical Engineering Materials, A. J. DEKKER, Prentice Hall.
2. Perspectives of Modern Physics, A. BEISER, McGraw-Hill.

EEE 309 Communication Engineering Fundamentals

1. Communication Systems, 4th edition, SIMON HAYKIN
2. Modern Digital and Analog Communication System, 3rd edition, B.P.LATHI
3. Modern Electronic Communication, 8th edition, JEFFERY S. BEASLEY and GARY M. MILLER
4. Information, Transmission, Modulation, Noise, 4th edition, MISCHA SCHWARTZ
5. Communication Systems, NIIT, Eastern Economy edition.
6. Communication Networks, 2nd edition, Leon- GARACIA, WIDJAJA

EEE 311 Digital Signal Processing

1. Digital Signal Processing, PROKIS
2. Signal Processing and Linear Systerms, B.P. Lathi

EEE 313 Microprocessor and Interfacing

1. System Design with MC68020, MC69040 32-bit Microprocessors, A. NOOR, 1994, Van Nostrand Reinhold.
2. 16-bit and 32-bit Microprocessors: Architecture, Software and Interfacing Techniques, A. SINGH, 1991, Prentice Hall.
3. The Intel Microprocessors 8086 / 8088, 80186, 80286, 80386 and 80486: Architecture, Programming and Interfacing Techniques, 2nd ed., 1990, McMillan.
4. Microprocessor Architecture, Programming and Applications, R. S. GAONKAR, 3rd ed., Penram International Publishing.

EEE 317 Control System- I

1. Control System Engineering , 4th edition, NORMAN S. NISE
2. Modern Control Systems, RICHARD C.DORF and ROBERT H. BISHOP
3. Discrete-Time Control Systems, KATSUHIKO OGATA

EEE 401 Energy Conversion and Special Machines

1. A Text Book of Electrical Technology, Vol. – II, B. L. THERAJA and A. K. THERAJA, S. Chand & Company Ltd., India.
2. Solar Energy, SUKTAMI.

EEE 411 Power Station Engineering

1. Power Stations Engineering and Economy, BERNHARDT G. A. SKROTZKI and WILLIAM A. VOPAT, TATA McGraw-Hill.
2. Elements of Electrical Power Station Design, M. V. DESHPANDE.
3. Generation of Electrical Energy, B.R.GUPTA

EEE 425 Solid State Devices

1. Semiconductor Devices, M. J. COOKE, 1990, Prentice Hall.
2. Solid State Electronic Devices, B. G. STREETMAN, 3rd ed., 1990, Prentice Hall.
3. Fundamentals of Solid State Electronics, C. T. SAH, World Scientific.
4. Physics of Semiconductor Devices, S. M. SZE.
5. Fundamentals of Semiconductor Processing Technology, BADIH EL KAREH.

EEE 433 Microwave Engineering

1. Fields and Waves in Communication Electronics, S. RAMO, J. R. WHINNERY and T. VANDUZER, 3rd ed., 1994, John Wiley.
2. Foundations for Microwave Engineering, R. E. COLLIN, 2nd ed., McGraw-Hill.
3. Microwave Engineering, D. M. POZAR, 1990, Addison Wesley.

CSE 447 Computer Networking

1. Data and Computer Communications, 4th ed., STALLINGS, 1994, McMillan.
2. Understanding Data Communication: from Fundamentals to Networking, G. HELD, 1991, John Wiley.
3. Data Communications: A Comprehensive Approach, G. HELD, 3rd ed., McGraw-Hill.
4. Computer Communication Networks, WATERS, McGraw-Hill.

EEE 453 Numerical Methods

1. Numerical Methods for Engineering, 2nd ed., CHAPRA and CANALE.
2. Advance Engineering Mathematics, E. KREYSZIG, 7th ed., John Wiley.
3. Engineering Mathematics, 3rd edition, NEIL.

EEE 317 Semiconductor Devices – I

1. Semiconductor Devices, M. J. COOKE, 1990, Prentice Hall.
2. Solid State Electronic Devices, B. G. STREETMAN, 3rd ed., 1990, Prentice Hall.
3. Fundamentals of Solid State Electronics, C. T. SAH, World Scientific.

EEE 457 Measurements and Instrumentation

1. A Course in Electrical and Electronic Measurement and Instrumentation, A.K. SAWHENY
2. Electrical Measurements and Measuring Instruments, GOLDING & WIDDIS.
3. Elements of Electronic Instrumentation and Measurement, 3rd edition, JOSEPH J. CARR
4. Electronic Instruments and Instrumentation Technology, M.M.S ANAND.

EEE 409 Industrial Electronics

1. Industrial Electronics and Robotics, SCHULER and McNAMEE, 1986, McGraw-Hill.
2. Industrial Electronics: A Test-lab Manual – 3rd edition, P. B. ZEAR, McGraw-Hill.

EEE 417 Advance Electronics

1. Physics of Semiconductor Devices, S. M. SZE.
2. Solid State Electronic Devices, 3rd edition B. G. STREETMAN, 1990, Prentice Hall.
3. Microwave Engineering, 9th edition, SANJEEVA GUPTA, Khanna Publishers and 1998.

EEE 423 VLSI Design-I

1. CMOS VLSI design by Ayan Banarjee,Neil H.E Weste,David Harris
2. Basic VLSI design by Pucknell douglas, ESHRAGHIAN, KAMRAN
3. Fundamentals of Digital Logic with Verilog Design by Stephen Brown, Zvonko Vranesic

EEE 435 Optical Fiber Communication

1. Optical Fiber Communication: Principles and Practice -John Senior

2. Optical Fiber Communications (4th edition, McGraw Hill) by Gerd Keiser
3. Fiber-Optic Communication Systems-Govind Agarwal.

EEE 437 Telecommunication Engineering

1. Wireless Communication, RAPAPORT
2. Telecommunication Switching and networks, VISHWNATHAN
3. Electronic Communication, RODDY and COOLEAN
4. Electronic Communication Systems, GEORGE KENNEDY

EEE 439 Mobile & Cellular Communication

1. Mobile Cellular Communication, C.Y. Lee
2. Wireless Communication, RAPAPORT

ECE 101 Basic Electrical Engineering

1. Electrical Technology - B. L Thereja
2. Introductory Circuit Analysis - R.L. Boylestad.
3. Introduction to Electrical Engineering - R. P.WARD
4. Electrical Circuits - Richard A. Doff
5. Electrical Circuits - Schaum Series

ECE 201 Electronic Devices & Circuits

1. Electronic Devices and Circuits Theory - Boylestad
2. Electronic Devices and Circuits - Millman & Helkias
3. Operational Amplifiers and Linear Integrated Circuits - Coughlin
4. Basic VLSI design - Eshragin & Puknel
5. Industrial Electronics – Schuler

ECE 301 Electrical Drives & Instrumentation

1. A Text Book of Electrical Technology II - B. L. Thereja
2. Alternating Current Circuit - Corcoran
3. Alternating Current Machines - Puchstein
4. Measurement & Instrumentation - Sawhry
5. Power Electronics – Rashid

ECE 303 Digital Electronics & Pulse Techniques

1. Digital System Principles and Applications - Ronald J. Tocci
2. Digital Integrated Electronics - Herbert Jaub/ Douald Schilling
3. Pulse Digital And Switching Waveforms - Jacob Millmanand Herbert Taub
4. Operational Amplifier Circuits - Fedrick Discroll

APPENDIX

Table: Mapping between COs Vs POs

Course Code	Engineering knowledge	Problem Analysis	Design/ development of solutions	Investigation	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team work	Communication	Project Management and Finance	Lifelong learning
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
HSS 101	√	√	√	√	√		√			√		
HSS 111(A)	√	√			√	√	√	√	√			
HSS 111(B)	√					√		√	√			
PHY 101	√	√	√									√
MTH 101	√	√	√									
EEE 101	√	√							√			
PHY 102	√	√		√	√				√			
EEE 102	√	√							√			
HSS 102										√		√
PHY 103	√	√										√
EEE 103	√	√	√									
EEE 105	√	√	√	√	√							
ECN 101		√								√		√
EEE 104	√	√		√	√							
EEE 106	√	√	√						√			
MTH 201	√	√	√									
EEE 201	√	√	√									
EEE 203	√	√										√
EEE 202	√	√	√	√				√	√	√		√
MTH 203	√	√	√									

Course Code	Engineering knowledge	Problem Analysis	Design/ development of solutions	Investigation	Modern Tool Usage	The Engineer and Society	Environment and Sustainabil-	Ethics	Individual and Team work	Communication	Project Management and Finance	Lifelong learning
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EEE 205	√	√	√									
EEE 207	√	√	√	√								
EEE 209	√	√										
EEE 200	√		√	√	√							
EEE 206	√	√	√						√			
EEE 208	√	√	√	√								
EEE 210	√	√							√			
MTH 301	√	√	√									
EEE 301	√	√		√								
EEE 303	√	√	√									√
EEE 305	√	√							√			
EEE 307	√	√				√			√	√		
EEE 300	√		√	√	√	√		√				√
EEE 302	√	√	√		√	√			√			
HSS 303								√	√	√		
EEE 309	√	√	√									√
EEE 311	√	√		√	√							√
EEE 313	√	√	√	√	√							
EEE 317	√	√	√	√								√
EEE 312	√		√	√	√				√	√		√
EEE 314	√	√	√	√	√				√	√	√	
EEE 318	√	√		√	√							
EEE 401	√	√	√				√					
EEE 403	√	√	√									√

Course Code	Engineering knowledge	Problem Analysis	Design/ development of solutions	Investigation	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team work	Communication	Project Management and Finance	Lifelong learning
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EEE 404	√	√	√	√					√			√
EEE 453		√	√		√							
EEE 455	√	√						√				√
EEE 454		√	√	√	√							
EEE 456	√	√						√	√			
EEE 411	√	√					√	√				
EEE 431	√	√			√							√
EEE 413	√	√	√	√								
EEE 423	√		√	√	√							
EEE 433	√	√	√	√								
EEE 414	√	√	√	√					√	√		
EEE 424	√		√									
EEE 434	√	√	√	√	√				√	√		
EEE 415	√	√	√	√								
EEE 425	√	√	√									
EEE 435	√	√	√									
EEE 437	√	√	√	√		√						√
CSE 447	√	√	√	√	√				√	√		
EEE 438	√	√	√	√	√				√	√		
CSE 448	√	√	√	√	√				√	√		
EEE 429		√	√	√				√				√
EEE 439	√	√	√	√		√						√