Khulna University of Engineering & Technology

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

Undergraduate & Post-Graduate Studies
© Department of Electrical and Electrical Engineering, KUET, 2008.

The information of this booklet intends to provide guidance to those who are concerned with undergraduate and postgraduate studies in the Department of Electrical and Electronic Engineering. The Department of Electrical and Electronic Engineering or Khulna University of Engineering & Technology will carry no responsibility, if any inconvenience or expenditure is caused to any person because of the information of this booklet or any error in quoting the rules and regulations described herein. In addition, the information contained in it, are subjected to change at any time without any prior notification.
Preface to Second Edition

Our previous departmental information booklet was published in 2001. Seven years had been passed. In these years, Electrical and Electronic Engineering Technologies have advanced rapidly. A significant change in the technologies, inventions and applications demands awareness of the future generation. These new changes require a revised, vivid and dynamic look to our previous departmental information book both in academic course outline and in the academic ordinance.

This time the information book has been thoroughly revised. The updated undergraduate and postgraduate ordinances have been included in this book for the ease of students and teachers. The special features in the changes are the allocation of marks for class tests, class participation/performance and attendance. Changes are made in teacher’s profile of the Department. After the approval of the Academic Council, the update of the syllabus is finalized. All the teachers of the Department have contributed to update the contents of different subjects. The editorial committee has paid extensive effort to revise and update the booklet. They deserve the special thanks from the Department and I do appreciate their challenging works.

I am happy to mention the editorial committee as follows.

Editorial Committee:

Dr. Bashudeb Chandra Ghosh
Dr. Md. Rafiqul Islam
Dr. Ashraful Ghani Bhuiyan
Dr. Mohiuddin Ahmad
Dr. Md. Shahjahan

I am grateful to my colleagues who worked in syllabus update committees and helped in preparing this information booklet.

I hope that the information provided in this booklet will be helpful to undergraduate and postgraduate students as well as to teachers and to all other concerned.

Prof. Dr. Md. Nurunnabi Mollah

Head of the Department,
Department of Electrical & Electronic Engineering,
Khulna University of Engineering & Technology.
Preface to First Edition

Bangladesh Institute of Technology (BIT), Khulna offers both undergraduate and postgraduate programs. The undergraduate program at this Institute follows the course system, as approved by the Academic Council of the Institute, have been incorporated in full in this calendar for information of the students, teachers and advisors. The department as well as non-departmental courses, together with details of courses offered to students of this Department, is presented here.

It is worth mentioning that the department and the non-departmental courses for Electrical and Electronics Engineering students have undergone a major revision to cater to recent advances in the field of Electrical and electronic technology. The revised curriculum as incorporated in this calendar has been approved by the academic council, BIT for the Electrical and Electronics Engineering undergraduate students commencing their first year semester classes in the 1998-99 session.

The postgraduate degree program follows the semester system. Some of the rules and regulations of the postgraduate program have been incorporated. For the remaining rules, students are referred to the latest version of postgraduate ordinance published by the academic council of BIT, Khulna. Recently a major revision has been made in the postgraduate courses of Electrical and Electronics Engineering department to reflect the recent developments in the field of electrical and electronic engineering. The revised postgraduate course contents have also been incorporated in this calendar.

Some general information about this institute, its historical background, faculties and information on the teaching departments and the institute administration have been included. The list of teachers in the department of Electrical and Electronic Engineering, fields of research interest of teachers offering postgraduate courses, and details on laboratories and research facilities in the department are presented.

The undergraduate students are advised to be in touch with their advisers to be aware of any changes made by the Institute in the rules and regulations or courses under the course system. The postgraduate students should be in touch with their course teachers/supervisors, for similar reasons.

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Khulna University of Engineering & Technology (KUET), at a glance

The former Khulna Engineering College, founded in 1967 and started academic program on 3rd June 1974, was affiliated to Rajshahi University and was converted to Bangladesh Institute of Technology (BIT), Khulna on 1st July 1986 as an autonomous institution to award degrees. In order to upgrade and develop the Institute it was finally converted to Khulna University of Engineering & Technology (KUET) in September 2003 as a public university by an act of the Government of Bangladesh to award degrees in the field of Engineering and Technology.

The university is aimed to take the leadership in promoting technological developments and management of the nation by strengthening engineering and technological education and research.

Location and its Surroundings

The campus is located at fulbarigate, about 13 km north from the Khulna City near the Khulna-Dhaka highway. Govt. B. L. College is located 4 km away from this campus to the southern side of it. Teacher's Training College, Technical Training Center etc. are located at the western side and the Jahanabad Cantonment is located at the northern side of KUET campus. The Khulna-Dhaka highway is passing through the eastern side of the campus.

Faculties and Teaching Departments

The University has ten (10) teaching departments under three faculties. All departments, with the exception of the department of Humanities, offer degree programs. However, some of them offer Postgraduate (PG) degrees only and other offers both Undergraduate (UG) as well as PG degrees. Faculty wise list of the departments with the status of the degree offered is given below:

Faculty of Civil Engineering

<table>
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<tr>
<th>Department</th>
<th>Degree Status</th>
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<tr>
<td>Department of Civil Engineering</td>
<td>UG and PG</td>
</tr>
<tr>
<td>Department of Physics</td>
<td>PG only</td>
</tr>
<tr>
<td>Department of Chemistry</td>
<td>PG only</td>
</tr>
<tr>
<td>Department of Mathematics</td>
<td>PG only</td>
</tr>
<tr>
<td>Department of Humanities</td>
<td>---</td>
</tr>
</tbody>
</table>
Faculty of Electrical and Electronic Engineering

Department of Electrical and Electronic Engineering UG and PG
Department of Computer Science and Engineering UG only
Department of Electronic and Communication Engineering UG only
Department of Bio-Medical Engineering PG only

Faculty of Mechanical Engineering

Department of Mechanical Engineering UG and PG
Department of Industrial Engineering and Management PG only
Department of Energy Technology PG only

A new department will be opened in the postgraduate level very soon in KUET. This is:

⇒ Department of Leather Engineering

Academic Program

Undergraduate Program Four (04) years Bachelor of Science in Engineering degree
Postgraduate Program Master of Science in Engineering (M. Sc. Engg.) or Master of Philosophy (M. Phil) and Doctor of Philosophy (Ph. D.)

The postgraduate courses are designed to meet the growing needs of engineering professions as well as further development of different specialized subjects of the above-mentioned areas.

Language of Instruction

Official language of instruction and examination is English. However, teachers may use native language, Bengali; occasionally if no international students are present in the class.

Academic Facilities

To support the excellent and high quality academic environment, Khulna University of Engineering & Technology maintains a number of academic units.
Computer Center

KUET has its own VSAT facility with a bandwidth of 512 kbps for upload and 1024 kbps for download. It operates a large computing network equipped with six (06) IBM servers. The system has more than 250 workstations interconnected by 1 GB optical fiber line and six (06) optical switches. All stations are equipped with latest version computers with necessary printing, scanning and CD-writing facilities. All undergraduate and postgraduate students as well as faculties have easy access to the network. Each academic department maintains Local Area Network (LAN), which are further connected with the central network backbone. The central computer network provides state-of-art computing software for researchers of various disciplines.

Library Facility

KUET operates centrally two types of library system, General Library and Reference Library. The General Library provides in house reading and short duration borrowing opportunity of book and other reference material to the students and faculties. The Reference Library provides the in place reading. All students and faculties can enjoy these facilities for more than 10 hours in every working day. Audio-visual systems are available for studying audio and video documents. Right now, the General library System has more than 35,000 books and 5,000 Journals and periodicals in its collection. The book searching facility is fully computerized with SQL database support for easy searching of any book. Moreover, Central Library enriches every year by collecting recent books and journals. Besides the general library system, each academic department maintains rent-based library from which students can borrow textbooks at a nominal rate for the whole semester.

Campus Life

The university has 101 acres large campus with nice green landscape blended with beautiful architectural constructions. It is located at about 12 km from Khulna, the third largest metropolitan city of Bangladesh. Nice countryside and the rivers Rupsha and Bhairab surround the city. Newly constructed Khan Jahan Ali Bridge connected the city with Mongla port and south-west region of Bangladesh. The Sundarban, world's largest mangrove forest, is about 40 km from the city. The city has also housed with some of the major industries of Bangladesh.

Climate

Being a part of tropical climate region, Bangladesh has warm and humid weather. The three main seasons prevailing in this country are winter (November-February), summer (March-June) and rainy (July-October). However, there are three more seasons available in between these seasons namely spring, autumn and late autumn, but their effects are not predominant. The warmest days in Khulna region are between April and June with temperature ranging from 30°C to 37°C. Winter temperatures usually vary between 8°C to 20°C. Humidity is high (70-90%) in summer and rainy seasons but moderate in winter (50-70%).

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Accommodation

Five nice residential halls can accommodate more than 1250 male students and one female hall can accommodate 180 female students in the campus. Four students have to share a large room. There is a common rest room in the each residential hall. Every residential hall is equipped with modern recreation facilities like Cable TV connection, common room, reading room, library and a well-furnished guestroom. Social, cultural and other co-curriculum activities are scheduled throughout the semester/term to offer breaks in tedious study routine. One Provost and one/two Assistant Provosts are appointed from the faculty members to look after the administration of each hall.

Sports and Entertainment

Both indoor and outdoor sports facilities are available for refreshment of the students. The physical education section of the university is under the control of Director of Students Welfare (DSW) who arranges central indoor and outdoor sports competition annually. The university also organizes annual cultural competitions and occasional cultural programs on some special events like celebration of different national days, university foundation day, New Year's Eve etc. Besides, a number of cultural and social groups like theater group, debating society etc. are also active in the campus. The university team also attends different national level sports and cultural competitions and shown excellent performance. The university has a big auditorium of capacity 1000 seats for these cultural activities.

Transportation

For the convenience of the students, faculty members, officers and staffs, KUET operates its own Shuttle Bus Service between Khulna city and the campus. In weekends, special services are also provided to meet the weekend recreational and other needs.

Students Union

The Student Union of KUET is a student organization to promote the interests and welfare of the student body. All full time students are members of the student union who vote for the office bearers of it. The DSW is the President of the Student Union as ex-officio appointed by the University Authority from the senior faculty members. The university authority as the treasurer of the student union appoints one more faculty member. Moreover, a strong student welfare committee is also available for looking after the students facilities in some special cases. Sports, cultural and social activities, indoor and outdoor games are organized regularly to keep the students campus life pleasing.

Medical Centre

The university operates a medical center for meeting the needs of students’ health care and medical facilities. The center is equipped with necessary medical equipment, sick beds and full time experienced medical doctors, nurse and assistants. Mostly medical counseling and in some cases, medicine is supplied to the students free of cost.
Food and Stationeries

Each residential hall has its own cafeteria, which serves two meals per day. Each hall authority maintains the cafeteria. Students are also involved for their daily menu. Special menus are provided in different occasions in the hall cafeteria. One annual grand dinner is also arranged in each hall in honor of outgoing students. Besides these, a large central cafeteria and a fast food shop offers breakfast, meals and snacks, etc. Moreover, in Khulna city, there are number of nice restaurants that serve a wide variety of food including oriental and western flavor. Any sorts of alcohol or alcoholic drinks are completely prohibited in the campus. A Departmental Store is also housed in the campus for the benefit of all.

Other Facilities

In the campus, there is a water treatment plant to treat the water. There is also a large Mosque, a bank and a post office in the campus. To provide uninterrupted power supply an electrical substation is located in the campus. There are also a Gymnasium and a large well-equipped auditorium.

Admission

The admission process of Khulna University of Engineering & Technology emphasizes to identify students who will be able to successfully complete the degree requirements of various departments of engineering as well as contribute to the social and techno-economical environment of the nation.

Undergraduate Admission

Applicants for the undergraduate program must pass' the Higher Secondary Certificate (H.S.C) or equivalent examination from any education board with science and must obtain a minimum CGP A of 4.00 in Physics, Chemistry and Mathematics courses. The candidates who have completed a-level examination can also apply. The applicants have to go through a rigorous entry examination to be qualified for admission. The entry examination named as Admission Test consists of MCQ questions and broad questions that are based on current syllabus of Higher Secondary level Physics, Chemistry, Mathematics and English. The undergraduate admission is conducted once in each academic session.

Postgraduate Programs

Applicants for the masters programs must have B.Sc. Eng. degree or equivalent in the relevant field from a recognized University/Institute with good academic records. Students who have higher research aptitude are welcome to the program. KUET invites applications twice in a year (January and July). The respective departments arrange an interview at a suitable time to select candidates for this program. The selected candidates have to take admission by depositing a prescribed amount-of money to the bank. Two categories of students, namely, full-time and part-time are in this program. For full time meritorious students, financial help can be provided. A part-time student must have consent from his employer to pursue postgraduate studies.
International Applicants

International applicants for both undergraduate and postgraduate program can apply throughout the year. Application materials and other information are available in the admission office. Inquires can be directed to the Registrar. According to the present policy of KUET, an international student does not have to go through the entry examination procedure. However, they should have excellent high school record or equivalent to be qualified for admission. The admission committee and equivalence committee (if necessary) takes decision about the illegibility of admission of the applicants. KUET always encourages international students to maintain wide cultural and social diversity in its campus. Students from SAARC (India, Pakistan, Nepal, Bhutan, Srilanka and Maldives) countries can apply through their concern ministries to the Ministry of Education of Bangladesh to avail the special quotas, which are reserved under SAARC countries educational and cultural contract. These positions are limited. International applicants are required to submit two copies of official credentials and certificates with two passport size photographs. The completed application and above-mentioned documents should be reached to the Registrar's office along with $20 application-processing fee. For the postgraduate program applicants also have to submit two letters of recommendation. Inquires can be directed to:

Registrar
Khulna University of Engineering & Technology (KUET)
Khulna 920300, Bangladesh. Tel: +880 41 774403, Fax: +880 41 774403

Administration

The University Syndicate is the supreme body for making policy and other operational procedures. The syndicate frames rules and forms different policies under the recommendation of different committees, namely, the Academic Council, Planning and Development Committee and the Finance Committee. Nationally and internationally recognized academicians, planners, and economists as well as distinguished faculties from KUET form these committees. The Vice-Chancellor is the administrative and academic head of the University. A non-formal advisory committee formed by the senior faculties of different academic disciplines and hall provosts, helps the Vice-Chancellor in various decisions making. For the proper operation of different administrative services, the office of the Vice-Chancellor maintains various administrative sections, namely, Academic Section, Engineering Sections (maintenance and repairs), Establishment section, Accounts section, Security section, Procurements Section etc. Registrar is the custodian of records, the properties, the common seal and such other property of the university as the Syndicate may commit to his charges. The Vice-Chancellor and the Comptroller control the fund of the university.

Department of Electrical and Electronic Engineering, at a glance

The Department of Electrical and Electronic Engineering (EEE) is one of the oldest and largest departments of Khulna University of Engineering & Technology (KUET). The Department provides a unique opportunity for students to get quality education in the filed
of Electrical and Electronic Engineering. It started its academic activities from January 1974. Since then, it has been widely recognized for its excellent research and teaching capabilities throughout the country and the world. The graduates from this department are recruited by both academia and industry of home and abroad and they are performing well.

The Department provides an outstanding research environment complemented by superior teaching for its students to flourish in. The department produced noticeable undergraduate and postgraduate research works, which were published in world-recognized Conferences/journals. The major areas of research include Power Electronics and Machine Drives, Power system Protection and Reliability, Semiconductor Material, Antenna Design, Artificial Intelligence, Signal Processing, VLSI, Optical Communication, and so on. Besides theoretical and laboratory based research, faculty in the Department also maintain strong ties with many reputed national and international organizations and are involved in a large number of projects in the forefronts of cutting edge technology.

The student bodies of the Department, namely, Electrical and Electronic Engineering Association (EEEA) in association with local IEEE student branch is active in organizing regular workshops/seminars, lecture series, and practical demos. They also prepare many industrial tours for the students to have practical ideas about industry-based technology. They are devoted to the sports and cultural activities of this University.

**Undergraduate Program**

The Bachelor of Science in Electrical and Electronic Engineering curriculum covers the fundamental aspects of Electrical and Electronic technology, emphasizes basic principles and teaches the students in the use of these principles to reach optimal design solution for engineering problems. Importance is given on Mathematics, Physics, Chemistry, Economics, Basic Mechanical Engineering and Basic Electrical Engineering in the first year. The other three years are devoted to the Engineering Mathematics, Electrical Circuits, Electrical Machines and Drives, Analog Electronics, Digital Electronics, Power Electronics, Electromagnetic Fields, Special Programming Techniques, Power Transmission and Distribution, Electrical Measurement and Instrumentation, Control System Engineering, Communication Engineering, Switch Gear and Protection, Power Station and Economy, Microwave Engineering and Antenna Design, Microprocessors and Microcomputers, VLSI, Signal Processing and other recent topics of Electrical and Electronic engineering. The curriculum includes theoretical courses, laboratory works, industrial training and different field trips.

**Postgraduate Program**

The postgraduate program has a vigorous, rapidly expanding program of advanced study and research in the areas of Power System Planning, Energy Conversion, Optical Fiber Communication, Digital signal Processing, Power Semiconductor Circuits, Industrial Drives, MOS Devices, Microwave Theory and Techniques, Laser Theory, Artificial Intelligence and Neural Network etc. These postgraduate programs lead to the degree of Master of Science in Electrical and Electronic Engineering and Doctor of Philosophy in Electrical and Electronic Engineering. To be awarded an M. Sc. degree, a student should
have to complete 36 credit hours of which a maximum of 12 credit hours of project work or 18 credit hours of thesis work. The degree requirement for PhD is 60 credit hours of which maximum of 45 credit hours is thesis.

**Research Facilities**

The Department of Electrical and Electronic Engineering has many advanced instruments and equipment with laboratories for study of various Electrical and Electronic Engineering problems. At present Electrical and Electronic Engineering Department has following Laboratory facilities:

- Electrical Circuit Lab
- Measurement and Instrumentation Lab
- Digital Electronics Lab
- Analog Electronics Lab
- Electrical Machine Lab
- Communication Engineering Lab
- Control Engineering Lab
- Microprocessor and Hardware Interfacing Lab
- Power Electronics and Machine Drives Lab (PEMD Lab)
- Power system and Protection Lab
- High Voltage Engineering Lab
- Pattern recognition and Image Processing Lab
- Computer Language, Simulation and Numerical Processing Lab
Faculty Members

DEAN

Prof. Dr. Bashudeb Chandra Ghosh

HEAD

Prof. Dr. Md. Nurunnabi Mollah

PROFESSORS

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Departmental Monitoring Committee:
Khulna University of Engineering & Technology

Academic Ordinance for Undergraduate Studies
(Effective from 1st Year session 2004-2005)
(Approved by 7th meeting of Academic Council on 07/04/05 & 08/04/05 and confirmed by 8th meeting of Academic Council on 05/09/05)
1. **Definitions**

1.1. ‘University’ means the Khulna University of Engineering & Technology.
1.2. ‘Syndicate’ means the Syndicate of the University.
1.3. ‘Academic Council’ means the Academic Council of the University.
1.4. ‘Vice-Chancellor’ means the Vice-Chancellor of the University.
1.5. 'Dean' means the Dean of a faculty of the University.
1.6. 'Head of the Department' means the Head of a department of the University.
1.7. ‘Academic Committee’ means the Academic Committee for Undergraduate Studies (ACUG) of a degree awarding department of the University.
1.8. ‘Degree’ means the degree of Bachelor of Science in Engineering offered by the University.

2. **Departments**

2.1. Degree Awarding Departments:

The University shall have the following degree awarding departments:

i) Department of Civil Engineering

ii) Department of Electrical and Electronic Engineering

iii) Department of Mechanical Engineering

iv) Department of Computer Science and Engineering

v) Department of Electronics and Communication Engineering

vi) Any other department to be instituted by the Syndicate on the recommendation of the Academic Council from time to time.

2.2. Teaching Departments:

The University shall have the following teaching departments:

i) Department of Civil Engineering

ii) Department of Electrical and Electronic Engineering

iii) Department of Mechanical Engineering

iv) Department of Computer Science and Engineering

v) Department of Electronics and Communication Engineering

vi) Department of Industrial Engineering and Management

vii) Department of Mathematics

viii) Department of Chemistry

ix) Department of Physics

x) Department of Humanities

xi) Any other department that may be instituted by the Syndicate on the recommendation of the Academic Council from time to time.

3. **Degrees Offered**

The University shall offer courses leading to the award of the following degrees:

i) Bachelor of Science in Civil Engineering, abbreviated as B. Sc. Eng. (CE)

ii) Bachelor of Science in Electrical & Electronic Engineering, abbreviated as B. Sc. Eng. (EEE)

iii) Bachelor of Science in Mechanical Engineering, abbreviated as B. Sc. Eng. (ME)
iv) Bachelor of Science in Computer Science & Engineering, abbreviated as B. Sc. Eng. (CSE)

v) Bachelor of Science in Electronics & Communication Engineering, abbreviated as B. Sc. Eng. (ECE)

vi) Any other degree that may be awarded by a department on the recommendation of the Academic Council and approval of the Syndicate from time to time.

4. **Students Admission**

4.1 The four academic years of study for the degree of Bachelor of Science in Engineering (B. Sc. Eng.) shall be designated as first year, second year, third year and fourth year class in succeeding higher levels of study. Students shall generally be admitted into the first year class.

4.2 An Admission Committee shall be formed in each academic session by the Academic Council for admission into first year B. Sc. Eng. class consisting of the following members:

i) One of the Deans in order of seniority (as professor) for Chairman each year by rotation

ii) All other Deans Member

iii) Five senior most Heads of the Departments Member

iv) Registrar Secretary

The Committee is empowered to co-opt member/members (if required) not below the rank of a professor.

4.3 A candidate for admission into the first year class must have passed the H.S.C. Examination from an Education Board in Bangladesh (after 12 years of schooling) with Physics, Chemistry and Mathematics as his/her subjects of examination in Higher Secondary level or examination recognized as equivalent thereto, and must also fulfill all other requirements as may be prescribed by the Academic Council on the recommendation of the Admission Committee. In case of confusion regarding the equivalence, the case may be referred to central Equivalence Committee.

4.4 The rules and conditions for admission into different departments shall be framed by the Academic Council on the recommendation of the Admission Committee in each year.

4.5 All candidates for admission into the courses of B. Sc. Eng. must be citizens of Bangladesh unless the candidature is against the seats those are reserved for foreign students. Candidates for all seats except the reserved ones, if any, shall be selected based on merit. The rules for admission into the reserved seats shall be framed by the Academic Council on the recommendation of the Admission Committee.
4.6 No student shall ordinarily be admitted in the first year class after the start of the corresponding classes or after the call goes out for the admission which ever is later. The date of commencement of classes for the newly admitted students will be announced in advance.

4.7 Admission of a newly admitted student in the first year class will be cancelled if he/she remains absent without prior permission of the Registrar through the Head of the Department for first two consecutive weeks after the start of class. If any student fails to report due to unavoidable circumstances within the stipulated first two weeks, he/she may appeal within the next four weeks to the Academic Council through the Head of the Department. The decision of the Academic Council will be final.

4.8 Prior to admission to the University, every student shall be examined by a competent medical officer as prescribed in the admission rules.

5. Admission on Transfer

5.1 There shall be no admission on transfer in the first year class. In special cases, students may be admitted into a higher class.

5.2 A student may be allowed to transfer a maximum of 50% of the required theory courses of this University completed by the student at other universities/institutions. The candidate must have a minimum CGPA of 3.0 without any F grade in any course and there should not be any break of study.

5.3 A candidate seeking admission on transfer from other university should apply to the Registrar of this University. The Registrar will refer the case to the Head of the Department concerned and to the Central Equivalence Committee. On receiving the opinions of the Departmental Monitoring Committee, the Central Equivalence Committee will consider the matter and it will be placed before the Academic Council. The decision of the Academic Council will be final and it will be communicated to the Head of the Department and the candidate.

6. Academic Calendar

6.1 The academic year shall ordinarily be divided into two regular Terms each ordinarily having duration of not less than 13 weeks of classes.

6.2 There shall be a final examination at the end of each Term and the examination will be conducted as per Academic regulations.

6.3 The Head of the Department will announce the academic schedule for each Term ordinarily before the start of the class subject to the approval of the Academic Council.

6.4 Academic schedule may be prepared according to the following guidelines based on two regular Terms:
Term-1

<table>
<thead>
<tr>
<th>Class</th>
<th>No. of weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes</td>
<td>13</td>
</tr>
<tr>
<td>Recess before examination</td>
<td>2</td>
</tr>
<tr>
<td>Term Final Examination</td>
<td>2.4*</td>
</tr>
<tr>
<td>Publication of result</td>
<td>2.3*</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

Inter-Term recess

<table>
<thead>
<tr>
<th>Class</th>
<th>No. of weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Term-11

<table>
<thead>
<tr>
<th>Class</th>
<th>No. of weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes</td>
<td>13</td>
</tr>
<tr>
<td>Recess before examination</td>
<td>2</td>
</tr>
<tr>
<td>Term Final Examination</td>
<td>2.4*</td>
</tr>
<tr>
<td>Publication of result</td>
<td>2.3*</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

Vacations throughout the session

<table>
<thead>
<tr>
<th>Class</th>
<th>No. of weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacations</td>
<td>11</td>
</tr>
</tbody>
</table>

Including one 8-week Short Term

**Total:** 52 weeks

- The digit after the decimal point indicates number of days.

7. Duration and Credit of Courses

7.1 The B. Sc. Eng. courses shall extend over a period of four academic years, each with a normal duration of one calendar year. Each academic year will be divided into two Terms for the purpose of academic programs and conducting of examinations.

7.2 The curricula of the B. Sc. Eng. degree in the different departments shall be as proposed by the concerned ACUG through the Executive Committee of the concerned Faculty and approved by the Academic Council.

7.3 The ACUG may review the curricula once in every academic year and put forward suggestions to the Academic Council through the Executive Committee of the concerned Faculty.

7.4 Teaching for the courses is reckoned in credits and the credits allotted to various courses will be determined by the ACUG with the following guidelines:
<table>
<thead>
<tr>
<th>Type of Course</th>
<th>Contact Hour (in a term)</th>
<th>No. of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Theory/Lecture</td>
<td>1 hour/week</td>
<td>1.0</td>
</tr>
<tr>
<td>ii) Tutorial</td>
<td>1 hour/week</td>
<td>1.0</td>
</tr>
<tr>
<td>iii) Independent Lab/Sessional/Design</td>
<td>3/2 hours/week</td>
<td>0.75</td>
</tr>
<tr>
<td>iv) Project/Thesis</td>
<td>3 hours/week</td>
<td>1.5</td>
</tr>
<tr>
<td>v) Field work</td>
<td>2 weeks of field work</td>
<td>1.0</td>
</tr>
<tr>
<td>vi) Seminar/Special Studies</td>
<td>Preparation of technical paper and its presentation.</td>
<td>1.0</td>
</tr>
</tbody>
</table>

7.5 The minimum number of credits that a student has to complete successfully for the award of B. Sc. Eng. degree will be 160 of which a maximum of 150 credits to be assigned as core courses.

7.6 A regular student can normally register 5 (five) theoretical courses in a Term. The total number of credit hours shall generally be between 15 to 24 credits in a Term. However, a student may be allowed to register less than 15 credits in a Term if—
   i) He/she is considered academically weak.
   ii) number of credits required for graduation is less than 15 in that Term and
   iii) He/she cannot find appropriate courses for registration as suggested by the Adviser.

7.7 The total contact hours for students including lecture, tutorial and laboratory/sessional should be around 30 periods per week, each period being of 50 minutes duration.

7.8 A course plan for each course proposed by the course teacher with the consultation of the Head of the Department showing details of lectures is to be announced at the start of each Term.

7.9 Project/Thesis should preferably be of 1.5 to 3 credits in each Term. Credit in any theory course should not exceed 4 and that in sessional/laboratory course should not exceed 1.5.

8. Course Designation and Numbering System

Each course is designated by a two to four letter code identifying the course offering department followed by a four digit number with the following criteria:
8.1 The first digit will correspond to the year in which the students normally take the course.

8.2 The second digit will correspond the Term (1 for odd, 2 for even and 0 for both) in which the course is normally taken by the students.

8.3 The third and fourth digits will be reserved for departmental use, of which the last digit will be odd for theoretical and even for sessional/laboratory course.

8.4 The course designation system is illustrated by the following example:

<table>
<thead>
<tr>
<th>Course Title: Electromagnetic Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd and 4th digits are reserved for departmental use. Last odd digit designates a theoretical course.</td>
</tr>
<tr>
<td>Second digit signifies Term number (1 for odd, 2 for even and 0 for both).</td>
</tr>
<tr>
<td>First digit signifies year (Second year).</td>
</tr>
<tr>
<td>Department identification code (Electrical and Electronic Engineering).</td>
</tr>
</tbody>
</table>

8.5 Project/thesis courses shall be designated by the department identification code followed by 4000 (Example: EE 4000) applicable in both odd and even Terms.

9. **Classification of Courses**

The courses included in undergraduate curricula are classified as follows:

9.1 **Core Courses**

In each department, a number of courses will be identified as core courses, which form the nucleus of the respective Bachelor's degree program. A student has to complete all the designated core courses for his/her degree.
9.2 Pre-requisite Courses
Some of the core courses are identified as pre-requisite courses. A pre-requisite course is one, which is required to be completed before some other course(s) can be taken. Any such course, on which one or more subsequent courses build up, may be offered in each of the two regular Terms.

9.3 Optional Courses
Apart from the core courses, a student will have to take a number of courses, which he/she can choose from a specified group/number of courses to complete the credit requirements.

9.4 Non Credit Courses
Non-credit course(s) may be offered to a student to improve his/her knowledge in some specific fields. The credits in these courses will not be counted for GPA and CGPA calculation but will be reflected in the transcript as satisfactory (S)/unsatisfactory (U). Non-credit course(s) may be offered under the following circumstances:

If a student's Thesis/Project supervisor feels that the study/design is highly related to course(s) offered by any department for their students, he can recommend to the concerned Head of the Department for participation of the student(s) in the course(s). Such registration of course(s) will not affect the normal course registration of the student.

10. Departmental Functional Bodies

10.1 Departmental Monitoring Committee
Each degree-awarding department will form a Departmental Monitoring Committee with Head of the Department as Chairman and three senior most teachers of the department as members. The Committee may propose to ACUG any changes and modifications needed for upgrading/changing the Undergraduate Course Curriculum (at least in every three years). The Committee will also nominate Advisers for the students.

10.2 Student Adviser
An Adviser (normally not below the rank of an Assistant Professor) will be nominated for one or more students for the entire period of study by the Departmental Monitoring Committee. He will advise each student on the courses to be taken in a Term. However, it is the student’s responsibility to keep contact with his/her Adviser who will review and eventually approve the student’s specific plan of study and monitor on subsequent progress of the student.

For a student of second and subsequent Terms, the number and type of courses for which he/she can register will be decided on the basis of his/her academic performance during the previous Term. The Adviser will advise the students to register the courses during the next Term within the framework of the guidelines in respect of minimum/maximum credit hours limit. He may also advise the student to change/drop one or more courses based on student's academic performance.
10.3 Course Coordinator
In each degree-awarding department, one of the senior teachers, nominated by the Departmental Monitoring Committee, will act as Course Coordinator and Member Secretary to the ACUG.

11. Course Registration and Withdrawal

A student who wants to study a course is required to register formally. A student can register courses he/she intends to take during a given term only based on the advice and consent of his/her Adviser.

11.1 Registration Procedure
Students must register for each course in which they will participate. Each student will fill up his/her Course Registration Form in consultation with his/her Adviser and submit it to the departmental office. The original copy of the Course Registration Form will be forwarded to the Registrar’s office by the Head of the Department. The registration information will be communicated to the student. Consolidated information of registration record will be distributed to Controller of Examinations, concerned Head of the Department and Advisers by the Registrar's office. The date, time and venue for registration will be announced in advance by the Registrar’s office. It is absolutely necessary that all students present themselves for registration to the Adviser at the specified date and time.

11.2 Pre-condition for Registration
A student will be allowed to register courses, depending upon the student category and satisfaction of pre-requisite courses. If a student fails in a pre-requisite course in any term, the concerned Adviser and Head of the Department may allow him to register for a course that builds on the pre-requisite course provided his attendance does not fall below 60% and assessment in the said pre-requisite course is found to be satisfactory.

Registration will be done at the beginning of each Term. However, late registration is permitted during the first week of class on payment of a late registration fee. A student having outstanding dues to the University or a Hall of Residence shall not be permitted to register. All students, therefore, have to clear their dues and get a clearance or no dues certificate, on the production of which, they will be given necessary Course Registration Form to complete the course registration procedure. Course Registration Form will normally be available in the Registrar's office. An orientation program will be conducted only for the first year students at the beginning of the first Term when they will be handed over the registration package on production of enrollment slip/proof of admission.

11.3 Pre-Registration
Pre-registration for courses to be offered to the students in a particular Term will be done on a specified date before the end of the previous Term. All students in consultation with their course Adviser are required to complete the pre-registration formalities. Further more a student who does not pre-register may not get the courses desired by him/her subsequently.
11.4 Registration Deadline
A student must register for the courses to be taken before the commencement of each Term and no late registration will be accepted after one week of classes. Relaxation up to a maximum of two weeks may be made for the newly admitted first year students. Late registration after this date will not be accepted unless the student submits a written appeal to the Registrar through the concerned Head of the Department and can document extenuating circumstances such as medical problems (Physically incapacitated and not able to be present) or some other academic commitments which precluded enrolling prior to the last date of registration. Proper certificates from concerned authorities must be submitted along with the application.

11.5 Penalty for Late Registration
Students who fail to register within the specified dates for registration will be charged a late registration fee (an amount as may be decided by the authority). This extra fee will not be waived whatever be the reason for the late registration.

11.6 Course Adjustment Procedure
A student would have some limited options to add or delete courses from his/her registration list. Addition of course is allowed within the first two weeks from the beginning of the Term. Dropping of a course is allowed within four weeks from the beginning of the Term. Adjustment of initially registered courses in any Term can be done only by duly completing the Course Adjustment Form. These forms will normally be available in the Registrar’s office. For first year students such forms can be included in the registration package at the time of orientation. Any student willing to add or drop courses will have to fill up a Course Adjustment Form in consultation with his/her Adviser. The original copy of the Course Adjustment Form will be submitted to the Registrar’s office through the Head of the Department.

11.7 Withdrawal from a Term
If a student is unable to complete the Term Final Examination due to illness, accident or any other valid reason, etc. he/she may apply to the Registrar through his/her Head of the Department for total withdrawal from the Term within a week after the end of the Term final examination. However, he/she may choose not to withdraw any laboratory/sessional/design course if the grade obtained in such a course is ‘D’ or better and that he/she has to indicate clearly in his/her withdrawal application. The withdrawal application must be supported by a medical certificate from University Medical Officer. The Academic Council will take final decision about such an application.

12. Striking off the Names and Readmission

12.1 The names of the students shall be struck off and removed from the rolls on the following grounds:
   i) Non-payment of University fees and dues within the prescribed period.
   ii) Forced to discontinue his/her studies under disciplinary rules.
   iii) Withdrawal of names from the rolls of the University on grounds acceptable to the Vice-Chancellor of the University after having cleared all dues.
iv) Could not earn required credits for graduation as outlined in the respective curriculum and/or fulfill CGPA requirement within the maximum allowed time of 7 (seven) consecutive academic years.

12.2 Every student whose name has been struck off from the rolls by exercise of the clause (ii) of Article 12.1 seeking readmission after expiry of the period for which he/she was forced to discontinue his/her studies shall submit an application to the Head of the Department in the prescribed form before the commencement of the session to which he/she seeks readmission. The Head of the Department shall forward the application to the Vice-Chancellor of the University with his remarks. In case the readmission is allowed, the student will be required to get him/herself admitted on payment of all dues not later than one week from the date of permission given by the Vice-Chancellor. All re-admission should preferably be completed before the Term starts.

12.3 No student who has withdrawn his/her name under clause (iii) of Article 12.1 shall be given readmission.

12.4 A student, whose name has been struck off from the rolls by exercise of clause (iv) of Article 12.1, is not eligible to seek readmission.

12.5 In case a student whose name has been struck off the rolls under clause (i) of Article 12.1 seeks readmission before the start of the next Term he/she shall be readmitted on payment of all arrear fees and dues (excluding course registration fees). But if he/she seeks readmission in any subsequent year the procedure for his/her readmission will be the same as described in Article 12.2.

12.6 Readmission for discontinuance of studies
A student will be considered to discontinue his studies under the following conditions:

i) Non-payment of University fees and other dues for Terms concerned.
ii) Withdrawal from a Term/absent in the Term final examination.
iii) Forced to discontinue under disciplinary rules.

The maximum allowable period of discontinuance is two academic years (four regular Terms) whatever may be the reason. A student seeking readmission within the allowable period of discontinuance may be readmitted after payment of all arrear fees and dues.

12.7 In case any application for readmission is rejected, the student may appeal to the Academic Council for re-consideration. The decision of the Academic Council shall be final.

12.8 A student failing to earn a minimum of 36 credits in the first 4 (four) consecutive Terms or 54 credits in the first 6 (six) consecutive Terms will cease to be a student of this University.
13. **Grading System and Calculation of GPA and CGPA**

13.1 **Grading System**

The letter grade system shall be used to assess the performance of the student and shall be as follows:

<table>
<thead>
<tr>
<th>Numerical grade</th>
<th>Letter grade</th>
<th>Grade point</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% or above</td>
<td>A+</td>
<td>4.00</td>
</tr>
<tr>
<td>75% to less than 80%</td>
<td>A</td>
<td>3.75</td>
</tr>
<tr>
<td>70% to less than 75%</td>
<td>A-</td>
<td>3.50</td>
</tr>
<tr>
<td>65% to less than 70%</td>
<td>B+</td>
<td>3.25</td>
</tr>
<tr>
<td>60% to less than 65%</td>
<td>B</td>
<td>3.00</td>
</tr>
<tr>
<td>55% to less than 60%</td>
<td>B-</td>
<td>2.75</td>
</tr>
<tr>
<td>50% to less than 55%</td>
<td>C+</td>
<td>2.50</td>
</tr>
<tr>
<td>45% to less than 50%</td>
<td>C</td>
<td>2.25</td>
</tr>
<tr>
<td>40% to less than 45%</td>
<td>D</td>
<td>2.00</td>
</tr>
<tr>
<td>Less than 40%</td>
<td>F</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Continuous assessment  
(For courses extended over two regular Terms, such as project/thesis/design, etc.)

Withdrawl  
Non Credit Course  
S/U (Satisfactory/Unsatisfactory)

13.2 **Calculation of GPA and CGPA**

Grade point average (GPA) is the weighted average of the grade points obtained in all the courses passed/completed by a student in a Term. ‘F’ grades will not be counted for GPA calculation. GPA of a Term will be calculated as follows:

\[
GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}
\]

where \( n \) is the total number of courses passed by the student, \( C_i \) is the number of credits allotted to a particular course \( i \) and \( G_i \) is the grade point corresponding to the grade awarded for \( i \)-th course.

Cumulative Grade Point Average (CGPA) gives the cumulative performance of the student from first Term up to any other Term to which it refers and is computed by dividing the total weighted grade points (\( \sum C_i G_i \)) accumulated up to the date by the total credit hours (\( \sum C_i \)).

Both GPA and CGPA will be rounded off to the second place of decimal for reporting.

14. **Distribution of Marks**

14.1 The distribution of marks for a given course will be as follows:

i) **Theory courses:**
- Class participation, attendance and assignments  
  Class tests, Quizzes, Spot test, etc.  
  Term Final Examination (3 hours duration)  
  Total: 100%

ii) **Independent laboratory/design/field work courses:**
Class participation and attendance 10%
Quizzes, Viva-Voce conducted in lab class 20%
Viva-Voce conducted centrally 20%
Performance and reports 50%
Total: 100%

iii) Project/thesis: (Continued for two Terms)
a) To be evaluated at the end of 4th year 1st Term: 20% of total marks by a committee formed by the Department.
b) At the end of final Term 80% of the total marks to be evaluated as follows:
   Presentation and viva-voce (conducted by a viva voce committee) 20%
   Supervisor (internal examiner) 40%
   External examiner (any other teacher of the Department/a member of examination committee) 20%
Total: 100% (in two Terms)

14.2 Attendance

i) Eligibility for Scholarship/stipend/grant
   The students whose percentage of attendance will fall short of 75% in any of the theory, lab/sessional courses for which he/she has registered in any Term of an academic year shall not be eligible for the award of any type of scholarship/stipend/grant for the following academic year.

ii) Basis for awarding marks for attendance will be as follows:

<table>
<thead>
<tr>
<th>Attendance</th>
<th>Marks (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>90% and above</td>
<td>100%</td>
</tr>
<tr>
<td>85% to less than 90%</td>
<td>90%</td>
</tr>
<tr>
<td>80% to less than 85%</td>
<td>80%</td>
</tr>
<tr>
<td>75% to less than 80%</td>
<td>70%</td>
</tr>
<tr>
<td>70% to less than 75%</td>
<td>60%</td>
</tr>
<tr>
<td>65% to less than 70%</td>
<td>50%</td>
</tr>
<tr>
<td>60% to less than 65%</td>
<td>40%</td>
</tr>
<tr>
<td>less than 60%</td>
<td>0%</td>
</tr>
</tbody>
</table>

15. Class Tests, Quiz and Spot Test

15.1 For theory courses, 3 class tests will be taken. Normally no more class tests will be taken on any course.

15.2 The class teacher will assign problems to the students and take spot test and quiz examination for assessment.

15.3 The date of class tests/quiz shall be fixed by the course teacher in consultation with the Head of the Department.

15.4 Duration of class tests should be 20-30 minutes and quizzes and spot tests should be 10-20 minutes.
15.5 All class tests shall ordinarily be of equal value. The result of each individual class test shall be posted for information of the students preferably before the next class test is held.

16. Earned Credits, Backlog and CGPA Improvement

The courses in which a student has obtained ‘D’ or a higher grade will be counted as credits earned by him/her. Any course in which a student has obtained ‘F’ grade will not be counted towards his/her earned credits calculation. A student who obtains an ‘F’ grade in any core course in any Term, he/she will have to repeat the course. If a student obtains an ‘F’ in an optional course, he/she may choose to repeat the course or take a substitute course, if available. F grades will not be counted for GPA calculation but will stay permanently on the grade sheet and transcript. When a student will repeat a Backlog course in which he/she previously obtained ‘F’ grade, he/she will not be eligible to get a grade better than B in such a course.

A student obtaining D grade in a course, will be allowed to repeat the course for the purpose of grade improvement if CGPA of the student falls below 2.20 In such case he/she will be awarded the new grade thus he/she obtains or retains his/her previous grade if he/she fails. A student obtaining ‘C’ or a better grade in a course will not be allowed to repeat the course for the purpose of grade improvement if CGPA of the student falls below 2.20. Absence in Term final examination will result ‘F’ grade unless he/she has withdrawn from the Term as per Article 11.7.

17. Performance Evaluation

The minimum CGPA requirement for obtaining a B. Sc. Eng. degree is 2.20. The performance of a student will be evaluated in terms of two indices, viz. GPA and CGPA.

Students will be considered to be making normal progress toward a degree if their CGPA for all courses passed is 2.20 or more. Students whose GPA will fall below 2.20 will have to appeal to the Head of the Department through his Adviser for the course registration so that the necessary remedial measures can be taken.

18. Honors, Dean's List and University Gold Medal

18.1 Honors
Candidates for Bachelor’s degree will be awarded the degree with Honors if their CGPA is 3.75 or better.

18.2 Dean's List
In recognition of excellent performance, the names of students who maintains an average GPA of 3.75 or above in two regular Terms of an academic year may be published in the Dean's List in each Faculty. Students who have received an ‘F’ grade in any course during any of the two consecutive regular Terms will not be considered for Dean's List in that year.
18.3 University Gold Medal
University Gold Medal for outstanding graduates will be presented to the students who secure the 1st position in each Department and whose CGPA is above or equal to 3.75. The student must have completed his/her undergraduate course work within four consecutive academic years with no 'F' grades and have a satisfactory attendance to his credit.

19. Student Classification

19.1 Year wise classification
Regular students of the University are classified according to the number of credit hours earned. The following classification applies to the students:

<table>
<thead>
<tr>
<th>Year</th>
<th>Earned Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year</td>
<td>0 to 36</td>
</tr>
<tr>
<td>Second Year</td>
<td>&gt;36 to 72</td>
</tr>
<tr>
<td>Third Year</td>
<td>&gt;72 to 108</td>
</tr>
<tr>
<td>Fourth Year</td>
<td>&gt;108</td>
</tr>
</tbody>
</table>

19.2 Earned credit wise classification
A student is normally required to earn at least 15 credits in a Term. At the end of each Term, the students will be categorized as follows:

**Category 1:** This category consists of students who have passed all the courses prescribed for the Term and have no backlog courses. A student belonging to Category 1 will be eligible to register all courses prescribed in the syllabus for the next regular Term.

**Category 2:** This category consists of students who have earned at least 15 credits in the Term but do not belong to Category 1. A student belonging to Category 2 is advised to take at least one regular course less in the next Term subject to the condition that he/she has to register such backlog courses as may be prescribed by the Adviser.

**Category 3:** This category consists of students who have failed to earn 15 credits in the Term. A student belonging to Category 3 is advised to take at least two regular courses less than Category 1 student to register a minimum of 15 credits. However, he/she will be required to register such backlog courses as may be prescribed by the Adviser.

20. Probation and Suspension
Students who fail to maintain minimum GPA of 2.20 and could not complete the minimum credit requirements may be placed on academic probation.

The status of academic probation is a reminder/warning to the student that satisfactory progress towards graduation is not being made. A student may be placed on academic probation when either of the following conditions exists:

i) The GPA falls below 2.20, or
ii) The CGPA falls below 2.20 or
iii) Earned Credits fall below 15 times the number of Terms attended/studied.
Students on probation are subject to such restrictions with respect to courses and extracurricular activities as may be imposed by the respective Head of the Department. The minimum period of probation is one term, but the usual period is one academic year. A student must improve himself during this period and will be required to pass the backlog courses. Any student who does not improve himself/herself during probation period may be suspended on receiving report from the Head of the Department.

A student on academic probation who fails to maintain a GPA of at least 2.20 during two consecutive academic years may be suspended from the University. A student who has been suspended may apply for consideration to the Vice-Chancellor.

Petitions for reinstatement must indicate clearly the reasons for the previous unsatisfactory academic record. It must describe the improved conditions that have been created to prevent the recurrence of such work. Each such petition will be considered individually on its own merits.

After consideration of the petition and after consultation with the student Adviser and the respective Head of the Department, the Vice-Chancellor in some cases may reinstate the student if this is the first suspension. However, a second suspension will be regarded as final and absolute.

21 Measures for Helping Academically Weak Students
The following provisions will be made as far as possible to help academically weak students to enable them to complete their studies within the maximum period of seven consecutive years (fourteen Terms).

21.1 Student's having CGPA below 2.20
All such students whose CGPA is less than 2.20 at the end of a Term may be given a load of not exceeding four theory courses, in the next Term.

21.2 Students having Withdrawal/Backlog Subjects
Students may be allowed to take backlog courses subject to the approval of his/her Adviser and Head of the Department based on the following rules:

i) Students having several withdrawal/backlog courses in the previous Terms have to register those courses, which have been offered for the regular students in the current Term with priority.

ii) Students having backlog in one or several courses will be allowed to register for a maximum of 6 (six) theory courses including backlog courses within the maximum credit limit of 27.5.

iii) Respective Department will try to arrange classes of few courses in the 6th slot (6th slot means the course in addition to 5 courses), so that students having backlog can attend. In this case, students having backlog shall have to study the courses along with the regular students.
iv) If it is not possible to arrange any course or courses described in (iii), then the students having class attendance at least 60% (sixty percent) may be allowed to register the backlog courses as self study retaining the already obtained marks of class tests, class performance/attendance/assignments etc. In such case student must register the backlog courses within 3 weeks after the commencement of respective Term.

v) Final examination for the backlog courses may be conducted with the regular students in the same question paper and on the same day and time if possible. Otherwise, final examination for the backlog courses will be arranged by the Head of the Department as soon as possible.

22 Special Examination

If Short-Term is not possible to arrange, a special examination on backlog subjects may be conducted for the students who have participated their 4 year degree course (upto 4th year 2nd term) and have a maximum of 3 (three) backlog courses (theory) and a shortage of maximum credits upto 12 may be allowed to register for special backlog examination. The special backlog examination will be arranged in a convenient time by the Head of the Department after 30 (thirty) days of publication of results of the 4th year 2nd Term regular examination. The evaluation system will be the same as backlog with self-study. The students willing to appear at the special backlog examination have to apply to the Head of the Department and with his permission must register within 7 (seven) days of publication of 4th year 2nd Term results. A student who has failed in the special backlog examination will register the course(s) in the next regular Terms.

23. Minimum Earned Credits and GPA Requirements for Obtaining Degree

The credit requirements for the award of Bachelor degree will be decided by the respective ACUG following Article No.7.5. The minimum CGPA requirement for obtaining a Bachelor degree is 2.20.

A student may take additional courses with the consent of his/her Adviser in order to improve CGPA, but he/she may take a maximum of 15 such additional credits beyond respective credit requirements for the degree during his/her entire period of study.

24. Time Limit for Completion of the Degree

A student must complete his studies within a maximum period of 7 (seven) consecutive academic years (fourteen regular Terms) for completion of the degree.

25. Industrial/Professional Training Requirements

Depending on each Department’s requirement, a student may have to complete a prescribed number of days of industrial/professional training in addition to minimum credit and other requirements, to the satisfaction of the concerned Department.
26. Absence during Term
A student should not be absent from quizzes, class tests, and spot tests etc. during the Term. Such absence will naturally lead to reduction in points/marks that count towards the final grade. Absence in Term final examination will result in ‘F’ grades.

A student who has been absent for short periods, up to a maximum of three weeks due to illness, should approach the course teacher(s) or the Course Coordinator for a make-up quizzes or assignments immediately on returning to the classes. Such request should be supported by medical certificate from University Medical Officer. The medical certificate issued by a registered medical practitioner and endorsed by University Medical Officer will also be acceptable only in those cases where the student has valid reason for his/her absence from the University.

27. Application for Graduation and Award of Degree.
A student who has fulfilled all the academic requirements for the degree will have to apply to the Controller of Examinations through his/her Adviser and Head of the Department for graduation. Degree will be awarded on completion of the minimum Credit and CGPA requirements subject to the approval of the Academic Council.

COURSE REQUIREMENTS FOR UNDERGRADUATE STUDENTS OF ELECTRICAL AND ELECTRONIC ENGINEERING DEPARTMENT

The undergraduate students of different semesters of this department have to follow the course schedule given below. The letter prefix in any course number indicates the department offering the course viz. EE for electrical and electronic engineering, CE for civil engineering, ME for mechanical engineering, CSE for computer science and engineering, Math for mathematics, Ch for chemistry, Ph for physics, Hum for humanities. The first digit in the course number indicates the year for which the course is intended. The second digit in the course number indicates the semester for which the course is intended. The odd numbered courses are theory courses and the even numbered courses are sessional/Practical/Laboratory courses.

In the summary of course,
L stands for Lecture Hours per week.
T stands for Tutorial Hours per week.
P stands for Practical/ Laboratory/sessional works hours per week.

COURSES OFFERED TO THE UNDERGRADUATE STUDENTS OF ELECTRICAL & ELECTRONIC ENGINEERING DEPARTMENT
(Effective from Batch 2006)
### Summary of Courses

#### FIRST YEAR FIRST TERM

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 1103</td>
<td>Basic Electrical Engg</td>
<td>3</td>
</tr>
<tr>
<td>EE 1104</td>
<td>Sessional on EE 1103</td>
<td>1.5</td>
</tr>
<tr>
<td>Ch 1103</td>
<td>Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Ch 1104</td>
<td>Sessional on Ch 1103</td>
<td>1.5</td>
</tr>
<tr>
<td>Ph 1103</td>
<td>Physics-I</td>
<td>3</td>
</tr>
<tr>
<td>Ph 1104</td>
<td>Sessional on Ph 1103</td>
<td>0.75</td>
</tr>
<tr>
<td>Math 1103</td>
<td>Mathematics-I</td>
<td>3</td>
</tr>
<tr>
<td>Hum 1103</td>
<td>Economics</td>
<td>2</td>
</tr>
<tr>
<td>CE 1104</td>
<td>Civil Engg Drawing</td>
<td>0.75</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>19.5</strong></td>
</tr>
</tbody>
</table>

1st year 1st term Load = 15L+9P=25 Hrs/week=19.5 Credit

#### FIRST YEAR SECOND TERM

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 1203</td>
<td>Electrical Circuit &amp; filter Design</td>
<td>3</td>
</tr>
<tr>
<td>EE 1204</td>
<td>Sessional on EE 1203</td>
<td>1.5</td>
</tr>
<tr>
<td>EE 1222</td>
<td>Programming Technique-I</td>
<td>1.5</td>
</tr>
<tr>
<td>Ph 1203</td>
<td>Physics-II</td>
<td>3</td>
</tr>
<tr>
<td>Ph 1204</td>
<td>Sessional on Ph 1203</td>
<td>0.75</td>
</tr>
<tr>
<td>Math 1203</td>
<td>Mathematics-II</td>
<td>3</td>
</tr>
<tr>
<td>ME 1203</td>
<td>Basic Mechanical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ME 1204</td>
<td>Sessional on ME 1203</td>
<td>0.75</td>
</tr>
<tr>
<td>Hum 1203</td>
<td>Economics &amp; Accountancy</td>
<td>3</td>
</tr>
<tr>
<td>Hum 1204</td>
<td>English Skills laboratory</td>
<td>0.75</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>20.25</strong></td>
</tr>
</tbody>
</table>

1st year 2nd term Load = 15L+9P = 24 Hrs/week = 20.25 Credit

Yearly total credit =19.75 + 20.25 = 40.0

#### SECOND YEAR FIRST TERM

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 2107</td>
<td>Electrical Machines-I</td>
<td>3</td>
</tr>
<tr>
<td>EE 2108</td>
<td>Sessional on EE 2107</td>
<td>0.75</td>
</tr>
<tr>
<td>EE 2109</td>
<td>Electronics-I</td>
<td>3</td>
</tr>
<tr>
<td>EE 2110</td>
<td>Sessional on EE 2109</td>
<td>1.5</td>
</tr>
<tr>
<td>EE 2122</td>
<td>Program. Technique-II</td>
<td>1.5</td>
</tr>
<tr>
<td>Math 2103</td>
<td>Mathematics-III</td>
<td>3</td>
</tr>
<tr>
<td>IEM 2103</td>
<td>Industrial Management</td>
<td>3</td>
</tr>
<tr>
<td>CE 2103</td>
<td>Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>CE 2104</td>
<td>Sessional on CE 2103</td>
<td>0.75</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>19.5</strong></td>
</tr>
</tbody>
</table>

2nd year 1st term Load = 15L+9P = 24 Hrs/week = 19.5 Credit
## SECOND YEAR SECOND TERM

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 2200</td>
<td>Electrical &amp; Electronic shop practice</td>
<td>1.5</td>
</tr>
<tr>
<td>EE 2209</td>
<td>Electronics-II</td>
<td>3</td>
</tr>
<tr>
<td>EE 2210</td>
<td>Sessional on EE 2209</td>
<td>1.5</td>
</tr>
<tr>
<td>EE 2211</td>
<td>Electromagnetic Fields</td>
<td>3</td>
</tr>
<tr>
<td>EE 2235</td>
<td>Signals and Systems</td>
<td>3</td>
</tr>
<tr>
<td>EE 2240</td>
<td>Electrical and Electronic Circuit Simulation Laboratory</td>
<td>1.5</td>
</tr>
<tr>
<td>Math 2203</td>
<td>Mathematics-IV</td>
<td>4</td>
</tr>
<tr>
<td>Hum 2203</td>
<td>Optional-I</td>
<td>3</td>
</tr>
</tbody>
</table>

Total: 20.5

2nd year 2nd term Load = 16L + 9P = 25 Hrs/week = 20.5 Credit
Yearly total credit = 19.5 + 20.5 = 40.0

## THIRD YEAR FIRST TERM

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 3101</td>
<td>Electrical Engineering Materials</td>
<td>2</td>
</tr>
<tr>
<td>EE 3107</td>
<td>Electrical Machines-II</td>
<td>3</td>
</tr>
<tr>
<td>EE 3108</td>
<td>Sessional on EE 3107</td>
<td>1.50</td>
</tr>
<tr>
<td>EE 3109</td>
<td>Electronics-III</td>
<td>4</td>
</tr>
<tr>
<td>EE 3110</td>
<td>Sessional on EE 3109</td>
<td>1.50</td>
</tr>
<tr>
<td>EE 3113</td>
<td>Digital Electronics and Logic Design</td>
<td>4</td>
</tr>
<tr>
<td>EE 3114</td>
<td>Sessional on EE 3113</td>
<td>1.50</td>
</tr>
<tr>
<td>EE 3121</td>
<td>Numerical Methods and Statistics</td>
<td>3</td>
</tr>
<tr>
<td>EE 3122</td>
<td>Sessional on EE 3121</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Total: 21.25

3rd year 1st term load = 16L + 10.5 P = 26.5 Hrs/Week = 21.25 credit

## THIRD YEAR SECOND TERM

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 3200</td>
<td>Electrical &amp; Electronic Project Design</td>
<td>0.75</td>
</tr>
<tr>
<td>EE 3203</td>
<td>Power System Analysis-I</td>
<td>3</td>
</tr>
<tr>
<td>EE 3205</td>
<td>Communication Engineering -I</td>
<td>3</td>
</tr>
<tr>
<td>EE 3206</td>
<td>Sessional on EE 3205</td>
<td>0.75</td>
</tr>
<tr>
<td>EE 3207</td>
<td>Electrical Machines-III</td>
<td>3</td>
</tr>
<tr>
<td>EE 3208</td>
<td>Sessional on EE 3207</td>
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</tr>
<tr>
<td>EE 3213</td>
<td>Microprocessors ,Microcontrollers &amp; Peripherals</td>
<td>3</td>
</tr>
<tr>
<td>EE 3214</td>
<td>Sessional on EE 3213</td>
<td>1.50</td>
</tr>
<tr>
<td>EE 3215</td>
<td>Electrical Measurement &amp; Instrumentation</td>
<td>4</td>
</tr>
<tr>
<td>EE 3216</td>
<td>Sessional on EE 3215</td>
<td>0.75</td>
</tr>
<tr>
<td>EE 3220</td>
<td>Electrical Machines Design</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Total: 21.25

3rd year 2nd term Load = 16L + 10.5 P = 26.5 Hrs/Week = 21.25 credit
Yearly total credit = 21.25 + 21.25 = 42.50
## FOURTH YEAR FIRST TERM

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 4000</td>
<td>Project &amp; Thesis*</td>
<td>1.5</td>
</tr>
<tr>
<td>EE 4101</td>
<td>Control System Engineering</td>
<td>3</td>
</tr>
<tr>
<td>EE 4102</td>
<td>Sessional on EE 4101</td>
<td>0.75</td>
</tr>
<tr>
<td>EE 4103</td>
<td>Power System analysis-II</td>
<td>3</td>
</tr>
<tr>
<td>EE 4104</td>
<td>Sessional on EE 4103</td>
<td>0.75</td>
</tr>
<tr>
<td>EE 4105</td>
<td>Communication Engineering-II</td>
<td>3</td>
</tr>
<tr>
<td>EE 4106</td>
<td>Sessional on EE 4105</td>
<td>0.75</td>
</tr>
<tr>
<td>EE 4109</td>
<td>Power Electronics and Industrial Drives</td>
<td>3</td>
</tr>
<tr>
<td>EE 4110</td>
<td>Sessional on EE 4109</td>
<td>0.75</td>
</tr>
<tr>
<td>EE 4130</td>
<td>Seminar</td>
<td>0.75</td>
</tr>
<tr>
<td>Optional- II</td>
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</tr>
<tr>
<td>Total</td>
<td></td>
<td>20.25</td>
</tr>
</tbody>
</table>

* Continued to the second term

4th year 1st term Load = 15L + 10.5 P = 25.5 Hrs/Week = 20.25 credit

## FOURTH YEAR SECOND TERM

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 4000</td>
<td>Project and Thesis (Total credit 4.5)</td>
<td>3</td>
</tr>
<tr>
<td>EE 4203</td>
<td>Switchgear &amp; Protection</td>
<td>3</td>
</tr>
<tr>
<td>EE 4204</td>
<td>Sessional on EE 4203</td>
<td>0.75</td>
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<tr>
<td>EE 4205</td>
<td>Communication Eng-III</td>
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<tr>
<td>EE 4206</td>
<td>Sessional on EE 4205</td>
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<tr>
<td>EE 4235</td>
<td>Digital Signal Processing</td>
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<tr>
<td>EE 4236</td>
<td>Sessional on EE 4235</td>
<td>0.75</td>
</tr>
<tr>
<td>Optional-III</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Optional-IV</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>20.25</td>
</tr>
</tbody>
</table>

N.B The course EE4000 will be evaluated at the end of 2nd term.

4th year 2nd term load = 15L + 10.5 P = 25.5 Hrs/Week = 20.25 credit

Yearly total credit =20.25+ 20.25 = 40.50
Total: 40.0+ 40.00 + 42.50 + 40.50=163.00

**Optional I:** Hum2203 Sociology & Government, Hum2217 Professional Ethics & Moral Thoughts, Hum2219 Occupational Psychology.

**Optional II:** EE4107 Generalized Machine Theory, EE4113 Embedded Systems, EE4119 Telecommunication Switching, EE4121 VLSI Design.

**Optional III:** EE4209 Semiconductor Device & Technology, EE4211Microwave Engineering, EE4233 High Voltage Engineering, EE4237 Reliability Analysis & Prediction, EE4239 Artificial Intelligence.

**Optional IV:** EE4201 Advanced Control System, EE4213 Digital Image Processing, EE4217 Power Plant Engineering, EE4219 Opto-electronics and Lightwave Technology, EE4221 Biomedical Engineering.
SUMMARY OF CREDIT HOURS FOR THE DEGREE OF B. SC. ENGINEERING (ELECTRICAL & ELECTRONIC):

The minimum credit hours to be completed for obtaining the degree of B.Sc. Engineering (Electrical and Electronic) is 163.00 of which 124 credit hours are for theoretical courses and 39.00 credit hours for sessional courses.

Semester-wise distribution of courses credit hours are listed below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Sem</th>
<th>No. of Courses</th>
<th>Contact Hours</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Theory</td>
<td>Sessi</td>
<td>Total</td>
</tr>
<tr>
<td>1st</td>
<td>1st</td>
<td>5</td>
<td>4</td>
<td>9</td>
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<td></td>
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<td>5</td>
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<td>1st</td>
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<td>4</td>
<td>9</td>
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<td>4th</td>
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<td>5</td>
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<td>34</td>
<td>74</td>
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</table>

CONTENTS OF THE COMPULSORY ELECTRICAL & ELECTRONIC ENGINEERING COURSES

EE-1103 Basic Electrical Engineering-I
Credit: 3
Contact Hours: 3 Hrs/week

Fundamental concepts and units, Variables and parameters: Voltage, current, power, energy, independent and dependent sources, resistance.
Basic laws: Ohm’s law, Kirchhoff’s current and voltage laws, Joule’s law.
Simple resistive circuits: Series and parallel circuits, voltage and current division, Wye-Delta transformation.
Techniques of circuit analysis: Nodal and mesh analysis including supernode and supermesh. Network theorems: Source transformation, Thevenin’s, Norton’s and superposition theorems with applications in circuits having independent and dependent sources, Millman’s theorem, Compensation theorem, Maximum power transfer theorem and Reciprocity theorem.
Introduction to measuring instruments: Ammeter, voltmeter, galvanometer and wattmeter.
Alternating Current circuits: Introduction to alternating current circuits, instantaneous, average and R.M.S values, complex impedance and phasor algebra, Power relations in A/C circuits: real, reactive and apparent power, power factor, power factor improvement.
Single-phase AC circuits: Series and parallel RL, RC and RLC circuits, nodal and mesh analysis, application of network theorems in AC circuits.
Resonance in AC circuits: Series and parallel resonance, half-power bandwidth, quality factor, energy analysis at resonance.

EE-1104 Basic Electrical Engineering Sessional
Credit: 1.5
Contact Hours: 3Hrs/Week

Laboratory Works: Experiments based on Basic Electrical Engineering

Ph-1103 Physics-I
Credit: 3
Contact Hours: 3Hrs/Week

Heat and thermodynamics:
Thermometry: Concepts of heat and temperature, measurement of high and low temperature, resistance thermometer, constant volume thermometer, thermo electric thermometer and pyrometer.
Equation of state: Physical explanation of the behavior of real gases. Andrew’s experiments, Vander walls equation, Critical constants, defects of Vander wall’s equation, State of matter near the critical point.
Thermodynamics: Zeroth law of Thermodynamics and its significance. First law of thermodynamics, work done during adiabatic and isothermal processes. Second law of thermodynamics, Carnot’s cycle, Carnot’s engine, thermonic emission, entropy changes in reversible and an irreversible process, entropy of a perfect gas, zero point energy and negative temperature, Maxwell’s thermo dynamical relations.
Wave and oscillations: Wave and composition of simple harmonic motion, simple harmonic motion, average value of kinetic and potential energies of a harmonic oscillation, superposition of simple harmonic motions, uses of Lissajous figures.
Damped and forced harmonic oscillator: Damped oscillatory system, damped harmonic oscillation, the LCR circuit, forced vibration, quality factor of forced oscillator, sharpness of resonance, phase of driven oscillator, power absorption.
Wave Motion: Types of wave, progressive and stationary wave, Energy distribution due to progressive and stationary wave, interference of sound wave, phase velocity and group velocity.
Sound Wave: Audible, ultrasonic, infrasonic and super sonic waves, Doppler’s effects and its application, applications of ultrasonic sound.
Acoustics: Intensity of sound, Bel, sound pressure level, phonon, acoustic intensity, architectural acoustics, Diffraction of sound, Musical sound, and noises, Speech, Characteristic’s of musical Sound.
Building Acoustic: Reverberation, Sabine’s reverberation formula, growth intensity, decay intensity, reverberation time and absorption co-efficient, requisites for good acoustic.
Optics:
Interference: Nature of light, interference of light, coherent sources, young double slit experiment, energy distribution, condition for interference, production of interference fingers, Fresnel Bi-prism, Newton’s ring.

**Ph-1104 Physics Sessional**

Contact hours: 3/2 Hrs/Week

Credit: 0.75

Experiments based on Physics- I (Ph-1103)

**Ch-1103 Chemistry**

Contact Hours: 4Hrs/Week

Credit: 4

Crystal symmetry, Miller indices, different methods for the determination of structure; Structures of the metallic elements and certain compounds with 3-dimensional lattices; Defects in solid states, Semiconductors. Electronic structure of the elements: metallic bond, band theory, hydrogen bonding, chelate bond.

*Periodic Table:* Generalization of chemical properties from periodic table. Inert gases and their importance in industry.

*Chemical kinetics:* Theories of reaction rates.

*Chemical Equilibrium:* Law of mass action and its application; Effect of pressure on chemical equilibrium; Le-Chateller’s theorem and application; Solvent extraction and ion exchange processes.

*Electro-Chemistry:* Electrolytes; Nerst’s theory of electrode potential, type of electrodes and electrode potentials, emf measurement, polarization and over potentials; Origin of EMF, Free energy and EMF, Electrical double layer, Factor affecting electrode Reaction and current, Modes of Mass transfer, Lithium ion and Lithium ion battery, Transport number; pH value and its determination; Electrode potentials and corrosion, Electroplating and galvanizing.

Nuclear chemistry, Nuclear reaction, nuclear hazard & photochemistry.

*Chemistry of polymer:* Polymer and polymerization, co-polymerization, ionic polymerization, living polymer, structure and properties of macromolecules, plastic and rubber, conducting polymer.

**Ch-1104 Chemistry-I Sessional**

Contact Hours: 3/2 Hrs/Week

Credit: 0.75

Experiments based on Ch-1103.

**Math-1103 Mathematics-I**

Contact Hours: 3 Hrs/week

Credit: 3

*Differential calculus:* Limit and continuity; differentiability; Differentiation: reviews of differentiation of various types of functions, application of differentiation, Successive differentiation; Successive differentiation of different types of functions, Leibnitz’s theorem; Expansion of functions: Rolle’s theorem; Mean value theorem; Taylor’s theorem (finite and infinite forms); Maclaurin’s theorem in finite and infinite forms; Cauchy’s forms of remainder and Lagrange’s forms of remainder. Expansion of functions by differentiation; Indeterminate forms; L’ hospitals Rule; Partial differentiation, Euler’s theorem. Maximum and minimum: Maxima & minima of different types of functions, Physical application, Tangents and normal: Tangents and normal, sub tangent and subnormal in Cartesian and
polar co-ordinates; Asymptotes. Curvatures: Curvature, radius of curvature, circle and centre of curvature, Chord of curvature in Cartesian and polar co-ordinates, curve tracing Evolute and involute, envelopes.

Co-ordinate geometry of two dimensions: Change of axes, General equation of second degree.

Co-ordinate Geometry of three dimensions: system of co-ordinates, distance between two points; Direction cosine and ratio; angle between two straight lines; Equation of a plane; Plane through three given points; Angle between two planes; Equation of a straight line through two points.

Set theory: Review of sets, equivalence relations, functions; Boolean algebra: Definition, basic theorems and properties of Boolean algebra, Boolean functions.

Hum-1103 Technical English
Contact Hours: 3 Hrs/week
Credit: 3

Structure and written expression: The noun-phrase, the verb phrase, subject verb agreement, pronouns; verb as complements; questions; affirmative agreement (too / so); negative agreement (either / neither); negation; commands; modal auxiliaries; adjectives and adverbs; comparison; nouns functioning as adjective; enough with adjective, adverbs and nouns; cause connectors; passive voice ; causative verbs; relative clauses; that-other uses; subjunctive; inclusive; use of know / know how; clause of concession; problem verbs; style in written English; problem with vocabulary and prepositions; verbal idioms.

Scientific terminology: Construction of sentences and paragraphs; phrases and idioms; proverbs; punctuation; commercial correspondence and tender notice, amplification and description; Comprehension, précis; Technical report writing; standard forms of term papers, thesis, etc.

CE-1104 Civil Engineering Drawing
Contact hours: 3/2 Hrs/Week
Credit: 0.75


EE 1203 Electrical circuits & filter design
Contact Hours: 3 Hrs/Week
Credit: 3
Prerequisite Course: EE1103

Transients: Transient conditions in electrical (ac & dc) circuits.
Graph theory: Loop, Path-set, cut-set and mesh matrix & their relationships.
Coupled circuits: self and mutual inductances, coupling co-efficient, analysis of coupled coils, dot rule, energy in a pair of coupled coils, reflected impedance, conductively coupled circuits, transfer impedance.
Poly-phase circuits: Analysis of balanced and unbalanced polyphase circuits, Phase sequence, Methods of checking phase sequence, power in the three phase circuits and its measurement.
Dissipation less network: Reactance and Susceptance curves, analysis and synthesis of dissipationless networks.
Filter: Conventional filter design and operation, elementary filter sections, fundamental equations of an ideal filter, theorem connecting characteristic impedance and attenuation
constant-k sections, prototype filter sections, m-derived filter sections, use of reactance
curves in determining filter performance, impedance matching of filters, composite filters,
band pass and band stop filters, frequency transformations to develop other types of filter
from low pass case.

*Modern Filter:* Ideal transfer function, general design procedure, Butterworth and
Chebychev filters: approximation and design.

*Two Port Networks (TPN):* Two port networks (symmetrical & asymmetrical),
determination of two port parameters, relationship between two port parameters, equivalent
model for different parameters’ representation of TPNs, reciprocity and symmetry of TPNs,
π and T equivalent networks, interconnection of TPNs, choice of parameter type, validity
tests, applications of terminal characteristics, recurrent networks- ladder, lattice sections,
bridged-t section; T & PI sections, half section, L section, terminated two port networks;
iterative impedance, image impedance, characteristic impedance, symmetrical two port
networks, image propagation function, reflection of voltage, current and power; insertion
loss.

**EE-1204: Electrical circuits & filter design Sessional**
Contact hours: 3 Hrs/week

Laboratory Work-Experiments based on EE1203

**EE 1222 Programming Technique-I**
Contact Hours: 3 Hrs/week

*FORTRAN Language:* Introduction, characters, constants and variables, real, integer,
complex and logical variables, relational operators, arithmetic expressions etc. GOTO
(conditional & unconditional), input/output, format, arithmetic and logical if statements, do,
nested do loops and while-do loops, library functions.

*Introduction to C programming:* Programming concepts; structured programming language:
Data types, operators, expressions, control structures; functions and program structures:
Function basics, parameter passing conventions, scope rules and storage classes, recursion;
header files; preprocessor; arrays and pointers; user defined data type: Structures, unions,
enumeration; input and output: Standard input and output, formatted input and output, file
access; variable length argument list; command line parameters; error handling

**Ph-1203 Physics-II**
Contact Hours: 3 Hrs/week

*Solid State Physics:*
*Crystal structure:* Periodic array of atoms, fundamental types of lattices, Miller index.
*Reciprocal Lattices:* Diffraction of waves by crystals, scattered wave amplitude, Brillouin
Zones, Fourier analysis of basis.
* Phonon: Vibration of crystal with monatomic basis, two atoms per primitive basis, phonon
heat capacity, thermal conductivity, enharmonic crystal interaction.
* Free electron Fermi gas:* Energy levels in one dimension, Fermi-Dirac distribution, heat
capacity of electric gas, electrical conductivity and Ohms law, motion in magnetic law,
thermal conductivity of metals.
*Breakdown of the classical theory of conduction:* Mean free paths, specific heat, Hall
Effect, Fermi structure of metals, construction of Fermi surface, electron orbits, hole orbits
and open orbits, Wigner-Scitz method for calculation of energy bands, Fermi surface of copper, velocity of electron according to band theory.

**Laser:** History of laser, physical process in lasers, laser structure, parameter and modes of operation, laser type, semiconductor lasers, ruby laser, Raman laser, Nobel gas lasers and application of laser.

**Modern Physics:**

- **Practical properties of waves:** Black body radiation, Planck’s Quantum hypothesis, Photo electric effect, The Crompton effect, Quantum state of energy, Dual Character of light, X-ray diffraction, formulation of Bragg and Von Laue, Application of x-ray.
- **Wave Properties of matter:** De Broglie’s hypothesis, nature of De Broglie’s waves, phase velocity and group velocity, uncertainty principle, elementary proof Heisenberg’s uncertainty relation; application of uncertainty principle.
- **Atomic Structure:** Bohr’s atom model, nature of electron orbits, orbital energy, electron energy levels in hydrogen, orbital energy level diagram of hydrogen atom, correspondence of principle, vector atom model, space quantization, magnetic moment of orbital electron, quantization of magnetic moment; spin magnetic moment of an electron.

**Nuclear Physics:**

- **Radio activity:** introduction to radioactivity, Laws of radio active disintegration, Half life, mean life, laws of successive disintegration, secular and transient radioactive equilibrium; practical application of radioactivity.
- **Nuclear energy:** Fission and fusion process, mass distribution, energy distribution, chain reaction, binding energy, nuclear force, nuclear reactor.
- **Relativity:** Galilean Transformation, Lorentz transformation, length contraction, time dilation, proper and non proper time, relativistic variation of mass, Einstein’s mass energy relation; Min Kowaski space.

**Ph1204 Physics Sessional**

**Contact hours:** 3/2 Hrs/week

Experiments based on physics-II (Ph-1203).

**Math-1203 Mathematics-II**

**Contact hours:** 3 Hrs/week

**Prerequisite Course:** Math 1103

- **Integral calculus:** Definition of integration; Integration by the method of substitution; Integration by parts; Standard integrals; Integration by the method of successive reduction; Definite integrals, its properties and uses in summation of series; Wallis’s formula; Improper integral; Differentiation under the sign of integration, integration under the sign of integration, Beta and gamma functions; Area under a plane curves in Cartesian and polar coordinates; parametric and pedal equation, intrinsic equation; volume of solid revolution, volume of hollow solids of revolutions by shell method, area of surface of revolution.
- **Differential Equations in one Independent Variable:** Formation of differential equation, Order and degree of differential equations; Solution of differential equation of first order first degree by different methods; Solution of first order and higher degree, Application of first order deferential equation, Solutions of linear differential equations of second and higher orders with constant coefficients; Solutions of homogeneous linear equation.
Hum-1204 English skills laboratory  
Contact hours: 3/2 Hrs/week

Grammar: Tense, article, preposition, subject-verb agreement, clause, conditional and sentence structure.  
Vocabulary building: Correct and precise diction, affixes, level of appropriateness, Colloquial and standard, informal and formal.  
Developing reading skill: Strategies of reading, skimming, scanning, predicting, inferring; analyzing and interpreting variety of texts; practicing comprehension from literary and nonliterary texts.  
Developing writing skill: Sentences, sentence variety, generating sentences; clarity and correctness of sentences, linking sentences to form paragraphs, writing paragraphs, essays, and reports, formal and informal letters.  
Listening skill and note taking: Listening to recorded texts and class lectures and learning to take useful notes based on listening.  
Developing speaking skill: Oral skills including communicative expressions for personal identification, life at home, giving advice and opinion, instruction and directions, requests, complaints, apologies, describing people and places, narrating events.  

ME-1203 Basic Mechanical Engineering  
Contact hours: 3 Hrs/week

Energy and First law: Systems and surroundings; Conservation of energy; Different thermodynamic processes; Energy transfer as heat for a control volume.  
Entropy and Second law: Reversibility and irreversibility; Definition and corollaries of second law of thermodynamics. Entropy: its transfer and change.  
Characteristics of some thermodynamic cycles: Analysis of different thermodynamic cycles, vapor power cycles, Representation of various cycles on PV & TS planes.  
Basic concepts of refrigeration systems: Vapor compression refrigeration, Absorption refrigeration, cop, refrigerants and their classifications and properties.  
Air conditioning: Introduction, objectives and major components of air conditioning systems; Humidity; Dew point.  

ME-1204 Basic Mechanical Engineering Sessional  
Contact hours: 3/2 Hrs/week

Experiments based on basic mechanical engineering (ME1203).  

Hum-1203 Economics & Accounting  
Contact Hours: 3 Hrs/week

Economics:  
Definition, scope and methods. Demand, supply and their elasticity’s; equilibrium analysis- partial and general; Consumer behavior, marginal utility; indifference curve, consumer’s
surplus; producer behavior; iso-quant, iso-cost line. Factors of production function; production possibility curve; fixed cost and variable cost; short run and long run costs, total, average and marginal cost; laws of returns; internal and external economics and diseconomies; market and market forms; perfect and imperfect competition; price output determinations. Introductory ideas on GNP, GDP, perceptual income, interest, rent, saving, investment, inflation; Project approval, NPV, IRR & their application, cost benefit analysis.

Accounting:
Introduction: Definition, advantages, objects; Nature of transaction; double-entry system of book-keeping; classification of account.
Accounting cycle: Journal, ledger, trial balance, final account including adjustment.
Final Accounts: Trading & manufacturing accounts, profit and loss accounts and balance sheet.
Depreciation: methods of depreciation.

EE 2107 Electrical Machines-I
Contact Hours: 3 Hrs/Week
Credit: 3

DC Generators: Description of different parts of DC generators, emf equation, principle of DC generators, Different types of winding, Winding Table, Voltage build up, Armature reaction, losses and efficiency, Parallel operation of DC generators.

DC Motor: Principle of operation, classification, losses and efficiency, Starting, Separately excited DC motor, Permanent magnet DC motor, Two and four-quadrant operation of DC motors; speed control by converter and chopper, Crane, traction and hoist application of DC motor, Choice of DC motors for different applications.


EE 2108 Electrical machine-I Sessional
Contact hours: 3/2 Hrs/ Week
Credit: 0.75

Experiments based on EE 2107

EE 2109 Electronics-I
Contact Hours: 3 Hrs/Week
Credit: 3

Introduction: Properties of Insulators, Semiconductors, and Metals; Conduction in solids, Conventional current and electron flow, Drift and diffusion current, Mobility and Conductivity. The potential barrier; work function; contact potential. The Hall Effect and Hall devices.

Semiconductor diode characteristics: Qualitative and Quantitative theory of the p-n junction as a diode; Ideal pn junction, pn junction band diagram, current components in p-n diode; Volt-ampere characteristics; Transition and diffusion capacitance, Dynamic resistance, Reverse breakdown; Avalanche and Zener breakdown; Zener diode, Rectifier Diode: controlled & uncontrolled rectification, Special-Purpose Diodes: Tunnel diode, varactor diode, and breakdown diode; Metal oxide semi-conductor diode, optical diode, PIN diode, Schottky diode, Current regulator diode. Introduction to BJT, SCR, TRIAC, DIAC.

EE 2110 Electronics-I Sessional
Contact hours: 3 Hrs/ Week
Credit: 1.5

Electronic symbols; Ratings and identification of resistor, capacitor, inductor, diodes, transistors, SCR, DIAC, TRIAC, etc. and H.F. Transformer, low rating relays, switches etc. and their uses in electronic circuits. Experiments based on Electronics-I.

EE 2122 Programming Technique-II
Contact Hours: 3 Hrs/Week
Credit: 1.5
Prerequisite Course: EE 1222

Introduction to C++ programming language: Introduction, Characters, Constants and Float, Integer, character, Complex and logical Variables, Relational operators and logical operators, key words, Arithmetic expressions, looping, branching, array, string, input/output file handling, Binary file handling, binary operators, class, Dynamic programming, Structure, Self referential structure, union, pointer and dynamic memory allocation. Some typical program development tactics using C++ program. Introduction to object oriented programming, problem-solving using object oriented programming. Advanced problem solving technique: Algorithm development for sorting, inserting, delete for a database, queue, stack and linked list. Introduction to Java and HTML.

Math -2103 Mathematics-III
Contact Hours: 3Hrs/Week
Credit: 3
Prerequisite Course: Math 1203

Vector Analysis: Reviews of vector algebra. Vector differentiation: Differential operators; gradient, divergence, curl; Vector integration; line surface and volume integrals; integral theorem: Green’s, Gauss’s and Stoke’s theorems; curvilinear co-ordinates: orthogonal coordinates, spherical and cylindrical polar Co-ordinates; Introduction to tensor.

Matrices: Reviews of matrix algebra; Elementary transformations: inverse by elementary transformation, rank; linear dependence and independence of vectors and matrices; solution of linear equations using matrix, vector spaces. Linear transformations; Eigen values and Eigen vectors; Cayley-Hamilton theorem.

Differential equations: solution in series by Frobenious method. Solution of Bessel’s differential equation; solution of legendre differential equation; Bessel’s function and its properties; modified Bessel’s function, ber and bei functions; Legendre polynomials and its properties, Legendre function of second kind.
IEM2103 Industrial Management  
Credit: 3  
Contact hours: 3 Hrs/Week

Introduction: Evolution and various thoughts of management, organization and environment, 
Organization: theory and structure, co-ordination, span of control, authority, delegation, centralization and decentralization, 
Personal Management: need hierarchy, motivation, leadership, performance, appraisal, wages and incentives, organizational change and conflicts. 
Cost and financial Management: Elements of costs, of products depreciation, break event analysis,  
Operational Management: Forecasting, inventory management, ABC analysis, MRP and JIT, master planning, basic scheduling technique, CPM and PERT, plant Location, and layout, maintenance management, manage information system(MIS), computer aided process planning (CAPP), manufacturing resource planning,(MRP-II)

CE-2103 Strength of Material & Structure  
Credit: 3  
Contact hours: 3 Hrs/Week

Stress and strain: Tension and compression; Internal force; stress; Axial stresses and shear stresses; Strain; Elasticity and elastic limit; Hook’s law; Modulus of Elasticity; Proportional limit; Stress strain diagram; Bearing stress; Hoop stress; Centrifugal stress; thermal stress; shearing strain; Modulus or rigidity; Impact load. 
Combined stress and strain: Stress in an inclined plain of an axially load member; principal stress and principal plane; thin walled pressure vessel; Mohr’s circle; pure shear; Relation between modulus of rigidity and modulus of elasticity; Combined stress and principal planes.  
Torsion: Relation between shearing stress and torque in solid and hollow shaft; Torsional stiffness and equivalent shaft; close coiled helical spring. Statically determinate Beams; Simple beams; different types of loading and reactions at supports; shear force and bending moment; shear force and bending moment diagrams; relation between shear force and bending moment; superposition principle; consideration for flexure equation and distribution of bending stress; Shearing stress due to bending; Economical sections; Deflection of beams.  
Column Theory: Compression blocks struts; column and braces; Euler’s column formula for central load and different end conditions; Modes of failure and critical load; Slenderness ratio and classification of column; Secant formula for columns with eccentric loading; Empirical formulae; straight-line equation.

CE-2104 Strength of Material & Strictures Sessional  
Credit: 0.75  
Contact hours: 3/2Hrs/Week

Experiments based on CE-2103

EE 2200 Electrical & Electronic Shop Practice  
Credit: 1.5  
Contact Hours: 3 Hrs/Week

Familiarization with electric switches; Electric tools; electrical fittings and fixtures.; Wire wrapping; Soldering; Electrical symbols; Connection of tube light, staircase lighting, flickering lighting, moving lighting, simple traffic signals, calling bells, etc.
Wire specification: Flexible wire: Electrical cables: T&T cables; fuse wire, etc. Safety devices: Fuse wires; MCCB; fuse distribution board (FDB); oil circuit breaker, air circuit breaker, etc. Motor winding, fans and regulator repairing, transformer winding, etc. Testing: Megger test, fan and transformer test, earthing and its testing.

Electrical wiring: Illumination, House wiring, Industrial installation wiring, Estimation for electrical wiring system, Safety rules, wiring of air conditioning, designing underground cable, erection estimation, electricity rules, electricity codes, Tariff of PDB and REB.

EE 2209 Electronics-II
Contact Hours: 3 Hrs/Week
Credit: 3
Prerequisite Course: EE2109

Different types of electron emissions, Electron Ballistics: Motion of charged particles in constant, parallel, and perpendicular electric & magnetic fields; electrostatic deflection, CRT; Electric and magnetic focusing. Vacuum Tubes: diodes, triodes, tetrodes, pentodes and multigrid tubes; their characteristics and equivalent circuits.

Transistor: Transistor and its current components, transistor as an amplifier, BJT, Different transistor configurations and their equivalent circuits, study of load lines, transistor switching times, detailed study of transistor biasing and thermal stabilization.

Transistor circuit analyses: Review of different transistor configurations and their equivalent circuits; r-parameters and h-parameters; Analysis at low, medium and high frequencies; Transistor amplifier circuits and their cascading; effect of input output impedances; Darlington pair; Emitter follower.

FET: Introduction, Construction and characteristics, transfer characteristics, MOSFET: depletion type and enhancement type, biasing, FET amplifier, VVR, and UJT, CMOS, VMOS, FET small signal model and analysis.

EE 2210 Electronics-II Sessional
Contact hours: 3 Hrs/Week
Credit: 1.5

Experiments based on EE 2209

EE 2211 Electromagnetic Fields
Contact hours: 3 Hrs/Week
Credit: 3
Prerequisite Course: Math 2103

Vector analysis: Reviews of vector analysis.

Electrostatics: Coulomb’s law and forces, Electric field intensity, Electrical flux density, Gauss’s-theorem with application, Electrostatic potential, Equipotential surfaces, Boundary conditions, Method of images, Laplace’s and Poisson’s equations and its solutions, Energy of an electrostatic system.

Magnetostatics: Concept of magnetic field, flux density and magnetic field intensity. Faraday’s law, Biot-Savart law and Ampere’s law, vector magnetic potential; Energy of magnetostatic system; Mechanical forces and torque’s in electrical and magnetic fields; Solutions to static field problems;

Electromagnetic fields and its radiation: Introduction to displacement current, Derivation of Maxwell’s equation in different co-ordinate systems and its application. Boundary conditions for time varying systems, Retarded potentials.

The electrostatics of circuits: Circuit concepts and its derivation from the field equations. High frequency circuit concepts, Circuit impedance’s, Concepts of good and perfect conductors, Depth of penetration, internal impedance, Power loss calculation, Skin effect of practical conductors.
Propagation and reflection of electromagnetic wave in unbounded media: Plane wave propagation, Polarization, Power flow and pointing theorem, Transmission line analogy, Reflection from conductor and conducting dielectric boundary.

Radio wave propagation: Plane wave propagation through ionosphere and ground wave propagation. Effect of earth curvature on propagation.

EE-2235: Signals and Systems  
Credit: 3  
Contact hours: 3 Hrs/Week  
Prerequisite Course: EE 1203

Introduction to linear systems and signal classification: 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.

Analogous systems: f-v and f-i analogy, Electro-mechanical systems.

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.

Laplace transformation: Fourier to Laplace, Properties, inverse transform, solution of system equations, system transfer function, system stability and frequency response and application, Convolution integral and its application, Superposition integral.

The Z Transformation: Sampled data system, Definition and properties of Z-transform, ROC, Inverse Z-transform, Mapping between Z plane and S plane, Stability, Solution of Difference equations.

EE-2240 Electrical & Electronic Circuit Simulation Laboratory  
Credit: 1.5  
Contact hours: 3 Hrs/week

Simulation laboratory based on EE1103, EE 1203 and EE2209 theory courses. Students will verify the theories and concepts learned in EE1103, EE 1203 and EE2209 using simulation software like PSpice and MATLAB. Students will also perform specific design of electrical (DC and AC) and electronic circuits theoretically and by simulation.

Math 2203 Mathematics-IV  
Credit: 4  
Contact Hours: 4 Hrs/Week  
Prerequisite Course: Math 2103

Complex variable: Complex number system; Graphical representation, roots, functions; limits; continuity; complex differentiation, analytic function, Cauchy Riemann equation; singular points, harmonic function, orthogonal family of curves, Complex integration, Cauchy’s theorem; Morera’s theorem, Consequences of Cauchy’s theorem; Cauchy’s integral formula, Expansion of function. Taylor’s and Laurent’s theorem; Residue: Calculation residues, Residue theorem, Evaluation of integrals, conformal mapping transformation, Jacobian of transformation, some general transformation.

Fourier series and Fourier transformation: Fourier series representation of function, complex form of Fourier series, Parseval’s theorem, Fourier integral, finite Fourier
transformation, series, infinite Fourier transformation, use of Fourier transformation in boundary value problems.

Laplace transform: Laplace transforms of elementary functions; properties of Laplace transform, inverse Laplace transform and its properties; convolution theorem; application of Laplace transform to solve differential equations related linear circuit and partial differential equations.

Harmonics: solution of simple partial differential equation with initial and boundary condition; Heat flow equation; Two dimensional wave equation; solution of two and three dimensional Laplace equation.

EE 3107 Electrical Machines-II
Credit: 3
Contact Hours: 3 Hrs/Week
Prerequisite Course: EE 2107

Induction Motor: General principles, construction, rotating magnetic field, equivalent circuits, squirrel cage and slip ring motors, torque developed, starting methods, speed control, tests, losses and efficiency, determination of constants from test data, two-axis theory, axis transformation, dynamic model, model in different frames (stationary and synchronous), circle diagram, harmonics in the air gap flux, induction generator.

Single Phase Induction Motor: Rotating field, characteristics of different types of motors, equivalent circuits and theories.

Alternators: Construction, theory of operation, armature windings, voltage regulation, armature reaction and reactance, control of excitation, two-reaction analysis, transient condition, losses and efficiency, synchronizing and load sharing, low power single-phase alternator.

EE 3108 Electrical Machines-II Sessional
Credit: 1.5
Contact hours: 3 Hrs/Week

Laboratory Experiments based on EE 3107

EE 3109 Electronics-III
Credit: 4
Contact Hours: 4 Hrs/Week
Prerequisite Course: EE 2209

Pulse circuits: Bistable, monostable and astable multivibrators; Frequency generators, PLL, Analysis of RC coupled transistor amplifier circuits at LF, MF, and HF ranges.

Feedback Amplifiers: Basic concept, Amplifiers: voltage and current, negative feedback amplifiers, effect of negative feedback upon output and input resistances, different types of feedback amplifiers; stability; gain and phase margins, topologies and analysis for discrete transistor amplifiers.

Oscillators: Conditions of self-oscillations, Oscillators: sinusoidal, feedback, relaxation, square-triangle types, design, frequency stability, and negative resistance in oscillators.

Power Amplifiers: Untuned Class A, AB and B amplifiers, tuned class B and C amplifiers, neutralization, push-pull Class B and C amplifiers and their design, transistor amplifier with complimentary symmetry, Tuned potential amplifiers: single, double and Cascaded.

OP-AMP: Different types of operational amplifiers and their applications in: Differentiator, integrator and comparator circuits. Analog computer and its application in differential equation solution, active filter.

TV engineering: Principles of black & white (B&W) and color TV, composite video & chrominance signals, formulation of the chrominance signal, I & Q signals, block, schematic
& pictorial diagrams of TV and their characteristics, CRT, static & dynamic convergence, automatic degaussing circuits, pincushion cause & correction, raster & raster formation, different sections of B&W and color TV, VHF & UHF frequency allocations, control of all section, AFT & remote control circuits, basic troubleshooting procedures, isolating and replacing the defective stage & component, video signal & camera tubes. Introduction to LCD monitor.

EE 3110 Electronics-III Sessional
Contact hours: 3 Hrs/Week

Laboratory Experiments based on EE 3109

EE 3113 Digital Electronics and Logic Design
Contact Hours: 4 Hrs/Week

Prerequisite Course: EE 2109

Number systems: Representation of numbers in different bases, addition and subtraction in different bases, Complement: Subtraction using complements, binary multiplication & division.

Binary codes: Different coding system, Boolean algebra, various gates, sum of products and product of sums, standard and canonical forms and other logical operations.

Simplification of Boolean functions: Karnaugh map method, tabular method of simplification; Implementation of logic circuit using various gates, universal gates.

Combinational logic circuit: Design procedure: Adder, subtractor, code converters, parity bit checker and magnitude comparator, analysis of different combinational circuits, encoder, decoder, multiplexer, demultiplexer, ROM, PLA and their applications.

Flip-flops: SR, JK, Master slave, T and D type flip-flops and their characteristic tables & equations; triggering of flip-flops; flip-flop, excitation table.

Sequential circuits: Introduction to sequential circuits, analysis and synthesis of synchronous and asynchronous sequential circuits.

Counters: Classifications, Synchronous and asynchronous counter design and analysis, ring counter, Johnson counters, ripple counter and counter with parallel load.

Registers: Classification, shift registers, circular registers and their applications and registers with parallel load.

Digital IC logic families: Brief description of TTL, DTL, RTL, ECL, T^{2}L, MOS and CMOS logic and their characteristics, principles of operation and application.

Memory Units: Various memory devices and their interfacing.

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

EE 3114 Digital Electronics Sessional
Contact hours: 3 Hrs/Week

Laboratory Experiments based on EE 3113

EE 3121 Numerical Methods and Statistics
Contact hours: 3 Hrs/Week

Computer Application to Numerical Methods: Solution of Algebraic and Transcendental Equations, Half interval search, Method of false opposition, Newton-Raphson method,
Method of iteration, Solution of polynomial equations, Solution of systems of linear equation, Cramer’s rule, Gam’s equation method, Gauss’s-Seidel method.

*Interpolation:* Forward difference and backward difference, Lagrange’s interpolation formula.

*Numerical differentiation:* Use of Newton’s interpolation formulas.

*Numerical integration:* Trapezoidal rule, and Simpson’s rule.

*Solution of differential equation:* Picard’s methods, Runge-Kutta method, and Finite difference method.

*Statistical Analyses:* Frequency and frequency distribution and its graphical representation. Measure of central tendency, mean, media, & mode, Index number, variance, mean deviation, standard deviation, quartile deviation, time series analyses.

*Probability:* Probability function and probability distribution: Normal distribution, Poisson’s distribution and binomial distribution. Theory of error and Gaussian law of error. Arithmetic Mean, Geometric Mean and Harmonic Mean, Moment Skewness and Kurtosis, Moments for grouped data, Relation between moments and grouped data.

*Curve Fitting:* Relationship between variables; Equations of approximating curves. The straight line; the method of least squares, the least square line on linear relation ship. The least square parabola. Regression Application to time series. Problem involving two or more variable.


**EE 3122 Numerical methods & Statistics**

*Credit: 0.75*

*Contact hours: 3/2 Hrs/Week*

Laboratory Experiments based on EE 3121

**EE 3200 Electrical & Electronic Project Design**

*Credit: 0.75*

*Contact hours: 3/2 Hrs/Week*

*General design aspect of electronic components:* Filters, amplifier, oscillator audio amplifiers, power supply from both mains & batteries and other electronic circuit design. Typical design problems, Digital circuit design. Electronic circuit design using operational amplifiers and programmable timers. Electronic circuit design & analysis using SPICE

**EE 3203 Power System Analysis-I**

*Credit: 3*

*Contact Hours: 3 Hrs/Week*

*Introduction to transmission lines:* Flux linkages, inductance due to external flux, inductance of single-phase two-wire line, composite conductor lines, G.M.D, 3-phase line with equilateral and with unsymmetrical spacing, parallel circuit of 3-phase line, and use of tables.

*Capacitance of Transmission lines:* Electric field, capacitance of two wire line, three-phase lines with symmetrical & with equilateral spacing, effect of earth, parallel circuits lines,
representation of lines: short, medium and long transmission lines, T and π representation, exact solutions, equivalent circuit of long transmission line. Underground and overhead lines.

Generalized line constants: General line equations in terms of ABCD constants, relations between constants, charts of line constants, constants of combined networks measurement of line constants.

Power Network Representations: P.U method of performance calculation, P.U. impedance of three winding transformers, Power flow in simple systems, Load flow studies of large systems using the Gauss-Seidel methods; Control of voltage, power and reactive power; Symmetrical three phase faults on synchronous machine, Symmetrical Components: Sequence impedance and sequence networks of generators, transformers and lines, sequence network of systems, Unsymmetrical Faults: Single line to ground fault, line to line fault, double line to ground fault.

EE 3205 Communication Engineering –I
Contact Hours: 3 Hrs/Week
Credit: 3
Prerequisite Course: EE 3109

Introduction of communication systems: Basic principles, fundamental elements, system limitations.
Information Theory: Information and system capacity, information transmission, entropy, continuous channel capacity, transmission through electrical network.
Analog communication: AM, FM, PM, DSB, SSB, VSB, ISB.
Radio Engineering: AM, FM, PM transmitter & receiver, super heterodyne receiver.
Multiplexing: Space division multiplexing, frequency division multiplexing, time division multiplexing, and code division multiplexing.
Noise: Physical sources of noise, types of noise, calculation of noise, SNR & noise figure, calculation of noise figure, noise temperature, equivalent noise resistance.

EE 3206 Communication Engineering –I Sessional
Contact hours: 3/2 Hrs/ Week
Credit: 0.75

Laboratory experiments based on EE 3205

EE 3207 Electrical Machines-III
Contact Hours: 3 Hrs/Week
Credit: 3
Prerequisite Course: EE 3107

Synchronous Motor: Theory of operation, Motor characteristics, Mathematical analysis, Vector diagram, V-curves, Motor tests, Losses, Efficiency and starting, Hunting and Damping, Synchronous condenser.
Special Machines: Universal motor, hysterisis and stepping motors, electrostatic motor, Repulsion motor, Brushless DC motor, Switched reluctance motors, Linear induction motors, Servomotors, Rotating power amplifiers, Permanent magnet motors, IPM motors and PMSM.
Electro Mechanical energy conversion: Principles of Electro-mechanical energy conversion, energy balance, Energy in singly excited magnetic systems, Mechanical force and energy,
State function, Variables & co-energy, Dynamic equations, Analytical techniques, Gross motion, Linearization, Block diagram, Generalized model and analysis of DC , Induction and synchronous machine.

EE 3208 Electrical Machines-III Sessional  
Contact Hours: 3/2 Hrs/Week  
Credit: 0.75  
Laboratory Experiments based on EE 3207

EE3213 Microprocessors, Microcontrollers & Peripherals  
Contact Hours: 3 Hrs/Week  
Credit: 3  
Prerequisite Course: EE 3113  
Introduction to different types of microprocessors: 8 bit, 16 bit, 32 bit and their architectures, Pin diagrams and junctions, Pentium microprocessors and Co-processors, RISK & CISC processor. EPROM and RAM (2764 and 6264), Instruction sets and assembly language programming.  
Microprocessor peripherals and their interfacing: Introduction to some available microprocessor peripherals IC’s and their applications such as 8251, 8253, 8254, 8255, 8257, 8259, 8279. A/D and D/A converter interfacing.  
Introduction to Networking: Network architectures, Introduction to ISO reference model.  
Introduction to operating system and Memory management.  
Microcontroller and embedded system: Introduction to AT89C52.

EE 3214 Microprocessors, Microcontrollers & Peripherals Sessional  
Contact Hours: 3 Hrs/Week  
Credit: 1.5  
Laboratory experiments based on EE 3213

EE 3215 Electrical Measurement & Instrumentation  
Contact Hours: 4 Hrs/Week  
Credit: 4  
Measurement of resistance, inductance and capacitance, balancing procedure for A.C bridges, cable faults and localization of cable faults, magnetic measurement, ballistic galvanometers, flux meter, separation of iron losses, high voltage measurement.  
Measuring instruments: Classification, operating principle of ammeters, voltmeters, wattmeter and watt-hour meters.  
Introduction to instrumentation Error: Classification of error, normal law of error, guarantee of error.  
Transducer: Resistive, strain gauges, thermal, magnetic, LVDT, capacitive, piezoelectric, optical, current and potential transformers.  
Electronic measuring instruments: Oscilloscope, DMM, VTVM, TVM.  
Computer based instrumentation: PC-based data acquisition, filtering by moving average, Instrumentation for process control, data conditioning.  
Mechanical measurement: Measurement of speed, frequency, pressure, temperature, flow force, weight level detector, shaft encoder.
EE 3216 Electrical Measurement & Instrumentation Sessional
Credit: 1.5
Contact hours: 3 Hrs/Week
Laboratory Experiments based on EE 3215

EE 3220 Electrical Machine Design Sessional
Credit: 0.75
Contact hours: 3/2 Hrs/Week
Specification and design of electromagnets, solenoids, chokes, transformers and induction motors.

EE 4000 Project and Thesis
Credit: 1.5
Contact hours: 3 Hrs/week
Study of problems in the field of Electrical & Electronic Engineering

EE 4101 Control System Engineering
Credit: 3
Contact Hours: 3 Hrs/Week
Introduction to control system: Conventional control system, steady state response to step, ramp, and parabolic inputs, transient response, poles and zeros, frequency response from pole-zero diagram, Routh’s stability criterion; block diagrams, canonical forms, transfer functions and signal flow graph, root locus, frequency response, Nyquist’s stability criterion. Modern control system: Introduction, state variable analysis, controllability and observability, application of Eigen value, linear control system design by state feedback. Controller design: On-off, fuzzy, P, PI, PD and PID types, introduction to programmable logic controllers (PLC), temperature control system, position control system.

EE 4102 Control System Engineering Laboratory
Credit: 0.75
Contact Hours: 3/2 Hrs/Week
Sessional based on EE 4101

EE 4103 Power system Analysis-II
Credit: 3
Contact Hours: 3 Hrs/Week
Prerequisite Course: EE 3203
Insulators for overhead lines: Types of insulators, their constructions and performance, potential distribution in a string of insulators, string efficiency, methods by equalizing potential distribution, special types of insulators, testing of insulators. Mechanical characteristics of transmission line: Sag and stress analysis, effect of wind and ice loading, supports at different elevation, conditions of erection, effects of temperature changes. Insulated cables: Underground cables vs. overhead lines, insulating materials, electro static stress grading, three core cable-dielectric losses and heating, modern developments oil filled and gas filled cables, measurements of capacitance, cable testing, corona & corona power loss. Economic marginal transmission cost and tariff: energy rates and analysis, economic operation of power system. Recent trends in transmission system: Overview of flexible ac transmission system (FACTS), high voltage dc transmission system (HVDC) and SCADA.
**Power system stability**: The stability problem of power system, distinction between steady state and transient stability, the swing equation, equal area criterion and its applications, solution of swing equation, factors affecting transient stability, improving stability.  
**Typical layout of a substation and load curves**: Demand factor, diversity factor, load duration curves, energy load curve, load factor, capacity factor, plant factor and load forecasting.

**EE 4104 Power System Analysis-II Sessional**  
Credit: 0.75  
Contact hours: 3/2 Hrs/Week  
Sessional based on EE 4103

**EE 4105 Communication Engineering-II**  
Credit: 3  
Contact Hours: 3 Hrs/Week  
Prerequisite Course: EE 3205

**Telephony**: Introduction to telephone system, principles, microphone, receiver and elements of telephone.  
**Ex-change**: Introduction to switching systems, strowger and crossbar exchange, digital exchange, signaling & switching technique, traffic theory, PABX system, telephone/exchange tariff measurement.  
**Mobile communication**: 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.  
**Introduction to networks**: ISDN, B-ISDN, LAN, MAN, WAN, BLUETOOTH, ATM, and multimedia communication, Unicast, Multicast, and Broadcast.

**EE 4106 Communication Engineering –II Sessional**  
Credit: 0.75  
Contact hours: 3/2 Hrs/Week  
Sessional based on EE 4105

**EE 4109 Power Electronics and Industrial Drives**  
Credit: 3  
Contact Hours: 3 Hrs/week  
Prerequisite Course: EE 3109

*Semiconductor power devices*: SCR, TRIACS power MOSFET and IGBT.  
**AC to AC converter**: Thyristor converter, characteristics, commutation, dc motor speed control, harmonics, power factor control and cycloconverter.  
**DC to DC converter**: characteristics and operation, dc motor speed control, switching converter and power supplies.  
**DC to AC converter**: Three phase and single phase voltage source and current source inverters, voltage, frequency and harmonic control, PWM inverters, SVM inverter.  
**Introduction to power electronic control of motors**: Scalar and vector control of poly phase induction motors, rotor power control, synchronous motor and PMSM motor control.  
**Industrial applications**: Introduction to resistance welding, saturable reactors and magnetic amplifiers, dielectric heating, induction heating.
EE 4110 Power and Industrial Electronics Sessional Credit: 0.75
Contact hours: 3/2 Hrs/Week
Laboratory experiments based on EE 4109

EE 4130 Seminar Credit: 0.75
Contact hours: 1.5 Hrs/week
Students will present two papers / topic related to their thesis work in two seminars. The papers must be published in any renowned journals or conferences. The papers should be electrical or electronics engineering related.

EE -4000 Project and Thesis Credit: 3.0
Contact hours: 6 Hrs/Week
Study of problems in the fields of Electrical and Electronic Engineering (Continued from the 4th year first semester)

EE 4203 Switchgear and Protection Credit: 3.0
Contact Hours: 3 Hrs/Week Prerequisite Course: EE 4103
Circuit breakers: Types, ratings, constructions and selections, arc extinction, maintenance, testing and recovery voltage.
Fuse: Commercially available fuses, their constructions, characteristics and applications.
Relays: Types, construction, principle and operating characteristics of over current, IDMT, reactance, directional, power and impedance relays, balanced current relaying of parallel line, ground fault relaying, pilot relaying principles, protection relay schemes for generators, transformers, line feeders, buses, motor, generator and power systems, reactors, lightning arrestors, surge absorbers, ground wire, generators grounding, co-ordination of over current relay.
Bus bar system and reactors: Simple bus bar, double bus bar, ring bus bar, Reactors

EE 4204 Switchgear and Protection Sessional Credit: 0.75
Contact hours: 3/2 Hrs/Week
Sessional based on EE 4203

EE 4205 Communication Engineering-III Credit: 3.0
Contact Hours: 3 Hrs/Week Prerequisite Course: EE 4105
Optical communication: Introduction, light propagation through optical fiber, ray optics theory and mode theory, optical fiber, types and loss 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: dispersions, nonlinear refraction, four wave mixing and laser phase noises, optical amplifier: laser and fiber amplifiers, applications and limitations, introduction to multi-channel optical system.
Satellite communication systems: Introduction to satellite communication systems, communication satellite subsystems, earth station, regenerative satellite systems, broadcasting by satellites and satellite link analysis.

EE 4206 Communication Engineering-III Sessional
Contact hours: 3/2 Hrs/Week
Credit: 0.75
Sessional based on EE 4205

EE4235 Digital Signal Processing
Contact hours: 3 Hrs/week
Credit: 3

Introduction to Digital Signal Processing (DSP): Digital signals and systems: Operations in digital signal processing, the scope of DSP, analog to digital conversion, frequency Domain Effects of Sampling: Periodic repetitions in frequency domain due to sampling in time domain, recovery of continuous-time signal from its samples (reconstruction), role of anti-aliasing and reconstruction filters, examples of aliased signals (how waveform is distorted), impulse response, finite impulse response (FIR) and infinite impulse response (IIR) of discrete-time systems, difference equation.

Discrete Transformations: Discrete Fourier series, the Discrete-Time Fourier Transform, discrete Fourier transform (DFT) and fast Fourier transform (FFT): Forward and inverse transforms; coefficient ordering; time and frequency resolution; periodic extension, zero padding and modulo-M reduction; properties of the DFT, circular convolution; Cooley-Tukey decomposition, recursive application, radix-2 FFTs, time and frequency decimation, computational complexity.

Z-Transforms: Basic Theory: background idea behind the z-transform (solution to LTI discrete-time diff. eq.), calculation of z-transform and its inverse (briefly), regions of convergence, Properties of z-transforms: role in solution of discrete-time LTI systems, convolution property and graphical interpretation of the convolution operation, z-transforms of cascaded systems, stability and causality, Realization and frequency Response: Frequency response (Magnitude and Phase), representation of LTI systems with rational polynomials, block-form implementations of a rational polynomial transfer function

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, linear phase, Butterworth, Chebychev, Inverse Chebychev, Bessel and elliptic filters, finite precision effects in implementing digital filters.

Implementing Digital Filters: Block-diagram representations; direct forms; cascade forms, first and second-order factors; parallel forms; feedback loops transposed forms; linear-phase FIR structures.

Wavelets: Short time Fourier transform; fundamentals of wavelets, wavelet transform (continuous and discrete), time - frequency density and orthogonal bases.

EE-4236: Digital Signal Processing Laboratory
Credit: 0.75
Contact Hours: 3/2 hours/week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EE-4235. In the second part, students will design simple systems using the principles learned in EE-4235.
**Elective subjects**  
(Optional-I, Optional-II, Optional-III & Optional-IV)

**Hum 2203 Sociology and Government (Optional-I)**  
**Credit:** 3  
**Contact hours:** 3 Hrs/Week

*Sociology* and its development; of Bengali society.  
*Fundamental concepts:* Society, Community, and Association, Group property; some evaluation and techniques of production; Culture and civilization.  
*Sociology and culture of Bangladesh:* pre-industrial & industrial society; Urbanization & Industrialization in Bangladesh; Impact of Industrialization & urbanization; Population and urban Ecology. Social problems: population, poverty, prostitution, Beggary, Crime and juvenile delinquency; problems arising out of liberation in Bangladesh primitive society; Social structure of the tribal people of Bangladesh.  
*Government:* Scope and utility of Government and politics, relation of political sciences; the origin and development of the state functions of the modern state; citizenship. Modern forms of Govt.: The electorate, public opinion part system, Democracy and socialistic ethics; Development of political through Plato and his “Republic”, Aristotle and “Policies”. Contribution of Islam to political thought. Feudalism (India Feudalism). Political importance of Feudalism; Fascism and Marxism; Fascism and Marxism; UNO; constitution of Bangladesh.

**Hum 2217: Professional Ethics and Moral Thoughts (Optional-I)**  
**Credit:** 3.0  
**Contact hours:** 3 Hrs/week

Introductions, egoism and relativism, relativism and subjectivism, Utilitarianism, rationalist Ethics, the Ethics of character and virtue.  
Cultural relativism and cultural sensitivity, ethics and religion, professional ethics codes.  
Definition of morality and moral thoughts, responsibility, interpersonal moral sentiments (anger, blame, and praise), respect for persons, intrapersonal moral sentiments (shame and guilt), reason, emotion, and intuition in moral judgment, morality and religion, confidentiality, privacy and harassment.

**Hum 2219: Occupational Psychology (Optional-I)**  
**Credit:** 3  
**Contact hours:** 3 Hrs/week

*Personnel Selection and Assessment:* Theory and context of personnel assessment; models of selection; validity, reliability and fairness; equal opportunities; selection interviews; psychometric tests; assessment centers; work samples; personality inventories; ethical issues in candidate assessment; assessment of managerial aptitude and other specific abilities. Feedback skills; performance appraisal; career development; counseling and personal development.  
*Organizational Behavior and Health:* Training and development in organizations; training needs analysis; models of training evaluation. Employee relations; the psychological contract at work; motivation theories, models and applications; job satisfaction and performance; job satisfaction and quality of working life; counseling at work; age and work; the impact of unemployment.  
*Human Factors and Ergonomics:* Job demands and job design; ergonomics; person-centered and job-centered approaches; person-machine interface, human-computer interaction;
psychological well-being at work; stress management; repetitive strain injury; organizational health assessment; human error; shift-work.

Assessing People for Work: Organization design; organization structure and performance; organization development and change; psychological bases of resistance to change; culture and climate in organizations; leadership style and models of leadership; work groups and team effectiveness at work; team building models and validation evidence; inter-group cooperation and conflict in organizations; business strategy at work; organizations and their environments. Multivariate Theories and Methods in Occupational Psychology: Topics selected from: principles of factor analysis; methods of factoring and rotation; factor analytic models of ability and personality; multivariate analysis of variance; multivariate classification procedures; profile analysis; typologies, nature of typologies, measurement of similarity; making predictions and testing hypotheses involving several measures; fitting and testing models about categorical data; general approaches to prediction, measurement and control in psychological investigations.

Research Design and Analysis: Basic concepts in research design; variables and definitions; populations and samples; reliability and validity, meta-analysis; experimental methods; quasi-experimental design; quality of life in the workplace; social indicators; evaluation research; observation methods and survey research; questionnaires and modular survey design; survey research; comparison groups and norms; new paradigms; ethics in research; applying research methods to small groups in organizations.

EE4107 Generalized Machine Theory (Optional-II) Credit: 3
Contact hours: 3 Hrs/Week

Introduction to generalized machine theory; Kronis primitive machine; Moving to fixed axis transformation; Parkis transformation; Three-phase to d-q transformation; Variable coefficient transformation; other transformations. Matrix analysis of machine; three phases synchronous and induction machine and two-phase servo motor analysis; Diagonalization by a change of variable, Unsymmetrical three phase machines.

EE4113 Embedded Systems (Optional-II) Credit: 3
Contact Hours: 3 Hrs/Week

Embedded systems introduction: Processor technologies, implementation technologies, and design technologies, overview of dedicated and automated systems and their specific requirements (robust design, environmental issues, temporal constraints, technological constraints, software systems), the product design cycle, development of a system specification including case studies, evaluation and justification of the available levels of system integration (custom chip design through to turnkey-systems) and technological choice, Power issues in embedded systems.

Software Issues: Development environment: compilers, linkers, debuggers, emulators, real time operating systems and kernels. Designing and implementing code for dedicated systems. IP- and Platform-Based SoC Designs.


Transducers: sensors for measuring physical phenomena, output devices such as power actuators and motors, data transformation, signal conditioning and data conversion, the impact of EMC regulations on design practice.

Implementation technologies: Custom VLSI, standard cell and gate array, programmable logic devices (including FPGA’s).

Design technologies: Synthesis (of custom processors using VHDL, synopsis FPGA Express and Xilinx FPGA’s), verification (simulation and test) and intellectual property.

EE 4119 Telecommunication Switching (Optional-II) Credit: 3
Contact hours: 3 Hrs/Week

Introduction to switching systems Different types of switching, SPC and digital signaling and switching techniques, design of switching centers, Traffic theory, Telephone network organization, Practical signaling system switching network design, Charging and numbering plan, Time and space switching, Introduction to ATM.

EE 4121 VLSI Design (Optional –II) Credit: 3
Contact Hours: 3 Hrs/Week

Introduction to microelectronics and MOS technology, basic electrical properties and circuit design processes of MOS and Bi-CMOS circuits, Scaling of MOS circuits, Sub-system design processes and layout. Computational elements: Design of and ALU sub-system, adder, multipliers, memory, registers, and aspects of system timing, practical aspects of design tools and test-ability, CMOS Design: Behavioral description, structural description, physical description and design verification. Introduction to GaAs technology: Ultra-fast VLSI circuits and systems.

EE 4209 Semiconductor Devices & Technology (Optional –III) Credit: 3
Contact hours: 3 Hrs/Week

Processing of devices: Bulk and epitaxial crystal growth,
Etching: Wet chemical etching, RIBE, plasma etching, ion beam milling.
Doping of Semiconductors: Epitaxial doping, doping by diffusion, ion implantation.
Lithography: Photo-resist Coating, mask generation and image transfer.
Hetero-Junction Devices: Band alignment, band offset, Anderson’s rule, single and double sided hetero-junctions, quantum wells and quantization effects, lattice mismatch and strain and common hetero-structure material systems, hetero-Junction diode, Band banding, carrier transport and I-V characteristics, hetero-junction field effect transistor, structure and principle, band structure, carrier transport and I-V characteristics:
EE 4211 Microwave Engineering (Optional- III)  
Contact Hours: 3 Hrs/Week  
Credit: 3

Microwave Tubes: Transit time effects. Velocity modulation, Klystron amplifier, multicavity Klystron amplifier, reflex Klystron oscillator, magnetron, test wave tube (TWT) amplifier, backward Wave Oscillator (BWO).  
Transmission lines: High frequency transmission lines, smith chart, impedance matching techniques and applications.  
Antennas: Antennas & radiation, Hertzian dipole, long antennas analysis, antenna arrays, introduction to antenna array design, rhombic & slot antenna, frequency independent and log-periodic antennas, V-antenna, introduction to microstrip antenna.

EE4233 High Voltage Engineering (Optional-III)  
Contact Hours: 3 Hrs/Week  
Credit: 3

High voltage supplies: AC: Cascaded Transformers, Tesla coils. DC: Valve Rectifier circuits, Cascaded Rectifiers, Electrostatic generators, Graff generators.  
Corona: Power loss calculation, Break down of solid, liquid and gaseous dielectrics. Insulation testing, standard specifications; High voltage DC. Transmission, merits and demerits over AC transmission; Bridge arrangement. Mathematical analysis of the bridge circuit, Regulation, Reactive power, artificial commutation.  
Protection against lighting and Insulation co-ordination: Lighting phenomena, Direct and indirect lighting, Transmission line design based on Direct strokes, ground wire; Protective devices: lightning arrestors and protector tubes; Insulation co-ordination and transformer insulation protection; Selection of lighting arrester, BIL.

EE 4237 Reliability analysis and prediction (Optional-III)  
Contact hours: 3 Hrs/Week  
Credit: 3

Reliability Concept: Concept of Reliability, mean time to failure, mean time between failures, down time, up time, type of failures, Burn in, useful life and wear out periods, debugging Bath tub curve.  
Combinational reliability: Series, parallel, K-out-of m configurations, reliability evaluation of complex systems by inspection, event space, path-tracing, decomposition, утест и детектирование, matrix methods, critical dependent failures.  
Catastrophic failure models: Failure data, failure modes, reliability in semesters of hazard rate and failure density, Hazard models: constant hazard, linearly increasing and linearly decreasing hazard models and their comparison; weibull model, exponential hazard, piecewise linear models.  
System Reliability: system reliability evaluation of series, parallel K-out-of m, standby configurations in semesters of hazard rates, approximation and bounds, meantime to failure, Markov models, computer methods of analysis, and analog and digital simulation, Monte Carlo methods.
**Reliability Improvement:** Component improvement, redundancy concepts, component and system redundancy, redundancy in digital systems, comparison of active and standby redundancy.

**EE4239 Artificial Intelligence (Optional- III)**  
**Contact Hours:** 3 Hrs/Week


**EE 4201 Advanced Control System (Optional- IV)**  
**Contact Hours:** 3 Hrs/Week

**Closed loop pole zero Assignment (State-Variable feed back):** Introduction to modern control system: Optimal design by use of quadratic performance index, structural properties of linear multivariable control systems. Digital control system: Digital PID, PLC based practical control system, optimal control problem, adaptive control system, adaptive tuning of control parameters, introduction to Neuro-Fuzzy controllers, comparison between Neuro-Fuzzy and conventional controllers

**EE 4213 Digital Image Processing (Optional-IV)**  
**Contact Hours:** 3 Hrs/Week

**Basic Image Processing System:** Image sources, characteristics, image representation, hardware and software requirements

**Two Dimensional Systems:** Properties of two dimensional sequence and Systems, 2D Fourier Transform, 2D Z-Transform, 2D sampling Theory.

**Image quantization:** Image Perception, quality Measures.

**Image Transform:** 2D DFT, 2D DCT, Sine Transform, Hadamard, Slant and KL Transform.

**Image compression algorithms:** Pixel coding-PCM, run length Coding, predictive technique DPCM, transform coding-DCT, Vector Quantization, VQ in image coding, wavelet based compression, intra-frame coding, standard for image compression-JPEG, MPEG.

**Image segmentation:** Feature extraction, edge detection, boundary extraction, region representation, moment representation, shape feature, scene matching, image segmentation, classification techniques of super supervised and non-supervised learning.
EE 4217 Power Plant Engineering (Optional- IV)  Credit: 3
Contact Hours: 3 Hrs/Week

Planning of power Plant: Generating capacity and selection of plants, types of load and their
effects. Plant location: Site selection for different plants, plant performance.
Station performance: Efficiency, heat rate and incremental rate, load division between
generating units for economy.
Generation scheduling: deterministic and probabilistic.
Conventional power plant: Hydro and thermal power plant, generating cost.
Nuclear power plant: Nuclear fission and fusion; energy release; moderation, control,
cooling and shielding aspects; Nuclear power station of different types.
Non-conventional power generation: Microhydel power plant; Wind, magneto
hydrodynamic and photovoltaic power generation.
Reliability concepts: Failure rate, outage, mean time of failure, series and parallel systems
and redundancy, Reliability evaluation techniques of single area system.

EE 4219 Opto-Electronics Integrated Circuit (Optional-IV)  Credit: 3
Contact hours: 3 Hours/week

Fundamentals of opto-electronic devices: theory and industrial practice, photo detectors,
quantum efficiency, gain, bandwidth, noise, light emitting diodes and lasers, homojunction,
heterojunction, BH, quantum well structure lasers, wavelength, power, line width, linearity,
temperature sensitivity.
Optical modulators: Bandwidth speed, extinction ratio, switching voltage.
Opto-electronics Integrated circuits: Integration techniques, monolithic, hybrid integration,
integrated receivers, integrated transmitter, integrated guided wave devices, photonic crystal
integrated circuits,
Opto-electronic system packing: Packing consideration, optical alignment, power dissipation
loss, RF port, operation sensitivity, optical transponders, system monitoring, function,
silicon optical bench, optical and RF connector.
Opto-electronic interconnection: Wavelength division multiplexing(WDM) optical fiber
interconnect systems, CWDM, DWDM, parallel rack to rack optical interconnect, back
plane, (for board to board), on board high speed digital interconnection, (chip to chip).
Opto-electronic system: Opto-electronic communication systems; imaging systems, digital
video camera, image intensifiers, multi-wavelength imagers, displays, liquid crystal
displays, optical MEM array displays, optical storage systems; 3D hologram.

EE4221 Biomedical Engineering (Optional- IV)  Credit: 3
Contact Hours: 3 Hrs/Week

Action potential, ECG, EEG, and EMG signals, their origin and applications in medical
diagnosis. Electrodes for recording ECG, EEG and EMG signals, instrumentation
amplifiers, signal Conditioners, A/D and D/A converter interfaces to PC, computerized
Automatic Analysis, Biotelemetry, monitoring biological parameters from distance.
Transducer for physiological parameter reading, their characteristics, measurement of body
temperature, blood pressure and heart beat.
Diagnostic methods, ultrasound, CT and MRT, merits of these methods, surgical diathermy
machines, defibrillators, pacemakers, ventilators, intensive care Units. Lasers and
applications of Lasers in medical diagnostics and therapy, Prosthesis and Prosthetic devices,
patient Safety, electrical shock hazards, incorporation of safety aspects in biomedical instrumentation.

CONTENTS OF THE COURSES OFFERED BY OTHER DEPARTMENT FOR UNDERGRADUATE STUDENTS OF ELECTRICAL & ELECTRONIC ENGINEERING

COURSES OFFERED BY THE DEPARTMENT OF CIVIL ENGINEERING

CE-1104 Civil Engineering Drawing
Credit: 0.75
Contact hours: 3/2 Hrs/Week


CE-2103 Strength of Material & Structure
Credit: 3
Contact hours: 3 Hrs/Week

Stress and strain: Tension and compression; Internal force; stress; Axial stresses and shear stresses; Strain; Elasticity and elastic limit; Hook’s law; Modulus of Elasticity; Proportional limit; Stress strain diagram; Bearing stress; Hoop stress; Centrifugal stress; thermal stress; shearing strain; Modulus or rigidity; Impact load.

Combined stress and strain: Stress in an inclined plain of an axially load member; principal stress and principal plane; thin walled pressure vessel; Mohr’s circle; pure shear; Relation between modulus of rigidity and modulus of elasticity; Combined stress and principal planes.

Torsion: Relation between shearing stress and torque in solid and hollow shaft; Torsional stiffness and equivalent shaft; close coiled helical spring. Statically determinate Beams; Simple beams; different types of loading and reactions at supports; shear force and bending moment; shear force and bending moment diagrams; relation between shear force and bending moment; superposition principle; consideration for flexure equation and distribution of bending stress; Shearing stress due to bending; Economical sections; Deflection of beams.

Column Theory: Compression blocks struts; column and braces; Euler’s column formula for central load and different end conditions; Modes of failure and critical load; Slenderness ratio and classification of column; Secant formula for columns with eccentric loading; Empirical formulae; straight line equation.

CE-2104 Strength of Material & Strictures Sessional
Credit: 0.75
Contact hours: 3/2Hrs/Week

Experiments based on CE-2103

COURSES OFFERED BY THE DEPARTMENT OF MECHANICAL ENGINEERING
ME-1203 Basic Mechanical Engineering

Credit: 3
Contact hours: 3 Hrs/week

Introduction to the sources of heat energy. Renewable and non-renewable sources and their potential; Introduction to steam generation, Steam generator: Boilers and their classification; Working principle of few common and modern boiler; boiler mountings and accessories; Performance of boiler. Heat engines: Gas turbines, diesel engines, petrol engines, Fuel, lubrication and cooling systems of I.C engines.

Energy and First law: Systems and surroundings; Conservation of energy; Different thermodynamic processes; Energy transfer as heat for a control volume.

Entropy and Second law: Reversibility and irreversibility; Definition and corollaries of second law of thermodynamics. Entropy: its transfer and change.

Characteristics of some thermodynamic cycles: Analysis of different thermodynamic cycles, vapor power cycles, Representation of various cycles on PV & TS planes.

Basic concepts of refrigeration systems: Vapor compression refrigeration, Absorption refrigeration, cop, refrigerants and their classifications and properties.

Air conditioning: Introduction, objectives and major components of air conditioning systems; Humidity; Dew point.

ME-1204 Basic Mechanical Engineering Sessional

Credit: 0.75
Contact hours: 3/2 Hrs/week

Experiments based on basic mechanical engineering (ME1203).

COURSES OFFERED BY THE DEPARTMENT OF INDUSTRIAL ENGINEERING AND MANAGEMENT

IEM2103 Industrial Management

Credit: 3
Contact hours: 3 Hrs/Week

Introduction: Evolution and various thoughts of management, organization and environment, Organization: theory and structure, co-ordination, span of control, authority, delegation, centralization and decentralization,

Personal Management: need hierarchy, motivation, leadership, performance, appraisal, wages and incentives, organizational change and conflicts.

Cost and financial Management: Elements of costs, of products depreciation, break event analysis,

Operational Management: Forecasting, inventory management, ABC analysis, MRP and JIT, master planning, basic scheduling technique, CPM and PERT, plant Location, and layout, maintenance management, manage information system(MIS), computer aided process planning (CAPP), manufacturing resource planning,(MRP-II)
COURSES OFFERED BY THE DEPARTMENT OF PHYSICS

Ph-1103 Physics-I  Credit: 3
Contact Hours: 3Hrs/Week

Heat and thermodynamics:
Thermometry: Concepts of heat and temperature, measurement of high and low temperature, resistance thermometer, constant volume thermometer, thermo electric thermometer and pyrometer.
Equation of state: Physical explanation of the behavior of real gases. Andrew’s experiments, Vander walls equation, Critical constants, defects of Vander wall’s equation, State of matter near the critical point.
Thermodynamics: Zeroth law of Thermodynamics and its significance. First law of thermodynamics, Carnot’s cycle, Carnot’s engine, thermionic emission, entropy changes in reversible and an irreversible process, entropy of a perfect gas, zero point energy and negative temperature, Maxwell’s thermo dynamical relations.
Wave and oscillations: Wave and composition of simple harmonic motion, simple harmonic motion, average value of kinetic and potential energies of a harmonic oscillation, superposition of simple harmonic motions, uses of Lissajous figures.
Damped and forced harmonic oscillator: Damped oscillatory system, damped harmonic oscillation, the LCR circuit, forced vibration, quality factor of forced oscillator, sharpness of resonance, phase of driven oscillator, power absorption.
Wave Motion: Types of wave, progressive and stationary wave, Energy distribution due to progressive and stationary wave, interference of sound wave, phase velocity and group velocity.
Sound Wave: Audible, ultrasonic, infrasonic and super sonic waves, Doppler’s effects and its application, applications of ultrasonic sound.
Acoustics: Intensity of sound, Bel, sound pressure level, phonon, acoustic intensity, architectural acoustics, Diffraction of sound, Musical sound, and noises, Speech, Characteristic’s of musical Sound.
Building Acoustic: Reverberation, Sabine’s reverberation formula, growth intensity, decay intensity, reverberation time and absorption co-efficient, requisites for good acoustic.
Optics:
Interference: Nature of light, interference of light, coherent sources, young double slit experiment, energy distribution,, condition for interference, production of interference fingers, Fresnel Bi-prism, Newton’s ring.

Ph-1104 Physics Sessional  Credit: 0.75
Contact hours: 3/2 Hrs/Week

Experiments based on Physics- I (Ph-1103)
Solid State Physics:
Crystal structure: Periodic array of atoms, fundamental types of lattices, Miller index.
Reciprocal Lattices: Diffraction of waves by crystals, scattered wave amplitude, Brillouin Zones, Fourier analysis of basis.
Phonon: Vibration of crystal with monatomic basis, two atoms per primitive basis, phonon heat capacity, thermal conductivity, enharmonic crystal interaction.
Free electron Fermi gas: Energy levels in one dimension, Fermi-Dirac distribution, heat capacity of electric gas, electrical conductivity and Ohms law, motion in magnetic law, thermal conductivity of metals.
Breakdown of the classical theory of conductions: Mean free paths, specific heat, Hall Effect, Fermi structure of metals, construction of Fermi surface, electron orbits, hole orbits and open orbits, Wigner-Scitz method for calculation of energy bands, Fermi surface of copper, velocity of electron according to band theory.
Modern Physics:
Practical properties of waves: Black body radiation, Planck’s Quantum hypothesis, Photo electric effect, The Crompton effect, Quantum state of energy, Dual Character of light, X-ray diffraction, formulation of Bragg and Von Laue, Application of x-ray.
Wave Properties of matter: De Broglie’s hypothesis, nature of De Broglie’s waves, phase velocity and group velocity, uncertainty principle, elementary proof Heisenberg’s uncertainty relation; application of uncertainty principle.
Atomic Structure: Bohr’s atom model, nature of electron orbits, orbital energy, electron energy levels in hydrogen, orbital energy level diagram of hydrogen atom, correspondence of principle, vector atom model, space quantization, magnetic moment of orbital electron, quantization of magnetic moment; spin magnetic moment of an electron.
Nuclear Physics:
Nuclear energy: Fission and fusion process, mass distribution, energy distribution, chain reaction, binding energy, nuclear force, nuclear reactor.
Relativity: Galilean Transformation, Lorentz transformation, length contraction, time dilation, proper and non proper time, relativistic variation of mass, Einstein’s mass energy relation; Min Kowaski space.

Experiments based on physics-II (Ph-1203).
COURSES OFFERED BY THE DEPARTMENT OF CHEMISTRY

Ch-1103 Chemistry
Contact Hours: 4Hrs/Week

Credit: 4

Crystal symmetry, Miller indices, different methods for the determination of structure; Structures of the metallic elements and certain compounds with 3-dimensional lattices; Defects in solid states, Semiconductors. Electronic structure of the elements: metallic bond, band theory, hydrogen bonding, chelate bond. 

Periodic Table: Generalization of chemical properties from periodic table. Inert gases and their importance in industry.

Chemical kinetics: Theories of reaction rates.

Chemical Equilibrium: Law of mass action and its application; Effect of pressure on chemical equilibrium; Le-Chateller’s theorem and application; Solvent extraction and ion exchange processes.

Electro-Chemistry: Electrolytes; Nerst’s theory of electrode potential, type of electrodes and electrode potentials, emf measurement, polarization and over potentials; Origin of EMF, Free energy and EMF, Electrical double layer, Factor affecting electrode Reaction and current, Modes of Mass transfer, Lithium ion and Lithium ion battery, Transport number; pH value and its determination; Electrode potentials and corrosion, Electroplating and galvanizing.

Nuclear chemistry, Nuclear reaction, nuclear hazard & photochemistry.

Chemistry of polymer: Polymer and polymerization, co-polymerization, ionic polymerization, living polymer, structure and properties of macromolecules, plastic and rubber, conducting polymer.

Ch-1104 Chemistry-I Sessional
Contact Hours: 3/2 Hrs/Week

Credit: 0.75

Experiments based on Ch-1103.

COURSES OFFERED BY THE DEPARTMENT OF MATHEMATICS

Math-1103 Mathematics-I
Contact Hours: 3 Hrs/week

Credit: 3

Differential calculus: Limit and continuity; differentiability; Differentiation: reviews of differentiation of various types of functions, application of differentiation, Successive differentiation; Successive differentiation of different types of functions, Leibnitz’s theorem; Expansion of functions: Rolle’s theorem; Mean value theorem; Taylor’s theorem (finite and infinite forms); Maclaurin’s theorem in finite and infinite forms; Cauchy’s forms of remainder and Lagrange’s forms of remainder. Expansion of functions by differentiation; Indeterminate forms; L’ hospitals Rule; Partial differentiation, Euler’s theorem. Maximum and minimum: Maxima & minima of different types of functions, Physical application, Tangents and normal: Tangents and normal, sub tangent and subnormal in Cartesian and polar co-ordinates; Asymptotes. Curvatures: Curvature, radius of curvature, circle and centre of curvature, Chord of curvature in Cartesian and polar co-ordinates, curve tracing Evolute and involute, envelopes.

Co-ordinate geometry of two dimensions: Change of axes, General equation of second degree.
Co-ordinate Geometry of three dimensions: system of co-ordinates, distance between two points; Direction cosine and ratio; angle between two straight lines; Equation of a plane; Plane through three given points; Angle between two planes; Equation of a straight line through two points.

Set theory: Review of sets, equivalence relations, functions; Boolean algebra: Definition, basic theorems and properties of Boolean algebra, Boolean functions.

Math-1203 Mathematics-II  Credit: 3
Contact hours: 3 Hrs/week  Prerequisite Course: Math 1103

Integral calculus: Definition of integration; Integration by the method of substitution; Integration by parts; Standard integrals; Integration by the method of successive reduction; Definite integrals, its properties and uses in summation of series; Wallis’s formula; Improper integral; Differentiation under the sign of integration, integration under the sign of integration, Beta and gamma functions; Area under a plane curves in Cartesian and polar co-ordinates; parametric and pedal equation, intrinsic equation; volume of solid revolution, volume of hollow solids of revolutions by shell method, area of surface of revolution.

Differential Equations in one Independent Variable: Formation of differential equation, Order and degree of differential equations; Solution of differential equation of first order first degree by different methods; Solution of first order and higher degree, Application of first order differential equation, Solutions of linear differential equations of second and higher orders with constant coefficients; Solutions of homogeneous linear equation.

Math -2103 Mathematics-III  Credit: 3
Contact Hours: 3Hrs/Week  Prerequisite Course: Math 1203

Vector Analysis: Reviews of vector algebra, Vector differentiation: Differential operators; gradient, divergence, curl; Vector integration; line surface and volume integrals, integral theorem: Green’s, Gauss’s and Stoke’s theorems; curvilinear co-ordinates: orthogonal coordinates, spherical and cylindrical polar Co-ordinates; Introduction to tensor.

Matrices: Reviews of matrix algebra; Elementary transformations: inverse by elementary transformation, rank; linear dependence and independence of vectors and matrices; solution of linear equations using matrix, vector spaces. Linear transformations; Eigen values and Eigen vectors; Cayley- Hamilton theorem.

Differential equations: solution in series by Frobenious method. Solution of Bessel’s differential equation; solution of legendre differential equation; Bessel’s function and its properties; modified Bessel’s function, ber and bei functions; Legendre polynomials and its properties, Legendre function of second kind.

Math 2203 Mathematics-IV  Credit: 4
Contact Hours: 4 Hrs/Week  Prerequisite Course: Math 2103

Complex variable: Complex number system; Graphical representation, roots, functions; limits; continuity; complex differentiation, analytic function, Cauchy Riemann equation; singular points, harmonic function, orthogonal family of curves, Complex integration, Cauchy’s theorem; Morera’s theorem, Consequences of Cauchy’s theorem; Cauchy’s integral formula, Expansion of function. Taylor’s and Laurent’s theorem; Residue:
Calculation residues, Residue theorem, Evaluation of integrals, conformal mapping: transformation, Jacobian of transformation, some general transformation.

*Fourier series and Fourier transformation:* Fourier series representation of function, complex form of Fourier series, Parseval’s theorem, Fourier integral, finite Fourier transformation, series, infinite Fourier transformation, use of Fourier transformation in boundary value problems.

*Laplace transform:* Laplace transforms of elementary functions; properties of Laplace transform, inverse Laplace transform and its properties; convolution theorem; application of Laplace transform to solve differential equations related linear circuit and partial differential equations.

*Harmonics:* solution of simple partial differential equation with initial and boundary condition; Heat flow equation; Two dimensional wave equation; solution of two and three dimensional Laplace equation.

**COURSES OFFERED BY THE DEPARTMENT OF HUMANITIES**

**Hum-1103 Technical English**

**Contact Hours:** 3 Hrs/week

*Structure and written expression:* The noun-phrase, the verb phrase, subject verb agreement, pronouns; verb as complements; questions; affirmative agreement (too / so); negative agreement (either / neither); negation; commands; modal auxiliaries; adjectives and adverbs; comparison; nouns functioning as adjective; enough with adjective, adverbs and nouns; cause connectors; passive voice; causative verbs; relative clauses; that-other uses; subjunctive; inclusive; use of know / know how; clause of concession; problem verbs; style in written English; problem with vocabulary and prepositions; verbal idioms.

*Scientific terminology:* Construction of sentences and paragraphs; phrases and idioms; proverbs; punctuation; commercial correspondence and tender notice, amplification and description; Comprehension, précis; Technical report writing; standard forms of term papers, thesis, etc.

**Hum-1204 English skills laboratory**

**Contact hours:** 3/2 Hrs/week

*Grammar:* Tense, article, preposition, subject-verb agreement, clause, conditional and sentence structure.

*Vocabulary building:* Correct and precise diction, affixes, level of appropriateness, Colloquial and standard, informal and formal.

*Developing reading skill:* Strategies of reading, skimming, scanning, predicting, inferring; analyzing and interpreting variety of texts; practicing comprehension from literary and nonliterary texts.

*Developing writing skill:* Sentences, sentence variety, generating sentences; clarity and correctness of sentences, linking sentences to form paragraphs, writing paragraphs, essays, and reports, formal and informal letters.

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

*Developing speaking skill:* Oral skills including communicative expressions for personal identification, life at home, giving advice and opinion, instruction and directions, requests, complaints, apologies, describing people and places, narrating events.
**Economics:**
Definition, scope and methods. Demand, supply and their elasticity’s; equilibrium analysis-partial and general; Consumer behavior, marginal utility; indifference curve, consumer’s surplus; producer behavior; iso-quant, iso-cost line. Factors of production function; production possibility curve; fixed cost and variable cost; short run and long run costs, total, average and marginal cost; laws of returns; internal and external economics and diseconomies; market and market forms; perfect and imperfect competition; price output determinations. Introductory ideas on GNP, GDP, perceptual income, interest, rent, saving, investment, inflation; Project approval, NPV, IRR & their application, cost benefit analysis.

**Accounting:**
*Introduction:* Definition, advantages, objects; Nature of transaction; double-entry system of book-keeping; classification of account.
*Accounting cycle:* Journal, ledger, trial balance, final account including adjustment.
*Final Accounts:* Trading & manufacturing accounts, profit and loss accounts and balance sheet.
*Depreciation:* methods of depreciation.
LIST OF THE COURSES TO BE OFFERED BY ELECTRICAL & ELECTRONIC ENGINEERING DEPARTMENT FOR THE STUDENTS OF OTHER DEPARTMENTS

a) Civil Engineering Department

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Contact Hr/Wk</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE-1172</td>
<td>Basic Electrical Engg.</td>
<td>1.5</td>
<td>0.75</td>
</tr>
</tbody>
</table>

b) Mechanical Engineering Department

<table>
<thead>
<tr>
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<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE-2105</td>
<td>Basic Electrical Engg. &amp; Machines</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>EE-2106</td>
<td>Sessional Based on EE-2105</td>
<td>3/2</td>
<td>0.75</td>
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</tbody>
</table>

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</thead>
<tbody>
<tr>
<td>EE-2205</td>
<td>Electronics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE-2206</td>
<td>Sessional Based on EE-2205</td>
<td>3/2</td>
<td>0.75</td>
</tr>
</tbody>
</table>

c) Computer Science & Engineering Department

<table>
<thead>
<tr>
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<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE-1107</td>
<td>Basic Electrical Engineering</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>EE-1108</td>
<td>Sessional Based on EE-1207</td>
<td>3</td>
<td>1.5</td>
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</tbody>
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</tr>
</thead>
<tbody>
<tr>
<td>EE-1217</td>
<td>Analog Electronic Circuits</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>EE-1218</td>
<td>Sessional Based on EE-2117</td>
<td>3</td>
<td>1.5</td>
</tr>
</tbody>
</table>

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</thead>
<tbody>
<tr>
<td>EE-2113</td>
<td>Digital Electronic &amp; Pulse Tech.</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>EE-2114</td>
<td>Sessional Based on EE-2213</td>
<td>3/2</td>
<td>0.75</td>
</tr>
</tbody>
</table>
## Second Year Second Semester

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Contact Hr/Wk</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE-2217</td>
<td>Electrical Drives and Instrumentation</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>EE-2218</td>
<td>Sessional Based on EE-2217</td>
<td>3/2</td>
<td>0.75</td>
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</tbody>
</table>

## d) Electronic and Communication Engineering Department

### First Year First Semester

<table>
<thead>
<tr>
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<th>Course Title</th>
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<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEE-1109</td>
<td>Basic Electrical Engineering</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>EEE-1110</td>
<td>Sessional Based on EEE-1109</td>
<td>3/2</td>
<td>0.75</td>
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</tbody>
</table>

### Second Year Second Semester

<table>
<thead>
<tr>
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<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEE-2209</td>
<td>Electrical Machines</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>EEE-2210</td>
<td>Sessional Based on EEE-2209</td>
<td>3/2</td>
<td>0.75</td>
</tr>
</tbody>
</table>

### Third Year 1st Semester

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>EEE-3109</td>
<td>Measurement and Instrumentation</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>EEE-3110</td>
<td>Sessional Based on EEE-3109</td>
<td>3</td>
<td>1.5</td>
</tr>
</tbody>
</table>

## CONTENTS OF THE COURSES OFFERED TO THE STUDENTS OF OTHER DEPARTMENT

**EE- 1172 Basic Electrical Engineering Sessional**  
**Credit: 0.75**  
**Contact Hours : 3/2Hrs/Week**

Introduction to electrical circuits and circuit analysis; Study of series and parallel circuit; Measurement of power; Study of Ohm’s Law; Study of AC circuit; Electrical wiring for residential and commercial loads.

**EE-2105 Basic Electrical Engineering and Machines**  
**Credit: 4**  
**Contact Hours : 4 Hrs/Week**

*Introduction to Electricity*: Electrostatics. Current and electricity; Electrical units and standards; Ohm’s law and Introduction to electrical measuring instruments; Storage cells; Magnetic concepts and units; Magnetic circuits and magnetic forces.

*Alternative current and AC quantities*: Steady state solution of single-phase circuits; (R.L, R.L and RLC) RMS and average value of AC quantities: Phasor Algebra.
D.C. Machines: Constructional Features and principles of operation; Shunt, series and compound generators and motors; performance characteristics; Starting and speed control of motors; 2 quadrant and 4 quadrant operation of motors; Choice of dc motors for industrial applications.

Transformers: Constructional features and principles of operation: losses; 3-phase connection of transformers.

Induction motors: Principles of operation; Equivalent circuit and circle diagram; Torque-speed characteristics; Improving starting torque for cage and wind rotor motors; Speed control and braking of induction motors; Single phase induction motors and their uses.

Synchronous Generators and Motors: Principles of operation and simple equivalent circuit, Starting and synchronization of synchronous motors; AC motors in Industrial applications.

EE-2106 Basic Electrical Engg & Machines (Sessional) Credit: 0.75
Contact Hours : 3/2 Hrs/Week

Experiment based on EE-2105

EE-2205 Electronics Credit: 3
Contact Hours : 3 Hrs/Week

Introduction: Time and frequency domain.

Electronic Devices: Junctions, semiconductor diodes, rectifier diodes, Schottky barrier diodes, Zenoor diode, tunnel diode, varactor diode, LED, photo diode, solar cells, Bipolar junction transistor, Field effect transistor, junction and MOS. Unijunction transistor, Four layers diode, SCR, Vacuum tubes, DIAC, TRIAC.

Terminal Behavior: Voltage, current and power gain, input output impedances; Ideal amplifier, equivalent circuits of transistor.

Amplifiers: Biasing, class of amplifiers; BJT and FET amplifiers; Feedback amplifiers, positive and negative feedback; Operational amplifiers, difference amplifier, output circuit, Applications of amplifiers.

Logic and Digital Circuits: Logic operations, basic gates, OR, AND, NOT, NAND, NOR, EXOR; Combination of sequential circuit Flip flops; Shift registers; Counters, binary and BCD; Comparators.

Industrial Electronics: Regulated power supplies; Ignitrons; Resistance welding and timing circuits.

Applications: Instruments CRO, Transducers; Temperature measurement, Audio electronics; Integrated circuits; Microprocessors.

EE-2206 Electronics (Sessional) Credit: 0.75 Contact Hours : 3/2 Hrs/Week

Experiment based on EE-2205
EEE 1107: Basic Electrical Engineering
Credits: 3  Contact Hours: 3 Hrs/Week


Alternating current: instantaneous and r.m.s. current, voltage and power, Average power for various combinations of R, L, and C circuits, Phasor representation of sinusoidal quantities, Single and Poly-phase A.C. circuit analysis

EEE 1108: Basic Electrical Engineering Laboratory
Credits: 1.5  Contact Hours: 3 Hrs/Week

Laboratory works based on EEE 1107

EEE 1217: Analog Electronic Circuits
Credits: 3  Contact Hours: 3 Hrs/Week

Introduction to Semiconductors: p-n junction diode characteristics; diode applications; half and full wave rectifier, regulated power supply using Zener diode; Bipolar transistor : operation principles, characteristics, Small-signal low frequency h-parameter model, hybrid pie model, Amplifiers, Darlington pairs, FET: Introduction to JFET, MOSFET, NMOS, PMOS and CMOS; Biasing and application in switching circuits. Operational amplifiers: Linear application of Op-Amp, gain, input and output impedances, offset null adjustment, frequency response and noise. SCR, TRIAC, DIAC, UJT: characteristics and applications, Introduction to oscillator, rectifiers, active filters, regulated power supply, Stabilizer and UPS, Basic ideas about IC fabrication techniques

EEE 1218: Analog Electronic Circuits Laboratory
Credits: 1.5  Contact Hours: 3 Hrs/Week

Laboratory works based on EEE 2117

EEE 2113: Digital Electronics and Pulse Technique
Credits: 3  Contact Hours: 3 Hrs/Week

Diode logic gates, transistor switches, transistor gates, MOS gates, Logic Families: TTL, ECL, IIL and CMOS logic with operation details. Propagation delay, product and noise immunity. Open collector and High impedance gates. Electronic circuits for flip-flop, counters and register, memory system, PLAs, PLDs, ADC, DAC design with applications. S/H circuits, LED, LCD and optically coupled oscillators. Nonlinear applications of OP AMPS. Analog switches.

EEE 2114: Digital Electronics and Pulse Technique Laboratory  
Credits: 1.5  
Contact Hours: 3 Hrs/Week

Laboratory works based on EEE 2113

EEE 2217: Electrical Machines and Drives  
Credits: 3  
Contact Hours: Hrs/Week


AC Machines: Transformers: Constructional features and principles of operation.


EEE 2218: Electrical Machines and Drives Laboratory  
Credits: 0.75  
Contact Hours: 3/2 Hrs/Week

Laboratory works based on EEE 2217

EEE 1109: Basic Electrical Engineering  
Credit: 4.0  
Contact Hours: 4 Hours/Week

DC Circuits:  
Fundamental Concept: Linear Parameters, Resistance, Inductance & Capacitance and their Properties.

Solution of Electrical Networks: Branch Current analysis, Loop and Nodal Analysis, Thevenin’s, Norton’s, Superposition, Millman’s and Reciprocity Theorems, Wye-Delta transformation, Condition for Maximum Power Transfer.


Source Concept: Sources of EMF, Dependent and Independent Sources, Primary and Secondary Cells.

AC Circuits:  
Introduction to Alternating Current Circuits: Sinusoidal voltage & current, frequency, phase difference, Energy Stored in Capacitor & Inductor, Average and RMS Values, Complex Impedance and Phasor Algebra, Power relations in AC Circuits, Series and Parallel Resonance.


Coupled Circuits: Analysis of Conductively Coupled and Magnetically Coupled Circuits.

EEE 1110: Basic Electrical Engineering Laboratory  
Credit: 0.75  
Contact Hours: 3/2 Hours/Week

Laboratory based on Basic Electrical Engineering (EEE-1109)
EEE 2209: Electrical Machines  
Contact Hours: 3 Hours/Week  
Credit: 3

**Generator: DC Generator:** Description of Different Parts of DC Generators, EMF equation, Principle of DC Generator. Parallel operation. Application of DC Generator.

**Transformer:** Working Principle and it’s Construction, Parallel Operation, Three Phase operation of Single Phase Transformer, Applications of Single phase & Three Phase Transformer.

**AC Generator:** Construction, Theory of Operation, Alternator Regulation, Synchronizing & Load Sharing of Alternator, Applications of AC Generator.

**Motor: DC Motor:** Principle of operation, Classification, Applications of DC Motor.

**AC Motor:** Induction Motor, General Principles, Rotating Magnetic Field, Starting Methods, Speed Control Methods. Applications of AC Motor.

**Synchronous Motor:** Theory of Operation, Motor Characteristics, Synchronous Condenser, Applications of Synchronous Motor, Introduction to Single Phase a/c Machines, Stepper Motor.

EEE 2210: Electrical Machines Laboratory  
Contact Hours: 3/2 Hrs/Week  
Credit: 0.75

Laboratory based on Electrical Machines (EEE 2209)

EEE 3109: Measurement & Instrumentation  
Contact Hours: 3 Hrs/Week  
Credit: 3


**Error:** Classification of Error, Normal Law of Error, Guarantee of Error.


**Electronic Measuring Instruments:** Oscilloscope, DMM, VTVM, TVM and Their Applications.

Measurement of Speed, Frequency, Pressure, Temperature.

EEE 3110: Measurement & Instrumentation Laboratory  
Contact Hours: 3 Hours/Week  
Credit: 1.5

Laboratory based on Measurement & Instrumentation (EEE 3109)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY  
Academic Ordinance for Post Graduate Studies  
(Effective from January'2005 semester)
(Approved by 6th meeting of Academic Council on 07/02/05 and confirmed by 7th meeting of Academic Council on 07/04/05 and 08/04/05)

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1. **Definitions**

1.1. ‘**University**’ means the Khulna University of Engineering & Technology.

1.2. ‘**Syndicate**’ means the Syndicate of the University.

1.3. ‘**Vice-Chancellor**’ means the Vice-Chancellor of the University.

1.4. ‘**Academic Council**’ means the Academic Council of the University.

1.5. ‘**CASR**’ means the Committee for Advanced Studies and Research of the University.

1.5.1. The CASR shall consist of the following members:

i) Vice-Chancellor Chairman

ii) Three Professors to be nominated by the Syndicate Member

iii) Two teachers having research experience to be nominated by the Academic Council Member

iv) Two experts, at least one from outside the University, to be nominated by the Vice-Chancellor Member

v) The Director (Research and Extension) Member-Secretary

1.5.2. At least one-third members will fulfill the quorum.

1.5.3. The term of office of the nominated members shall be three years.

1.6. ‘**EC**’ means the Executive Committee of any Faculty of the University.

1.6.1. The EC shall consist of the following members:

i) Dean of the Faculty Chairman

ii) Head of the Departments under the Faculty Member

iii) All Professors and Associate Professors of the Departments under the Faculty Member

iv) Three teachers, not related to the subjects of the Faculty but closely related to the subjects according to the Academic Council, nominated by the Academic Council Member

v) Two persons, having special knowledge to one or more subjects of the Faculty and not serving in the University, nominated by the Academic Council Member

1.6.2. At least one-third members will fulfill the quorum.

1.6.3. The term of office of the nominated members shall be three years.

1.7. ‘**ACPG**’ means the Academic Committee for Post-Graduate studies in a degree-awarding department of the University.

1.7.1. The ACPG shall consist of the following members:

i) Head of the Department Chairman

ii) All Professors and Associate Professors of the respective Department and all teachers who teach in the post-graduate classes
iii) One Professor from the relevant field from any other University to be nominated by the Vice-Chancellor

iv) One expert from the relevant field having experience in any industry, research or commercial organization to be nominated by the Academic Council

1.7.2. The Chairman will nominate one of the members from (ii) to act as the Member-Secretary.

1.7.3. At least one-third members will fulfill the quorum.

1.7.4. The term of the office of the nominated members shall be three years.

1.8. **DSC** means the Doctoral Scrutiny Committee.

1.8.1. The **DSC** shall consist of the following members:

i) Supervisor 

Chairman

ii) Joint Supervisor/Co-supervisor (if any) 

Member

iii) Head of the Department 

Member

iv) Not less than three experts of which at least one from outside the Department 

Member

1.8.2. There shall be a DSC for each Ph. D. student proposed by the Head of the Department and approved by the CASR.

1.8.3. The committee should be formed within 3 (three) months from the date of the student’s provisional admission in consultation with the supervisor.

1.8.4. The DSC will meet from time to time (at least on three occasions) on the request of the supervisor to review the progress of the student.

1.8.5. In special circumstances, the CASR may approve any addition and/or alteration in the DSC on the recommendation of the supervisor through the Head of the Department.

2. **Degree Awarding Departments**

The University shall have the following post-graduate degree awarding Departments:

i) Department of Civil Engineering

ii) Department of Electrical and Electronic Engineering

iii) Department of Mechanical Engineering

iv) Department of Computer Science and Engineering

v) Department of Electronics and Communication Engineering

vi) Department of Industrial Engineering and Management
vii) Department of Mathematics

viii) Department of Chemistry

ix) Department of Physics

x) Any other Department to be instituted by the Syndicate on the recommendation of the Academic Council from time to time.

3. Degrees Offered

The Post-Graduate degrees to be offered by the University under this ordinance are as follows:

3.1. Master of Science in Engineering

i) Master of Science in Civil Engineering abbreviated as M. Sc. Eng. (CE)

ii) Master of Science in Electrical & Electronic Engineering abbreviated as M. Sc. Eng. (EEE)

iii) Master of Science in Mechanical Engineering abbreviated as M. Sc. Eng. (ME)

iv) Master of Science in Computer Science & Engineering abbreviated as M. Sc. Eng. (CSE)

v) Master of Science in Electronics & Communication Engineering abbreviated as M. Sc. Eng. (ECE)

vi) Master of Science in Industrial Engineering & Management abbreviated as M. Sc. Eng. (IEM)

vii) Any such other degree as may be approved by the Syndicate on the recommendation of the Academic Council from time to time.

3.2. Master of Philosophy

i) Master of Philosophy in Mathematics abbreviated as M. Phil. (Math)
ii) Master of Philosophy in Chemistry abbreviated as M. Phil. (Chem)

iii) Master of Philosophy in Physics abbreviated as M. Phil. (Phy)

iv) Any such other degree as may be approved by the Syndicate on the recommendation of the Academic Council from time to time.

3.3. Doctor of Philosophy

i) Doctor of Philosophy in Civil Engineering abbreviated as Ph. D. (CE)

ii) Doctor of Philosophy in Electrical & Electronic Engineering abbreviated as Ph. D. (EEE)

iii) Doctor of Philosophy in Mechanical Engineering abbreviated as Ph. D. (ME)

iv) Doctor of Philosophy in Computer Science & Engineering abbreviated as Ph. D. (CSE)

v) Doctor of Philosophy in Electronics & Communication Engineering abbreviated as Ph. D. (ECE)

vi) Doctor of Philosophy in Industrial Engineering & Management abbreviated as Ph. D. (IEM)

vii) Doctor of Philosophy in Mathematics abbreviated as Ph. D. (Math)

viii) Doctor of Philosophy in Chemistry abbreviated as Ph. D. (Chem)

ix) Doctor of Philosophy in Physics abbreviated as Ph. D. (Phy)

x) Any such other degree as may be approved by the Syndicate on the recommendation of the Academic Council from time to time.

4. Admission Requirements
4.1. **Master of Science in Engineering**  
For admission to the courses leading to the award of the degree of M. Sc. Eng. in any department, a candidate must have obtained a B.Sc. Eng. or an equivalent degree with at least a CGPA of 2.50 in the scale of 4.00 or its equivalent from any recognized University/Institution in the relevant field/branch and with good previous academic records.

4.2. **Master of Philosophy**  
For admission to the courses leading to the award of the degree of M. Phil. in any department, a candidate must have obtained an M. Sc. or an equivalent degree in the relevant field/branch with at least Second Class/CGPA of 2.50 in the scale of 4.00 in both B.Sc. (Hon's/Pass) and M. Sc. with good previous academic records.

or

A candidate having B.Sc. Engineering degree with good academic records from relevant field/branch, as decided by the ACPG of the respective department, is also eligible; provided that he/she completes some pre-requisite courses as determined by the Selection Committee, constituted under Art 5.3 of this ordinance.

4.3. **Doctor of Philosophy**

4.3.1. For admission to the courses leading to award of the degree of Doctor of Philosophy in any department, a candidate must have obtained an M. Sc. Eng./M. Eng./M. Phil or its equivalent degree with good academic records in the relevant field/branch of Engineering/Science or its equivalent from any recognized University/Institution.

4.3.2. A student already working for an M. Sc. Eng./M. Phil. degree in this University and showing excellent progress and promise in thesis work may be provisionally transferred to Ph.D. program after completion of his/her M. Sc. Eng./M. Phil. course work with a minimum CGPA of 3.50 out of 4.00 on the recommendation of the ACPG and approval of the CASR.

4.4. The above requirements may be relaxed for candidates on deputation or sponsored by Academic Institutions/Research Organizations/Government and Semi-Government Organizations. Such relaxation shall be recommended by the ACPG to the CASR for approval.

5. **Admission Procedures**

5.1. Applications for admission to the above programs shall be invited before commencement of each semester through regular means of advertisement and received by the Registrar.
5.2. On the recommendation of the appropriate EC, the Academic Council shall frame the rules for admission to the University for M.Sc. Eng./M. Phil. /Ph.D. program from time to time.

5.3. There shall be a Selection Committee in each department as constituted by the respective ACPG on the recommendation of the Head of the Department.

5.4. Before being finally selected for admission, a candidate may be required to appear at an interview by the Selection Committee.

5.5. Every selected candidate other than a Ph.D. candidate shall have to get himself/herself admitted to the University within the prescribed time limit on payment of prescribed fees.

5.6. A Ph.D. candidate selected by the Selection Committee shall be provisionally admitted to the University within the prescribed time limit on payment of prescribed fees and he/she may be required to pass the prerequisite credit and non-credit courses, if any, as prescribed by the DSC.

5.7. A provisionally admitted Ph.D. candidate shall be deemed to be eligible for final admission as a Ph.D. student with effect from the date of his/her provisional admission if and when he/she qualifies the comprehensive examination (Art 6.10.3(iii) of this ordinance).

6. Academic Regulations

6.1. There shall be two semesters in one academic year. One will start in January and the other in July.

6.2. The courses of study in a department shall be proposed by the respective ACPG and approved by the Academic Council on the recommendation of the Executive Committee of the respective Faculty. The ACPG may review the curriculum from time to time and propose for any modification if necessary.

6.3. The courses to be offered by a department in any semester shall be determined by the respective department.

6.4. Academic progress shall be assessed in terms of credit hours earned by the student. One credit hour theoretical course shall normally require 14 periods of lecture during one semester while one credit hour of laboratory/project/thesis work should normally require 42 periods of laboratory/project/thesis work in a semester. The number of credit hours for each course shall be specified in the syllabus of the respective department.

6.5. Status of a Student

There shall be two categories of student, namely,

i) Full-time: A full-time student shall not ordinarily be an employee of any organization; however, employees serving in different organizations may be registered as full-time student with prior permission from the concerned authority/employer. A full-time student may be employed as teaching/research assistant in this University.
ii) Part-time: Students serving in different organizations may be admitted as part-time student with a written consent from the employer.

6.6. Course Registration

6.6.1. Every admitted student shall have to get himself/herself registered into the courses on payment of prescribed fees.

6.6.2. Course registration by a student must be completed within two weeks from the start of a semester; otherwise, the student shall not be allowed to continue the course in that semester.

6.6.3. A full-time student must register a minimum of 12 (twelve) credit hours and a maximum of 15 (fifteen) credit hours per semester.

6.6.4. A part-time student should normally register a minimum of 6 (six)-credit hours and a maximum of 9 (nine) credit hours per semester.

6.6.5. A student may be permitted to withdraw and/or change his/her registered course within three working weeks from the commencement of that semester on the recommendation of his/her supervisor (if any) and upon approval of the concerned teacher(s) and Head of the Department.

6.6.6. No student will be allowed to register a course for grade improvement. A student having an F grade in a compulsory course (if any) shall be allowed to repeat.

6.7. Credit Transfer

On the recommendation of the respective ACPG through EC and by the approval of the Academic Council, a student may be allowed to transfer a maximum of 50% of the required theory courses of this University completed by the student at other universities/institutions where he/she enrolled earlier for M. Sc./ M. Phil/ Ph. D program provided that the courses were not taken earlier than 3 (three) calendar years from the date of his/her first enrollment in the respective program in this University. In addition, the student must obtain a minimum Grade Point of 3.00 out of 4.00 or its equivalent in each course to be transferred and the courses should be equivalent to the approved courses of this University.

6.8. Course Duration

The minimum duration to complete the requirements of M. Sc. Eng. degree shall normally be 3 (three) semesters and generally not be more than 5 (five) academic years from the date of his/her admission.

6.8.2. M. Phil. Degree
The minimum duration to complete the requirements of M. Phil. degree shall normally be 4 (four) semesters and generally not be more than 5 (five) academic years from the date of his/her admission.
6.8.3. **Ph. D. Degree**

The minimum duration to complete the requirements of Ph.D. degree shall normally be 4 (four) semesters from the date of his/her provisional admission and generally not be more than 7 (seven) academic years from the date of his/her provisional admission.

6.9. **Requirements for Continuation of the Post-Graduate Program**

6.9.1. A student will not be allowed to continue the program if he/she obtains F grades in three or more courses in the first two registered semesters.

6.9.2. A student will not be allowed to continue the program if his/her CGPA falls below 2.5 (including C grades) at the end of the second or any subsequent semester.

6.9.3. A Ph. D. student will not be allowed to continue the program if he/she fails to qualify the Comprehensive Examination [Art 6.10.3(iii)] in 2(two) chances.

6.10 **Requirements for the Degrees**

6.10.1. **M. Sc. Eng. Degree**

The following are the requirements for M. Sc. Eng. degree:

i) A student must obtain a minimum CGPA of 2.65 in his/her course works.

ii) A student must have to complete a minimum of 36 credit hours of which 18 credit hours shall be assigned to a thesis or 9 credit hours for a project.

iii) In addition to the successful completion of course works, every student shall have to submit a thesis on his research work or a dissertation on his project work, as applicable, fulfilling the requirements as detailed in Art. No. 9.

6.10.2. **M. Phil. Degree**

The following are the requirements for M. Phil. degree:

i) A student must obtain a minimum CGPA of 2.65 in his/her course works.

ii) A student must have to complete a minimum of 48 credit hours of which 24 credit hours shall be assigned to a thesis.

iii) In addition to the successful completion of course work, every student shall have to submit a thesis on his research work fulfilling the requirements as detailed in Art. No.9.

6.10.3. **Ph.D. degree**

The following are the requirements for Ph. D. degree:

i) A student must obtain a minimum CGPA of 2.65 in his/her course works.

ii) A student must have to complete a minimum of 60 credit hours of which 45 credit hours shall be assigned to a thesis.
iii) He/she must have to pass the Comprehensive Examination. Comprehensive Examination shall comprise a written examination and/or an oral examination to test the knowledge of the student in his/her field of study and research. Comprehensive Examination shall ordinarily be held after the completion of the course work by the student. The DSC on the request of the supervisor shall fix a date and time for the Comprehensive Examination. The DSC shall conduct the Comprehensive Examination.

iv) In addition to the successful completion of course work and Comprehensive Examination, every student shall have to submit a thesis/dissertation on his/her research work fulfilling the requirements as detailed in Art. No. 9.

7. Grading System

7.1. Numerical marks may be made in answer scripts, tests etc. for assessing the performance of the students but all the final grading shall be made in letter grade/grade point as follows:

<table>
<thead>
<tr>
<th>Numerical Marks</th>
<th>Letter Grade</th>
<th>Grade Point (G_i)</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>90% and above</td>
<td>A+</td>
<td>4.0</td>
<td>Excellent</td>
</tr>
<tr>
<td>≥80% but &lt;90%</td>
<td>A</td>
<td>3.5</td>
<td>Very good</td>
</tr>
<tr>
<td>≥70% but &lt;80%</td>
<td>B+</td>
<td>3.0</td>
<td>Good</td>
</tr>
<tr>
<td>≥60% but &lt;70%</td>
<td>B</td>
<td>2.5</td>
<td>Average</td>
</tr>
<tr>
<td>≥50% but &lt;60%</td>
<td>C</td>
<td>2.0</td>
<td>Pass</td>
</tr>
<tr>
<td>Below 50%</td>
<td>F</td>
<td>0.0</td>
<td>Fail</td>
</tr>
<tr>
<td>Incomplete</td>
<td>I</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>S</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Unsatisfactory</td>
<td>U</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

7.2. The Grade Point Average (GPA) shall be computed for each semester as follows:

\[ GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \]

Where \( n \) is the number of courses completed during the semester, \( C_i \) is the number of credits allotted to a particular course, and \( G_i \) is the grade point corresponding to the letter grade awarded for that course.

A Cumulative Grade Point Average (CGPA) shall also be computed at the end of second and subsequent semesters. The CGPA will be computed as follows:

\[ CGPA = \frac{\sum_{j=1}^{m} S_j T_j}{\sum_{j=1}^{m} T_j} \]

where \( m \) is the total number of semesters being considered, \( S_j \) is the GPA of the \( j \)-th semester, \( T_j \) is the total number of credits registered during \( j \)-th semester.
Both GPA and CGPA will be rounded off to the second place of decimal for reporting.

7.3. On the written request from a student, a maximum of two courses, having B or C grade in each, may be ignored for the calculation of CGPA. In such case, the CGPA must not be less than 2.65 in the remaining courses.

7.4. Courses in which a student gets F grade shall not be counted towards credit hour requirements and for the calculation of GPA.

7.5. A student shall get I grade in a course with prior permission from the Head of the Department if he/she is unable to complete the course due to any unavoidable circumstances. He/she has to complete the course within the next two consecutive semesters; otherwise, he/she will get F grade in that course. He/she may, however, be allowed to register that course without further payment of course registration fees.

7.6. Satisfactory (S) and unsatisfactory (U) shall be used for grading of thesis/project and non-credit prerequisite courses. If, however, thesis is discontinued an I grade shall be recorded.

8. Conduct of Examination for Theoretical Courses

8.1. In addition to class tests, assignments, term papers etc. there shall be a written examination on all theoretical courses at the end of each semester. The Head of the Department shall announce a date of the examination generally two weeks before its commencement. The final grade in a theoretical course shall be based on the performance of all class tests, assignments, term papers and written examination.

8.2. The respective course teacher will be solely responsible for the performance evaluation of a student as detailed in Art. No. 8.1. He/she will announce the final grade of the course within three weeks from the date of examination of that course and will also submit a copy to the Head of the Department.

8.3. The Controller of Examinations shall keep up-to-date record of all the grades obtained by a student in individual Academic Record Card. A student can get an official grade sheet from the office of the Controller of Examinations on payment of prescribed fees.

9. Project/Thesis

9.1. Appointment of Supervisor

9.1.1. Research works for a project/thesis shall be carried out under the supervision of a teacher, not below the rank of an Assistant Professor, from the respective or from any other department of this University proposed by the Head of the Department and accepted by the ACPG. A Joint-supervisor or Co-supervisor (if necessary) may be appointed from within/outside the University recommended by the ACPG.
9.1.2. In case of selecting a Supervisor/Joint supervisor/Co-supervisor from other than the respective department, an approval from the supervisor’s Head of the Department has to be taken.

9.1.3. The Supervisor, Joint-supervisor/Co-supervisor (if any) shall be approved by the CASR on the recommendation of the ACPG.

9.1.4. A thesis/project supervisor has to be normally appointed after the completion of the first semester for M.Sc. Engg/M. Phil and within three months for Ph. D. students.

9.2. Research Proposal

9.2.1. M. Sc. Eng./ M. Phil
A student shall submit a project/thesis proposal to the ACPG through supervisor(s). The ACPG shall examine the proposal and recommend it for the approval of the CASR through the Head of the Department. In special circumstances, the ACPG may recommend any subsequent changes in the research topic and forward it through the Head of the Department to CASR for approval.

9.2.2. Ph. D.
After the successful completion of the Comprehensive Examination, a student shall submit a research proposal to the DSC through the supervisor(s). The DSC shall examine the proposal and recommend it for the approval of the CASR through the Head of the Department. In special circumstances, the DSC may recommend any subsequent changes in the research topic and forward it to CASR for approval through the Head of the Department.

9.3. The project/research work should normally be carried out in the University. However, if necessary, the supervisor can allow his/her student to carry out the research work outside the University with the approval of the ACPG in the case of M. Sc./M. Phil. student or with the approval of the DSC in the case of Ph. D. student. The work schedule and financial involvement should be mentioned in the research proposal for carrying out research work.

9.4. At the end of a student’s research work on the advice of the supervisor the student shall submit a thesis which must be an original contribution to engineering/sciences and worthy of publication. Every student shall have to submit required number of printed copies of his/her thesis/project dissertation in the approved format to the Head of the Department through his/her supervisor on or before a date to be fixed by the Head of the Department in consultation with the supervisor(s).

9.5. A student shall have to declare that he/she has carried out the project/research work and it not been submitted elsewhere for any purpose, except for publication, duly countersigned by the supervisor(s).
9.6. Project/Thesis Examination


9.6.1.1. The CASR shall constitute an examination committee for each project/thesis examination and oral examination from the panel of examiners proposed by concerned Head of the Department in consultation with supervisor(s) and recommended by the concerned ACPG. The examination committee shall be as follows:

i) Supervisor Chairman

ii) Joint supervisor/Co-supervisor (if any) Member

iii) Head of the Department Member

iv) One or two teachers from within the department not below the rank of Assistant Professor. Member

v) One external Examiner outside the University (External) Member

9.6.1.2. The supervisor(s) and the external examiner shall examine the thesis/dissertation; whereas the examination committee shall assess the performance in the oral examination only.

9.6.1.3. If any examiner is unable to accept the appointment or wants to relinquish his/her appointment before the examination, the Vice-Chancellor shall appoint another examiner from the panel.

9.6.2. Ph. D. Thesis

9.6.2.1. Each student has to submit 10 (ten) copies of synopsis at the end of the research work and has to appear in an Oral Examination arranged by the Chairman of DSC. After satisfactory completion of the Oral Examination the student shall submit at least 5 (five) printed copies of the thesis in the final form to the Head of the Department through the supervisor in the approved format.

9.6.2.2. The DSC will propose a panel of external examiners for each thesis. Board of Examiners shall consist of the DSC and 2 (two) more external examiners, at least one from outside the country, from the relevant field to be appointed by the Vice-Chancellor in consultation with the thesis supervisor. The supervisor shall act as the Chairman of the Board of Examiners. A copy of the thesis is to be sent to each external examiner for evaluation and written opinion.
9.6.2.3. If any examiner is unable to accept the appointment or wants to relinquish his/her appointment before the examination, the Vice-Chancellor shall appoint another examiner from the panel in his/her place, without further reference to the DSC. The Vice-Chancellor may also appoint a third external examiner, if referred by the DSC in case of major contradiction to the external examiners’ viewpoint.

9.6.2.4. On receipt of satisfactory report from the thesis examiners, an oral examination shall be arranged on a date or dates fixed by the Chairman of DSC in which the student shall defend his/her thesis. The student must satisfy the Board of Examiners as constituted under Art. 9.6.2.2 that he/she is capable of intelligently applying the results of his/her research to the solution of the problems and of undertaking independent research work. Besides, he/she should show the evidence of satisfactory knowledge related to the theory and technique used in his/her research work.

9.6.2.5. In case a student fails to satisfy the Board of Examiners in thesis and/or Oral Examination, he/she shall be given one more chance to resubmit the thesis and/or re-appear in Oral Examination as recommended by the Board of Examiners.

9.6.2.6. A student may be awarded an M. Sc. Eng./M. Phil degree on the recommendation of the supervisor, if the student fails to qualify for the award of Ph. D degree.

10. Striking off and removal of names from the rolls
The name of the student shall be struck off and/or removed from the rolls of the University on the following grounds:
   i)  Unsatisfactory progress of the student reported by the supervisor through the ACPG and approved by the CASR.
   ii) Failing to proceed with the program according to the Art. 6.8. and 6.9 of this ordinance.
   iii) Forced to discontinue his/her studies under disciplinary rules.
   iv) Withdrawal of his/her name from the roll-sheet of the University.
   v) Non-payment of dues of the University and the Halls of residence within a prescribed period.

11. Academic fees:
The amount of academic fees shall be decided by the University from time to time.

12. Refund of Fees:
   12.1. A student withdrawing officially from all courses and/or including thesis/project as per Art 10(iv) is entitled to get a refund of the course registration fees provided he/she withdraws in writing through the respective Head of the Department before the expiry of two working weeks from the commencement of the classes. Thesis/project registration fees in any case are not refundable.
12.2. In case of Art.10(ii) or after successful completion of the course, a student can get refund of University and Hall caution money after producing the clearance from all concerned.
Postgraduate Courses of the Department of Electrical and Electronic Engineering

Courses Offered To the Post-Graduate Students of EEE Department

**Compulsory Courses.**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 6000</td>
<td>Thesis (for M. Sc. Engineering)</td>
<td>18</td>
</tr>
<tr>
<td>EE 6000</td>
<td>Project (for M. Sc. Engineering)</td>
<td>6</td>
</tr>
</tbody>
</table>

**Elective subjects.**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 6101</td>
<td>Engineering Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EE 6201</td>
<td>Physical System Modeling</td>
<td>3</td>
</tr>
<tr>
<td>EE 6202</td>
<td>Modeling and Simulation</td>
<td>3</td>
</tr>
<tr>
<td>EE 6203</td>
<td>Estimation and Identification Techniques</td>
<td>3</td>
</tr>
<tr>
<td>EE 6205</td>
<td>Optimal Control theory</td>
<td>3</td>
</tr>
<tr>
<td>EE 6206</td>
<td>Non-linear Control theory</td>
<td>3</td>
</tr>
<tr>
<td>EE 6207</td>
<td>Computer Aided Design of Systems</td>
<td>3</td>
</tr>
<tr>
<td>EE 6208</td>
<td>Stochastic Processes</td>
<td>3</td>
</tr>
<tr>
<td>EE 6209</td>
<td>Neural Networks and Applications</td>
<td>3</td>
</tr>
<tr>
<td>EE 6211</td>
<td>Soft Computing</td>
<td>3</td>
</tr>
<tr>
<td>EE 6301</td>
<td>Power System Planning</td>
<td>3</td>
</tr>
<tr>
<td>EE 6302</td>
<td>Computer Aided Power System Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EE 6303</td>
<td>Power System Stability</td>
<td>3</td>
</tr>
<tr>
<td>EE 6304</td>
<td>Optimization of Power System Operation</td>
<td>3</td>
</tr>
<tr>
<td>EE 6305</td>
<td>Transient over Voltage in Power System</td>
<td>3</td>
</tr>
<tr>
<td>EE 6306</td>
<td>Advanced Power System Protection</td>
<td>3</td>
</tr>
<tr>
<td>EE 6307</td>
<td>Advanced Power System Control</td>
<td>3</td>
</tr>
<tr>
<td>EE 6308</td>
<td>Distribution &amp; Industrial system planning</td>
<td>3</td>
</tr>
<tr>
<td>EE 6309</td>
<td>Reliability of Power system</td>
<td>3</td>
</tr>
<tr>
<td>EE 6401</td>
<td>Energy Conversion</td>
<td>3</td>
</tr>
<tr>
<td>EE 6402</td>
<td>Rural Energy System</td>
<td>3</td>
</tr>
<tr>
<td>EE 6501</td>
<td>Information and Coding Theory</td>
<td>3</td>
</tr>
<tr>
<td>EE 6502</td>
<td>High Power Microwave Devices</td>
<td>3</td>
</tr>
<tr>
<td>EE 6503</td>
<td>Data Communication</td>
<td>3</td>
</tr>
<tr>
<td>EE 6504</td>
<td>Optical Fiber Communication</td>
<td>3</td>
</tr>
<tr>
<td>EE 6505</td>
<td>LASER Theory</td>
<td>3</td>
</tr>
<tr>
<td>EE 6506</td>
<td>Antennas &amp; Propagation</td>
<td>3</td>
</tr>
<tr>
<td>EE 6507</td>
<td>Microwave Theory &amp; Techniques</td>
<td>3</td>
</tr>
<tr>
<td>EE 6601</td>
<td>Digital Signal Processing</td>
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<td>EE 6603</td>
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Contents of the Compulsory EEE Courses for the Departmental Students

EEE 6101 Engineering Analysis  
Credit: 3  
Contact Hours : 4 Hrs/Week

Linear system analysis, Linear algebra, state-space representation and analysis, sampled Data systems, Z-transform, discrete time systems, complex planes. Calculus of variance; Modeling and simulation techniques, computer methods and tools.

EEE 6201: Physical System Modeling  
Credit: 3  
Contact Hours : 4 Hrs/Week

Development of conceptual framework for physical system. Transformation of physical system into mathematical form; projection and prediction of system response; System stability analysis; Controlling the system response; policy prescription for optimum system response.

EEE 6202: Modeling & Simulation  
Credit: 3  
Contact Hours : 3 Hrs/week

Modeling of complex systems; State Variable Approach; Analytical and algorithmic techniques for static and dynamic, linear and non-linear systems; Mathematical, Statistical, stochastic and heuristic models. Analogue and Hybrid computer-solution of linear and non-linear differential equations; Simulation: Partial Differential Equations; Random signals; Hybrid simulation. Digital simulation: simulation languages-GPSS, SIMSCRIPT, CSMP, etc. Real time simulation for process control.

EEE 6203: Estimation and Identification Techniques  
Credit: 3  
Contact Hours: 3 Hrs/week

EEE 6205: Optimal Control Theory  
Credit: 3  
Contact Hours : 3 Hrs/week

The optimal control problem, cost functional, Use of calculus of variations in optimal control, Optimization by pontryagin’s maximum principle and dynamic programming applications, Linear regulator problems. Computational methods of solving two-point boundary value problems.

EEE 6206: Non-Linear Control Theory  
Credit: 3  
Contact Hours : 3 Hrs/week


EEE 6207: Computer Aided Design Of Systems  
Credit: 3  
Contact Hours : 3 Hrs/week


EEE 6208: Stochastic Processes  
Credit: 3  
Contact Hours : 3 Hrs/week

Basic probability theory and functions of random variable. Binomial, Poisson and Normal distributions; Bivariate and Multivariate Gaussian distributions; Stationary process; Spectral representation. Auto-and cross- correlation functions; Winner and Kalman filter; Markov chains; Point processes: Non-linear stochastic systems.
EEE 6209: Artificial Intelligence & Neural Network
Credit: 3  Contact Hours : 3 Hrs/week


EEE 6211: Soft Computing
Credit: 3  Contact Hours : 3Hrs/Week

Fuzzy Set Theory: Introduction, type of fuzzy mathematics, operation of fuzzy sets, fuzzy relation, fuzzy measures and fuzzy set applications.
Neural Networks: Biological neural systems, modeling of human brain, neural networks paradigms and training, and applications.
Evolutionary Algorithms: Introduction, natural evolution, genetic operators and selection methods theoretical aspects of genetic algorithms (GA) evolution strategy (ES), evolution programming (EP) and their moderate applications.

EEE 6301: Power System Planning
Credit: 3  Contact Hours: 3 Hrs/week

Basic objectives of power system planning; Generation expansion planning process. Electrical demand forecasting; Current demand forecasting approaches. Generation planning; economic analysis, expected energy generation, expected fuel cost, Booth-Baleriux, cummulant and segmentation methods. Probabilistic simulation of hydro and energy limited units. Expected energy production cost of interconnected systems. Economic aspects of interconnection. Different aspects of Load Management; effect of Load Management of reliability and on production and on production cost, Joint ownership of generation.

EEE 6302: Computer Aided Power System Analysis
Credit: 3  Contact Hours : 3 Hrs/week

Symmetrical components and application; Sequence impedance and their representation; Evaluation of fault levels; General review of network and matrix theories, Algorithms for formation of network matrices and their modifications for analysis by different iterative methods; Load flow studies; Acceleration of convergence; MVA mismatch considerations; Terminal constraints.
EEE 6303: Power System Stability
Credit: 3
Contact Hours: 3 Hrs/week

General theory of power transfer, power transfer limits; Stability problems steady state stability limits, Dynamic and Transient stability analysis; Representation of synchronous machines and systems in different frames of reference; Governors and excitation control system in stability; Small oscillation analysis; stability analysis of two-machine and multi-machine system; stability under different types of faults; Analysis of large disturbance in power system; Methods of improving stability, state variable representation and application to stability study, Application of Lyapunov’s function in transient stability analysis.

EEE 6304: Optimization of Power System Operation
Credit: 3
Contact Hours: 3 Hrs/week


EEE 6305: Transient Over-voltage in Power Systems
Credit: 3
Contact Hours: 3 Hrs/week

Classification of system transient, causes of power system over voltage. Transmission line energisation, Traveling waves, switching duty and its calculation. Mechanisms and characteristics of lightning, Frequency of lightning flashes to power lines, shielding of transmission lines against lightning, Overvoltage limitation by spark gaps, Expulsion tube, Over voltage limiting by surge Diverts, Modifications of surge waveshapes by cable connections, Modification of surge waveshape by corona, Characteristic of external insulation, principles of insulation co-ordination, Insulation co-ordination applied in a substation.

EEE 6306: Advanced Power System Protection
Credit: 3
Contact Hours: 3 Hrs/Week

The philosophy of protective relaying; construction, principle and characters of over-current, differential, directional, distance and pilot relays.
Principles of relay design. Effects of transient on relay performance. Errors introduced by CT and PT on relay operation.
Static and digital relays: Applications of static and digital relays in various protection schemes. Voltage sags: Analysis & remedy.

EEE 6307: Advanced Power System Control
Credit: 3
Contact Hours: 3 Hrs/week

Introduction to power system monitoring and control, voltage, power and frequency control; Principles of small-scale and large-scale power system control; Applications of network decomposition and sparsely; Modern control, schemes: Closed loop generation control, load frequency control and security control; Centralized computer control of power system,
functional, geographical and voltage level hierarchy; Analysis of various online functions: network topology, state estimation, short semester load forecasting, unit commitment. Active and reactive power control; Application of pattern recognition and artificial intelligence in power system restoration, voltage prediction and contingency analysis.

EEE 6308: Distribution and Industrial System Planning  
Credit: 3  
Contact Hours: 3 Hrs/week


EEE 6309: Reliability of Power System  
Credits: 3  
Contact Hours: 3 Hrs/week


EEE 6401: Energy Conversion  
Credit: 3  
Contact Hours: 3 Hrs/week

Energy conversion processes; General introduction, energy sources, principles of conservation of energy, energy balance equations. Direct Electrical Energy Conversion: introduction, Magnet hydrodynamic (MHD), fuel cell, thermoelectric static, Ferro-electric, photovoltaic, electrostatic and piezoelectric energy conversions; characteristics including efficiency, power densities. Terminal properties and limitations. Electromechanical energy conversion; General introduction of electrical to mechanical, mechanical to electrical and electrical to electrical conversions; Bulk energy conversion devices; General formulations of equations; Co-ordinate transformation and terminal characteristics.

EEE 6402: Rural Energy System  
Credit: 3  
Contact Hours: 3 Hrs/week

Role of Energy; Rural Flow in Developing Countries; Energy Demand-supply Balance: Impact of Rural Energy Flow on Rural Development and physical Quality of Life; Economic Constraints for sustaining the Energy Flow: Rural Energy system simulation for Development planning.
EEE 6501: Information and Coding Theory
Credit: 3  Contact Hours: 3 Hrs/week

*Fundamentals of* probability theory with a brief review of the methods for the representation and analysis of linear system. Definition of a measure of information. Discrete noiseless and noisy systems; Channel capacity, coding the continuous case.

EEE 6502: High-Power Microwave Devices
Credit: 3  Contact Hours: 3 Hrs/week

Microwave amplifiers and oscillators; principles of generation of millimeter and sub millimeter waves from FAST WAVE devices (including FELS and Electron Cyclotron Masers). SLOW WAVE delow WAVE devices (INCLUDING Klystrons, Magnetrons, Cerenkov Masers, BWOS RDGS and MWCGS), and PLASMA devices (including VIRCTORS and reeditrons). Detailed study of electromagnetic slow wave systems; General properties of slow wave structures. Analysis of cold slow wave structures. Interaction of Electromagnetic fields supported by slow wave structures.

EEE 6503: Data Communications
Credit: 3  Contact Hours: 3 Hrs/week

*Communication* environment, concepts function and forms; components of communication systems and devices; Networks, network topologies, protocol and control; Common carrier services; Communication network design.

EE 6504: Optical Fiber Communication
Credit: 3  Contact Hours: 3 Hrs/week


EE 6505: Laser Theory
Credit: 3  Contact Hours: 3 Hrs/week

*Black body radiation and the Plank law*. Stimulated and spontaneous emission, atomic and spectral line width. 3-level and 4-level atomic systems. Laser operation under steady state

**EE 6506: Antennas and Propagation**  
Credit: 3  
Contact Hours: 3 Hrs/week


**EE 6507: Microwave Theory & Techniques**  
Credit: 3  
Contact Hours: 3 Hrs/week

*Circuit theory* for wave-guide systems. N port circuits: impedance matrix, admittance matrix, scattering matrix and transmission matrix, their properties.  
*Periodic structures and filters*: wave analysis, impedance matching, wave and group velocities; comb lines and their analysis; introduction to filters, filter design by image parameter and insertion-loss methods; design of different types of filters.

**EE 6508: Advanced Electromagnetics**  
Credit: 3  
Contact Hours: 3 Hrs/week

*Moment Methods*: Introduction, Integral Equations, Green's Functions; For Free Space, For Domain with Conducting Boundaries.  
EE 6601: Digital Signal Processing
Credit: 3

Contact Hours: 3 Hrs/week

Main features and applications of digital signal processing: Introduction to speech, image and data processing; Discrete-time signals, sequences, linear systems, linear constant coefficient difference equations; Sampling of continuous time signals; Two dimensional sequences and systems; Z-transform; Inverse Z-transform theorems and properties; System function; Two dimensional Z-transform; H-transform.; Frequency domain representation of discrete time systems and signals; Discrete Fourier series and Fourier transform; properties of discrete Fourier transform (DFT) ; Parseval’s theorem; equivalent noise definition of bandwidth; Convolution, correlation and method of numerical integration: Computation of the DFT, Goertzel, FFT and Chirp Z-transform algorithms.


EEE 6602: Computer Application in Engineering
Credit: 3

Contact Hours: 3 Hrs/week

Advanced programming techniques to engineering problems; Program optimization. Computational pitfalls; Management of files and databases; File strictures; Computation aspects of matrix algebra-relaxation methods various reduction and elimination schemes; storage and/or computation with large and sparse matrices. Numerical detentions and integration; Interpretation and curve fillies; linear and non-linear programming algorithm; computer graphics. Interactive analysis, simulation and design programming in the relevant fields.

EEE 6603: Reliability Analysis and Prediction
Credit: 3

Contact Hours: 3 Hrs/week

Reliability concept: Concept of Reliability, mean time to failure, mean time between failures, down time, up time, type of failures, Burn in, useful life and wear out periods, debugging Bathtub curve . Combinatorial Reliability:- Series, parallel, K-out-of m configurations, reliability evaluation of complex system by inspection, event space, path-tracing, decomposition, cut-set and tie-set methods. Matrix methods, critical dependent failures. Failure models:- Failure data, failure modes, reliability in semester of hazard rate and failure density, hazard models-constant hazard, linearly increasing and linearly decreasing hazard models and their comparison waybill model, exponential hazard, piece wise linear models. System Reliability:- system reliability evaluation of series, parallel k-out-of m, standby configurations in semesters of hazard rates. Approximation and bounds, meantime of failure, Markov models. Computer methods of analysis, analogue and digital simulation, Monte Car 10 methods. Reliability Improvement :- Component improvement. Redundancy concepts, component and system redundancy, redundancy in digital systems, comparison of active and standby redundancy.
EE 6701: Generalized Machine Theory  
Credit: 3  
Contact Hours: 3 Hrs/week  


EE 6702: Advanced Electrical Machine Design  
Credit: 3  
Contact Hours: 3 Hrs/week  

General treatment of Electrical Machine Design. Review of standard procedures in design of DC machines, AC machines, transformers and special machines. Optimization and synthesis of design procedures. Applications of material balance and critical path principles in electrical design. Design economics and safety factors. Applications of computers in modern designs including the operation of the machine in non-linear ranges; Magnetic flux-plots and heat transfer process, etc. Mechanical design of electrical machinery and relation between mechanical and electric machine design.

EE 6703: Special Electrical Machines  
Credit: 3  
Contact Hours: 3 Hrs/week  

Course will be broadly on current research topics on electrical machines and devices. The following areas will be covered: permanent magnet machines, Hysteresis machine. Eddy current torque devices; homopolar machines. PAM motors. In addition, reluctance machines.

EEE 6801: Digital Circuit Design  
Credit: 3  
Contact Hours: 3 Hrs/week  

The course will present advanced techniques of digital circuit design. It will concentrate on the design of sequential circuits, microprogramming viewed as a sequential circuit. And fault tolerant design. Basic review of combinational circuit design using K-map, multiplexes and EPROMS. Introduction to sequential circuits-fundamental mode circuits. Concept of state-construction of state diagrams. Event driven circuits using RS latch, multiplexes and EPROMS. Clock driven circuits using JK flip-flops, counters and EPROMS. Microprogramming and use of AMD 2909 microsequencer in sequential circuits. Fault detection in combinatorial and sequential circuits. Reliable design theory and techniques. Some examples like Data Acquisition system, microprocessor peripheral interface digital printer interface and DMA controller will be taken up.

EEE 6802: Microprocessors, Their Applications and Interfacing  
Credit: 3  
Contact Hours: 3 Hrs/week  

Internal organization of the Intel 8085, Z80, M6809, Rockwell 6502 Intel 8086/88, M68000 and Z8000 microprocessors. Comparison of the architectures based on hardware features
such as addressing modes interrupts structures, instruction execution, multiprogramming abilities and memory management. Bit-slice processors: Basic structure of control unit of a microprocessor. Organization of bit-slice processors like AM2903 and Intel 3008. Comparison with microprocessor chips. Architecture of microcomputers like SDK-85, HP 5032, SDK-86, single chip microcomputer 8748, intelligent CRT terminal, microprocessor development system like Intellect series II and III, BBC-microcontrollers PLCS, graphics processors and floppy disk controllers; arithmetic processors like Intel 8087 and 80287; FFT processors and array processors.

EE 6803: MOS Devices
Credit: 3


EEE 6901: Power Semiconductor Circuits and Devices
Credit: 3

Introduction: High voltage switches and definitions, p-n junction’s theory, high voltage/power diodes in circuits. Thermal design of power electronic equipment. Introduction Simulation tools like SPICE and MATLAB

Diodes, Bipolar Transistors and Thyristors: Discrete bipolar power semiconductor device construction, characteristics and operation. Base and Gate drive circuits and introduction to switching aid circuits.

Power MOSFETs and bipolar-MOS devices: Discrete MOS and MOS-bipolar power semiconductor device (IGBTs), device construction, characteristics and operation; Discussion of drive circuits, driver ICs and protection circuits; edge terminations.

High Voltage devices for Power Integrated Circuits (PICs): Device design principles (RESURF effect), novel device structures, example of power integrated circuits and smart-power.

Power microelectronics technologies: DMOS and Trench technologies for discrete power devices; from VLSI to high Voltage technologies Smart-power, CMOS and Bipolar-CMOS-DMOS (BCD) technologies, SOI technology.


Superjunction Devices: Introduction – Why Superjunction Devices, Superjunction MOSFETs vs. IGBTs, Superjunction Device Structures, Superjunction Device Physics, Fabrication Processes, Termination Design, Quasi-Saturation in Superjunction MOSFETs, Integral Diode Problem in Superjunction MOSFETs, Promises and Limitations of Superjunction Devices

New Technologies for Active and Passive Integrated Power Modules: Planar hybrid technologies for integration of active switching functions as well as passive functions such as power resonant circuits, transformers, capacitors, inductors and integrated EMI filters into power modules. Active modules using Embedded Power technology: no wire-bonds, planar
metallized interconnects, double sided cooling, integration of sensors and advanced functionality. Passive electromagnetic power modules: Planar metallized dielectrics embedded in ferrites for integrated transformers, resonant circuits and capacitors. EMI filter modules using identical technology but different structural optimization.

EE6902: Industrial Drives
Credit: 3 Contact Hours: 3 Hrs/week

Control of DC Drives: Converter and chopper control for motoring, braking and four-quadrant operation. Transfer function and stability analysis. Control of Induction Motors: AC phase Control, slip Power recovery. Control of AC Drives: Open and closed loop control systems, Vector control, Case study of Industrial drives.

EE 6903: HVDC Transmission
Credit: 3 Contact Hours: 3 Hrs/week

AC versus DC: Historical development; Need for Interconnection; Technical considerations for comparative evaluation; DC system configurations.
Converter operation: Choice of converter circuit; converter operation with no ignition delay and ignition delay; effect of commutation reactance; rectification and inversion mode of operation; Twelve-phase operation.
Control of HVDC system: Basic concepts; control characteristics; rectification and inverter control; VDCOL; reversal of power.
System studies: AC/DC interaction: Basic consideration in modeling of integrated AC /DC power system for load; transient stability; small signal stability and digital simulation. System components.

EE 6905: Advanced Solid State Electronics
Credit: 3 Contact Hours: 3 Hrs/week

Solid-state electronics in modern life, Bonding and types of solids, Types of crystals, Crystal directions and planes, Allotropy, Crystal defects and their significance.
Electrons in solid: Classical theory, Temperature dependence resistivity, Matthiessen’s rule, Temperature dependence of carrier concentration and drift mobility,
Coming of the quantum age. The electron as a wave, Schrödinger equation, a confined electron, Heisenberg’s uncertainty principle.

Scattering in semiconductors, Velocity-electric field relations in semiconductors, Carrier transport, Carrier generation and recombination, Optical processes in semiconductors.
Processing of devices: Semiconductor growth, Lithography, Doping of semiconductors, Etching.
Advanced semiconductor materials and their applications in practical devices, characterization of semiconductors, advanced growth of semiconductor and device technology.
EE 6111: Special Study

*Special topic in Electrical & Electronic Engineering*

Course content and title would be designed by the teacher, who is offering the course. The course content & title would be approved in the next CPGCS meeting and subject to the approved of CASR and Academic Council).