

CURRICULUM & SYLLABI

2013-2014

B. TECH.

IN

ELECTRICAL ENGINEERING



**DEPARTMENT OF ELECTRICAL ENGINEERING
FACULTY OF ENGINEERING AND TECHNOLOGY
JAMIA MILLIA ISLAMIA
(A CENTRAL UNIVERSITY)
NEW DELHI-110025**

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P R E F A C E

Technology is constantly growing and changing aspect of our field that is creating a need for content and resources. To address this emerging need Department of Electrical Engineering, JAMIA MILLIA ISLAMIA, New Delhi, has designed, developed and upgraded its previous syllabus. It creates new learning tools and makes students more knowledgeable.

This booklet presents the course structure and detailed syllabi, internal assessment, marks distribution in theory and lab courses for B. Tech. Programmes offered by the Department of Electrical Engineering.

The revised course curriculum is being designed to meet the AICTE and UGC norms on one hand and covering syllabi of competitive exams conducted by UPSC, NTPC, Power Grid, BHEL and GATE. The bulk courses are offered in core discipline of electrical engineering along with electives in emerging areas to specialize in chosen discipline. In addition, due weightage has been given to foundation courses in basic sciences, humanities and engineering. The main motive of curriculum development has been to imbibe a sense of confidence amongst the students in the area of electrical engineering. The syllabus has been framed so as to cover all basic aspects of electrical engineering education at par with national/international standards. Keeping in view the recent developments such as HVDC, FACT devices, SCADA and Automation systems, renewable energy, embedded systems, sensor technology, advances in power electronics, microcontroller design, digital signal processing, and soft computing etc., the department has updated its syllabi to include the latest areas.

Emphasis has been laid down towards self-learning through tutorials, seminars, colloquium and field visits, and industrial training components. Students have to undertake practical training in labs, and class-room teaching.

The booklet has been the outcome of **Workshop on Curriculum Revision for B. Tech. and M. Tech. Courses** held on December 3-4, 2012. I am indebted to all staff members for their continuous contribution for about one semester in the process of course revision.

I hope this booklet shall be of great help to all the B. Tech. students of Electrical Engineering Department, Jamia Millia Islamia.



(Prof. Zaheeruddin)
Head

WORKSHOP ON CURRICULUM REVISION

B. TECH. AND M. TECH. COURSES DECEMBER 3-4, 2012

Workshop Committee

Chief Coordinator:	Prof. Zaheeruddin
Coordinator:	Prof. Mini S. Thomas
Convener:	Dr. Shabana Mehfuz

Subject Groups:

1. Power System

Expert:	Dr. Subir Sen, Director, Power Grid Corporation of India Ltd.
Group Coordinator:	Prof. Mini S. Thomas
Faculty members:	Prof. Majid Jamil, Prof. Anwar Shehzad Siddiqui, Dr. Naimul Hasan, Dr. Arunesh Kumar Singh, Dr. Iqbal Ali

2. Control & Instrumentation

Expert:	Prof. R. P. Maheshwari, IIT Roorkee Dr. Subrata Mukhopadhyay, Chief Engineer (retired), CEA
Group Coordinator:	Prof. Ibraheem
Faculty members:	Prof. Shahida Khatoon, Prof. Shakeb A. Khan, Dr. Tariqul Islam, Mr. Rajveer

3. Machines and Power Electronics

Expert:	Dr. Sohail Akhtar, Director, Ministry of New and Renewable Energy
Group Coordinator:	Prof. H. E. Akhter,
Faculty members:	Dr. Haroon Ashfaq, Mr. Ahteshamul Haque, Mr. Sheeraj Kirmani

4. Electronics & Communication

Group Coordinator:	Prof. A. Q. Ansari
Faculty members:	Prof. Z. A. Jaffery, Prof. Munna Khan

5. Computer Technology

Expert:	Prof. Moinuddin, Pro VC, DTU Delhi
Group Coordinator:	Prof. Zaheeruddin
Faculty members:	Dr. Shabana Mehfuz, Dr. Manaullah

In addition, advice was sought from the following experts who could not attend the workshop:

- | | |
|------------------------------------|---|
| 1. Prof. Sukumar Mishra, IIT Delhi | 2. Prof. D. R. Kohli (Retired), IIT Roorkee |
| 3. Prof. B. H. Khan, AMU Aligarh | 4. Dr. D. K. Lobiyal, JNU New Delhi |
| 5. Prof. D. T. Sawhney, IIT Delhi | 6. Prof. H. K. Verma (Retired), IIT Roorkee |

Acknowledgement: The Department expresses profound gratitude and sincere thanks to Mr. Najeeb Jaung (IAS), Vice Chancellor of Jamia Millia Islamia for providing financial support.

JAMIA MILLIA ISLAMIA

Jamia was established in 1920 by a group of nationalist Muslim intelligentsia at Aligarh (Uttar Pradesh). Its campus shifted from Aligarh to Delhi in 1925 and the foundation stone of the present campus was laid on 1st March 1930. Since then, the university has expanded and become known as a premier educational institution of the country. Recognizing its contributions in the field of teaching, research and extension work, the University Grants Commission (UGC) bestowed the “deemed university” status to it in 1962, and it was designated a Central University in 1988. The journey from Aligarh to Delhi, not only presents the physical expansion of Jamia, but also presents a lesson for those who want to build educational institutions for the nation. It is therefore not surprising that Rabindranath Tagore once called the University as “one of the most progressive educational institutions of the country”.

Jamia and the Nationalist Alternative

Jamia was conceived as the *National Muslim University* in October 1920 on the campus of the Mohammedan Anglo-Oriental College set up by Sir Syed Ahmed Khan at Aligarh. Since its inception in 1892, the Aligarh College had produced an elite and middle class leadership that was actively involved with the nationalist movement in one manner or the other. The landed gentry connected with the Aligarh College had helped to form the All India Muslim League in 1906. At the same time, the educated and secular Muslim intelligentsia from the college was associated with the khilafat and noncooperation movements led by Gandhiji and whose main plank of political mobilisation was Hindu-Muslim unity. The changing character of the nationalist movement in the Gandhian leadership had its impact on those connected with the Aligarh College. The syndicate of the college proclaimed that it had been founded to turn out “worthy and useful subjects of the British Crown”. In contrast, freedom fighters like, Mohamed Ali (the khilafat leader and the first vice-chancellor) and Hakim Ajmal Khan wanted to build an educational institution which would serve to inculcate both, modern education and nationalist ideals in students from all communities, particularly the Muslims. They also actively opposed the “two nation theory” propagated by the Muslim League. This stand brought about a split between the Muslim intelligentsia and the Jamia was born out of this ideological conflict.

The formation of Jamia was supported by Gandhiji and Tagore who had himself initiated such an effort in Santiniketan. The start, with the foundation stone laid down by Shaikhul Hind Maulana Mahamud Hasan in Krishna Ashram of the Aligarh College campus, was also a difficult one due to lack of funds and infrastructure. The new university demonstrated that a society with diverse cultures could be groomed into a modern nation on the basis of a shared culture and perspective. In Jamia, Hindu, Muslim and other students not only studied together, they also ate and lived together in a Spartan lifestyle. Teachers came from all over the country and lived the same simple lifestyles. The use of ‘khaddar’ for uniforms epitomised the nationalist principle that was to follow throughout its development.

In 1924, after the withdrawal of khilafat, the institution faced a serious threat of closure. It then moved to Delhi and its reins were handed over to Dr Zakir Husain in 1926 who aptly remarked: “The biggest objective of Jamia is to prepare a roadmap for the future of Indian Muslims with the religion of Islam at its core and to fill that roadmap with the colour of the civilisation of India in such a way that it merges with the colours of the life of the common man.” Jamia survived this transitional phase with the active support and involvement of leaders like Hakim Ajmal Khan,

M.A. Ansari, Abid Hussain and Mohammad Mujeeb who shared Zakir Husain's vision for the institution. This phase of Jamia's development was characterised by the equal sacrifices that were made by the staff and students of the university and were ably aided by Gandhiji in their fund collection.

Jamia: A reflection of a self reliant modern and secular nation

From its inception, the Jamia had catered to students from disadvantaged backgrounds (in contrast to the elite Aligarh College) and its course curriculum was suited to meet the needs of such students. The medium of instruction and learning was Hindi, Urdu and English. By 1937, the Jamia campus had already shifted to Okhla. The university was an active participant in spreading Gandhiji's idea of *nai talim* which was popularly known as the 'Wardha Scheme'. Under the leadership of Zakir Husain, the chief architect of Wardha Scheme, Jamia started the "Book Bank" project, the "Village (dehat) Project", and "Subzi Mandi Project". They also started programmes on *sehat aur safai* (health and hygiene), *kapda* (weaving), carpentry and soap making where students learnt the merits of combining manual labour along with broadening their intellectual horizons. Vocational training and school education became one of the cornerstones of Jamia education and models for innovative teaching.

At the threshold of independence, Jamia was emerging as a dynamic and unique institution that aspired for support from the independent Indian government. The trials and tribulations of a newly formed nation were also reflected in Jamia, which faced enormous financial difficulties in this period. However, the coping strategies used by the administration, staff and students themselves reflected the values of self-reliance and democratic functioning that were to form the core principles of Nehruvian India. Nehru assigned many roles to the founders of Jamia: both Zakir Husain and Mujeeb were inducted into the Planning Commission to develop a plan for integrated education. But despite these contributions to national development, they were forced to fight hard for a university status.

Contemporary Jamia

It was in 1962 that Jamia became a deemed university recognised by the University Grants Commission Act, 1956 under the leadership of Mohammad Mujeeb, "At last Jamia employees were able to draw regular salaries". By 1963, regular teaching programmes like masters in history and education, and undergraduate programmes in sciences were started. Thereafter, in 1969 doctoral programmes were started. The emergence of the university as a premier institution of learning was recognised in 1988 when it was accorded the status of a Central University. Today, Jamia Millia Islamia is an ensemble of a multi layered educational system which covers all aspects of schooling, under-graduate and postgraduate education. The university recognises that teaching and research are complementary activities that can advance its long-term interest. It has Natural Sciences, Social Sciences, Engineering & Technology, Education, Humanities & Languages, Architecture & Ekistics, Fine Arts, Law and Dentistry Faculties. Also, it has a well known AJK Mass Communication Research Centre. Jamia Millia Islamia has also started several other research centres that have given an edge to Jamia in terms of critical research in various areas. Obviously, these initiatives aim to promote new and emerging areas of research and programmes that can offer opportunities to its students and teachers to expand their horizons.

The Jamia Millia Islamia conducts Undergraduate, Postgraduate, M. Phil. and Ph.D. as well as Diploma and Certificate programmes. The number of students in the University is 15094 of

which 7253 are enrolled in undergraduate programmes, 2875 in postgraduate, 146 in M. Phil./M.Tech., 1570 Ph. D and 3250 in Diploma/Certificate programmes.

Jamia Millia Islamia, as before, continues to cater to the interests of students from all communities, but also aims to meet the particular needs of the disadvantaged sections of the Muslim society. True to the legacy of its founders, it continues to support measures for affirmative action and foster the goals of building a secular and modern system of integrated education. Thus, Jamia Millia Islamia is constantly learning from its history to negotiate the new and emerging challenges facing a nation of the twenty first century.

OFFICERS OF THE JAMIA

Amir-i-Jamia (Chancellor)	Lt. Gen. (Retd.) M.A. Zaki
Shaikh-ul-Jamia (Vice-Chancellor)	Mr. Najeeb Jung, IAS
Naib Shaikh-ul-Jamia (Pro-Vice-Chancellor)	Prof. S. M. Sajid
Musajjil (Registrar)	Prof. Shahid Ashraf
Dean, Faculty of Humanities & Languages	Prof. G. P. Sharma
Dean, Faculty of Social Sciences	Prof. Khan Masood Ahmed
Dean, Faculty of Natural Sciences	Prof. Khalil Ahmad
Dean, Faculty of Education	Prof. Ahrar Husain
Dean, Faculty of Engineering & Technology	Prof. Khalid Moin
Dean, Faculty of Law	Prof. Rose Varghese
Dean, Faculty of Architecture & Ekistics	Prof. S. M. Akhtar
Dean, Faculty of Fine Arts	Prof. Z. A. Zargar
Dean, Faculty of Dentistry	Prof. Ragini
Dean, Students' Welfare	Prof. Tasneem Meenai
Finance Officer	Prof. Shahid Ahmad
Librarian	Dr. Gayas Makhdumi

FACULTY OF ENGINEERING AND TECHNOLOGY

Faculty of Engineering and Technology was established in the year 1985. The Faculty is presently running undergraduate programmes leading to the degree of B. Tech. in Civil, Electrical, Mechanical, Electronics & Communication and Computer Engineering. Postgraduate programmes leading to degree of M. Tech. in Environmental Science and Engineering, Electrical Power System Management, M. Tech. in Control and Instrumentation System, Mechanical Engineering & Earthquake Engineering and M.Sc. Electronics programmes are also offered. Research Programmes leading to the degree of Ph.D. are also offered by all the departments. The Faculty is also running Evening Programmes (part-time) in Civil, Electrical, Mechanical, Electronics & Communication and Computer Engineering at undergraduate (B.E.) level. The Evening Programmes at B.E. level are designed and conducted to provide opportunities to improve technical qualification of in-service Diploma holders with the objective to equip the students with the knowledge and experience of modern technology relevant to their profession. In addition to these programmes, University Polytechnic offers Diploma Engineering programmes in Civil, Electronics, Electrical, Mechanical and Computer Engineering. As an extension of continuing education program, University Polytechnic also offers part-time Diploma Engineering programmes in Civil, Electronics, Electrical, Mechanical and Computer Engineering branches in the evening for in-service vocational professionals.

Faculty of Engineering and Technology has highly qualified faculty members in all the Departments. The laboratories of all the departments are well equipped and strengthening of these laboratories are continuously pursued. The Faculty has its own library and computer centre in addition to the central library and a Centre for Information Technology to cater to the specialised needs of the students of the Faculty. The University has an excellent facility for the games & sports (indoor and outdoor both) and gymnastics, which is shared by all the faculties.

In all such programmes that follow Semester System, each Academic Year is divided into two semesters viz. odd semesters and even semesters each of which is ordinarily of 20 weeks duration followed by Winter vacation and Summer vacation respectively. The Academic Schedule for all the semesters is notified by Dean's office at the commencement of the Annual Academic Session. End Semester Examinations are conducted and completed in two weeks time allotted for this purpose. Under normal circumstances, a maximum gap of one day between End Semester examinations of two theory programmes of a Semester is permissible.

The Training & Placement Office of the University is actively looking after the training and placement needs of the students of Faculty of Engineering & Technology. A large number of leading organizations are regularly visiting for campus placements. The graduates of earlier batches have been gainfully employed in reputed public and private sector organizations in India and abroad. Many have opted for higher education in India and abroad.

Faculty of Engineering and Technology comprises of the following:

1. Department of Civil Engineering
2. Department of Mechanical Engineering
3. Department of Electrical Engineering
4. Department of Electronics & Communication Engineering
5. Department of Computer Engineering
6. Department of Applied Sciences & Humanities
7. University Polytechnic

DEPARTMENT OF ELECTRICAL ENGINEERING

The Department of Electrical Engineering was incepted in 1985. Since then it has registered tremendous growth in teaching and research and has got its recognition at national and international levels. The Department offers the following courses:

Undergraduate programmes

Bachelor of Technology (B. Tech.) in Electrical Engineering

Four year programme after XII standard or Diploma Engineering Certificate

Bachelor of Engineering (B. E.) in Electrical (Evening Programme)

Four year programme for working professionals with Diploma in Electrical Engineering

Postgraduate programmes

Master of Technology (M. Tech.) in Electrical Power System Management

Two years programme after B. Tech. in Electrical Engineering

Master of Technology (M. Tech.) in Control and Instrumentation Systems

Two years programme after B. Tech. in Electrical/Instrumentation/Control/Electronics and Communication Engineering

Ph. D. Programmes

The Department offers Ph. D. programmes in five major areas namely:

- (1) Power System
- (2) Machines, Drives and Power Electronics
- (3) Control and Instrumentation
- (4) Electronics and Communication
- (5) Computer Technology

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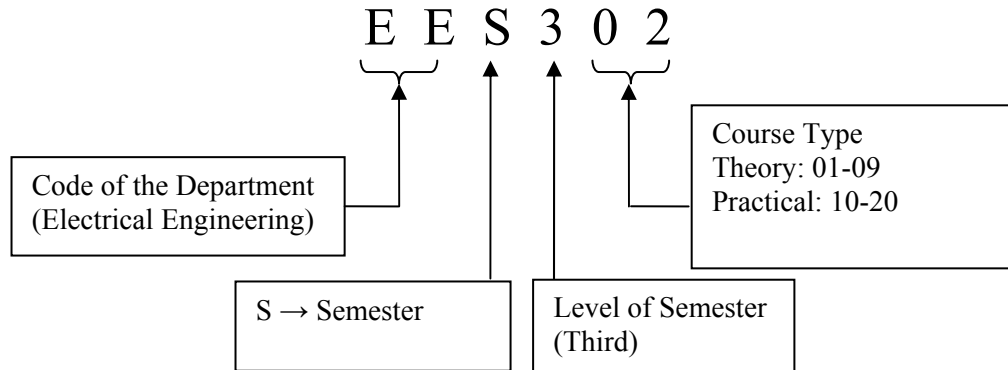
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COURSE NOMENCLATURE AND CREDIT SYSTEM

Course numbering scheme

Each course number is denoted by six alpha-numerals, three alphabets followed by three numerals:



Weightage for Course Evaluation

Evaluation in every course is based on the weightage assigned to various components of the course curriculum. These components are designated as under:

- L Lecture
- T Tutorial
- P Practical
- CCA Continuous Class Assessment
- MTE Mid Term Exam

Course credits assignment

Each course has a certain number of credits assigned to it depending upon its lecture, tutorial and laboratory contact hours in a week.

Lectures and Tutorials: One lecture or tutorial hour per week per semester is assigned one credit.

Practical/Laboratory : One laboratory hour per week per semester is assigned half credit.

Examples:

Theory Course *EES-302 Analog Electronics*; 4 credits (3-1-0)

The credits indicated for this course are computed as follows:

3 hours/week lectures = 3 credits

1 hours/week tutorial = 1 credit

0 hours/week practical = 0 credit

So, (3-1-0) 4 credit course = (3 h Lectures + 1 h Tutorial + 0 h Practical) per week
= 4 contact hours per week

Practical Course *EES-312 Analog Electronics Lab*; 2 credits (0-0-4)

The credits indicated for this course are computed as follows:

(0-0-4) 2 credit course = (0 h Lectures + 0 h Tutorial + 4 h Practical) per week
= 4 hours/week practical = 4 x 0.5 credit = 2 credit

ORDINANCE X “UNIVERSITY EXAMINATION”

Bachelor of Technology (B. Tech.) Programme (Semester System)

Notwithstanding anything contained to the contrary, the following Ordinance shall apply to the B. Tech Programme of the Faculty of Engineering & Technology under the Semester System.

1. The degree of the Bachelor of Technology (B. Tech) shall be awarded to candidates who have successfully undergone at this University, a regular programme of study of minimum four Academic Years (eight semesters) in the relevant branch of Engineering and who satisfy other academic requirements as specified by the Academic Council from time to time.

Evaluation:

2. A course may be a theory course or a practical course (including project, seminar, field work, industrial training etc). A course will carry a specified number of credits decided by the concerned Board of Studies. Each credit will be equivalent of 25 marks.
 - (a) In each semester, for each prescribed theory course there shall be a Mid Semester Evaluation and an End Semester Examination.
 - (b) The Mid Semester Evaluation shall have a weightage of 40% while the remaining 60% weightage will be for End Semester Examination.
 - (c) The marks in respect of the Mid Semester Evaluation of a course shall be notified by the Head of the Department concerned before the commencement of the End Semester Examination. The Mid Semester Evaluation (40%) shall comprise the following;
 - i. 30% for two Mid Semester Tests, both of equal weightage;
 - ii. 10% for other modes of Sessional Evaluation (to be specified by the Faculty Committee and notified before the commencement of teaching of each course).
3. A student has to secure at least 35% marks in each component (i.e. Mid Semester Evaluation and End Semester Examination) in order to pass the course. In order to be eligible to appear in the End Semester Examination of the particular course, a student must get the required minimum of 35% marks in the Mid Semester Evaluation of that course.
4. There will be no Mid Semester Practical Tests. In a Practical course/project/seminar/industrial training/field work, the End Semester Examination shall have a weightage of 40% while the performance of the student as evaluated by the teacher concerned during the Semester (i.e. Mid Semester Evaluation) shall have a weightage of 60%.
5. The marks of each course shall be the combined marks obtained by the student in the Mid Semester Evaluation and the End Semester Examination.

Promotion:

6. If a student is detained due to shortage of attendance in any semester, he/she will not be promoted to the next semester. He/She will also be detained for the subsequent semester. Thereafter he/she will become a regular student of the same semester in which he/she was detained. As a regular student, he/she will appear in the Mid Semester Tests as well as the End Semester Examination.
7. (a) Every student shall be promoted from an Odd Semester to the Even Semester except those detained due to shortage of attendance (as in clause 6 above).
(b) A student will be promoted from an Even Semester to the next Odd Semester (except those detained due to shortage of attendance as in clause 6 above), provided the total number of he/she uncleared credits does not exceed 22.
8. A student who is not promoted as in 7 (b) above; due to uncleared courses exceeding 22 credits, will be detained for a whole year and will appear (as an ex-student) in the End Semester Examinations of all his/her uncleared courses (held in that year, in both semesters). He/She may, however be permitted to attend classes of the uncleared courses, with permission of the Head of the Department. However, he/she will have to reappear in the Mid Semester Evaluation of only those courses in which he/she could not secure the required minimum of 35% marks (specified in clause 3).
9. A promoted student will not appear in the Mid Semester Evaluation of uncleared course, provided he/she had obtained the required minimum of 35% marks in the Mid Semester Evaluation of that course. The marks obtained by him/her in the Mid Semester Evaluation (as a regular student) will remain valid.

Use of Unfair Means:

10. (a) If the result of a student is cancelled on account of using unfair means, his/her previous Mid Semester Evaluation marks shall remain valid and will be taken into account for the award of grades whenever he/she is subsequently permitted to appear in the End Semester Examination.
(b) The cases of students resorting to unfair means shall be referred to the Examination Committee.

Re-evaluation:

11. There shall be no re-evaluation in any B. Tech (Semester System) Courses.

Compartmental Examination:

12. Compartmental examinations will be held only for regular students, in the theory courses of VII & VIII Semesters, after the declaration of VIII Semester results.

Maximum Time Limit:

13. No students shall be allowed to appear in the examination after the expiry of seven Annual Academic Sessions including the one in which he/she was first admitted to the Bachelor of Technology programme.

14. **Attendance:**

The provisions of the University Ordinance-X in this respect shall be applicable.

15. **LEETER GRADES:**

The Letter Grades will be awarded in each course on the basis of the combined marks obtained by the students in two components of evaluation (Mid Semester Evaluation and End Semester Examination) mentioned in Clauses 3 & 4. Letter Grades on 10-Point Scale will be awarded as described here in below. On obtaining a pass grade, the student will be supposed to have earned the credits assigned to that course and no change for improvement of this grade shall be provided.

16. **GRADING:**

16.1. A Letter Grade shall be awarded in each course and on obtaining a pass grade, A, B, C, or D, the student shall be supposed to have earned the credits assigned to the course.

16.2. The combined marks obtained by a student in the two components of the Evaluation (Mid Semester Evaluation and End Semester Examination) of a course shall be the basis of award of Letter Grades (A, B, C, D and F) on 10-Points Scale in accordance with the table given below;

Range of Marks Obtained	Letter Grades	Grade Points	Significance
75% and above	A	10	Outstanding
60% and above but less than 75%	B	8	Very Good
45% and above but less than 60%	C	6	Good
35% and above but less than 45%	D	4	Satisfactory (Minimum Passing Grade)
Less than 35%	F	0	Unsatisfactory (Fail Grade)

17. **Submission of Grade Award List:**

The Grade Award List of course shall be prepared by the teacher(s) concerned in the triplicate and shall be submitted along with evaluated answer scripts (if any) for tabulation of results.

18. **Semester Performance Index (SPI):**

It is the weightage average of the grade points of all courses during the semester and shall be calculated as follows:

$$SPI = \frac{\sum(\text{Credits assigned to a course}) \times (\text{Numerical value of the grade awarded})}{\sum \text{Credits}}$$

$$SPI = \frac{\sum C_i W_i}{\sum C_i}$$

where the sum run over all course of that semester.

Cumulative Performance Index (CPI):

19. The final CPI (Cumulative Performance Index) of a student shall be calculated on a base of 10 and shall be on the basis of the candidate's performance, spread over the first year, the second year, the third year and the fourth (Final) year of Bachelor of Technology Programme. The relative weightage assigned to each of the four years shall be as follows;
- (i) The First Year : 25% (of the sum of SPI of I and II Semesters)
 - (ii) The Second Year : 50% (of the sum of SPI of III and IV Semesters)
 - (iii) The Third Year : 75% (of the sum of SPI of V and VI Semesters)
 - (iv) The Fourth (Final) Year : 100% (of the sum of SPI of VII and VIII Semesters)

where SPI (Semester Performance Index) will be calculated according to the provision given in the Clause 18 herein above.

Division:

20. The Division will be awarded in the following manner (with maximum CPI of 10 as base):

I Division with honours	: CPI ≥ 8.5
II Division	: 6.5 ≤ CPI < 8.5
III Division	: CPI < 6.5

21. **Conversion Formula of Cumulative Performance Index (CPI):**

For the purpose of conversion of CPI after Final Year B. Tech. Examination into an equivalent Percentage of Aggregate (Y%), the following formula may be used:

$$Y\% = (20X^3 - 380X^2 + 2725X - 1690) / 84$$

Where, X is the CPI of the student.



Ordinance 35 (XXXV) (Academic)

ATTENDANCE

(for Regular Students)

1. In order to be eligible to appear at the Annual/Semester End Examination, a student shall be deemed to have undergone a regular course of study in the University, if he/she has attended at least 75% in lectures/tutorials, AND separately 75% in practicals/ field work/teaching practice and/or such other activities as decided by the Academic Council from time to time.

Provided that a relaxation to the maximum extent of 10% of the total attendance may be accorded to a student on account of serious sickness/excruciating medical disability*, participation in the university-approved co-curricular/extra-curricular activities and prescribed educational/cultural tours.

Provided further that in case of medical disability as mentioned herein above, an application for condonation shall be supported by a medical certificate advising such a condonation issued by a Public Hospital or such hospitals as notified by Jamia Millia Islamia (as per the appended annexure). The University may, at its discretion, refer such cases to the Ansari Health Centre of Jamia. The decision of the medical experts of the Ansari Health Centre shall be final and conclusive. ***Such applications must be submitted either during the period of treatment/hospitalization or within two weeks following recovery.*** In case of review/rejection by the Ansari Health Centre, the same shall be communicated to the applicant by the concerned department *vithin two weeks* of receipt of application for condonation.

- 2.** In the case of B.A. LL.B. (Hons.) programme, in terms of the requirements of the Bar Council of India, no student shall be allowed to take the End-Semester Examination in a subject if the student concerned has not attended a minimum of 70% of the classes held in the subject as also in the 'moot court', room exercises, tutorials and practical training conducted in the subject taken together.

Provided that if a student for any exceptional reason(s) fails to attend 70% of the classes as mentioned herein above, a committee set up by the Vice-Chancellor, on the recommendation of the Dean of the Faculty, may examine the case and submit its recommendation to the Vice-Chancellor to allow/ disallow the student to take the examination if the student concerned attended at least 65% of the classes held in the subject concerned and attended 70% of the classes in all the subjects taken together.

3. In the case of B.D.S. programme, a student shall be required to satisfy the following requirements pertaining to attendance:
 - (a) No student shall be permitted to appear in the annual examination unless he/she has fulfilled all the requirements of the course and has secured not less than 75% attendance in theory and 75% in practical and clinical, individually in all subjects.
 - (b) In case of a subject in which there is no examination at the end of the academic year, the percentage of attendance shall not be less than 70% in theory/ practical/ clinical individually. However, at the time of appearing for the University Examination in

those subjects, the aggregate percentage of attendance in each subject should satisfy the condition (a) above.

4. Notwithstanding anything contained in the Paras 1-3, a Faculty/Department/Centre, as it may deem fit, may include certain other components of the programme/courses like agency placement, conferences, self development modules, camps, training and other allied activities for regulating attendance, as approved by the Academic Council from time to time on the recommendation of the concerned Board of Studies/ Committee of Studies.

Provided that the attendance requirements in the components of such programme of study/ courses shall in no way be less than 75%.

5. In consonance with these Ordinances, the University may frame regulations for effective implementation of the rules pertaining to attendance.

* Serious sickness/ excruciating medical disability shall include all diseased conditions requiring hospitalization or such diseases that render immobility for the period duly certified by the State Government/Central Government hospitals/dispensaries and all such hospitals that have been empanelled by Jamia Millia Islamia as per the C.G.H.S. rules.

** Paras 2 and 3 are as per the regulations of the Bar Council of India and Dental Council of India, respectively.

Regulation R-35 (R-XXXV) (*academic*)

Counting of Attendance of Students

1. Subject to the provisions laid down in Ordinance 35 (*academic*), the attendance of students, who have registered themselves in various programmes/courses of study, shall be computed as per the procedure described in this Regulation.
2. Attendance of students admitted to the 1st semester/ 1st year of any programme/course of study shall be counted from the date of admission in the respective classes.
3. Classes of the consecutive semesters/years shall commence from the 1st working day after the summer/winter vacations and all students who have been/are likely to be promoted to the next semester/year of the class will be deemed to have been given 'provisional' admission, even if the examination results of such students are awaited or they have not completed their re-admission. The attendance of all such provisionally admitted students shall be counted from the 1st working day of the respective semester/year.

Provided that in the Bachelor of Dental Surgery (B.D.S.) course where there is a provision of 'supplementary examination' as per the ordinance of the said course, if a student passes the supplementary examination, his/her attendance shall be counted from the date of his/her provisional admission. However, if a student fails in the supplementary examination, his/her attendance shall be counted from the date of his/her re-admission to the previous class, which he/she has been reverted back.

Provided further that the provisionally admitted students shall be required to complete their re-admission by 31st of July of each year or within 15 days of the declaration of result, whichever is latter. In case the student is unable to complete the re-admission as per the above time limit, he/she will be allowed to complete the re-admission within the next 15 days after the expiry of the cut-off date with the provision of late payment of such fees as is notified from time to time.

Provided further that if a student fails to complete his/her re-admission by the above extended schedule of late payment of fee, his/her admission shall stand cancelled.

4. If a student is found to be continuously absent from the class without information, communicated in writing explaining with valid cause, the reason for such absence, for a period of 30 days or more (15 days in case of the Faculty of Engineering & Technology/ Architecture & Ekistics/ Education/ Dentistry), his/her name shall be struck off the rolls.
5. A student whose admission is cancelled due to his/her inability to pay the late payment fee within the prescribed time limit or due to his/her absence from classes as per the provision of para no. 4 above, he/she may only be re-admitted after getting permission from the Vice-Chancellor.

It is clarified that the late submission of fee by the student will not entitle him/her for any relaxation in attendance and that his/her attendance shall be counted from the date of commencement of classes.

COURSE STRUCTURE AND CURRICULUM

(w.e.f. 2013-2014)

B. TECH. PROGRAMME ELECTRICAL ENGINEERING

COURSE STRUCTURE

B. TECH. ELECTRICAL ENGINEERING –I YEAR

S. No	Course No.	Course Name	CREDIT	Periods Per week			Examination Scheme (Distribution of Marks)					
				L	T	P	Mid Semester Evaluation		End Semester Evaluation	Total Marks		
							CCA	MSE				
FIRST SEMESTER												
THEORY												
01	AS-101	English	2	2	-	-	-	20	30	50		
02	AS-102	Engineering Physics-I	3	2	1	-	-	30	45	75		
03	AS-103	Engineering Chemistry-I	3	2	1	-	-	30	45	75		
04	AS-104	Engineering Mathematics-I	3	2	1	-	-	30	45	75		
05	CE-101	Elements of Environmental Engineering	3	2	1	-	-	30	45	75		
06	ME-101	Engineering Mechanics	3	2	1	-	-	30	45	75		
07	ECS-101	Basics of Electronics Engineering	3	2	1	-	-	30	45	75		
08	CS-101	Fundamentals of Computing	2	1	1	-	-	20	30	50		
PRACTICAL (LAB.)												
01	AS-111	English Language Lab.	1	-	-	2	-	15	10	25		
02	AS-112	Physics Lab-I	2	-	-	4	-	30	20	50		
03	AS-113	Chemistry Lab-I	2	-	-	4	-	30	20	50		
04	ME-111	Engineering Mechanics Lab.	2	-	-	4	-	30	20	50		
05	ME-113	Engineering Graphics-I	2	-	-	4	-	30	20	50		
06	ME-114	Workshop Practice –I	2	-	-	4	-	30	20	50		
Total Credits			33							Total marks		825
SECOND SEMESTER												
THEORY												
01	AS-201	Social Sciences	3	2	1	-	-	30	45	75		
02	AS-202	Engineering Physics-II	3	2	1	-	-	30	45	75		
03	AS-203	Engineering Chemistry-II	3	2	1	-	-	30	45	75		
04	AS-204	Engineering Mathematics-II	3	2	1	-	-	30	45	75		
05	CE-201	Elements of Civil Engineering	3	2	1	-	-	30	45	75		
06	ME-201	Thermodynamics	3	2	1	-	-	30	45	75		
07	EES-201	Basics of Electrical Engineering	3	2	1	-	-	30	45	75		
PRACTICAL (LAB.)												
01	AS-212	Physics Lab –II	2	-	-	4	-	30	20	50		
02	AS-213	Chemistry Lab-II	2	-	-	4	-	30	20	50		
03	ME-212	Engineering Graphics-II	2	-	-	4	-	30	20	50		
04	CE-211	Element Civil Engineering Lab.	2	-	-	4	-	30	20	50		
05	ME-213	Workshop Practice –II	2	-	-	4	-	30	20	50		
06	EES-211	Basics of Electrical Engineering Lab.	2	-	-	4	-	30	20	50		
Total Credits			33							Total marks		825

B. TECH. ELECTRICAL ENGINEERING –II YEAR

S.No	Course No.	Course Name	CREDIT	Periods Per week			Examination Scheme (Distribution of Marks)				
				L	T	P	Mid Semester Evaluation		End Semester Evaluation	Total Marks	
							CCA	MSE			
THIRD SEMESTER											
THEORY											
01	AS-301	Engineering Mathematics—III	4	3	1	-	10	30	60	100	
02	EES-302	Analog Electronics	4	3	1	-	10	30	60	100	
03	EES-303	Electrical Machines—I	4	3	1	-	10	30	60	100	
04	EES-304	Circuit Analysis	4	3	1	-	10	30	60	100	
05	EES-305	Signals and Systems	4	3	1	-	10	30	60	100	
06	EES-306	Fluid Mechanics and Fluid Machines	4	3	1	-	10	30	60	100	
PRACTICAL (LAB.)											
01	EES-312	Analog Electronics Lab.	2	-	-	4	30	-	20	50	
02	EES-313	Electrical Machines-I Lab.	2	-	-	4	30	-	20	50	
03	EES-314	Circuit Analysis Lab.	2	-	-	4	30	-	20	50	
04	EES-316	Fluid Mechanics and Fluid Machines Lab.	2	-	-	4	30	-	20	50	
Total Credits			32	Total marks							800
FOURTH SEMESTER											
THEORY											
01	EES-401	Electrical Measurements-I	4	3	1	-	10	30	60	100	
02	EES-402	Electromagnetic Field Theory	4	3	1	-	10	30	60	100	
03	EES-403	Digital Electronics	4	3	1	-	10	30	60	100	
04	EES-404	Power Systems-I	4	3	1	-	10	30	60	100	
05	EES-405	Electrical Machines –II	4	3	1	-	10	30	60	100	
06	EES-406	Circuit Synthesis	4	3	1	-	10	30	60	100	
PRACTICAL (LAB.)											
01	EES-411	Electrical Measurements-I Lab.	2	-	-	4	30	-	20	50	
02	EES-413	Digital Electronics Lab.	2	-	-	4	30	-	20	50	
03	EES-415	Electrical Machines-II Lab.	2	-	-	4	30	-	20	50	
Total Credits			30	Total marks							750

B. TECH. ELECTRICAL ENGINEERING –III YEAR

S.No	Course No.	Course Name	CREDIT	Periods Per week			Examination Scheme (Distribution of Marks)				
				L	T	P	Mid Semester Evaluation		End Semester Evaluation	Total Marks	
							CCA	MSE			
FIFTH SEMESTER											
THEORY											
01	AS-501	Numerical Analysis and Computer Programming	4	3	1	-	10	30	60	100	
02	EES-502	Power Electronics	4	3	1	-	10	30	60	100	
03	EES-503	Control Systems	4	3	1	-	10	30	60	100	
04	EES-504	Communication Systems	4	3	1	-	10	30	60	100	
05	EES-505	Power Systems-II	4	3	1	-	10	30	60	100	
06	-	Elective-I	4	3	1	-	10	30	60	100	
PRACTICAL (LAB.)											
01	AS-511	Numerical Analysis and Computer Programming Lab.	2	-	-	4	30	-	20	50	
02	EES-512	Power Electronics Lab.	2	-	-	4	30	-	20	50	
03	EES-513	Control Systems Lab.	2	-	-	4	30	-	20	50	
04	EES-514	Communication Systems Lab.	2	-	-	4	30	-	20	50	
Total Credits			32							Total marks	800
SIXTH SEMESTER											
THEORY											
01	EES-601	Microprocessors	4	3	1	-	10	30	60	100	
02	EES-602	Programming Languages	4	3	1	-	10	30	60	100	
03	EES-603	Electrical Measurements—II	4	3	1	-	10	30	60	100	
04	EES-604	Power Station Practice	4	3	1	-	10	30	60	100	
05	EES-605	Computer Architecture	4	3	1	-	10	30	60	100	
06	-	Elective – II	4	3	1	-	10	30	60	100	
PRACTICAL (LAB.)											
01	EES-611	Microprocessors Lab.	2	-	-	4	30	-	20	50	
02	EES-612	Programming Languages Lab.	2	-	-	4	30	-	20	50	
03	EES-613	Electrical Measurements—II Lab.	2	-	-	4	30	-	20	50	
04	EES-610	Seminar	2	-	-	4	30	-	20	50	
Total Credits			32							Total marks	800

Elective- I

EES-506 Electrical Engineering Materials, EES-507 Electronic Engineering Materials

Elective –II

EES-606 Electric Drives, EES-607 Data Structures

B. TECH. ELECTRICAL ENGINEERING –IV YEAR

S.No	Course No.	Course Name	CREDIT	Periods Per week			Examination Scheme (Distribution of Marks)				
				L	T	P	Mid Semester Evaluation		End Semester Evaluation	Total Marks	
							CCA	MSE			
SEVENTH SEMESTER											
THEORY											
01	EES-701	Industrial Management	4	3	1	-	10	30	60	100	
02	EES-702	Utilization of Electrical Energy	4	3	1	-	10	30	60	100	
03	EES-703	Electrical Machines-III	4	3	1	-	10	30	60	100	
04	EES-704	Power Systems-III	4	3	1	-	10	30	60	100	
05	-	Elective-III	4	3	1	-	10	30	60	100	
PRACTICAL (LAB.)											
01	EES-713	Electrical Machines-III Lab.	2	-	-	4	30	-	20	50	
02	EES-714	Power Systems –III Lab.	2	-	-	4	30	-	20	50	
03	EES-710	Industrial Training *	4	-	-	4	60	-	40	100	
04	EES-720	Minor Project	6	-	-	12	60	-	90	150	
Total Credits			34							Total marks	850
EIGHTH SEMESTER											
THEORY											
01	EES-801	Advanced Control Systems	4	3	1	-	10	30	60	100	
02	EES-802	Switchgear and Protection	4	3	1	-	10	30	60	100	
03	EES-803	Energy Management Systems	4	3	1	-	10	30	60	100	
04	-	Elective-IV	4	3	1	-	10	30	60	100	
PRACTICAL (LAB.)											
01	EES-821	Switchgear and Protection Lab.	2	-	-	4	30	-	20	50	
02	EES-813	Energy Management and SCADA Lab.	2	-	-	4	30	-	20	50	
03	EES-820	Major Project	12	-	-	24	180	-	120	300	
Total Credits			32							Total marks	800

*** During Summer vacation after 6th Semester (Minimum 4 Weeks)**

Elective -III

EES-705 High Voltage Engineering, EES-706 Electric Traction, EES-707 Digital Signal Processing, EES-708 AI & Soft Computing, EES-709 Industrial Automation and Control, EES-710 Estimation and Design of Power Systems, EES-711 Biomedical Instrumentation

Elective -IV

EES-804 Data Communications and Computer Networks, EES805 Advanced Microprocessors, EES-806 HVDC Transmission, EES-807 Electrical Machine Design, EES-808 Advanced Protective Relays,

B. TECH. IN ELECTRICAL ENGINEERING
SEMESTER-I

AS-101 English

L-T-P (2-0-0) Credit (2)

Unit-1 Communication and Interfering Barriers

Communication and Sharing

Barriers of Communication

Cultural Negotiation and Socio-linguistics aspects

Unit-II Grammar (theoretical concepts)

Sentence Structure

Subject-Verb agreement

Tenses

Prepositions

Unit-III Professional Writing Skills

Paragraph

Essays

Formal Letters

Reports

Email Messages

Unit-IV Literature

Fiction :

Old Man and the Sea by Earnest Hemmingway

Play: Pygmalion by G.B. Shaw

Prose: Of Studies by Francis Bacon

How Much Land Does a Man require? by Leo Tolstoy

Poetry Daffodils by William Wordsworth

Ulysses by A. L. Tennyson

Road Not Taken by Robert Frost

The Express by Stephen Spender

Poetry by J.P. Das

Unit V: English Phonetics

International Phonetic Alphabets

Classification of consonant and vowel sounds

Mechanism of Production

AS-102 Engineering Physics-I

L-T-P (2-1-0) Credit (3)

Unit-1 Physics of Motion

Conservative & non conservative forces, Potential energy function in one, two and three dimensions, equation of motion for a conservative system (in one dimension), effect of friction on simple harmonic motion.

Unit-II Optics and Introduction to lasers

Interference of light, Double slit and triple slit interference, Newton's rings, interference in thin films, single slit diffraction, N slit diffraction, qualitative introduction to lasers, uses of lasers.

Unit-III Electromagnetism

Maxwell's equations, wave equation, plane electromagnetic wave, Poynting vector, electromagnetic spectrum.

Unit-IV Quantum Ideas

Photoelectric effect, Compton effect, Planck hypothesis, Bohr theory, de Broglie hypothesis, wave particle duality, uncertainty principle and its implications.

Unit-V Physics of Solids

Classification of solids, Bragg diffraction technique, Electrical properties of solids, thermal properties, classical free electron model for metals, critical assessment of the model

Text/Reference Books:

1. Resnick and Halliday : Physics
2. Beiser : Modern Physics
3. Mani and Damask : Modern Physics
4. Garcia and Damask : Physics for computer science
5. Thyagrajan : Laser

AS-103 Engineering Chemistry-I

L-T-P (2-1-0) Credit (3)

Unit-1 Molecules & Solid State

Homonuclear and Heteronuclear concepts, Non – covalent interaction, Van der waals bonding, hydrogen bonding, Idea of spatial periodicity of lattice, Unit cells, Bravais lattice, Atomic packing factor of SCC, BCC and FCC, Band theory, Conductors Semiconductors and insulators.

Unit-2 Reaction Dynamics, Catalysis & Electrochemistry

Rate laws, 1st Order reaction & 2nd order reaction, Mechanism and Theories of reaction rates, Characteristics and Types of Catalyst, Theories of Catalysis Electrode potential, Redox reaction & Nerst Equation.

Unit-3 Co-Ordination Chemistry

Transition elements, Werner's co-ordination theory, Structure of Co-ordination Compounds corresponding to Co-ordination number 2 to 6, Types of ligands, Isomerism & its types viz. Geometrical, Optical, Ionization, linkage & Co-ordination isomerism, Theories of bonding in Co-ordination compounds viz. crystal field theory and valence bond theory.

Unit-4 Polymers

Polymerization, Mechanism of Addition polymerization, Classification of plastics, Preparation properties & industrial applications of PTFE, PVC, Phenolic resin & Polyester resin, Conducting polymers & Biopolymers.

Unit-5 Reactivity of Organic Molecules & Types of Reactions

Inductive effect, Resonance, Hyper conjugation, Electromeric effect, Carbonium ion, carbanion & free radicals, Addition reactions, Elimination reactions & their Mechanism.

Text/ Reference Books

1. "Basic Inorganic Chemistry" Cotton, F A Wilkinson G. and Gaus, P L John Wiley & Sons. Inc. Singapore.
2. Puri & Sharma
3. Organic Chemistry by Morrison & Boyd
4. Engineering Chemistry By Jain & Jain
5. University General Chemistry, By CNR Rao, Macmillan India Ltd.
6. Mechanism in Organic Chemistry by Petersykes, Orient Longman.
7. Chemistry in Engineering and Technology Vol. 1 & 2 by Kuriacose & Raja Ram, Tata McGraw Hill & Co.

AS-104 Engineering Mathematics –I

L-T-P (2-1-0) Credit (3)

UNIT-I Curve Tracing and Applications of Definite Integrals

Two dimensional curve tracing in Cartesian, polar and parametric forms, Double points & points of inflexion, Oblique and parallel asymptotes, Length of the curves.

UNIT-II Techniques of one Variable Calculus

Leibnitz's theorem; n^{th} derivative of $F(x)$ at $x=0$, Maclaurin's expansion of $F(x)$, Formation of Intrinsic and pedal equations, Curvature, radius of curvature and centre of curvature.

UNIT-III Calculus of Several Variables and Matrices

Taylor's expansion of a function of one & two variables, Leibnitz's rule for differentiation under the sign of integration, Maxima and minima of a function of two and more variables including Lagrange's method, Eigen values and Eigen vectors of a square matrix, Properties of Eigen values, Applications of Cayley-Hamilton theorem.

UNIT-IV Ordinary Differential Equations

Orthogonal and Isogonal trajectories of a family of curves, Complementary function, particular integral and general solution of ordinary linear differential equations of higher order with constant and variable coefficients (Cauchy and Legendre forms). Method of variation of parameters and solutions of simultaneous differential equations with constant coefficients.

UNIT-V Partial Differential Equations

Change of independent variables in P.D.E., Complete solution of homogeneous and non-homogeneous L.P.D.E. of higher order with constant and variable coefficients. One dimensional wave and heat conduction equations. Two dimensional Laplace equations.

Text/ Reference Books

1. A.B. Mathur & V.P. Jaggi, A text book of Engg. Maths. & Advanced Engg. Mathematics
2. B.S. Grewal, Engg. Maths & Higher Engg. Maths
3. B.V. Ramana, Higher Engineering Mathematics.
4. R.K. Jain and S.R.K. Iyengar : Advanced Engineering Mathematics.

CE-101 Elements of Environmental Engineering

L-T-P (2-1-0) Credit (3)

UNIT-I

Introduction, scope, components of environment and environmental degradation.

UNIT-II

Ecology, elements of ecology, structures and functions of an ecosystem, ecological succession, food webs and ecological pyramids, basic features of major ecosystems such as forest, grassland and desert etc

UNIT-III

Renewable and non-renewable resources, forest, water, mineral exploitation and their uses.

UNIT-IV

Atmospheric composition, air pollution, sources, primary and secondary pollutants, effects of pollutants on human, global implications of air pollution, Noise pollution, sources, effects and standards.

UNIT-V

Hydrological cycle, water resources, major water pollutants, its origin and impacts on human and water bodies, effluent discharge standards.

Text/ Reference Books

1. Basics of Environmental Studies by J P Sharma, Laxmi Publisher

ME-101 Engineering Mechanics

L-T-P (2-1-0) Credit (3)

UNIT-1

Force, Moment, Couple, Principle of Transmissibility, Varignon Theorem, Resolution of Forces, Concurrent and Non-concurrent Force, Free body diagram, Equilibrium Equations.

UNIT-2

Plane Trusses - Method of joints and section, Lawss of friction, Belt friction, Introduction to lifting machines

UNIT-3

Centroid, Centre of gravity, First moment of Area, Second moment of area, Mass M.O.I., Polar Moment of Inertia. Transformation of axis.

UNIT-4

Equation of motion:, General plane motion, Kinematics of a particle, Kinetics of particle, Work-Energy principle, Impulse momentum principle.

UNIT-5

Kinematics of rigid bodies, Translation and rotation, plane motion, moving reference plane, velocity & acceleration. Kinetics of rigid bodies:- Plane motion, Translatory motion, Energy and momentum principle.

Text/ Reference Books

1. Vector Mechanics for Engineers: by Beer & Johnston, Tata Mc GrawHill
2. Statics and Dynamics : by by Merlum, John Wiley & Sons.
3. Engineering Mechanics: by K.L. Kumar, Tata Mc Graw Hill

ECS-101 Basics of Electronics & Communication Engineering

L-T-P (2-1-0) Credit (3)

Unit – I Semiconductor Diodes:

Semiconductors – Intrinsic and Extrinsic, PN junction diode, V – I Characteristics, static and dynamic resistance, linear and non-linear application of diodes. HWR, FWR and bridge rectifier, Zener diode – characteristics and its use as a voltage regulator, clipper circuits and clamper circuits.

Unit – II Transistor (BJT & JFET):

Bopolar junction transistor (BJT) – construction and working, biasing and amplifier action, load line analysis of transistor amplifier, BJT configurations and their comparison. Junction field effect transistor (JFET)

Unit – III Operational Amplifier:

Op-amp basics, practical opamp circuits, inverting and non-inverting amplifier, summing amplifier, integrators and differentiators

Unit-IV Feedback and Electronic Instruments:

Feedback concept, Barkhausen Criteria of Oscillation, weins bridge and phase shift oscillator, cathode ray oscilloscope (CRO), electronic multimeters

Unit – V Communication Systems:

Introduction to modulation, amplitude modulation, generation of AM waves, demodulation of AM waves, introduction to FM

Text/References Books

1. Microelectronics 2nd Edition, by 1. Millman and A. Grabel, Mc Graw Hill International Edition.
2. Electronic Devices and Circuit Theory 5th Edition, by Robert boyestad and Louis nashlesky, Prentice Hall of India Ltd., New Delhi.
3. Electronic Circuits-discrete and Integrated, by Schilling and Belove, Mc Graw Hill International Edition, New Delhi.
4. Communication System, 2nd Edition, by Simon Haykin, Wiley Eastern Ltd., New Delhi.
5. Fundamental of Information Technology by Alexander Leow UBS Publisher and distributors.

CS-101 Fundamentals of Computing

L-T-P (1-1-0) Credit (2)

UNIT-1 BASICS OF COMPUTERS

Computer fundamentals, Bits and Bytes, Generations of Computers , Classification of Computers, CPU, Memory, Input and Output Devices, Applications Software & System Software, Number system: Decimal , Binary, Octal, Hexadecimal.

UNIT-2 C PROGRAMMING

Flow Chart, Algorithms, The C character set, constants, variable, keywords, operator and expressions, decision controls, loops, case, functions, call by value and by reference, array, single dimensional, 2 dimensional, multidimensional arrays, Basic Concept of pointers & Structure.

UNIT-3 SEARCHING & SORTING

Searching and Sorting techniques, linear search, Binary Search, Bubble Sort, Strings, library string functions,

UNIT-4 OPERATING SYSTEM

OS definition, Role of OS in computer system, multi programming, time sharing, multitasking, multiprocessing, Multiprocessor and its type, cluster system, Real Time system, Client Server Computing, distributed OS, function of OS, user interface, CLI & GUI.

UNIT-5 NETWORKING & DBMS

Network, communication models, transmission media, connection topologies, LAN, WAN, MAN, ISO-OSI model of networking, Internet, ISP, WWW, Email, URL, Web browsers, websites, intranet, DBMS, DBMS applications, Advantage of DBMS, Data Model.

Text/References Books:

1. "Fundamentals of Computers" by V. Rajaraman, Prentice Hall of India Ltd.
2. Peter Norton, "Introduction to Computers, Tata Mc-Graw Hill.
3. M N Doja, "Introduction to Computers and Information Technology"
4. B. A. Forouzan, "Data Communication and Networking", Tata McGraw-Hill Education.
5. "An Introduction to Database Systems", C.J.Date, Pearson Education.
6. "Let Us C" by Yashwant Kanetkar, BPB Publication
7. "Programming in ANSI C" by Balaguruswamy. Tata McGraw-Hill Education

AS-111 English Language Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “English Language” (AS-101). The purpose of this Lab is to develop Communication Skills in the students through Group Discussion, Interviews and Seminars. There are around 8-10 sessions to be conducted by the students covering almost all units of theory course.

AS-112 Physics-I Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Physics-I” (AS-102). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include Physical Pendulum, Moment of Inertia table, Parallel axis theorem, Flywheel, Spiral Spring Characteristics, Conversion of Galvanometer into ammeter and voltmeter, Potentiometer, P N Junction Characteristics.

AS-113 Chemistry-I Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Chemistry-I” (AS-103). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. For example, determination of (1) the percentage composition of a given mixture of NaCl and NaOH, (2) the surface tension of a given liquid by drop number method using Stalagmometer, (3) strength of a strong acid by drawing titration curve using pH meter, and (4) the strength of a given HCl solution titrating it against N/10 NaOH solution conduct metrically etc.

ME-111 Engineering Mechanics Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Engineering Mechanics” (ME-101). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments are tensile strength, compressive strength, impact test, hardness testing, gear train, belt-pulley, torsion of rod etc.

ME-113 Engineering Graphics-I

L-T-P (0-0-4) Credit (2)

Unit-1 Introduction

Alphabets of lines, free hand lettering (upper case & lowercase) diagonal & Vernier scale Dimensioning. Determination of force in the members of truss using graphical method

Unit-2 Engineering Curves and Loci of the Points

Construction of ellipse using rectangular, concentric circle & intersecting arc methods, construction of parabola (Rectangular and tangent methods), Rectangular hyperbola, involutes of circle, cycloid, epicycloids and hypocycloid.

Unit-3 Projection

Concept of projection, orthographic projection of lines and plane, determination of true length of line, true shape of the plane, projection of solid in normal positions.

Unit-4 Projection (continued)

Projection of solid in included position using auxiliary plane method (axes of the solids inclined with H.P. and V.P. both, freely suspended position in air, pyramids resting on any principal plane on slant edge, triangular face etc.) Section of solids and the true shape of the section.

Unit-5 Development and intersection

Development of surface the frustum of solid and transaction pieces (when square section merges to circular section) reverse problem, intersection and penetration of solids.

Text/References Books

1. Engineering Drawing by N.D. Bhatt.
2. Engineering Graphics by L L Narayan and P. Kannarah
3. Engineering Drawsing Practice for schools and colleges, Bureau of Indian Standers, New Delhi.
4. Fundamentals of Engineering Drawing by Luzzadder.

ME-114 Workshop Practice-I

L-T-P (0-0-4) Credit (2)

1. Carpentry

Timber, definition, engineering application, seasoning and preservation, plywood and ply-boards, Job to be made: T-joint, Simple pattern.

2. Foundry

Moulding, Sands, constitutions and characteristics, Pattern, definition, material, types, core prints. Role of gate, runner riser, core and chaplets. Cause and remedies of some common casting defects like blowholes, cavities, and inclusions.

3. Metal Joining

Definitions of welding, brazing and soldering processes and their applications. Oxyacetylene gas welding process, equipment and techniques, type of flame and their applications. Manual metal arc welding techniques and equipment, AC and DC welding, constituents and functions of electrode coating. Welding Positions. Type of weld joint. Common welding defects such as cracks, undercutting slag inclusions, porosity. Jobs to be made: metal joining using steel flats, Arc welding and gas welding Metal joining using brazing, wise joining by soldering.

4. Fitting Blacksmithy and Tinsmithy

Tools required in fitting and operations. Forging principles and materials, operations. Tools required for forging and tinsmithy.

Job to be made: Fitting jobs on steel flats, Tinsmithy jobs on G. I. Sheet. Blacksmithy operations.

Text/References Books

1. "Workshop Technology", Chapman, W. A. J. And Arnold, E., Vol. I & III, Viva Low priced Student Edition.
2. "Workshop Technology", Raghuwanshi, B. S. Vol. I & II, Dhapat Rai and Sons.
3. "Elements of Workshop Technology", Chaudhary, Hajra, "Media Promoters & Publishers.
4. "Manufacturing Process", BEGEMAN, M. I. and Amsted, B. H., John Wiley.
5. "Basic Engineering process", Crawford, S. Hodder & Stoughton.

B. TECH. IN ELECTRICAL ENGINEERING
SEMESTER-II

AS-201 Social Sciences

L-T-P (2-1-0) Credit (3)

Unit-1:

Motivation and work :meaning definition, and types of human motives. Its relevance and significance for job performance and job satisfaction; learnt and inherent characteristics of human motives, Need Hierarchy Theory of Maslow (1943).

Unit-2:

Organization : Cocept, Meaning, and types of organization, Formal and Informal Organization, Similarities & differences therein; Concept of Line and Staff Agencies; Roles, Functions and limitations of these Agencies.

Unit-3:

Management: Concept ,Meaning and Definition; Roles, Functions and Responsibilities of a Manager; Qualities of a good Manager.

Unit-4:

Organizational Communication: the concept, meaning and Definition; superior and sub ordinate communication; written, verbal/oral communication; objectives and different components of communication; Barriers and guide lines of effective communication.

Unit-5:

Tastings/Experiments and Educational field work:

Experiments and Tastings on :

- Trial and Error learning.
- Testing Reaction Times,
- A personality test.
- Intelligence Test.
- Creativity Test.
- A motivational Test.

Text/ Reference Books

1. S P ROBINS : Organizational behaviour---, Prentice Hall of India ltd.Latest edition.
2. J P Chandan: Management :Theory and Practice.
3. Mohsin S M :Research Methods in Behavioral Sciences. Orient Longman.
4. Singh A K : Test Measurements & Research Methods in Behavioral Sciences.
5. Singh Nirmal; Organizational Behavior, concept theory and practice
6. S K Sharma and Savita Sharma: Industrial Engineering and Operation management. Kataria and Sons Gurunanak Market. New Delhi -6.
7. R D Aggarwal; Organization and Management;
8. K K Ahuja.: Industrial Management; S K Katria & Sons, New Delhi-6

AS-202 Engineering Physics-II

L-T-P (2-1-0) Credit (3)

Unit-I Special theory of relativity

Non relativistic view point, inertial and non inertial frames, Galilean transformations, principle of relativity, Lorentz transformations and their consequences, mass, momentum and energy in relativity

Unit-II Laser

Principle of laser action, population inversion, Einstein coefficients, elementary laser types, applications of lasers

Unit – III: Quantum theory

Wave function, probability density, Schrodinger equation, free [article, particle in a box, system of two dissimilar particles, system of two identical particles

Unit – IV: Physics of Solids

Classical and quantum statistics, quantum free electron model of metals, critical assessment of the model, Fermi energy, intrinsic and extrinsic semiconductors, electron and hole densities, properties of semi conductors

Unit – V: Frontiers of Physics

Big bang model of the universe, critical assessment of the model, elementary particles and conservation laws, Last Nobel Prize in Physics

Text/ Reference Books

1. Resnick and Halliday : Physics
2. Beiser : Modern Physics
3. Mani and Damask : Modern Physics
4. Garcia and Damask : Physics for computer science
5. Thyagrajan : Laser

AS-203 Engineering Chemistry

L-T-P (2-1-0) Credit (3)

Unit-1 Water Treatment

Hardness of water, Units of Hardness, Problems on Hardness, Scale & Sludge formation in boilers, Caustic embrittlement, Boiler Corrosion, Priming & foaming, softens Methods, Problems on Softening, Chlorination.

Unit 2 Fuel And Combustion

Fossil fuels, Theoretical calculation of calorific value, Bomb and Boys gas calorimeter, Coal & its classification, Analysis of coal & its significance, crude petroleum and its refining, knocking in IC engines, Octane number & cetane number. Numericals based on combustion.

Unit 3 Lubricants & Inorganic Cementing Materials

Lubricants, Types of lubrication, classifications, Lubricating Oils, Greases, Solid lubricants, Properties of lubricating oil & Greases, Cement & its Types, Manufacturer of Portland cement, Chemical composition & Constituents of Portland cement, setting & Hardening of cement.

Unit 4 Steel & Corrosion

Steel, Difference between Iron & Steel. Manufacturer of Steel by Bessemer process, Open Hearth process, classification of Steel, Effect of Impurities on steel, Heat treatment of steel. Corrosion & its types, Mechanism of Chemical and Electrochemical corrosion,

Unit 5 Environmental Pollution & Its Control

Air Pollution – type of pollutants, sources, effects, sink & control of primary pollutants – Co, NP_x, HC, Sox & particulates, photochemical Smog, Acid rain & Global warming, CO₂ Sequestration, Water Pollution – Classification of Pollutants, their sources, waste water treatment, Soil Pollution – Composition & classification of soil, Effects of soil pollutants and their control, Solid Waste Pollution – Classification, waste treatment and disposal methods, composting, sanitary land filling, thermal process, recycling and reuse methods.

Text / Reference Books

1. Chemistry in Engineering and Technology Vol. 1 & 2 by Kuriacose & Raja Ram, Tata McGraw Hill & Co.
2. Environmental Chemistry & Pollution Control by S S Dara, S. Chand & Co.
3. Engineering Chemistry, P C Jain, Dhanpat Rai & Sons.
4. Environmental Chemistry, A K De, New Age Int. Pub. .

AS-204 Engineering Mathematics–II

L-T-P (2-1-0) Credit (3)

UNIT-I Solid Geometry and Multiple Integrals

Formation of equations of cylinder and cone under the given geometrical conditions, Tracing of some quadric (or Conicoids) three dimensional surfaces, Evaluation of multiple integrals by change of order of integration, Change of variables (Use of Jacobians).

UNIT-II Ordinary and Partial Differential Equations

Ordinary point and regular singular point. Series solutions of ordinary differential equations of second order with variable coefficients (polynomials) by the method of Frobenius, Complete solution of linear & non-linear P.D.E. of first order by Lagrange's method of undetermined multipliers and Charpit's method.

UNIT-III Complex Analysis

Analytic function, C-R equations, Geometrical representation of $W=F(z)$. Evaluation of complex contour integrals by Cauchy's integral theorem, Cauchy's integral formula associated with n^{th} order derivative and Cauchy's residue theorem (without proofs). Evaluation of real definite integrals by residue method.

UNIT-IV Laplace Transforms

Laplace and inverse Laplace transforms of some well known elementary functions and Special functions, Change of scale property, First and second shifting theorems, Laplace transforms of Derivative, Integral, $t^n f(t)$, $f(t)/t$, Convolution theorem. Periodic function, Problems on Inverse Laplace transforms. Evaluation of real definite integrals by Laplace transforms method.

UNIT-V Special Functions

Generating functions, Recurrence relations and orthogonal properties for Bessel's functions $J_n(x)$, Legendre's polynomials $P_n(x)$ and associated problems, Jacobi series, Fourier-Bessel series and Fourier-Legendre series.

Textbooks / Reference Books:

1. A.B. Mathur & V.P. Jaggi : Advanced Engineering Mathematics
2. B.S. Grewal : Higher Engineering Mathematics
3. B.V. Ramana : Higher Engineering Mathematics.
4. R.K. Jain and S.R.K. Iyengar : Advanced Engineering Mathematics.

CE-201 Elements of Civil Engineering

L-T-P (2-1-0) Credit (3)

Unit-I

Introduction to stress & strain: normal stress & strain, shear stress & strain, relationship between stress and strain; Uniaxial Tension Test: Stress-Strain diagrams for different materials; Mechanical Properties of materials: isotropy, homogeneity, continuity, ductility, brittleness, hardness & toughness, elasticity, work hardening, plasticity, creep, relaxation, fatigue.

Unit-II

Uniaxial deformation: Saint Vainant's principle, principle of superposition, free body diagram, bars of uniform and variable cross sections, compound/ composite bars, temperature stresses.

Unit-III

Analysis of stress & strain: tensor notations, equilibrium equations, transformation of stresses & strains, plane stress & plane strain, principal stresses & strains, maximum shear stress & strain and their planes, Mohr's circle, Strain Rosettes; Stress –Strain relationship: generalized Hooke's law, relation between elastic constants.

Unit-IV

Structures and their forms, loads, idealization of structures, supports and connections, elastic and linear behaviour of structures; Determinate and indeterminate structures, relation between in B.M., S.F. and loads, B.M. and S.F. diagrams in statically determinate simply supported (without overhang) and cantilever beams subjected to concentrated loads and udl.

Textbooks / Reference Books:

1. Engineering Mechanics of Solids By E.P.Popov, Pearson Education.
2. Solid Mechanics by S.M.A Kazimi, Tata Mcgraw Hill.
3. Mechanic of Materials by R.C Hibbeler, Pearsons.
4. Mechanics of Materials by Bear & Jonhsion, Dewolf, Mcgraw Hill.
5. Strength of Materials by S Timoshenko
6. Strength of Materials by R K Rajput

ME-201 Thermodynamics

L-T-P (2-1-0) Credit (3)

UNIT-1

Properties of a system, thermal equilibrium, zeroth law of thermodynamics and concept of temperature. Work, displacement work in various quasi-state systems, thermal equilibrium, sign convention for heat transfer. First Law of Thermodynamics, application to non-cyclic process. Internal energy, modes of energy. Enthalpy. Pure substance, specific heats, first law for control volumes, Application of first law to non-cyclic process, steady flow energy equation.

UNIT-2

Second Law of Thermodynamics, Kelvin-Planck and Clausius Statement and their equality, reversible and irreversible processes. Entropy physical interpretation of entropy. Corollaries of second law.

UNIT-3

Combined First Law and Second Laws Equations. Entropy calculation through T-ds relations. Maxwell's Relations, Clausius Inequality. Equations for specific heat Carnot cycle. Thermodynamics temperature scale. Entropy as a measure of irreversibility.

UNIT-4

Properties of pure substance, Use of Steam Tables and Mollier Diagram, Ideal gas and properties.

UNIT-5

Real gas, equations of state, Vander-Wall's Equation, compressibility factor, generalized charts of Compressibility. Principles of corresponding states. Power Cycles.

Text/References Books:

1. Engineering Thermodynamics, Spalding, D.B. and Cole, E.H., Edward Arnold.
2. Engineering Thermodynamics, Hawkins, G.A., John Wiley and sons.
3. Fundamentals of Classical Thermodynamics, Van Wylen, G.J. and Sonntag, R.E., John Wiley and Sons.

EES-201 Basics of Electrical Engineering

L-T-P (2-1-0) Credit (3)

UNIT-I

Kirchoff's laws, node voltage and mesh current methods, delta-star and star-delta conversion, classification of network elements, superposition principle, Thevenin's and Norton's theorems.

UNIT-II

Single phase AC circuits, average and effective values of sinusoids, solution of R,L,C series circuits, the j operator, complex representation of impedances, phasor diagram, power factor, power in complex notation, solution of parallel and series-parallel circuits, resonance. Introduction to balance three phase AC circuits.

UNIT-III

Ampere's circuital law, B-H curve, solution of magnetic circuits, hysteresis and eddy current losses. Relays as an application of magnetic force. Transformers- construction, e.m.f. equation, ratings, phasor diagram for no load and full load, equivalent circuit, regulation and efficiency calculations, open circuit and short circuit tests.

UNIT-IV

DC motors- construction, e.m.f. and torque equations, characteristics of DC generators and motors, speed control of DC motors. DC motor starter- working principle, ratings. Introduction to single phase induction motor.

UNIT-V

PMMC instruments, shunts and multipliers, multi-meters, moving iron ammeters and voltmeters, dynamometer wattmeters, AC watt-hour meters, extension of instrument ranges.

Text/Reference Books

1. V. Del Torro, Electrical Engineering Fundamentals, Second Edition, Prentice Hall of India Pvt. Ltd.
2. E. Hughes, Electrical Technology, English Language Book Society Publication with Longman.
3. H. Cotton, Advanced Electrical Technology, Issae Pitman, London.
4. S.S. Parker, Problems in Electrical Engineering, Asia Publications.

AS-212 Physics-II Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Physics-II” (AS-202). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. They include Laser experiments, Melde’s Experiment, Newton’s rings, Spectrometer, Conductivity Study, Hall Effect, Photo Diode Characteristics, Planck Constant determination, Zener Diode Characteristics, Damped Harmonics motion.

AS-213 Chemistry-II Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Chemistry-II” (AS-203). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. For example, determination of (1) temporary, permanent and total hardness of the given water sample by Versenate method, (2) dissolved oxygen contents of the given water sample using Winkler’s method, (3) chlorine ions in a given water sample by Argentometric method using Mohr’s method, (4) moisture, volatile & ash contents in a given coal sample by proximate analysis, (5) viscosity of a given oil sample using Redwood Viscometer etc.

ME-212 Engineering Graphic-II

L-T-P (0-0-4) Credit (2)

Unit-1 Orthographic Projection

Conversion of pictorial/isometric views into orthographic views of machine block. Identification of surface in orthographic views. Some practice on auto-Cad package.

Unit-2 Isometric Projection

Isometric scale, isometric projection of solids, missing line and missing views. Isometric view of simple objects when their orthographic views are given. Preparation of isometric views using Auto-Cad package.

Unit-3 Sectioning

Conventional representation in section of engineering materials. Methods of sectioning, sectional views of machine components, brackets, bushed bearing and foot step bearing.

Unit-4 Fasteners

Sketches of different types of threads, permanent fasteners (riveted and welded joints), temporary fasteners (nut and bolt assembly, studs, keys etc.)

Unit-5 Building Drawing

Symbols of electrical and sanitary items. Terminology used in building drawing, plan and elevation of 2/3-rooms building using Auto-CAD package, from corrosion, Refractories, their manufacture and properties: neutral, acid and basic refractors; glass its types and manufacture.

Text/References Books

1. Chemistry of Engineering Materials, C.V. Aggarwal, Tara Book Agency Varansi.
2. Chemistry in Engineering and Technology, Kuriacose & Raja Ram, Tata McGraw Hill.
3. Engineering Chemistry, B. K. Sharma, P C Jain, Dhanpa Rai & Sons.

ME-213 Workshop Practice-II

L-T-P (0-0-4) Credit (2)

- 1) Foundry: Mould cores, core prints, gates, runner, risers, chaplets, common defects in casting. Defects due to mould, metal pouring, solidification.
- 2) Metal Joining: Oxy acetylene gas welding equipment, types of flame. Electric arc and contact welding. Electrodes and equipment for AC and DC welding, electrode coating-functions and constitutes. Common welding defects.
- 3) Metal cutting operation and tools: Common metal cutting machine like lathe, milling, shaper, slotter and drill, Lathe operations like turning, chamfering, facing, taper turning and knurling. Materials for lathe tools and other tools. Bench grinder and use.

Related Iabs

1. Gas welding:- Simple joint like joint.
2. Electric Arc Welding:- Simple joints like butt joint.
3. Tin Smithy:- Mechanical Jointing, jobs like box, tray, funnel and soldering of joints.
4. Turning:- Plane turning, taper turning, threading, knurling facing and chamfering on the same job.
5. Shaping:- Surface finishing at right angles.
6. Milling:- Making a slot two or three surface finishing at angles of 120° C.
7. Drilling:- Making drilled holes in plates or flats and grinding the corner of a plate to round.

Text/References Books

1. Elements of Workshop Technology by, Chaudhry Vol. 1& 2. Media promoters and publisher.
2. Workshop Technology, Vol. 1-3 by W. A. J. Chapman, ELB.S.

EES-211 Basics of Electrical Engineering Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Basics of Electrical Engineering” (EES-201). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. In this laboratory, some of the experiments conducted are: verification of basic network laws, determining the efficiency of transformers, study of operation of energy meter, applications of CRO, determining the resistance of carbon resistors and study of V-I characteristics of semiconductors diodes. The experiments on verification of superposition theorem, Thevin’s theorem and Norton’s theorem are also included in their course.

B. TECH. IN ELECTRICAL ENGINEERING
SEMESTER-III

AS-301 Engineering Mathematics-III

L-T-P (3-1-0) Credit (4)

UNIT-I

Applications of double and triple integrals (Cartesian, polar, cylindrical and spherical coordinate) in finding the centre of gravity, moment of inertia, curved surface area and volume. Problems on Green's theorem, Gauss Divergence theorem, Stoke's curl theorem (Cartesian forms with out proof).

UNIT-II

Applications of Laplace and inverse Laplace transform in finding the particular solution of ordinary linear differential equations of higher order with constant and variable coefficients, Integral equations, Integro-differential equations.

UNIT-III

Fourier's series (full range and half range) for arbitrary period, Representation of a function in terms of Fourier integrals, Fourier Sine integral and Fourier Cosine integral, Fourier transform finite and infinite Fourier sine and cosine transforms and their inverse transforms, Properties of different transforms and associated theorems.

UNIT-IV

Complementary function and particular integral of linear difference equations with constant and variable coefficients, Z-transform and inverse Z-Transform (without proof) and its application in the solution of linear difference equation with constant coefficients.

UNIT-V

Extremals of functionals by calculus of variations, Beta and Gamma functions, Legendre and Jacobi forms of Elliptic integrals of different kinds.

Text/Reference Books

1. A. B. Mathur and V.P. Jaggi: A text book of Engg. Maths and Advanced Engg Mathematics
2. B.S. Grewal: Elementary Engg. Maths and Higher Engg. Maths.

EES-302 Analog Electronics

L-T-P (3-1-0) Credit (4)

UNIT-I

JFET: characteristics and equations. Common Source, Common Gate configurations and Source follower. MOSFET: Depletion type MOSFETs and Enhancement type MOSFETs. VMOS and CMOS. FET as an amplifier and biasing of FETs. Wave shaping circuits.

UNIT-II

Differential amplifier (Emitter-coupled), calculation of A_{dm} , A_{cm} and CMRR. Darlington pair emitter follower, Current mirrors, Cascade and cascode connections, RC-coupled amplifier.

UNIT-III

Differential and common mode operation, Op-amp basics and equivalent circuit, Op-amp based circuits, constant gain multiplier, voltage summer, integrator, differentiator and buffer circuits, instrumentation amplifier circuits, Log and Antilog amplifiers, Schmitt trigger.

UNIT-IV

Power Amplifier: Introduction and definition. Series fed class-A amplifier, Transformer coupled class-A amplifier, Class-B, Class-C, and class-D power amplifiers. Push-Pull amplifier circuits. Distortion and efficiency of Power Amplifiers.

UNIT-V

Feedback concept and types of feedback, Feedback connections. Effect of negative feedback on amplifier's input impedance, output impedance, gain, stability and bandwidth. Barkhausen's criterion for oscillations, Phase-shift oscillators, Wien's bridge oscillators, tuned oscillators, and crystal oscillator, Voltage controlled oscillator.

Text/Reference Books

1. Robert Boylested, Louis Nashelky, "Electronic Devices and Circuit Theory", Pearson Education, New Delhi, India.
2. Jacob Millman, Christor C. Halkias, " Electronic Devices and Circuits" , McGraw Hill Book company, New Delhi, India.
3. E. Norman lurch, "Fundamental of Electronics" , John Wiley and Sons, New York, USA.
4. Donald L. Schilling, Charles Belove, "Electronic Circuits: Discrete and Integrated," McGraw Hill Book company, Singapore.

EES-303 Electrical Machines-I

L-T-P (3-1-0) Credit (4)

UNIT-I

General constructional features, types of transformers, e.m.f. equation, working principle. Voltage, current and impedance relationships. Phasor diagram on no-load and full-load. Exact and approximate equivalent circuits. Open circuit and short circuit tests. Per-unit representation. Voltage regulation, condition for maximum regulation, condition for zero regulation. Losses and efficiency, condition for maximum efficiency. All-day efficiency. Autotransformers: Principle of working and comparison with two-winding transformers.

UNIT-II

Phasing out in three-phase transformer units. Polarity test. Single-phase transformers connected as three-phase banks. Star/star, delta/delta, star/delta, delta/star and open delta connections. 3-phase to 2-phase and 3-phase to 6-phase conversions. Parallel operation of transformers, load sharing with equal and unequal voltage ratios, effect of X/R ratio, proportional load sharing. Three-winding transformers. Harmonics and magnetizing inrush.

UNIT-III

Induced e.m.f., developed torque, lap winding, wave winding, equalizer connection. Armature flux distribution and its effects, brush shift, demagnetizing and cross magnetizing m.m.f., Commutation, interpoles and compensating winding. Determination of compensating winding m.m.f., Determination of interpole m.m.f. for compensated and uncompensated DC machines.

UNIT-IV

Types of DC generators, magnetization characteristics, self-excitation principles. External and internal characteristics of separately excited and self excited DC generators, applications. Power balance, losses and efficiency, condition for maximum power output and maximum efficiency. Parallel operation of DC generators.

UNIT-V

Types of DC motors, back e.m.f., developed torque, power balance, losses and efficiency, condition for maximum power output and maximum efficiency. Load characteristics of separately excited, shunt, series and compound motors. Starting of DC motors, three point and four point starters. Speed control of DC motors, field control and armature control, Ward Leonard system. Testing: Swinburne's, Hopkinson's, Field's and retardation tests, separation of losses

Text/Reference Books

1. A.E. Clayton and N. Hancock, "The Performance and Design of D.C. Machines", Oxford and IBH Publishing Co., New Delhi.
2. I.J. Nagrath and D.P. Kothari, "Electrical Machines", Tata McGraw Hill, New Delhi.
3. George McPherson, "An Introduction to Electric Machine and Transformers", John Wiley, New York.
4. M.G. Say, "Performance and Design of A.C. Machines", CBS Publishers, Delhi.

EES-304 Circuit Analysis

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction, RL and RC circuit with sources, source free RL and RC circuits, initial conditions, RLC circuit without source, series RLC circuit excited by a dc voltage and ac voltage sources.

UNIT-II

Three phase ac voltage and currents, star and delta connections, measurement of power and power factor, unbalanced three phase ac circuits.

UNIT-III

Network configuration. Z, Y, h, g Parameters and relationships. ABCD and inverse ABCD parameters. Condition of reciprocity and symmetry in two-port parameter representation. Inter-relationship between two-port networks. Interconnection of two port networks. Two port devices, ideal transformer and gyrator, N-terminal network.

UNIT-IV

Reciprocity, Substitution, Compensation, Maximum power transfer theorems. Millman's and Tellegan's theorem. T-lattice and bridge networks.

UNIT-V

Low pass, high-pass, band-pass and band-stop notch filters. Filter design and performance. Constant-k and m-derived filters.

Text/Reference Books

1. M E Van Valkenberg, "Network Analysis", Prentice Hall oh India, New Delhi.
2. T S K V Iyer, "Circuit Theory", Tata McGraw Hill New Delhi.
3. J. D. Ryder, Networks, Lines and Fields, PHI, New Delhi.
4. D Roy Choudhary, "Network Analysis", New Age Publications, New Delhi.
5. C L Wadhwa, "Circuit Analysis", New Age Publications, New Delhi.

EES-305 Signals and Systems

L-T-P (3-1-0) Credit (4)

UNIT-I

Morphology of signals and their classifications. Even and odd functions, orthogonal function, definition of Step, impulse, ramp functions. Other non-sinusoidal signals and wave forms as the sum of standard functions. Fourier series representation of signals.

UNIT-II

Fourier Integral and Fourier transform and its properties. Parseval's theorem. System representation using differential equations, transfer function, impulse response. Poles and zeros of a system

UNIT-III

Analysis of Linear Time Invariant (LTI) continuous-time system using Laplace Transform. Frequency response of LTI systems, zero input response, forced input response. Stability of LTI system, pole criteria for stability, Routh's stability test.

UNIT-IV

Introduction to Z-transform, Inverse Z- transform and their properties, region of convergence. Poles and zeros. Difference equation, transfer function, pulse response. Application of Z-transform for the analysis of discrete-time LTI systems.

UNIT-V

Introduction to probability. Bay's theorem, concept of random variable, probability density and distribution function of a random variable. Introduction to random process. Power spectral density.

Text/Reference Books

1. S. Hykin, Barry Van Veen "Signals and System", John Wiley & Sons.
2. Robert A Gabel , "Signal and Linear Systems", John Wiley & Sons.
3. Henary Stark and John W Woods, "Probability and Random Processes", Pearson Education, New Delhi.

EES-306 Fluid Mechanics and Fluid Machines

L-T-P (3-1-0) Credit (4)

UNIT-I

Fluid properties, Measurement of pressure simple manometers, differential manometers, Hydrostatic forces on vertical plane, horizontal plane and inclined plane surfaces, curved surface submerged in liquid.

UNIT-II

Buoyancy and Floatation, Center of Buoyancy, Metacentre and Metacentric height, conditions of equilibrium of floating and submerged bodies, Experimental methods of determination of metacentric height. Kinematics of flow; Types of fluid flow, stream line and potential line, pathline, streak line, potential function and stream function, continuity equation, velocity and acceleration.

UNIT-III

Dynamics of fluid flow, Equations of motion, Euler's equation of motion, Bernaulli's equation from Euler's equation, Assumptions for Bernaulli's equations, Practical applications of Bernaulli's equations, Venturimeter, Orificemeter, nozzlemeter and pilot static to flow through an orifice, hydraulic coefficient, experimental determination of hydraulic coefficient time of emptying a tank of uniform cross-sectional area and hemi-spherical tank.

UNIT-IV

Impact of jet, force exerted by jet on hinged plate, force exerted by jet on moving plates. Turbines, pelton turbine (wheel), Francis turbine, Kaplan turbine, work done and efficiencies, specific speed, performance characteristics of turbines.

UNIT-V

Centrifugal pump, Main parts, work done by pump on water, efficiencies, minimum starting speed, multistage centrifugal pump. Specific speed and cavitation. Reciprocating pump work done by the reciprocating pump, discharge and slip of reciprocating pump. Indicator diagram, effect of acceleration in suction and delivery pipes on indicator diagram, effect of friction in suction and delivery pipe on indicator diagram, Air vessels.

Text/Reference Books

1. I.H.Shames, Mechanics of Fluid, McGraw Hill International Book Co.
2. K.L. Kumar, Engg. Fluid Mechanics, S. Chand and Company, New Delhi.

EES-312 Analog Electronics Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Analog Electronics” (EES-302). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. This laboratory is equipped with high quality dual channel oscilloscopes (C.R.O.), dual power supply, function generators, digital multimeters, milliammeters and micro-ammeters and also voltmeters and ammeters. Here the students are trained to identify the basic electronic devices like transistor, diode and digital ICs and their pin-configuration. The students are encouraged to lookup the analog and digital circuits on bread board and test them using various testing equipments.

EES-313 Electrical Machine-I Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Electrical Machine-I” (EES-303). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include open and short circuit tests of single phase transformer, load characteristics of DC shunt generator, speed control of DC shunt motor, measurement of slip of three phase induction motor, measurement of power by two wattmeter method etc.

EES-314 Circuit Analysis Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Circuit Analysis” (EES-304). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include verification of Reciprocity theorem, Maximum power transfer theorem, Tellegan,s theorem, Z, Y, A, B, C, D, and h-parameters of two port networks, transient response of R, L, C network, various types of filters.

EES-316 Fluid Mechanics and Fluid Machines Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Fluid Mechanics and Fluid Machines” (EES-306). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments consist of Bernoulli’s theorem, stream lines pattern, frictional characteristics, Francis and Kaplan turbines, centrifugal pumps, and pressure distribution etc.

B. TECH. IN ELECTRICAL ENGINEERING
SEMESTER-IV

EES-401 Electrical Measurement-I

L-T-P (3-1-0) Credit (4)

UNIT-I

Units, dimensions, classification of errors, accuracy and precision, statistical analysis of errors, standards for measurement, temperature, emf, resistance, current, inductance, capacitance. Methods of measurements. Classification of instruments- absolute, secondary, indicating, recording, integrating.

UNIT-II

Instruments for voltage and current measurement, control, balancing and damping forces of instruments, D Arsonval galvanometer- construction and operation, PMMC (Permanent magnet moving coil), moving iron, dynamometer type instruments. Electrostatic and induction type instruments. Use of rectifier for measuring instruments.

UNIT-III

Extension of range of voltmeter and ammeter. Current transformer (CT) and Potential transformer (PT) - theory, ratio and phase angle error, design considerations, characteristics, effect of power factor, secondary burden. Industrial current sensors (Hall Effect)

UNIT-IV

Power in ac circuits, construction and operation of dynamometer and induction type wattmeter. Measurement of power using wattmeter for single phase circuits and three phase circuits. Measurement of reactive power (CT and PT)

UNIT-V

Measurement of energy- single phase induction type watt-hour meter and clock meters. Polyphase watt-hour meters. Ac energy meter testing. Meters for special purposes- prepayment meters, maximum demand indicator, power factor meter, frequency meter and synchroscope.

Text/Reference Books

1. W D Cooper, A D Helfric, "Electronic Instruments and Measurements", Prentice Hall of India, New Delhi.
2. E W Golding and F C Widdis, "Electrical Measurements and Measuring Instruments", JOBS Publications.
3. A.K.Sawhney, "A Course in Electrical and Electronic Instruments and Measurements", Dhanpat Rai and Sons, Delhi.

EES-402 Electromagnetic Field Theory

L-T-P (3-1-0) Credit (4)

UNIT-I

Vector Analysis, coordinate systems. Coulomb's law, electric field intensity, field due to continuous volume charge distribution, field of a line charge, field of a sheet of charge.

UNIT-II

Electric flux density, Gauss's law, symmetrical charge distributions, differential volume element, divergence, Maxwell's first equation, vector operator and divergence theorem, energy expended in moving a point charge in an electrostatic field, line integral, definition of potential; and potential difference, potential field of a charge, potential field of a system of charges, potential gradient, the dipole, energy density in electric field.

UNIT-III

Current and current density, continuity of current, metallic conductors, conductor properties and boundary conditions, semiconductors, nature of dielectric materials, boundary conditions for perfect dielectric materials, capacitance, several capacitance examples, capacitance of two wire line, Poisson's and Laplace's equations, unique Theorem, examples of the solution of Laplace's and Poisson's equations, product solution of Laplace equation.

UNIT-IV

Biot Savart law, Ampere's circuital law, curl, Stoke's theorem, magnetic flux and magnetic flux density, scalar and vector magnetic potentials, derivations of steady magnetic field laws, force on a moving charge, force on differential current element, force between differential current elements, force and torque on a closed circuit.

UNIT-V

Faraday's law, displacement current, Maxwell's equations in point forms and in integral forms, the retarded potentials. Application of Maxwell's equations, EM waves and propagation of energy. Wave equation for free space. Plane and uniform plane wave. Poynting vector and power, Intrinsic impedance of media for uniform plane wave.

Text/Reference Books

1. William H. Hayt (Jr.), "Engineering Electromagnetics", McGraw Hill Book Co., New Delhi.
2. N.Narayana Rao, "Elements of Engineering Electromagnetics", Prentice Hall of India Pvt. Ltd., New Delhi.
3. Joseph A. Edminister, "Electromagnetics", Schaum's Outline Series in Engineering, McGraw Hill Co., New Delhi.
4. David K. Cheng, "Field and Wave Electromagnetics", Second Latest Edition, Addison Wesley Publishing Company Inc. Reading, Massachusetts, U.S.A.

EES-403 Digital Electronics

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction to Logic Gates, Boolean Algebra and Minimization Techniques for Boolean Expressions, Introduction to codes: ASCII, Excess-3, Gray, Hamming codes.

UNIT-II

Binary Half-Adder, Full-Adder, Subtractor, Parity Checker/Generator, Multiplexer/Demultiplexer, Encoder, Decoder, Digital to Analog Converter, Weighed Register: R-2R Ladder Network: Analog to Digital Conversion, Successive Approximation Type, Dual Slope Type.

UNIT-III

Introduction to Asynchronous Systems, Flip-Flop: RS, T, D, JK, Master-Slave JK, Ripple Counters-Shortened modulus. Up and down counter designs, Applications of Ripple counter.

UNIT-IV

Parallel Counters, Type T Counter Design, Non-Sequential Counting (Skipping States), Type D Counter Design, Shift Registers, Ring Counters, Type JK Counter Design, Asynchronous Sequential Circuits Design.

UNIT-V

Diode Transistor Logic (DTL), Transistor Transistor Logic (TTL), Typical TTL NAND Gate, Function of the Input Transistor, Volt-Ampere Characteristics, Fan-In and Fan-Out Calculations, Output Stages: Totem Pole and Modified Totem Pole, Introduction to Emitter Coupled Logic (ECL), Integrated Injection Logic (IIL) and MOS-logic, Comparison of Various Logic Families.

Text/Reference Books

1. Herbert Taub and Donald Schilling, "Digital Integrated Electronics", McGraw Hill Book Co.
2. William H. Gothman, "Digital Electronics-An Introduction to Theory and Practice", Prentice Hall of India Pvt. Ltd., New Delhi.
3. Morris Manno, "Digital Circuits and Logic Design", Prentice Hall of India Pvt. Ltd., New Delhi.

EES-404 Power System-I

L-T-P (3-1-0) Credit (4)

UNIT-I

Line parameters, Resistance, calculation of Inductance of single-phase and three-phase line with equilateral and un-symmetrical spacing. transposition, GMD, GMR, Capacitance calculation of two wire and three-phase lines with symmetrical and un-symmetrical spacing, Skin effect, Proximity effect.

UNIT-II

Representation of short and medium lines. Nominal Tee-Pie method. Solution for long line. ABCD parameters. Receiving and sending-end voltages. Regulation and efficiency.

UNIT-III

Ferranti effect, Corona, disruptive critical voltage, visual corona, corona power-loss. Interference between power and communication circuits Types of insulators and their constructional features. Potential distribution in string of suspension insulator. Methods of equalizing the potential. String efficiency. Single and bundle conductors.

UNIT-IV

Types and construction of cables, insulation resistance of a cable, capacitance and grading in cables, current rating of a Power Cable, dielectric stress. Overhead lines versus underground cables. Types of towers and poles used. Standard clearance. Sag calculations in conductor suspended on level supports and supports at different levels. Effect of wind, ice, tension and sag at erection.

UNIT-V

Substation classification, layout, scheme of bus-bar arrangement, single line diagram of typical substation showing location of different components and their functions, grounding and testing of installation.

Text/Reference Books

1. William D. Stevenson, Jr., "Elements of Power Systems Analysis", McGraw Hill Book Co., Singapore.
2. H. Cotton and Barber, "The Transmission and Distribution of Electrical Energy", B. I. Publications Pvt. Ltd., New Delhi.
3. I.J. Nagrath and D.P. Kothari, "Modern Power System Analysis", Tata McGraw Hill Publishing Co., New Delhi.
4. C.L. Wadhwa, "Electrical Power System", Wiley Eastern Ltd., New Delhi.
5. Hadi Saadat, "Power System Analysis", Tata McGraw Hill Publishing Co., New Delhi.

EES-405 Electrical Machines-II

L-T-P (3-1-0) Credit (4)

UNIT-I

General constructional features, principle of operation, types of rotor, e.m.f. equation, short pitch winding and pitch factor, distributed winding and distribution factor. Cylindrical rotor generator: Interaction between excitation flux and armature m.m.f., steady state equivalent circuit and phasor diagram, steady state power flow and power angle characteristics. Open-circuit, short-circuit and zero power factor (lagging) tests. Short Circuit Ratio (SCR). Voltage regulation by synchronous impedance, m.m.f. and Potier's triangle methods.

UNIT-II

Synchronization and parallel operation of synchronous generators (Alternators). Synchronizing current, synchronizing power and synchronizing torque. Significance of synchronous reactance in synchronous operation. Load sharing, active and reactive power control. Operation on infinite bus. Generator capability curve.

UNIT-III

Operation of synchronous machine as synchronous motor, steady state equivalent circuit and phasor diagram, steady state power flow and power angle characteristic. Effect of variation in excitation, V-curves. Starting methods of synchronous motor. Operation as synchronous condenser.

UNIT-IV

Salient-pole machines: Two reaction theory. Operation under balanced steady-state conditions in generator and motor modes. Equations in terms of voltage phasors, current phasors, direct and quadrature axis reactances, Power angle equations and characteristics. Determination of X_d and X_q , slip test. Hunting in synchronous machines, time period of oscillation. Synchronous generator subjected to sudden symmetrical short circuit, qualitative analysis, machine reactances and time constants.

UNIT-V

General constructional features. Qualitative description of working of poly-phase induction motor from rotating field viewpoint. Steady state analysis: Equivalent circuit, phasor diagram, power flow diagram, and torque-slip characteristics. Concept of leakage reactance and its importance in machine performance and design. Starting methods, speed control and braking. No-load and blocked-rotor tests, circle diagram, prediction of performance by circle diagram.

Text/Reference Books

1. A.S. Langsdorf, "Theory of Alternating Current Machines", Tata McGraw Hill, New Delhi.
2. I.J. Nagrath and D.P. Kothari, "Electrical Machines", Tata McGraw Hill, New Delhi.
3. George McPherson, "An Introduction to Electric Machine and Transformers", John Wiley, New York.
4. M.G. Say, "Performance and Design of A.C. Machines", CBS Publishers, Delhi.
5. A.E. Fitzgerald, C. Kingsley and S.D. Umans, "Electric Machinery", McGraw Hill

EES-406 Circuit Synthesis

L-T-P (3-1-0) Credit (4)

UNIT-I

Concept of a Network graph, properties of tree in a graph. Incidence matrix, cut-set matrix, Tie-set matrix and their properties. Node and mesh analysis, duality, coupled circuits, coefficient of coupled network.

UNIT-II

Natural frequency, complex frequency, System functions, driving point and transfer functions, properties of driving point function and transfer functions, concept of pole and zero's of network function.

UNIT-III

Causality, stability, Hurwitz polynomials, positive real functions, elementary synthesis procedure, Synthesis of one port networks. Properties of R-C driving point impedances, Synthesis of R-C impedance and R-L admittances using Caure Foster forms. Synthesis problems.

UNIT-IV

Properties of L-C immitance functions. Synthesis of L-C driving point immitances. Foster I, II and Caure forms. Synthesis problems.

UNIT-V

Synthesis of Voltage transfer functions using active devices (Op-amps). Synthesis using inverting Op-amp and non-inverting Op-amps. Synthesis of first-order and second-order transfer functions. Design problems.

Text/Reference Books

1. M.E. Vanvalken Berg, Network analysis and synthesis, Mc GrawHill Company, New Delhi.
2. F.F.Kuo, Network Analysis and Synthesis, Wiley international Edition New York.
3. G. Daryanani, Active filter design, Prentice Hall Inc.
4. D Roy Choudhary, "Network Analysis", New Age Publications, New Delhi.
5. C L Wadhwa, "Circuit Analysis", New Age Publications, New Delhi.

EES-411 Electrical Measurement-I Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Electrical Measurement-I” (EES-401). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include determination of limiting errors, measurement of power by ammeter, voltmeter, wattmeter methods, and testing of CT and PT etc.

EES-413 Digital Electronics Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Digital Electronics” (EES-403). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include basic logic gates, half and full adders, parity checkers, multiplexer/demultiplexer, coder/decoder, various types of flip flops.

EES-415 Electrical Machines-II Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Electrical Machines-II” (EES-415). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include Scott connection, no-load and blocked rotor tests on three phase induction motor, parallel operation on three phase transformer, induction generator, and alternator etc.

B. TECH. IN ELECTRICAL ENGINEERING
SEMESTER-V

AS-501 Numerical Analysis and Computer Programming

L-T-P (3-1-0) Credit (4)

UNIT-I

Fundamental theorem of finite (ordinary and divided) difference calculus, problems on direct interpolation, extrapolation, numerical successive ordinary differentiation by Gregory-Newton (forward and backward) formulas. Laplace-Everett formula for equally spaced data, Newton's divided difference formula. Lagrange's formula for unequally spaced points. Inverse interpolation by Lagrange's and Newton's divided difference formula, Numerical single, double integration for equidistant ordinates by means of trapezoidal rule, Simpson's 1/3, 3/8 rules.

UNIT-II

Numerical solution of non-linear, algebraic and transcendental equation in one variable and two variables. Idea of bisection method, Newton-Raphson Method for real roots, Numerical solution of simultaneous linear algebraic equations in four variables by Gauss systematic elimination method (partial pivoting and complete pivoting), Gauss-Seidel iterative method, Jacobi method, Numerical solution of ordinary differential equations of second order, simultaneous differential equations of I order by Picard's method and Runge-Kutta fourth order method, Fitting of linear-non linear, algebraic, exponential and other curves by Legendre Least square method.

UNIT-III

Computer Programs for: Newton divided difference formula for one point and more than one point, Numerical successive ordinary differentiation by Gregory-Newton (Forward and Backward formulae, Interpolation for unequally spaced points by Lagrange's formula, Inverse Interpolation by Lagrange's method and Newton's divided difference formula.

UNIT-IV

Computer Programs using Numerical Integration by Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 rule. Solution of Non-linear, algebraic and transcendental equation in one and two variables by Bisection method, Newton's method.

UNIT-V

Program for solution of simultaneous linear equation in four variable (extended to n-variable) by Gauss Elimination method, Gauss Seidel method, Jacobi method, Program for solution of ordinary differential equation by Picard's method, Runge-Kutta fourth order method, Program for curve fitting by Least Square method.

Text/Reference Books

1. S. S. Sastri, "Introductory Method for Numerical Analysis," Prentice Hall of India.
2. M.K. Jain, S.R.K. Iyengar, R.K. Jain, "Numerical Methods for Scientific and Engineering Computations" Prentice Hall of India, New Delhi.
3. John H. Mathews, "Numerical Methods for Mathematics, Science and Engineering", Prentice Hall of India, New Delhi.
4. Stewen C. Chapra/Raymond O. Canale, "Numerical Method for Engineers".
5. V. Rajaraman, "Computer Oriented Numerical Methods", Prentice Hall of India.

EES-502 Power Electronics

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction, Devices: Diodes-silicon, fast recovery, Schottky diode, SCR, TRIAC, SCS, GTO, PUT, SUS, CUJT, LASCR, Mosfet, IGBT with their V-I characteristics. SCR: Operating principle, Gate Characteristics, Two transistor model, over-current and over voltage protection, snubber circuits, methods of turning on (triggering) and turning off (commutation).

UNIT-II

Half-wave and full-wave controlled rectifiers with resistive and reactive load, battery load freewheeling diode. Detailed derivation of rms, average value, harmonic factor, displacement factor, THD, crest factor. Three phase half wave and full wave controlled rectifiers. Effect of Source impedance.

UNIT-III

Voltage-driven inverter, current-driven inverter, Single-phase inverter with resistive load, inductive load: Bridge, Parallel, Centre tapped. Mc-Murrey-Bedford inverter, Zero current switching (ZCS), Zero voltage Switching (ZVS). Introduction of resonant inverters. Three phase bridge inverter, 120-180 degree conduction.

UNIT-IV

Principle of chopper, Step down-Step up chopper, Step down chopper with RL load without linear approximation, Chopper classification: First Quadrant, Second Quadrant, Third and Fourth Quadrant, Fourth Quadrant, All Four Quadrant Chopper. Buck, Boost, Buck-boost DC-DC converters. Morgan and Jones Chopper.

UNIT-V

AC Voltage Controllers: Single and three phase ac voltage controllers. Cycloconverters: Single-phase to single-phase, three-phase to single-phase, three-phase to three-phase cyclo-converter circuit and their operation. Various PWM Techniques.

Text/Reference Books

1. P. C. Sen, "Power Electronics" Tata McGraw Hill Book Co., New Delhi.
2. G. K. Dubey, S.R. Doradla, A.Joshi and R.M.K. Sinha, "Thyristorised Power Controllers" Wiley Eastern Ltd., New Delhi.
3. M. H. Rashid, "Introduction to Power Electronics", Pearson Education India, New Delhi.

EES-503 Control Systems

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction, Terminology and basic structure, Industrial control examples, Mathematical modeling of mechanical, electrical, thermal, hydraulic and pneumatic systems. Industrial control devices: Potentiometers, tacho-generators, DC and AC servo-motors, Open and closed loop systems : their merits and demerits.

UNIT-II

Transfer Functions of linear systems, Block Diagram representation, Block Diagram reduction techniques, Signal Flow Graphs and Mason's Gain Formula. Time Response analysis of second order systems, Performance specifications in time domain. Steady state errors and error constants, static error coefficients.

UNIT-III

Stability concept, Necessary conditions for stability. Routh stability criterion, Hurwitz's stability criterion. Root locus plots, examples, general rules for constructing root loci, analysis of control system by root loci. Sensitivity of the roots of the characteristic equation. Relative stability analysis.

UNIT-IV

Relationship between time and frequency response, Polar plot, Bode's Plot, Nyquist plot and Nyquist stability criterion, Relative Stability, Phase and Gain Margins, Constant M and N circle and Nichol's chart.

UNIT-V

Concept of state, State-variable, State model, State models for linear continuous-time function, control system analysis using state-variable methods, state variable representation, conversion of state-variable modes to transfer functions, conversion of transfer function to canonical state-variable models, solution of state equation, concepts of controllability and observability. Equivalence between transfer function and state variable representation.

Text/Reference Books

1. Gopal, M., "Control Systems: Principles and Design", Tata McGraw Hill Book Co., New Delhi.
2. Gopal, M., "Digital Control Systems and State Variable techniques", Tata McGraw Hill Book Co., New Delhi.
3. Kou, B.C., "Automatic Control System", Prentice Hall of India Pvt. Ltd., New Delhi.
4. Ogata, K., "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., New Delhi.
5. Nagrath and Gopal, "Modern Control Systems" New Age International, New Delhi.

EES-504 Communication System

L-T-P (3-1-0) Credit (4)

UNIT-I

Need for modulation, Amplitude modulation, modulation index, SSB-SC, DSB-SC and vestigial side band: generation and detection, Calculation of power.

UNIT-II

Concept of frequency and phase modulation, frequency deviation and modulation index. FM spectra, carlson's rule. Generation of Narrow-band and Wide-band FM: Armstrong method, direct method and indirect method. Demodulation of FM.

UNIT-III

Sampling theorem, time-division multiplexing, pulse modulation, pulse width modulation (PWM), pulse position modulation (PPM), pulse code modulation (PCM), quantization, encoding, quantization error, companding and expanding, delta-modulation and adaptive delta-modulation, performance of digital systems.

UNIT-IV

TRF receiver, disadvantages of TRF receiver, superheterodyne, advantages, performance of radio receivers, sensitivity, image frequency and its rejection, double spotting, AGC, AFC, AM and FM transmitters, their elementary circuits and block diagram representations.

UNIT-V

Introduction, optical fiber v/s metallic cable, Types of optical fiber: step index and graded index, multimode and single mode, Attenuation and dispersion in fibers, LEDs and Laser diode, Optical detectors: PIN and APDs, optical sources, optical coupling, splicing.

Text/Reference Books

1. Simon Haykin, "Communication Systems", New Age International, New Delhi.
2. B. P. Lathi, "Communications Systems", New Age International, New Delhi.
3. George Kennedy, "Electronic Communication Systems", McGraw Hill Book Co., Singapore.
4. Herbert Taub and Donald L. Schilling, "Principles of Communication Systems", McGraw Hill, Kogakusha Ltd., Tokyo.
5. Wayne Tomasi, "Electronics Communication System", Pearson Education India.

EES-505 Power Systems-II

L-T-P (3-1-0) Credit (4)

UNIT-I

Typical transmission and distribution scheme. DC 2-Wire and 3-wire, A.C single-phase, 3-phase and 4 wire system, comparison of copper efficiency, Kelvin's law, D.C. distributor fed at one end, three wire D.C. distributor fed at one end, distributor fed at both ends, uniformly loaded distributor, ring mains, stepped mains, A.C. distribution. Standard voltages and advantages of high voltage transmission. Comparison of D.C. and A.C. transmission

UNIT-II

One line diagram, impedance and reactance diagram, per unit representation of single phase and three phase system, change of base, per unit impedance of a transformer, Network model formulation, Formulation of Y-Bus and Load flow equation formulation, Classification of Buss.

UNIT-III

Load Flow Solution Techniques, Gauss-Siedal method, Newton-Raphson method, Fast decoupled load flow equation, comparison of solution methods.

UNIT-IV

Symmetrical 3-phase fault. Short-circuit current and reactance of synchronous machines. Fault current in unloaded systems. Internal voltage of loaded machines. Short-circuit currents by method of internal voltage and Thevenin's theorem. Symmetrical components of three-phase unbalanced phasors, Power in terms of symmetrical components, Phase-shift in Star-Delta transformer banks, Sequence impedance and sequence network. Zero-sequence equivalent circuits for various three-phase transformer connections.

UNIT-V

Inter-connection of sequence network for various faults: line-to-ground fault, line-to-line fault, double-line to ground fault, Fault through impedance. Introduction to computer calculations of fault current problems.

Text/Reference Books

1. William D. Stevenson, Jr., "Elements of Power Systems Analysis", McGraw Hill Book Co., Singapore.
2. H. Cotton and Barber, "The Transmission and Distribution of Electrical Energy", Third Edition, B.I. Publications Pvt. Ltd., New Delhi.
3. I. J. Nagrath and D.P. Kothari, "Modern Power System Analysis", Tata McGraw Hill Publishing Co., New Delhi.
4. C. L. Wadhwa, "Electrical Power System", New Age International, New Delhi.
5. Hadi Saadat, "Power System Analysis", Tata McGraw Hill Publishing Co., New Delhi.

EES-506 Electrical Engineering Materials

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction, Classification, Conductor material, properties, superconductivity, characteristics, conductor material used for overhead lines, underground cables, machine winding, resistor etc. low resistivity and high resistivity materials and their applications, electrical and mechanical properties of material, and their trade names

UNIT-II

Introduction, definitions, types of semiconductors commonly used, electron energy, band theory, covalent bonds, intrinsic and extrinsic semiconductors, p-type and n-type material, majority and minority carriers, Si and Ge atoms, thermistors, photovoltaic cell, varistors, hall effect generators, LCD, LDR, strain gauge, piezo electric material, quartz, Rochelle salt.

UNIT-III

Introduction, dielectric strength, factors affecting dielectric strength, dielectric loss, dissipation factor, factors affecting dielectric loss, permittivity-dielectric constant, charging and discharging of dielectric, conduction of gaseous dielectrics, conduction through liquid dielectrics, solid dielectrics, properties of dielectrics, electrical conductivity of dielectrics and their breakdown, application of dielectrics- impregnated paper capacitor, electrolytic capacitor etc.

UNIT-IV

Introduction, classification, properties, materials such as ceramics, mica, glass, rubber, resins, wax, varnish, coolants, mineral oil, gases, Thermocouple material, soldering material, fuse material, contact material, structural material, refractory material, fluorescent and phosphorescent material, galvanizing and impregnation process, electronic materials

UNIT-V

Introduction, classification, properties, dipole moment, diamagnetism, magnetisation characteristics, hysteresis, eddy currents, curie point, loss of magnetism, impurities, magnetostriction, soft and hard magnetic materials, antiferromagnetic materials, ferromagnetic materials, ferrites, permanent magnets

Text/Reference Books

1. K. B. Raina, S.K. Bhattacharya and T. Joneja, "Electrical Engineering Materials", Katson Publishing House, B. D. Kataria and Sons, Ludhiana.
2. N. Alagappan, N. T. Kumar, "Electrical Engineering Materials", Tata Mc-Graw Hill Publishing Co., New Delhi.
3. J. Dekker, "Electrical Engineering Materials", Prentice Hall of India, New Delhi.

EES-507 Electronic Engineering Materials

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction, Wave-particle duality. The Schrodinger equation. Free electron, Electron in potential well, Electron in a periodic field of a crystal. Tunnel effect, Energy bands in crystals. Fermi energy and Fermi distribution function. Effective mass of electron. Conductivity of electron.

UNIT-II

Band structure of semi conductor. Intrinsic and extrinsic semiconductors. Hall effect, Compound Semi conductors. Metal Semiconductor contacts. Rectifying contacts (Schottley Barrier contacts). Ohmic cotnacts (Metallization). p-n junction rectifier, Flow of current in p-n junction. Electron and hole current.

UNIT-III

Introduction to optical materials. Optical constants reflectivity and transmissivity. Hagen-Rubens relation. Characteristics penetration depth and absorbance. Optical spectra of materials.

UNIT-IV

Principles, Helium-Neon Lasers, Semiconductor Laser Carbondioxide Laser. Wave length of emitted light, Laser modulation, Laser amplifier. Light emitting diodes. Optical storage device, Optical computer, Optical modulators and switches.

UNIT-V

Fundamentals of magnetism, Classification, Properties, dipole, moment. Diamagnetism, Paramagnetism, Ferromagnetism, Anti-ferromagnetism. Loss of magnetism. Application of magnetic materials: Magnetic recording, magnetic memories.

Text/Reference Books

1. Electronic properties of Materials by Rolf E. Hummel, Norosa Publishing House, New Delhi.

AS-511 Numerical Analysis and Computer Programming Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Numerical Analysis and Computer Programming” (AS-501). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. Computer Programming Lab includes programs for Numerical Integration by Trapezoidal Rule, Simpson’s 1/3 Rule, Simpson’s 3/8 rule, Solution of Non-linear, algebraic and transcendental equation in one and two variables by Bisection method, Newton’s method, Newton divided difference formula for one point and more than one point, Lagrange’s method and Newton’s divided difference formula, Gauss Elimination method, Gauss Seidal method, Jacobi method, Runge-Kutta fourth order method etc. using C/C++ Language.

EES-512 Power Electronics Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Power Electronics” (EES-502). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments consist of SCR characteristics, R & RC firing circuit of SCR, UJT firing circuit of SCR, AC phase control using SCR, full wave AC phase control using DIAC and TRIAC, pulse width modulation using 555 timer IC, and simulation studies using PSIM.

EES-513 Control Systems Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Control Systems” (EES-503). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The control system laboratory is equipped with kits to perform experiments on PID control, speed control of DC motor and servo motor, stepper motor control, error detector etc. MATLAB programming is also used for a number of experiments.

EES-514 Communication Systems Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Communication Systems” (EES-504). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. This laboratory is designed to conduct experiments on basic communication systems such as transmitters, filters and receivers. It has a number of AM and FM transmitters/receivers, SSB, DSB, PCM, PAM, PWM, PPM, and delta modulation and demodulation kits.

B. TECH. IN ELECTRICAL ENGINEERING
SEMESTER-VI

EES-601 Microprocessors

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction, microprocessor architecture, functional block diagram, registers, ALU, bus systems, Timing and control signals, Machine cycles and timing diagrams.

UNIT-II

Introduction, instruction set: data transfer, arithmetic operations, logic operations, branch operations, Programming techniques- looping, counting and indexing. Additional data transfer and 16-bit instructions. Arithmetic operations related to memory. Logic operations- rotate, compare. Debugging.

UNIT-III

Counter and timing delays- counters and time delays, hexadecimal counter, zero-to-nine modulo counter, pulse timings, Stack and subroutines- stack, subroutine, conditional call and return instructions, advanced subroutine concepts, Code Conversion- BCD to binary conversion, Binary to BCD conversion, BCD to seven segment LED Code conversion, Binary to ASCII to Binary code conversion, BCD addition, subtraction, Introduction to advanced instructions and applications, multiplication, subtraction with carry.

UNIT-IV

Interfacing concepts, Interfacing output displays, input keyboards, memory mapped I/O, Memory mapped I/O scheme, I/O mapped I/O scheme Interfacing memory, Interrupts- Interrupt feature:–Need for interrupts, Characteristics of Interrupts, Types of Interrupts, Interrupts structure, Methods of servicing interrupts, Development of Interrupt service subroutines, Multiple interrupt requests and their handling, 8080A interrupts, 8085 interrupts, restart as software instruction, additional I/O concepts and processes., Serial I/O and data communication- SID, SOD.

UNIT-V

Simple I/O ports, Programmable peripheral interface (8255), Programmable Interval timer 8253, Programmable Interrupt Controller 8259. Programmable data transfer, DMA data transfer – Synchronous, Asynchronous and interrupt driven data transfer schemes, 8257 DMA controller. Interfacing of A/D converters (ADC 0800/ADC 0808/ADC 0809), Interfacing of D/A converters (DAC 0800).

Text/Reference Books

1. Goankar, R. S., “Microprocessor Architecture Programming and Applications with the 8085/8080A”, Penram International Publishing House.
2. Microprocessors, K.C. Shet and K.M. Hebbar, CBS Publishers, New Delhi.
3. Douglas, V.Hall, “Microprocessors and Interfacing Programming and Hardware”, McGraw Hill Inc.

EES-602 Programming Languages

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction to Procedure Oriented and Object-Oriented programming: Data abstraction and modular programming, Object-oriented paradigm, elements of object oriented programming, C++ fundamentals – data types, operators and expressions, control construct, arrays, functions.

UNIT-II

Classes and objects – Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Implementation of class in C++, Object as function arguments, returning object from function. Classes, and objects. Const and classes, constructors and destructors. Operator overloading, Inheritance.

UNIT-III

MATLAB environment: MATALAB Desktop overview, everything is matrix, defining data types, display formats, predefined variables, complex numbers, Uses of Symbols, Built-in Functions, input and output statements.

UNIT-IV

Control Constructs: sequential, selection and iteration using IF-END, IF-ELSE-END, ELSEIF, SWITCH-CASE, FOR LOOPS, WHILE loops, MATLAB applications: Polynomial in MATLAB, solving equations, numerical integration, differential integration, curve fitting.

UNIT-V

Graph and Figure plotting, Handling graphics window, plotting 2D and 3D graphs. File input and output: Opening and closing files, writing formatted output to files, reading formatted data from files, Introduction to Simulink.

Text/Reference Books

1. E. Balaguruswamy, “Object Oriented Programming with C++”, Tata McGraw Hill, New Delhi.
2. Marc E. Herinter, “Programming in MATLAB”, Thomson Learning.
3. David Kuncicky, “MATLAB Programming”, Pearson Education, New Delhi.
4. R K Bansal, “MATLAB and Its Application in Engineering”, Pearson Education, New Delhi.

EES-603 Electrical Measurements-II

L-T-P (3-1-0) Credit (4)

UNIT-I

Classification of resistance and their methods of measurement. Measurement of low resistance voltage drop method, potentiometer method, Kelvin double bridge method, necessary precautions for precision and accuracy. Measurement of medium resistance- substitution and Wheatstone bridge methods. Measurement of high resistance, insulation resistance, megger, and ohmmeters. Measurement of resistance of liquids.

UNIT-II

Elementary methods, AC bridges and their classifications, Maxwell's inductance bridge, Maxwell's inductance-capacitance bridge, Hay's bridge, Anderson's bridge, Owen's bridge, De Sauty's bridge, Schering bridge, Heaveside bridge, Campbell's bridge, Wein's bridge, Universal bridge and bridge accessories, balance of bridge, locus diagrams, sensitivity.

UNIT-III

Magnetic measurements, magnetometer, ballistic galvanometer, fluxmeter, Hall-effect devices (flux measurement). Separation of iron losses, methods of iron loss measurement. Transducers-thermistors and LVDT. Introduction to measurement of non-electrical quantities-displacement, strain, force, pressure, torque, velocity, temperature, level measurement.

UNIT-IV

Cathode ray oscilloscope (CRO), CRT, electron gun, deflection plates, screens for CRT, measurements of voltage, current and phase using CRO. Impulse waveform oscilloscope, multiple beam, multiple trace oscilloscope, digital storage oscilloscope (DSO)

UNIT-V

Electronic voltmeters, digital volt meter (DVM), multimeters, Q-meter, spectrum analyzer, ultrasonic measurements, introduction to data acquisition.

Text/Reference Books

1. E. W. Golding and F. C. Widdis, Electrical Measurements and Measuring Instruments, JOBS Publications.
2. W. D. Cooper, A D Helfric, Electronic Instruments and Measurements, Prentice Hall of India, New Delhi.
3. A J Bouwens, Digital Instrumentation, McGraw Hill Book Co., New York.
4. A K Shawhaney, "A course in electrical and electronics instruments and measurements", Dhanpat Rai and Sons, Delhi.
5. Melville Bigham Stout, "Basic Electrical Measurements", Prentice Hall of India, New Delhi.

EES-604 Power Station Practice

L-T-P (3-1-0) Credit (4)

UNIT-I

Cost of Power Generation: running cost and fixed cost, Method for providing for depreciation factor affecting cost of generation. Load Factor, Load Curve, Demand Factor, Diversity Factor. Number and size of generation units: plant capacity factor and plant use factor. Tarrifs: Flat-rate, Two part, Block rate, Maximum Demand and Power Factor, Tariff Economics of Power Factor improvements.

UNIT-II

Selection of site, Thermal Power Plants: Types and their relative merits, Boilers accessories, Economisers, Preheater and Super Heater. Fuel, Combustion Equipment: Types of Steam Turbines, Condensers, Pumps, Cooling Towers. Layout of Plant, Pollution Control Equipments. Elements of Nuclear Power Plant. Nuclear Reactor- it's components and their functions. Types of Nuclear Reactor, Boiling water, Pressurized water fast breeder reactor and Candu Reactor, their advantages and disadvantages.

UNIT-III

Hydro-Electric Power Plant: Selection of site. Classification based on: quantity of water available , Nature of load, Available head, Layout, it's main parts and their function: reservoir, Dam, spillways, intake, forebay, Penstock, Search tank , Prime-mover, Draft-tube. Governing of turbines, Types of Turbines and their characteristics, Comparison of various types of plants.

UNIT-IV

Advantages of coordinated operation of different types of power plants, hydro-thermal scheduling – short term and long term.

UNIT-V

Tidal, Wind, Geo-Thermal, Wave, Magnato-Hydro Dynamic (MHD), Photo-voltaic and Solar Power used for generation. Recent advances such as biogas generation, hydrogen, fuel cell.

Text/Reference Books

1. M. V. Deshpandae, "Elements of Electrical Power Station Design", A. H. Wheeler and Co. Pvt. Ltd. Allahabad.
2. B. G. A. Shrotzki and W. A. Vopal, "Power Plant Engineering and Economics", McGraw Hill Book Co.
3. C. L. Wadhwa, "Generation Distribution and Utilization of Electrical Engineering", New Age International, New Delhi.
4. C. L. Wadhwa, "Electrical Power Systems", New Age International, New Delhi.

EES-605 Computer Architecture

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction, Register section, General purpose register design. Adder and Subtractor design, Fast adder design, ALU design, Multiplication of unsigned and signed integer, Array multiplier, Division of unsigned integer.

UNIT-II

Introduction, Basic concepts of register transfer language (Micro operation), control unit design, Hardwired control, Multiplier control unit, CPU control unit, Micro programmed control, Basic concepts control memory.

UNIT-III

Introduction Characteristics of memory system, memory unit, Random access memory (RAM), Bipolar memory cell, dynamic memory cell, Internal organization of RAM, Main Memory design, Cache memory, Associative memory, concepts, Associative memory cell.

UNIT-IV

Basic concepts, Programmed I/O, Standard I/O versus memory mapped I/O, Unconditional and conditional programmed I/O, Interrupt I/O, Direct memory access (DMA), Virtual memory and memory management concepts, Magnetic tapes and Disk.

UNIT-V

Introduction, parallelism in conventional computers, Type of parallel processors, Array processors, Systolic arrays wave front array processors pipeline processing, basic concepts pipeline structure. Arithmetic pipeline, Instruction pipeline.

Text/Reference Books

1. Mohd Fariquzzaman and Rajan Chandra, "Modern Computer Architecture", Pearson Education India, New Delhi.
2. M. Morris Mano, "Computer System Architecture", Pearson Education India, New Delhi.

EES-606 Electric Drives

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction, concept of electric drives classification and components, characteristic, starting, speed control and braking of electric motors (dc and ac), Electro-mechanical transients during starting and braking, time energy calculation, load equalization.

UNIT-II

Converters for feeding electric motors – line commutated converters, choppers, inverters, cycloconverters, ac voltage controllers.

UNIT-III

Induction motor drive system, scalar control, vector control, sensorless control.

UNIT-IV

Permanent magnet motor drive system, number of phases, radial and axial field, sinusoidal and rectangular fed, closed loop control, sensor elimination and reduction.

UNIT-V

Switched Reluctance Motor Drive System – construction, principle of operation, advantages, disadvantages, characteristics, closed loop control, applications.

Text/Reference Books

1. G K Dubey, Power Semiconductor Controlled Drives, Prentice Hall Englewood Cliffs, New Jersey.
2. S. K. Pillai, A First Course in Electric Drives, New Age Publications, New Delhi.
3. P C Sen, Principles of Electric Machines and Power Electronics, John Wiley.
4. M. H. Rashid, "Introduction to Power Electronics", Pearson Education India, New Delhi.
5. G. K. Dubey, Fundamentals of Electric Drives, Narosa Publications, New Delhi.

EES-607 Data Structures

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction, Types and characteristics of Data structures, Abstract Data Type (ADT), Algorithm Concepts, Definition of Algorithm, Objectives of algorithms, Space complexity and Time complexity of algorithm, Arrays: Characteristics of an array, Implementation of 1-D arrays, Row and Column Major Implementations of 2-D, 3-D and n-D arrays.

UNIT-II

Stacks: Basic concepts, operations on stack, Stack implementation using array, Applications of Stack: Polish and reverse Polish notations, Evaluating a Postfix expression, conversion of an expression from Infix to Postfix, Recursion, Queue: Introduction, Operations on queue, and types of queues: Linear Queue, Circular Queue, Priority Queue, and Double Ended Queue, Queue implementation.

UNIT-III

Linked Lists: Concept of a Linked List, Inserting and removing nodes from the list, Linked implementation of stack and queues. Array implementation of lists, Linear, Single and Double lists, Circular Single and Double List, Generalized Linked List, Header Linked list.

UNIT-IV

Trees: Concepts of a Tree, Binary trees, Strictly Binary Tree, Complete Binary Tree, Almost Complete Binary Tree, Weight of a tree, Level of a node, Height/Depth of a Tree. Operations on tree, Tree Search Algorithms, Binary Search Tree, Tree traversal Algorithms, AVL Trees - Balance of a node, Weight Balanced Trees. Tree implementation.

UNIT-V

Graphs: vertex and edge, Types of graphs – directed/undirected, connected/disconnected, cyclic/acyclic, Representation of graphs: Adjacency matrix, linked list implementation. Searching and sorting techniques: Linear Search, Binary Search. Bubble Sort, Sequential Sort, Shell Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort techniques.

Text/Reference Books

1. Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum, “Data Structures Using C & C++”, Prentice Hall of India Pvt. Ltd., New Delhi.
2. D. Samanta, “Classic Data Structures”, Prentice Hall of India Pvt. Ltd., New Delhi.
3. S. Lipshutz, “Data Structures”, Schaum outline series, Tata McGraw Hill, New Delhi.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Cliff Stein, “Introduction to Algorithms”, Tata McGraw Hill.

EES-611 Microprocessors Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Microprocessors” (EES-601). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include 2’s complement of 16-bit numbers, addition and subtraction of two 8-bit numbers, decimal addition, multiplication and division of 8-bit numbers, ascending and descending order of a series etc.

EES-612 Programming Languages Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Programming Languages” (EES-602). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include C/C++ programming for electrical engineering problems and some MATLAB based programs.

EES-613 Electrical Measurement-II Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Electrical Measurement-II” (EES-603). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include Kelvin double bridge method, Wheatstone bridge method, Schering bridge method, Owen bridge method, B-H curve, temperature transducer, strain gauge etc.

EES-610 Seminar

L-T-P (0-0-4) Credit (2)

All the students of Semester VI will be required to deliver a seminar on the topic relevant to recent trends in Electrical Engineering using power point presentation. Topics are selected in consultation with their supervisors. Every student has to present the progress of their works of about 15 minutes duration before the duly constituted committee of Faculty Members of the department followed by a question answer session. The assessment by the committee members are a part of Mid Term Evaluation. A report of the seminar in the form of hard copy must also be submitted in the office before the final evaluation by External Examiners.

B. TECH. IN ELECTRICAL ENGINEERING
SEMESTER-VII

EES-701 Industrial Management

L-T-P (3-1-0) Credit (4)

UNIT-I

Planning, Nature, Purpose and Objectives of Planning; Organizing : Nature and Purpose of Organizing; Authority and Responsibility; Staffing, Supply of Human Resources; Performance Appraisal; Controlling; System and Process of Controlling; Control Techniques.

UNIT-II

Nature and Scope of Human Resource Planning; Training and Development; Recruitment and Selection; Career Growth; Absenteeism; Grievances; Motivation and its Types; Need for Motivation; Reward and punishment, Leaders, leadership styles, Role and functions of Leaders; Conflict Management; Kinds and Causes of Conflict; Settlement of conflicts; Group and team working, Organizational Design and Development.

UNIT-III

Marketing Environment; Consumer Markets and Buyer Behavior; Marketing Mix, Advertising and Sales Promotion; Channels of Distribution, Financial Management and Accounting Concepts, Book Keeping; Financial Statements Analysis; Financial Ratios; Capital Budgeting; Break-even Analysis.

UNIT-IV

Planning and Design of Production and Operations Systems; Facilities Planning, Location, Layout and Movement of materials; Materials Management and Inventory Control; Maintenance Management; PERT and CPM.

UNIT-V

Role of Information in decision making; Information System Planning, Design and Implementation; Evaluation and Effectiveness of the Information System, Statistical Quality Control, Total Quality Management and ISO Certification, Social and Ethical Issues in Management: Ethics in Management, Social Factors; Unfair and Restrictive Trade Practices, Strategic and Technology Management: Need, Nature, Scope and Strategy SWOT analysis, value chain concept.

Text/Reference Books

1. Kotler Philip, "Marketing Management", Prentice Hall of India.
2. Luthans Fred. "Human Resource Management", McGraw Hill Inc.
3. Robbins Stephen, P. "Organisational Behaviour Concepts, Controversies and Application", Prentice Hall, Englewood Cliffs, New Jersey.
4. Khan, M.Y. and Jain, P.K. "Financial Management", Tata McGraw Hill.

EES-702 Utilization of Electrical Energy

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction, general features, track specification, arrangement of locomotive drives, transmission of power from motor to driving wheel. Mechanics of train movement, speed-time curves, tractive effort for acceleration and propulsion, power and energy output from driving axis.

UNIT-II

Train resistance, adhesive weight, and coefficient of adhesion, Feeding and distributing system for tramways and railways, Track arrangements, collector gears and auxiliary equipments, Diesel-electric equipments, characteristics, transmission of drive, electric transmission. Review of traction motors and their control, comparative features of ac and dc traction. Recent trends in electric traction, Magnetic Levitation Systems.

UNIT-III

Nature of light, definitions, units, basics laws of illumination, determination of luminous flux, Light sources and their characteristics, light production by excitation and ionization, incandescence and fluorescence, sources of light- filament lam, halogen lamp, discharge lamp, fluorescent lamp, incandescent lamp, arc lamp and their applications, Direct lighting and mixed reflection, reflection factor, transmission factor, refractors, lighting fitting, street lighting, exterior and interior lighting.

UNIT-IV

Advantages of electric heating, resistance heating, types of furnaces, types of heating materials, temperature control of furnaces, variable voltage supply, design of heating element, arc furnace, induction heating, dielectric heating, microwave oven

UNIT-V

Welding- classification, electric supply, for arc welding, welding transformer, welding techniques, Electrolytic Process- Basic principles, electrodeposition, electrolysis, electric supply for electrolysis.

Text/Reference Books

1. H. Partab, Art and science of utilization of electrical energy, Pritam, Surat and brothers, New Delhi.
2. N. N. Hancock, Electric power utilization, Wheeler Publications, Allahabad.
3. Soni, Gupta and Bhatnagar, Electric power utilization, Dhanpat Rai and sons, New Delhi.
4. E. Openshaw Taylor, Utilization of electrical energy, Orient Longman Publishers.
5. C. L. Wadhwa, Generation, distribution and utilization of electric energy, New Age Publications, New Delhi.

EES-703 Electrical Machines-III

L-T-P (3-1-0) Credit (4)

UNIT-I

Single-phase induction motor: Double revolving field theory, Starting methods, split phase motor, capacitor type motors, shaded pole motor, characteristics and applications.

UNIT-II

Single-phase series motor, compensated and uncompensated motors, universal motor characteristics. Single-phase repulsion motors, principle of operation and operating characteristics, applications.

UNIT-III

Review of speed control of induction motors. Effect of voltage injection in secondary of slip ring induction motor, action of commutator as frequency converter. Scherbius and Kramer schemes of speed and power factor control of induction motors. Schrage motor: Construction, principle of operation, characteristics and applications.

UNIT-IV

Introduction to cross-field D.C. machines, constructional features, principles and characteristics of metadyne with different degrees of compensation. Amplidyne and Rosenberg generator. Applications.

UNIT-V

Introduction to machines in control system, A.C. tachogenerator, 2-phase servo-motor, stepper motor, synchros, their principles of operation and applications. Single phase synchronous motors: Reluctance motor, hysteresis motor, their principles of operation, characteristics and applications. Linear induction motors.

Text/Reference Books

1. A.S. Langsdorf, "Theory of Alternating Current Machines", Tata McGraw Hill, New Delhi.
2. I.J. Nagrath and D.P. Kothari, "Electrical Machines", Tata McGraw Hill, New Delhi.
3. George McPherson, "An Introduction to Electric Machine and Transformers", John Wiley, New York.
4. M.G. Say, "Performance and Design of A.C. Machines", CBS Publishers, Delhi.
5. A.E. Fitzgerald, C. Kingsley and S.D. Umans, "Electric Machinery", McGraw Hill Book Co., USA.

EES-704 Power Systems-III

L-T-P (3-1-0) Credit (4)

UNIT-I

System constraints, economic dispatch neglecting losses, optimum load dispatch including transmission losses, exact transmission loss formula, coordination equation, automatic load dispatching.

UNIT-II

Methods of voltage control, VAR compensation, Reactive power injection and control by transformers. Power flow through transmission line, receiving-end and sending-end power circle diagrams, universal power circle diagram.

UNIT-III

Introduction to automatic generation and voltage control: Speed Governor, turbine and Power System Modeling, load frequency control (LFC), (Single area case), Automatic Voltage Control.

UNIT-IV

Introduction, rotor dynamics, swing equation, power angle curve, steady state stability, transient stability, equal area criterion (sudden change in mechanical input, sudden loss of one of the parallel lines, sudden short circuit on one of the parallel lines), point-by-point solution of the swing equation. Multi-machine stability studies, factors affecting transient stability, effect of grounding on stability, prevention of steady-state pullout.

UNIT-V

Flexible AC Transmission, Series and Shunt Compensation Schemes, HVDC Transmission, Limitation and Advantages, Classification of DC Links, Back-to-back and Bulk Power Supply Systems.

Text/Reference Books

1. William D. Stevenson Jr, "Elements of Power System Analysis", Tata McGraw Hill Publishing Co., New Delhi.
2. C. L. Wadhwa, "Electrical Power System", New Age International, New Delhi.
3. I. J. Nagrath and D. P. Kothari, "Modern Power System Analysis", Tata McGraw Hill Publishing Co., New Delhi.
4. Allan Greenwood, "Electrical Transients in Power System", John Wiley and Sons, New York.
5. H. Cotton and Barber, "The Transmission and Distribution of Electrical Energy", B. I. Publication Pvt. Ltd., New Delhi.
6. N. G. Hingorani and L. Gyugyi, "Understanding FACTS", IEEE Press, USA.

EES-705 High Voltage Engineering

L-T-P (3-1-0) Credit (4)

UNIT-I

Voltage doubler circuits, voltage multiplier circuits, Van de Graff and electrostatic generators, cascade transformers, resonant transformers, Tesla coil, impulse generator, multistage impulse generator, Marx and modified Marx circuit, switching surge generation. Tripping of an impulse generator by three electrode gap system and trigatron gap system.

UNIT-II

Series resistance microammeter, generating voltmeter, oscillating spheroid, series impedance voltmeter, capacitive voltage transformer, electrostatic voltmeter, sphere gap, factors influencing sparkover voltage of spheres gaps.

UNIT-III

Delay cable, resistance capacitance and mixed potential dividers. Peak voltmeter and ionic wind voltmeter. CRO for impulse voltage measurement.

UNIT-IV

Application of insulating materials in power transformers, rotating machines, circuit breakers, cables, power capacitors. Over-voltage phenomenon and insulation co-ordination in electric power system. Non-destructive testing of materials and electrical apparatus.

UNIT-V

Disruptive discharge voltage, withstand voltage, flashover voltage, creepage distance, impulse voltages, reference atmospheric conditions. High voltage testing of insulators, bushing, isolators, circuit breakers, cables, transformers and surge diverters, radio interference measurements. Earthing of high voltage laboratory.

Text/Reference Books

1. M. S. Naidu and V. K. Kamaraju, "High Voltage Engineering", Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2. E. Kuffel and M. Abdullah, "High Voltage Engineering", Pergamon press, Oxford.
3. A.J. Sehwal, "High Voltage Measurement Techniques", M.I.T.Press.
4. K. R. Padiyar, "High Voltage D.C. Transmission", New Age International, New Delhi.
5. R. S. Jha, "High Voltage Engineering", Dhanpat Rai and Sons, Delhi.

EES-706 Electric Traction

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction, Systems of traction, their relative advantages and disadvantages, Requirements of an ideal traction system, Supply systems for electric traction.

UNIT-II

Speed time curves for train movement, Simplified speed time curve – Trapezoidal and quadrilateral, Average speed, Schedule speed, Mechanics of Train Movement, Energy consumption, Tractive effort, Power output from driving exless, specific energy consumption, coefficient of adhesion.

UNIT-III

Traction motors – DC shunt motors, DC series motor, AC series motor, three phase induction motor, series and parallel operation with unequal and equal wheel diameters, effect of sudden change in supply voltage, temporary interruption of supply, tractive effort and horse power.

UNIT-IV

Traction motor Control – DC series motor control, AC series motor control, three phase induction motor control, Multiple unit control, Braking of electric motors, recent trends in solid state speed control methods.

UNIT-V

Current collection systems, Electrolysis by currents through earth, track arrangements, auxiliary equipments, transways, trolley busses, diesel electric traction.

Text/Reference Books

1. E. Openshaw Taylor, ‘Utilisation of Electric Energy’, Orient Longman Ltd., Bombay.
2. C.L. Wadhwa, ‘Generation Distribution and Utilization of Electric Energy’, Dhanpat Rai and Sons, New Delhi.
3. Chakrabarti, Soni, Gupta and Bhatnagar, ‘A Text Book on Power System Engineering’, Dhanpat Rai and Sons, New Delhi.
4. H. Partap, ‘Art and Science of Utilisation of Electric Energy’, Dhanpat Rai and Sons, New Delhi.

EES-707 Digital Signal Processing

L-T-P (3-1-0) Credit (4)

UNIT-I

Discrete-time signal, discrete-time convolution, classification of discrete-time systems and their realization, transfer function and stability, steady-state frequency response of discrete-time systems.

UNIT-II

Introduction, properties of DFT, functional operations with DFT, convolution and correlation. Fast Fourier Transform (FFT), FFT algorithms: Decimation in time (DIT) and Decimation in frequency (DIF) algorithms.

UNIT-III

Introduction of IIR filters. Design of IIR filters: Bilinear transformation, Impulse invariance response and Stop Invariance Response methods. Design of digital Butterworth and Chebyshev filters. Frequency transformation.

UNIT-IV

Introduction, characteristics of FIR filter. Windowing and rectangular window. Design of FIR filter using windows. Hamming window, Hann window, Optimal FIR filter design.

UNIT-V

Representation of band-pass signals, sampling of band-pass signals. Analog to digital conversion: Sample and hold, quantization and coding, analysis of quantization errors. Digital to analog conversion: Sample and hold, sample and hold, first order hold, linear interpolation with delay, over sampling.

Text/Reference Books

1. S. K. Mitra "Digital Signal Processing", Tata Mc Graw Hill, New Delhi.
2. J G Proakis and D G Manolakis "Introduction to digital signal processing," Prentice Hall of India, New Delhi.
3. Johnny R Johnson "Introduction to digital signal processing," Prentice Hall of India.
4. A. Antonio "Digital Filter Analysis and Design", Tata McGraw Hill, New Delhi.

EES-708 AI and Soft Computing

L-T-P (3-1-0) Credit (4)

UNIT-I: Soft Computing

Hard Computing: Features of Hard Computing, Soft Computing: features of soft computing, Hybrid Computing, Fuzzy Set Theory: fuzzy versus crisp sets, basic fuzzy set operations, linguistic variables, membership functions, fuzzy Cartesian product, fuzzy relations, fuzzy rules.

UNIT-II: Fuzzy Implications

Approximate reasoning, fuzzy modelling, fuzzification, inferencing and defuzzification, fuzzy modeling and control schemes for nonlinear systems, applications in power system.

UNIT-III: Fundamentals of Neural Networks

Biological neural networks, models of an artificial neuron, neural network architectures, characteristics of neural networks, McCulloch-Pitts neuron, learning methods, Hebbian learning rules, Hebb nets.

UNIT-V: Backpropagation Networks

Architecture of backpropagation networks, perceptron model, single layer and multi-layer perceptron models, backpropagation learning, tuning parameters of backpropagation networks, neuro-fuzzy models, adaptive neuro-fuzzy inference system (ANFIS), applications.

UNIT-V: Genetic Algorithms

Basic concepts, creation of offsprings, working principle, encoding, fitness function, reproduction, Genetic Modelling; inheritance operators, cross over, inversion and deletion, mutation operator, bit-wise operator, generational cycle, convergence of genetic algorithm, multi-level optimization, real life problems

Text/Reference Books

1. Soft Computing and Intelligent System Design: Theory, Tools and Applications, Fakhreddine O. Karray and Clarence De Silva, Pearson Education Ltd., India.
2. Soft Computing: Techniques and its Applications in Electrical engineering, D. K. Chaturvedi, Springer-Verlag, Germany.
3. Soft Computing and its Applications, R. A. Aliev and R. R. Aliev, World Scientific Publishing Co. Pte. Ltd., Singapore.
4. Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, J.-S. R. Jang, C.-T. Sun, and E. Mizutani, Pearson Education Ltd., India.
5. Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications, S. Rajasekaran and G. A. Vijayalakshmi Pai, Prentice Hall of India, New Delhi.

EES-709 Industrial Automation and Control

L-T-P (3-1-0) Credit (4)

UNIT-I

Definition, Anatomy of Robots, Type of Robots, Applications of Robots in manufacturing.

UNIT-II

Robotic Systems, Sensors and Actuators, Components, Interfacing.

UNIT-III

Direct Kinematics and Inverse Kinematics Problems, D-H Representation, Links, Joints and their parameters, Kinematic Equation, Euler Angle Representation.

UNIT-IV

Lagrange-Euler Formulation, Kinetic Energy of a Robot Manipulator, Potential Energy of a Robot Manipulator, Equation of Motion, A Two Link Manipulator

UNIT-V

Review of Fundamental Control Techniques, Computed Torque Technique, Variable Structure Control, Adaptive Control.

Text/Reference Books

1. K. S. Fill, R.C. Gonzalez, C.S.G.Lea, “Robotics-Control, Sensing”, Vision and Intelligence’ McGraw Hill Book Co., New Delhi
2. J. J. Craig, “Introduction to Robotics Mechanics and Control”, Addison Wesley.
3. Richard D. Klafter, et al, “Robotics Engineering – An Integrated Approach”, Prentice Hall India New Delhi.

EES-710 Estimation and Design of Power Systems

L-T-P (3-1-0) Credit (4)

UNIT-I

Tools used, conventional symbols for electrical installations, wires, wire splicing and terminations, Types and installations of wiring systems, Lighting accessories, Fuse, Illumination-lamps, discharge lamps, fluorescent lamps, Internal wiring systems and lamp circuits

UNIT-II

Definitions, overhead lines, types of conductors, line supports, arrangement of conductors, insulators- material, types- pin, suspension, strain, stay and shackle type. Guy wire, pole fittings, lightning arrester, earthing of overhead lines, miscellaneous fittings, service lines. Introduction to Indian Electricity Rules.

UNIT-III

Introduction, cable insulation, underground cabling, types, cable laying, jointing, fitting compound, jointing a multi-core cable. Electrical earthing and Shock- Introduction, neutral wire, grounding, fire hazards, fuse in neutral, connection with earth, earth resistance, methods of earthing, electric shock.

UNIT-IV

Introduction, switches, and PCB, LTOCB, HT 11 KV, Ring Main T off switch, HT Feeder panel, LT feeder panel, specifications for items of overhead lines, ACSR, GI wire, specifications for items of internal wiring, VIR cable, PVC cable, TRS wire, fuse wire, conduits, conduit boxes, metal shades, tumblar switch, ceiling rose, HT underground cabling. Introduction, classification, transformer, out-door and in-door sub-station, design of sub-station, equipment in a substation, complete bus arrangement for HV and LV, ring main system, circuit breaker. Circuit breaker contacts, bushings.

UNIT-V

Introduction, estimation and conductor size calculations for internal wiring, HT, LT overhead lines and underground cables, price catalogue, labour rates, schedule of rates and estimating data, calculations, installation and estimates for service lines, estimate for LT distribution and street light feeders, estimate for 11 kV feeders and substations.

Text/Reference Books

1. S.L. Uppal, "Electrical wiring, estimating and costing", Khanna publishers, New Delhi.
2. Paul Rosenberg, "Electrical Estimating", Prentice Hall, New Jersey.
3. C.R. Dargan, "Electrical Engineering Drawing and Design", New Asian Publishers, New Delhi.
4. The Indian Electricity Rules, Commercial Law Publishers Ltd, New Delhi.

EES-711 Biomedical Instrumentation

L-T-P (3-1-0) Credit (4)

Unit-I: Introduction

The cell, body fluids, body as a control system, biomedical signals and electrodes, biomedical amplifiers, general block diagram of biomedical instrumentation.

Unit-II: Bio-Sensor and Transducer

Active versus passive sensors, Sensor error sources, sensor terminology, electrochemical sensors, electrodes for biophysical sensing, transducer and transduction principles, active and passive transducers, transducers for biomedical applications, transducer care.

Unit-III: Electrocardiography

Heart is a potential source, ECG waveform, Frontal plane ECG measurements, Lead systems for ECG recording, determination of heart rate, electrocardiograph, ECG faults and troubleshooting, Introduction of EEG based instruments.

Unit-IV: Electronic instruments for human body

Stimulators; types of stimulators, electrodiagnostic/ therapeutic stimulator, peripheral nerve stimulator, AC and DC defibrillators, pacemakers, diathermy, respirators, blood pumps, Myoelectric control of paralyzed muscles.

Unit-V: Special techniques for measurements of non-electrical biological parameters

Electrical impedance plethysmography, Audiometry, X-rays and radiography, X-ray computed tomography, diagnostic ultrasound, electromagnetic flow meter, Magnetic resonance imaging, electrical impedance tomography.

Text/Reference Books

1. Raja Rao, C; Guha, S.K. Principles of Medical Electronics and Biomedical Instrumentation. Orient Longman.
2. Joseph J. Carr and John M. Brown. Introduction of Biomedical Equipment Technology, Pearson Education, New Delhi.
3. John G. Webster. Medical Instrumentation: Application and design, John Wiley & Sons.
4. Leslie Cromwell, Fred J. Weibell, and Erich A. Pfeiffer. Biomedical Instrumentation and measurements, Pearson Education, New Delhi.
5. John G. Webster. Bioinstrumentation, John Wiley & Sons.

EES-713 Electrical Machines-III Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Electrical Machines-III” (EES-703). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include no-load and blocked rotor tests of single phase induction motor, load test of single phase induction motor, performance characteristics of universal motor and stepper motor. These experiments are also simulated using MATLAB.

EES-714 Power Systems-III Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Power Systems-III” (EES-714). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include load flow analysis using different methods, types of fault analysis, and determination of ABCD parameter of transmission lines using MATLAB.

EES-710 Industrial Training

L-T-P (0-0-4) Credit (2)

To get the hands-on training and get familiarization with the industrial working environment, students will undergo one month industrial training program during summer vacation. In this program, students are supposed to get professional training from relevant industries such as power transmission and distribution sites, power plants, software companies, automobile industry etc. The recommendation letter for this will be given from the training and placement office of the faculty of engineering and technology. On successful completion of one month training, students will be required to submit a 15-20 pages report of their training program duly certified by the company/industry. Every student has to give the power point presentation of about 15 minutes duration of their training before the duly constituted committee of Faculty Members of the department for the assessment as a part of Mid Term Evaluation.

EES-720 Minor Project

L-T-P (0-0-4) Credit (2)

This is generally a preparation to the major project and may involve literature review, preparatory training on software and hardware, and preliminary experimentation. During the project period, every student has to give the power point presentation of about 15 minutes duration of their works before the duly constituted committee of Faculty Members of the department. The assessment by the committee members are a part of Mid Term Evaluation. A report of the project in the form of hard copy must be submitted in the office before the final evaluation by the External Examiners.

B. TECH. IN ELECTRICAL ENGINEERING
SEMESTER-VIII

EES-801 Advance Control Systems

L-T-P (3-1-0) Credit (4)

UNIT-I

Compensation design using Root Locus plots, Time domain specifications, Reshaping the Root Locus, Cascade Lag Compensation, Cascade Lead Compensation, Cascade Lag Lead Compensation.

UNIT-II

Compensation design using Bode's plots, Frequency domain specifications, Reshaping the Bode's Plot, Cascade Lag Compensation, Cascade Lead Compensation, Cascade Lag Lead Compensation,

UNIT-III

Design of Feedback Controllers for single loop systems: Design of Proportional, Integral, Derivative, PI, PID controllers of first, second order systems. Control loop with auxiliary feedback, Feed forward control, Practical Controller tuning tips, Ziegler-Nichol's tuning methods.

UNIT-IV

Stability Improvement by state feedback, Necessary and sufficient conditions for arbitrary pole placement, State regulator, design of state observer, Servo design: Introduction of reference input by feed forward control.

UNIT-V

Introduction to Digital control system, Z- transform, s- z domain mapping, Jury's stability criterion, Non-linear systems, Liapunov's stability criterion, Optimal control problem, linear-quadratic regulators. Advances in control systems

Text/Reference Books

1. Gopal, M., "Control Systems: Principles and Design", Tata McGraw Hill, New Delhi.
2. Gopal, M., "Digital Control Systems and State Variable Techniques", Tata McGraw Hill, New Delhi.
3. KuO, B.C., "Automatic Control System", Prentice Hall, sixth edition, New Delhi.
4. Ogata, K., "Modern Control Engineering", Prentice Hall, second edition, New Delhi.

EES-802 Switchgear and Protection

L-T-P (3-1-0) Credit (4)

UNIT-I

Fuse, H.R.C. fuse, Isolators, Theory of arc formation, properties of arc, Arc interruption theories. Circuit constants and circuit conditions, Restriking voltage transient Rate of Rise of Restriking voltage(RRRV), Current Chopping, Duties of switch-gear, Resistance switching , Circuit breaker rating.

UNIT-II

Construction and Operation of Air-break circuit breakers (CBs), Oil CBs, Single and Multi-break construction, Air-blast CB, Recent development in circuit breakers, Vacuum Breaker, Sulphur Hexa-phloride CB's, DC circuit breaker, Comparative merits and demerits of CBs.

UNIT-III

Need for protective relaying, Protective Zones, Primary and back up protection, Desirable Properties of protective relaying, Principle and operation of Electromagnetic and Induction type Relays, Relay settings, Directional, Distance, Differential, Overcurrent and earth fault relays, Static Relays, Numerical Relays/IEDs (Intelligent Electronic Devices).

UNIT-IV

Scheme of protection of Generator, Transformer, Bus-Zone, Transmission line. Merz-Price circulating current scheme, Restricted earth fault protection, Negative Sequence Protection, Bucholz relay, Translay scheme, pilot protection.

UNIT-V

Lightning and switching surges, dynamic overvoltages, ground wire, transmission reflection, refraction and attenuation of surges, spark gap, arresters, surge absorbers, BIL, insulation coordination, grounding of power system.

Text/Reference Books

1. Suni S. Rao, "Switchgear and Protection", Khanna Publishers, New Delhi.
2. C. R. Masion, "The Art and Science of Protective Relaying", New Age International, New Delhi.
3. C. L. Wadhwa, "Electrical Power Systems", New Age International, New Delhi.
4. C. L. Wadhwa, Generation, distribution and utilization of electric energy, New Age Publications, New Delhi.

EES-803 Energy Management Systems

L-T-P (3-1-0) Credit (4)

UNIT-I

Classification and Characteristics of Loads. Approaches to load forecasting, Forecasting Methodology, Peak demand and energy forecasting, Demand forecasting of domestic, Commercial, public lighting, Industrial, Irrigation and Traction.

UNIT-II

Transmission Planning in India-Strategies, Planning Criteria: Philosophy and General Guidelines, Permissible Line Loading and Voltage limits. Planning Methodology.

UNIT-III

Supervisory Control and Data Acquisition (SCADA) Systems Introduction Types of Supervisory Systems, Uses of SCADA, Types of Data available, SCADA Hierarchy, Components of SCADA System, Remote Terminal Unit (RTU), Communication System, Master Station, Man Machine Interface (MMI), SCADA Functions.

UNIT-IV

National Grid, Regional Grid, Energy Management System Function, Sequence of events recording and fault diagnostics. Distribution Automation, Intelligent Electronics Devices, Phasor Measurement Units (PMUs).

UNIT-V

Basic Concepts of Power Quality, Power Quality Standards, Voltage Flicker, Sag, Swell, THD; Energy Audit- Energy Accounting Procedures, IT applications for Energy Accounting, Demand Side Management.

Text/Reference Books

1. Power System Planning, R. L. Sullivan, McGraw Hill International, USA.
2. Electric Power Transmission System Engg. Analysis and Design, Turan Gonen, John Wiley and Sons.
3. Power Generation, Operation and Control, Allen J. Wood and Bruce. F., Woolen Berg, John Wiley and Sons, USA.
4. Electrical System Control, T. Cegrell, Prentice Hall of India, New Delhi.
5. Handbook of Energy Audits, A. Thumann. The Fairmont Press, INC.
6. G. T. Heydt, "Electric Power Quality", Star in a Circle Publication, Avarua, Cook Ireland.

EES-804 Data Communications and Computer Networks

L-T-P (3-1-0) Credit (4)

UNIT-I

Data Communication System: Introduction, Purpose, Components; Concepts of Frequency, Spectrum, and Bandwidth; Bit Rate and Baud Rate, Bandwidth of a Transmission System, Nyquist and Shannon Theorems, Throughput, Latency, Jitter, Modes of Digital Data Transmission, DTE-DCE Interface, Data Modems: Introduction, Transmission Rates and Standards.

UNIT-II

Transmission Media: Guided Media: UTP and Co-Axial Cables, Unguided Media - Use of Frequency Spectrum, Radio Waves, Terrestrial Microwaves, Infrared and Millimeter Waves, Transmission Impairment–Attenuation, Distortion, Noise.

Error Detection and Correction: Types of Errors: Single-Bit Error, Burst Error; Block Coding, Process of Error Detection and Error Correction in Block Coding, Parameters of a Coding Scheme, Minimum Hamming Distance for Error Detection and Error Correction, Linear Block Codes, Simple parity Check Code.

UNIT-III

Computer Networks: Network Topologies, IEEE LAN standards, Metropolitan Area networks, Wide Area Networks, Internetworks, Overview of OSI Reference Model, TCP/IP Protocol Suite, Comparison OSI and TCP/IP models, Addressing Schemes, Dotted Decimal Notation, Classful and Classless Addressing, IPv4 and IPv6 addressing.

UNIT-IV

Medium Access Control Sublayer: Multiple Access Protocols at Data Link Layer, Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access (CSMA), CSMA/CD, CSMA/CA, Token Bus protocol, Token Ring Protocol.

UNIT-V

Cryptography and Network Security: Symmetric Key Cryptography, Traditional Cyphers, Substitution Cypher, Shift Cypher, Transposition Cypher, Simple Modern Cyphers, XOR Cypher, Rotation Cypher, Substitution Cyphers, S-box and P-box Cyphers, Modern Round Cyphers; Asymmetric Key Cryptography, RSA and Diffie-Hellman Algorithms; Network Security Services: Message Confidentiality, Message Integrity, message Authentication, Digital Signature.

Text/Reference Books

1. Andrew S. Tanenbaum, David J. Wetherall, “*Computer Networks*,” Edition, Pearson Education, New Delhi.
2. Behrouz A. Forouzan, “*Data Communication and Networking*,” Tata McGraw Hill, New Delhi.

EES-805 Advanced Microprocessors

L-T-P (3-1-0) Credit (4)

UNIT-I

Introduction to 16-bit microprocessors. Architecture and pin diagram of Intel 8086 microprocessor. Description of signals of 8086. Register organization of Intel8086. Minimum mode and maximum mode 8086 system and timings. Memory address space and data organization. Flags and Interrupts of 8086 microprocessor.

UNIT-II

Addressing modes of Intel 8086 microprocessor. Instruction sets of 8086: transfer instructions, arithmetic instructions, logic instructions, shift instructions , rotate instructions and control instructions. Programming using 8086 instructions for some problems.

UNIT-III

Memory interface of 8086 microprocessor, semiconductor memory interfacing. Hardware organization of memory address space. Memory bus status code. Memory control signals. Read and write bus cycles. De-multiplexing of Address / data bus.

UNIT-IV

Input / output interface of 8086 microprocessor. I/O interface, I/ O data transfer, I/O instructions, I/O bus cycles, Architecture and programming of 8255A PPI. Interfacing of ADC and DAC.

UNIT-V

Introduction to Intel family of 8-bit micro controllers. Architecture of Intel 8051 micro controller. Signals of 8051, register organization of 8051, memory and I/O addressing by 8051. Instruction sets 8051. Interrupts of 8051. Some design problems based on 8051 micro controller.

Text/Reference Books

1. Advance microprocessors and peripherals, A. K. Ray and K. M. Bhurchandi, Tata McGraw Hill, New Delhi.
2. 16-bit and 32-bit microprocessors: Architecture, Software and Interfacing techniques, Avtar Sing and Walter A Triebel, Prentice Hall, Englewood Cliffs, N.J.

EES-806 HVDC Transmission

L-T-P (3-1-0) Credit (4)

UNIT-I

Historical development of HVDC, Limitations and advantages of EHVAC and DC transmission, classification of DC links, Applications, Ground Return, Economic factors, future of HVDC transmission.

UNIT-II

HVDC Converters, properties and configurations of 1-phase. and 3-phase. Converter circuits, Graetz circuit, pulse number

UNIT-III

Selection of HVDC Converter, six pulse Converters, cascade converters, basic principle of HVDC protection.

UNIT-IV

Analysis of 3-phase. Bridge Converter, 3-phase. Bridge inverter, HVDC link and Converter control, characteristics, Analysis of HVDC link performance.

UNIT-V

Conventional cable systems, Electrical performance of cables in power system, stress in coaxial cables, Types of insulation in cables, Gas filled cables, HVDC cables.

Text/Reference Books

1. S. Rao, EHV AC and HVDC Transmission Engg. and Practice. Khanna Pub., Delhi.
2. Kimbark, Direct Current Transmission, Wiley Inter Science, New Delhi.
3. Radiyer, HVDC Power Transmission Systems. Technology and system, Interactions, New Age Publications, New Delhi.
4. Uhlmann, Power Transmission by Direct Current, Springer Verlag, N.Y.
5. Begmudre, Extra High Voltage A.C. Transmission Engg., New Age Publications, New Delhi.
6. Weedy, Underground Transmission of Electric Power, John Wiley & Sons, N.Y.

EES-807 Electrical Machine Design

L-T-P (3-1-0) Credit (4)

UNIT-I

DC Machine design, Main dimensions, output equation, specific electrical loading, specific magnetic loading, torque developed, choice of number of poles, Armature reaction-mmF distribution, shape of mmF wave, saturation and brush shifting, methods to reduce armature reaction. Commutation-commutator design. Magnetic circuit- mmF, reluctance, slot and ventilating ducts, apparent and real flux, flux density in teeth, calculations Field coil Armature winding- types, lap and wave, numbering, number of slots, equalizer connections, symmetry of commutator winding, layout Starters.

UNIT-II

Transformer Design, Core dimensions and winding turns- emf equation, output equation, iron and copper cost. Magnetizing current- calculations. Reactance- design and calculations. Losses, Cooling design- heat dissipation, plain tank, cooling tubes, methods of cooling. Construction and fitting details design- core binding, coil assembly, terminal gear, tank construction, fittings, bushings, cable box, conservator, indicators, breather, explosion vent, pressure release relay, tap changers, valves, Buchholz relay, lugs, oil cooling equipment, rollers, earthing terminals, rating and diagram plates. Design considerations for oil cooled transformers- RFC specifications, DGTD regulations, loss capitalization, winding details, conductor charts, core data, design procedure, volts/turn, core area, core circle, core steps, LV and HV windings, clearance and insulation details, weight of conductors and core, load and core loss, percentage impedance, regulation, efficiency maximum efficiency, tank dimensions, cooling calculations, oil calculation, design calculations, types of windings.

UNIT-III

Induction Motor Design, Main dimensions, output equation, specific electrical loading, specific magnetic loading, air gap, winding-layout, Calculation of magnetizing current, no load current. Leakage reactance calculations- specific slot permeance, significance, semi-closed rectangular slot, inductance calculations, rotor bar current calculation, semi-closed round slot, reactance/slot and slot reactance per phase. Eddy current loss ratio, Rotor bar currents- slip ring induction motor, squirrel cage induction motor, current distribution, cage rotor resistance, transformation ratio, rms value of rotor bar current, ring current, copper losses, equivalent cage resistance.

UNIT-IV

Synchronous Motor Design, Main dimensions. Harmonic calculations- pitch factor, distribution factor, winding factor, mmF wave, armature reaction, design considerations to reduce harmonics, Cooling design- cooling system, cooling media, calculations, AC Windings- three phase windings, single layer windings, double layer windings, fractional slot winding.

Text/Reference Books

1. Balbir Singh, Electrical Machine Design, Vikas Publishing House, New Delhi.
2. M.G. Say, "Performance and Design of A.C. Machines", CBS Publishers.
3. K. Sawhney, "Electrical Machine Design", Dhanpat Rai and sons

EES-808 Advanced Protective Relays

L-T-P (3-1-0) Credit (4)

UNIT-I

Development of Computer Relaying, Benefits of Computer Relaying, Computer Relay Architecture, Function of a Protection System, Protection of Transmission Line, Transformer, Reactor and Generator Protection, Bus Protection.

UNIT-II

Sources of Error, Relaying as parameter Estimation, Symmetrical Component Distance Relay, Protection of Series Compensated Lines

UNIT-III

Power Transformer Algorithms, Generator Protection, Motor Protection, Digital Bus Protection

UNIT-IV

The Nature of Hardware Issues, Computers for Relaying, The Substation Environment, Industry Environmental Standards, Countermeasure against EMI, Supplementary Equipment, Redundancy and Backup, Servicing, Training and Maintenance.

UNIT-V

Travelling Waves on Single-Phase Lines, Travelling Waves on Three-Phase Lines, Travelling Waves Due to Faults, Directional Wave Relay, Travelling Wave Distance Relay, Differential Relaying with Phasors, Travelling Wave Differential Relays, Adaptive Relaying, Fault Location Algorithms and Recent Developments.

Text/Reference Books

1. Phadke Arun G., “Computer Relaying for Power System”, John Willey and Sons, New Delhi

EES-812 Switchgear and Protection Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Switchgear and Protection” (EES-802). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include over current, under voltage, differential relays, microprocessor based relays, string efficiency, and A, B, C, D parameters of transmission line, and VAR compensator etc.

EES-813 Energy Management and SCADA Lab

L-T-P (0-0-4) Credit (2)

This laboratory course is designed based on theory course of “Energy Management Systems” (EES-803). There are around 8-10 experiments to be conducted by the students covering almost all units of theory course. The experiments include study of hardware and software architecture of SCADA, integration of Field Model with I/O of RTU, LAN for SCADA lab, and GUI for system operator.

EES-820 Major Project

L-T-P (0-0-4) Credit (2)

The objective of the major project is to develop and enhance students’ analytical and problem tackling skills. Also it is expected that the students must learn to use the latest equipment and software so that the Industry gets trained Engineers. The project may be analytical, computational and experimental or combination of them. It should consist of objectives of study, scope of work, critical literature review and an extension of Minor Project. During the project period, every student has to present the progress of their works before the duly constituted committee of Faculty Members of the department. The assessment by the committee members are a part of Mid Term Evaluation. A report of the project in the form of hard copy must be submitted in the office before the final evaluation by the External Examiners.