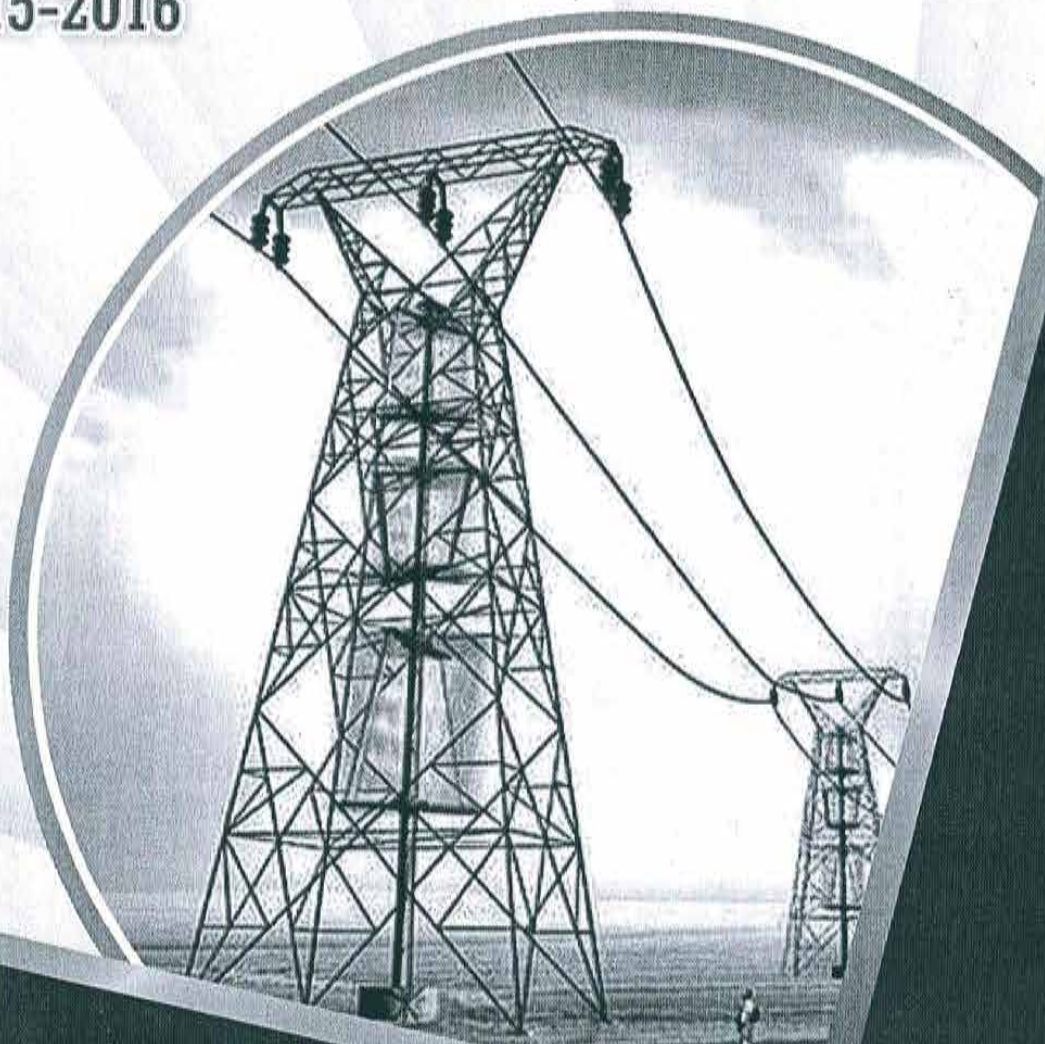
CURRICULUM AND SYLLABI FOR BACHELOR OF ENGINEERING (B.E.) IN ELECTRICAL (EVENING) 2015-2016



EPARTMENT OF ELECTRICAL ENGINEERING
ACULTY OF ENGINEERING & TECHNOLOGY
AMIA MILLIA ISLAMIA
EW DELHI - 110025

CURRICULUM AND SYLLABI

FOR

BACHELOR OF ENGINEERING (B.E.)

IN

ELECTRICAL (EVENING) 2015

DEPARTMENT OF ELECTRICAL ENGINEERING

FACULTY OF ENGINEERING & TECHNOLOGY

JAMIA MILLIA ISLAMIA

NEW DELHI – 11 00 25

PREFACE

To meet the challenging need of current and future academic and industries requirement, the Department of Electrical Engineering, Faculty of Engineering and Technology, Jamia Millia Islamia, New Delhi, has designed, developed and upgraded its syllabi with "***an far-reaching workshop for curriculum revision***" on October 18, 2014. It creates new learning tools and makes students more knowledgeable.

This booklet presents the course structure, detailed syllabi and marks distribution in theory and laboratory offered to BE (Electrical Engineering), Evening program of the Department of Electrical Engineering. The department offers separate Evening Program B.E. (Electrical Engineering) on annual pattern for diploma holder working professionals likely to be modified to semester system pattern (if approved). Department of Electrical Engineering also offers regular full time B. Tech (Electrical Engineering), M. Tech. in Electrical Power System Management (EPSM) and Control & Instrumentation (CIS).

The revised course curriculum is being designed to meet the AICTE and UGC norms and to cover syllabi of competitive examinations conducted by UPSC, NTPC, Power Grid, BHEL and GATE etc.

The curriculum has been carefully prepared giving sufficient emphasis on foundation courses in basic sciences, and engineering. The bulk courses are offered in core discipline of electrical engineering. Besides, electives in emerging areas are offered to specialize in selected disciplines. The basic motive of curriculum development has been to inculcate 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 microprocessor technology, digital signal processing, information technology and its applications, high voltage DC transmission, and Programmable Logic controller for industrial applications, Environmental issues, the syllabi is upgraded covering these topics also.

The emphasis has also been laid down towards self -learning through tutorials, seminars for projects in final year. The students have to undertake practical training in laboratories with class-room teaching.

Details of examination pattern are included giving internal assessment, laboratory evaluation and final examination weightage.

The booklet has been the outcome of continuous and rigorous efforts of all staff members of the Department specially Prof. Majid Jamil (Head), Prof. A.Q. Ansari, Prof. Mini S. Thomas, Prof. Zaheeruddin, Prof. Ibraheem, Prof. H. E. Akhter, Prof. Z.A Jaffery, Prof. Munna Khan, Prof. Shahida Khatoon Prof. Anwar Shahzad Siddiqui, Prof. Shakeb A. Khan, Prof. Tarikul Islam, Dr. Manaullah, Dr. Shabana Mehfuz Dr. Naimul Hasan, Dr. Ikbal Ali, Dr. Haroon Asfaq, , Mr. Rajveer Singh, Dr. Arunes Kumar Singh, Mr Ahteshamul Haque, Dr Sheeraz Kirmani, and Mr. Abrar Ahmad. I thank them all.

I appreciably acknowledge the support tendered by Prof. Anwaruddin Anwar, Department of Electrical Engg., Aligarh Muslim University, Aligarh, Prof. Madhusudan, Head, Department of Electrical Engg, .DTU,. Delhi Dr. Rizwan, DTU, Delhi, Dr. Sethu Selvam, Deputy Director, NPTI, Badarpur, Delhi, and Mr. Anwar Alam Alumni of Department during the preparation of the contents of this booklet.

The cooperation and contribution of Dr. Mudassir Husain, Prof. Musheer Ahmad, Prof. Masood Alam, of Department of Applied Science, Jamia Millia Islamia is highly appreciable. They have helped in providing a major part of the course curriculum of I Year.

I am grateful to administrative support of Prof. Mohammad Shakeel, Dean, Faculty of Engineering & Technology of Jamia Millia Islamia.

I want to place my sincere thanks on record to Mr. Abdul Qaium and Mr. Qamaruddin, Mr. Mohammad Yunus and other staff members of the department who had contributed at their level best during the compilation of these syllabi.

I hope this booklet shall be of great help to all the B.E.(Electrical Engineering.) students.

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Faculty of Engineering and Technology

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 epitomized 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 color of the civilization of India in such a way that it merges with the colors 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 characterized 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 programs 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 recognized 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 programs like masters in history and education, and undergraduate programs in sciences were started. Thereafter, in 1969 doctoral programs 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 recognizes 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 programs 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 programs. 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

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FACULTY OF ENGINEERING AND TECHNOLOGY

Faculty of Engineering and Technology was established in the year 1985. The Faculty is presently running undergraduate programs leading to the degree of B. Tech. in Civil, Electrical, Mechanical, Electronics & Communication and Computer Engineering. Postgraduate programs 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 programs are also offered. Research Programs leading to the degree of Ph.D. are also offered by all the departments. The Faculty is also running Evening Programs (part-time) in Civil, Electrical, Mechanical, Electronics & Communication and Computer Engineering at undergraduate (B.E.) level. The Evening Programs 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 programs, University Polytechnic offers Diploma Engineering programs in Civil, Electronics, Electrical, Mechanical and Computer Engineering. As an extension of continuing education program, University Polytechnic also offers part-time Diploma Engineering programs 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 is 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 specialized 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 programs that follow Semester System, each Academic Year is divided into two semester 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 programs 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

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.

1. **Undergraduate programs:**

   a. **Bachelor of Technology (B. Tech.) in Electrical Engineering**
   Four year program after XII standard.

   b. **Bachelor of Engineering (B. E.) in Electrical (Evening Program)**
   Four year program for working professionals with Diploma in Electrical Engineering.

2. **Postgraduate programs:**

   a. **Master of Technology (M. Tech.) in Electrical Power System Management**
   Two years program after B. Tech. in Electrical Engineering.

   b. **Master of Technology (M. Tech.) in Control and Instrumentation Systems**
   Two years program after B. Tech. in Electrical/Instrumentation/Control/Electronics and Communication Engineering

3. **Ph. D. Programs**
   Department is also offering PhD programs in different specialized field of Electrical Engineering viz:

- Power System
- Machines, Drives and Power Electronics
- Control and Instrumentation
- Electronics and Communication
- Computer Technology

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COURSE NOMENCLATURE AND MARKS ALLOTMENT

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
CSW	Class Sessional Work
MST	Mid Sessional Test

S. No	Course No.	Course Title	CREDIT	Periods/ week			Distribution of Marks			
				L	T	P	Mid Semester Evolution		End Semester Exam	Total
							CSW	MST		

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 practical/ 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 *within two weeks* of receipt of application for condonation.

2. ** In the case of B.A. LL.B. (Hons.) program, 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. program, 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) (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 programs/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 program/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 later. 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.

Bachelor of Engineering (Electrical)

B.E. Electrical Engineering –I Year

S. No.	Course No.	Course Title	Pds/week			Sessional Work Marks	Practical Exam. Marks	Annual Exam. Marks	Total Marks
			L	T	P				
01	BEE-101	Engineering Mathematics-I	2	1	–	25	–	100	125
02	BEE-102	Applied Sciences	2	1	–	25	–	100	125
03	BEE-103	Elements of Mechanical Engineering.	2	1	2	25	25	100	150
04	BEE-104	Basic Electronics	2	1	2	25	25	100	150
05	BEE-105	Computer Fundamentals & Programming Languages	2	1	2	25	25	100	150
06	BEE-106	Electrical Machine-I	2	1	2	25	25	100	150
						Total Marks			850

B. E. ELECTRICAL ENGINEERING –II YEAR

S. No.	Course No.	Course Title	Pds/week			Sessional Work Marks	Practical Exam. Marks	Annual Exam. Marks	Total Marks
			L	T	P				
01	BEE-201	Engineering Mathematics-II	2	1	–	25	–	100	125
02	BEE-202	Circuit Theory	2	1	2	25	25	100	150
03	BEE-203	Digital Electronics	2	1	2	25	25	100	150
04	BEE-204	Electrical Machines	2	1	2	25	25	100	150
05	BEE-205	Electro Magnetic Field Theory	2	1	–	25	–	100	125
06	BEE-206	Control Systems	2	1	–	25	25	100	150
						Total Marks			850

B. E. ELECTRICAL ENGINEERING –III YEAR

S. No.	Course No.	Course Title	Pds/week			Sessional Work Marks	Practical Exam. Marks	Annual Exam. Marks	Total Marks
			L	T	P				
01	BEE-301	Communication Systems	2	1	2	25	25	100	150
02	BEE-302	Signals & Systems	2	1	2	25		100	125
03	BEE-303	Electrical Measurement & Instrumentation	2	1	2	25	25	100	150
04	BEE-304	Power System-I	2	1	–	25	–	100	125
05	BEE-305	Power Electronics	2	1	–	25	25	100	150
06	BEE-306	Microprocessor & Its Apps	2	1	2	25	25	100	150
						Total Marks			850

B. E. ELECTRICAL ENGINEERING –IV YEAR

S. No.	Course No.	Course Title	Pds/week			Sessional Work Marks	Practical Exam. Marks	Annual Exam. Marks	Total Marks
			L	T	P				
01	BEE-401	Switchgear & Protection	2	1	2	25	25	100	150
02	BEE-402	Power Station Practice	2	1	–	25	–	100	125
03	BEE-403	Power System-II	2	1	2	25	25	100	150
04	–	Elective-I	2	1	2	25		100	125
05	–	Elective-II	2	1	–	25	–	100	125
06	BEE-410	Project	2	1	–	–	–	200	200
						Total Marks			875

Elective-I:

BEE-404 Utilization of Electrical Energy,
BEE-405 Soft Computing
BEE-406 Data Communication & Computer Network

Elective-II:

BEE-407 Programming Logic Controller (PLC)
BEE-408 Electrical Machine Design,
BEE-409 Biomedical Instrumentation

BEE-101 ENGINEERING MATHEMATICS-I

UNIT-1

Application of Leibnitz theorem in successive differentiation, curvature and radius of curvature in Cartesian, polar and parametric forms and centre of curvature, Asymptotes of Cartesian & polar curves, tracing of standard curves. Partial derivatives and their geometrical interpretation, total differential, maxima and minima for a function of two variables, Jacobian, and Taylor's theorem and Maclaurin series for a function of one, two and more variables.

UNIT-2

Review of well known formulae of integration, integration of rational, irrational and transcendental functions, simple reduction formulae, definite integral and their properties, Gamma and Beta functions. Area and arc length of curves, formulation of Fourier's full range and half range (sine and cosine) series of an explicit function for an arbitrary period.

UNIT-3

Solution of homogenous, linear and reducible to linear differential equations, solution of non-homogeneous linear differential equations (i.e. standard forms) and simultaneous linear differential equations of higher order with constant and variable coefficients, power series solution of homogeneous ordinary linear differential equations of second order with polynomial coefficients by the method of Frobenius when the roots of the equations are distinct and not differing by an integer.

UNIT-4

Review of Laplace transform & Inverse Laplace transform of functions, transforms of derivatives and integrals, first and second shifting theorems, and convolution theorem. Laplace transform of unit step function, periodic function with period T, unit impulse function, Dirac-delta function Bessel's functions Jo (at) and J1 (bt), application of Laplace transform and inverse Laplace transform for the solution of ordinary linear and simultaneous linear differential equations with constant and variable coefficients when initial and boundary conditions are given.

UNIT-5

Review of Determinant and their properties, solution of a system of simultaneous linear equations by matrix method, consistency of equations, Eigen values and Eigen vectors of a matrix and application of Cayley-Hamilton theorem in finding inverse of a square matrix. Lagrange method for the solution of linear partial differential equation of first order, Charpit's method for non-linear partial differential equation, product solution of one dimensional wave equation, one dimensional heat conduction equation, two dimensional Cartesian and polar forms of Laplace equation.

TEXT/REFFERENCE BOOKS

[1] NP Bali & Manish Goyal, ***A Text Book of Engineering Mathematics***, Laxmi Publication, 113, Golden House, Darya Ganj, New Delhi – 2.

[2] BS Grewal, ***Higher Engineering Mathematics***, Khanna Publisher, 2-B Nath Market, Nai Sarak, Delhi -6, 2003.

[3] M.K. Venkataraman, ***Engineering Mathematics***, Volume I & II, National Publishing Company, 7, Kondi Chetty Street, Madras - 608 001, 2003.

[4] P.N. Wartikar & J.N. Wartikar, ***Elements of Applied Mathematics***, Pune Vidhyarthi Griha Prakashan, PUNE -30 Published by P.B. Kulkarni, Pune, 2003.

BEE-102 APPLIED SCIENCES

UNIT-1

Static dielectric constant, polarization, interpretation of dielectric constant in mono-atomic and polyatomic gases and solids, spontaneous polarization, electronic, ionic and orientational polarization. Gauss's Law, Maxwell's Equation, Hall's Effect and its applications, LASERS, Coniston's Effect.

UNIT-2

Intrinsic and extrinsic semiconductors, effect of temperature on conductivity, origin of energy gap, carrier mobility, Uncertainty relation, de-Broglie relation, Schrodinger equation, particle in a box, wave function.

UNIT-3

Magnetic Materials: Introduction, classification and properties of magnetic materials, dipole moment, diamagnetism, magnetization characteristics, hysteresis, eddy currents, Curie point, loss of magnetism, impurities, magnetostriction, soft and hard magnetic materials, anti-ferromagnetic materials, ferromagnetic materials, ferrites, permanent magnets.

Frontier's of physics, Nanotechnology, Nobel Prize in physics.

UNIT-4

Water Treatment: Hardness of water, units of hardness, problems on hardness, scale and sludge formation, caustic embrittlement, boiler corrosion, priming and foaming, softening methods, lime soda process, zeolite process, ion exchange process, problems on softening of water, determination of hardness by O. Hehner's method, soap titration method & EDTA method, Problems.

UNIT-5

Polymer & Electrochemistry: Types of Polymerization, classification of polymers, mechanism of addition polymerization, conducting polymer, preparation, properties and use of PE, PVA, PVC, PTFE, Phenolic resin and polyester resin.

Redox reaction, Electrochemical cell, Electrode potential & cell potential, standard electrode potential, Nerst's equation and numerical.

UNIT-6

Environmental Pollution and its control: Pollution, Environment & its segment, zones of atmosphere, Air Pollution- air pollutants, gases namely SOX, NOX, CO, CO2, O3, HCs, particulates namely dust, smoke, fly ash, smog, lead and mercury, Control of air pollution using Cyclone collector, Cottrell electrostatic precipitator and Catalytic converter.

TEXT/REFERENCE BOOKS

[1] HS Mani and G.K. Mehta, ***Introduction to Modern Physics***, East West Publications, Delhi, 1985

[2] Resnick and Halliday, ***Fundamentals of Physics***, Wiley Eastern Limited, New Delhi.

[3] Beiser, ***Modern Physics***, McGraw Hill (International), Singapore.

[4] Engineering Chemistry, Wiley India.

[5] Kuriacose & R Ram, ***Chemistry in Engineering and Technology***, Tata McGraw Hill,

[6] PC Jain, ***Engineering Chemistry***, Rai & Sons.

BEE-103 ELEMENTS OF MECHANICAL ENGINEERING

UNIT-I

Rectilinear translation, kinematics of rectilinear motion, principle of dynamics, D' Alembert's principle, work and energy, curvilinear motion, kinematics of curvilinear motion. Friction- friction of nut and screw. Brakes- shoe brake and band brake. Dynamometers- absorption and transmission dynamometers. Belt, rope and chain drive - power transmitted by belt and rope. Centrifugal tension.

UNIT-II

Simple mechanism- kinematic chain, cams, different types of cams and followers. Toothed gearing - different types, module, diametric pitch. Tooth profiles. Gear trains - compound trains, motor car gear box, epicyclic gear trains, Ratchet.

UNIT-III

Thermodynamics- thermodynamic systems, concept and definitions, properties of a pure substance. Work and heat. First law, first law applied to steady flow system, second law of thermodynamics, Carnot cycle.

UNIT-IV

Steam Generators: classification of boilers, fire tube boilers, water tube boilers. Steam Engine: principle of operation of steam engine and indicator diagram. Steam turbine- principle of operation of steam turbine, impulse and reaction turbine. Internal Combustion Engines: four stroke system, two stroke system, indicator diagram. Simple carburetor. Fuel injector. Performance and testing of engines, simple gas turbine cycle.

UNIT-V

Fluid Mechanics: fluid properties, fluid statistics, fluid pressure and its measurement. Hydrostatic forces on plain and curved surface. Buoyancy and floatation. Stability conditions. Liquids in relative equilibrium.

TEXT/REFFERENCE BOOKS

[1] K.L. Kumar, ***Engineering Mechanics***, Tata McGraw Hill, New Delhi.

[2] Shigley and Vicker, ***Theory of Mechanisms and Machines***, Tata McGraw Hill, New Delhi

[3] IH Shames, ***Mechanics of Fluids***, McGraw Hill, International Book Co.

[4] PK Nag, ***Engineering Thermodynamics***, Tata McGraw Hill Publication.

BEE-104 BASIC ELECTRONICS

UNIT-1

Introduction, semiconductor materials, n-type and p-type materials, energy levels, semiconductor diodes, diode equivalent circuits and parameters, V-I characteristics, Zener diode and applications, LED, tunnel diode and its applications, half wave and full wave rectifiers, clippers and clampers circuits.

UNIT-2

Bipolar junction transistor (BJT)- construction, current components, configuration and characteristics. Biasing of BJT. Transistor as an amplifier, transistor parameters and its equivalent circuits, transistor hybrid model, RC-coupled amplifier.

UNIT-3

JFET- its construction and characteristics. MOSFET- its construction and characteristics; FET parameters, basic FET configurations, Biasing of JFET. JFET as voltage controlled resister.

UNIT-4

Classification of amplifiers, power amplifiers (class A, B and C), Push-Pull amplifier. Feedbacks in amplifiers and their effect on various amplifier parameters, condition of oscillations, Sinusoidal oscillator circuits,

UNIT-5

Introduction, Op-amp basics, Op-amp characteristics, CMRR, applications of Op-amp as an inverter, summer, integrator, differentiator. Instrumentation amplifier, current-to-voltage converter, log and antilog amplifiers, differential amplifiers and their characteristics.

TEXT/REFFERENCE BOOKS:

[1] J Millman and C.C. Halkias, ***Electronic Devices and Circuits***, 31st printing McGraw Hill Book Company New Delhi,

[2] R Boylested and L Nashelsky, ***Electronic Devices and Circuit Theory***, 4th Edition, Prentic Hall of India Pvt. Ltd., New Delhi

BEE-105 COMPUTER FUNDAMENTALS & PROGRAMMING LANGUAGES

UNIT - 1

Organization of a digital computer, building blocks, CPU, I/O devices, Memory unit, Auxiliary memories, Introduction to system software: operating system, Assembler, Compiler, Interpreter, Introduction to word processor.

UNIT - 2

C: character set, tokens, keyword and identifiers, data type, variables, constants, operators and expressions, arithmetic expressions and its evaluation, Simple program writing.

Decision making/ branching with IF ELSE, the switch statement, WHILE, DO, FOR statements. input/output statement, reading and writing a character, with use to program writing. Arrays, and initializing one and two dimensional arrays, Structure definition, Initializing structure, File management in C,

UNIT - 3

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 - 4

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.

UNIT - 5

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

Text/Reference Books

[1] B Ram, "***Computer Fundamentals: Architecture and Organization***" New Age Int'l Ltd Publication, New Delhi

[2] E Balagurusamy "***Programming in ANSI C***" Tata McGraw Hill Company Limited, New Delhi

[3] Manaullah Abid, "***Beginning with C11 and MATLAB***", IK Intl Publishing Pvt. Ltd. 2013.

[4] David Kuncicky, "***MATLAB Programming***", Pearson Education, 2003.

[5] RK Bansal, "***MATLAB and Its Application in Engineering***", Pearson 2012

BEE-106 ELECTRICAL MACHINE - I

UNIT-1

Transformers: types, construction, emf. equation, working principle, phasor diagram on NO-load and full-load, constant flux machine, exact and approximate equivalent circuits, its parameters, open circuit and short circuit tests, voltage regulation, losses, efficiency, condition for maximum efficiency, condition for zero regulation, all-day efficiency. Autotransformers - construction, principle of working and copper saving.

UNIT-2

Polarity test, single-phase transformers connected as three-phase banks, star/star, delta/delta, star/ delta, delta/star and open delta connections. Scott connection - phase shift, merits/demerits, applications. 3-phase to 6-phase conversions. Parallel operation of single/three phase transformer under no-load, with unequal voltage ratio, effect of X/R ratio, NO load and ON load tests. Tap changing transformers. Harmonics.

UNIT-3

DC machines: constructional features, emf equation, torque production, , armature winding, lap and wave winding, equalizer connection. Armature flux distribution and its effects, brush shift, cross reaction demagnetizing ampere turns. Commutation-variation of current, current density under the brush, straight line/over/under commutation, causes of bad commutation, methods of improving commutation- interpoles, compensating winding.

UNIT-4

DC generators: Types, voltage development, residual magnetism, critical resistance, critical speed, magnetization curve, internal and external characteristics, application of different generators. Parallel operation of DC generators.

UNIT-5

DC motors: Types, principle, back emf, torque condition for maximum power, load characteristics of series/shunt/compound motor. Starters- three point/four point starter, different methods of speed control, merits and demerits, losses in DC machines, applications. Testing: Swinburne' s Hopkinson' s field, retardation test, Separation of losses.

TEXT/REFERENCE BOOKS

[1] A.E. Clayton & N. Hancock, "***The Performance and Design of DC Machines***", 3rd Edition, Oxford & IBH Publishing Co., New Delhi, 1978.

[2] IJ Nagrath & D.P. Kothari, "***Electrical Machines***", Tata McGraw Hill, New Delhi.

[3] G McPherson, "***An Introduction to Electric Machines and Transformers***", John Wiley, New York.

[4] A Husain, "***Electric Machines***", Dhanpat Rai & Co. - 2014

BEE-201 ENGINEERING MATHEMATICS-II

UNIT-1

Bessel's function Jn(X) - recurrence relations, generating relations, Jacobi series, solution of typical differential equations in terms of Bessel's functions. Legendre polynomial Pn(X), Rodrigue's formula, generating relation, orthogonal property, Fourier-Legendre series of cubic and biquadratic polynomials. Evaluation of a definite integrals reducible to Beta and Gamma functions, fractional derivative. Laplace transforms of different combinations of functions.

UNIT-2

Evaluation of single definite integral by Romberg technique, evaluation of double and triple definite integrals (Cartesian form) by changing the order of integration and change of variables. Applications of double and Dirichlet's triple integral in calculating the area, mass and volume of two and three dimensional figures (Cartesian forms), generalization of Liouville's theorem related with multiple integrals.

UNIT-3

Derivation of Cauchy-Riemann equation in Cartesian and polar forms. Milne-Thomson method for determination of analytic function when its real or imaginary part is known. Evaluation of line integral around a simple closed curve in complex plane by means of Cauchy's integral theorem and Cauchy's integral formula associated with derivative & Cauchy's Residue Theorem. Applications of Euler Maclaurin's formula in the summation of a special series, particular term of a series or a sequence by calculus of finite differences. Representation of a tabulated function in powers of (x-a) by Newton's divided difference formula.

UNIT-4

Applications of gradient of a scalar field, directional derivative, divergence and curl of a vector field, determination of scalar & Vector point functions f(x, y, z) & its applications. Simple problems on line integral in space, surface integral, volume integral, Gauss divergence theorem, Green's theorem and Stoke's theorem in x-y plane.

UNIT-5

Applications of Laplace and inverse Laplace transforms in the solution of integral equations and integro-differential equations with initial and boundary conditions. Fourier Integrals, Fourier Sine & Cosine integrals. Fourier Transform Fourier sine & cosine transforms & their inverse transforms. Properties of various transforms & related theorems. Solution of system of non linear equations by method of iterations & Newton-Raphson method. Application of Fourier transform and inverse Fourier transform in the solution of integral equations.

TEXT/REFFERENCE BOOKS

[1] N. P. Bali & Manish Goyal, ***A Text Book of Engineering Mathematics***, Laxmi Publication , 113, Golden House, Darya Ganj, New Delhi -2,

[2] B.S. Grewal, ***Higher Engineering Mathematics***, Khanna Publisher, 2-B Nath Market, Nai Sarak, Delhi -6, 2003.

[3] M.K. Venkataraman, ***Engineering Mathematics***, Volume I & II, National Publishing Company, 7, Kondi Chetty Street, Madras - 608 001, 2003.

[4] P.N. Wartikar & J.N. Wartikar, ***Elements of Applied Mathematics***, Pune Vidhyarthi Griha Prakashan, PUNE -30 Published by P.B. Kulkarni, Pune, 2003.

BEE-202 CIRCUIT THEORY

UNIT-1

AC Circuit analysis- RLC series and Parallel. Mesh and nodal methods of circuit analysis. Superposition theorem, Thevenin's and Norton theorems, maximum power transfer theorem, reciprocity theorem, compensation theorem, Millman's theorem and Tellegan's theorem. Balanced and unbalanced three phase AC circuits.

UNIT-2

Introduction to graph, independent voltage and current variables, incidence matrix, isomorphic graphs, planar and non-planar graphs, Kirchhoff's laws, nodal analysis, mesh analysis, duality, coupled circuits, mutual inductance, dot rule, coefficient of coupling, network equations of networks having mutual inductances, analysis of networks using graph theory.

UNIT-3

Network configuration. z, y, h, g parameters. 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 e.g. ideal transformer and gyrator.

UNIT-4

Natural frequency, complex frequency, network functions, natural frequency of a network, calculation of network functions, concept of transfer function, poles and zeros, restrictions on poles and zeros, driving point transfer functions.

UNIT-5

Synthesis v/s analysis, positive real function, testing of network functions, driving point immittance functions, synthesis of RL, RC and LC passive networks, Foster-I and -II, Cauer-I and -II forms of RL, RC and LC immittance functions.

TEXT/REFFERENCE BOOKS

1. M E Van Valkenberg, ***Network Analysis***, Prentice Hall of India, New Delhi,1985
2. T S K V Iyer, ***Circuit Theory***, Tata McGraw Hill, New Delhi, 1985.
3. J. D. Ryder, ***Networks, Lines and Fields***, Prentice Hall of India, New Delhi, 1989.
4. D. Roy Chaudhary : B. R. Gupta and Vandana Singhal, ***Fundamentals of Electrical Networks***, S. Chand.
5. Schaum's Series, ***Electric Circuits***, Tata McGraw Hill, New Delhi
6. W.H. Hayt and J.E. Kemmerly, ***Engineering Circuit Analysis***, Tata McGraw Hill, New Delhi,

BEE–203 DIGITAL ELECTRONICS

UNIT–1

Introduction to Boolean algebra, truth table, AND, OR and NOT operator, laws of Boolean algebra, reducing Boolean expressions, universal building block, Karnaugh mapping-min terms, solving digital problems using sum of products and products of sums reduction of Boolean expressions, hybrid functions, specified function (don't care conditions). Introduction to codesASCII codes, excess-3 code, Grey code.

UNIT–2

Binary half adder and full adder design, parallel adder, subtractor, parity checker/ generator, multiplexer/demultiplexer, applications, digital to analog converter-weighed register, R-2R ladder network- analog to digital conversion, successiye approximation type, dual slope type.

UNIT–3

Introduction to sequential systems, flip-flp-R-S, T, D, J-K, master-salve JK ripple counters-shortened modulus. Up and down counter designs, applications of ripple counters. Synchronous counters.

UNIT–4

Parallel counters, type T counters, up and down counters, non-sequential counting (skipping states), type- D counter design, shift registers, ring counters, type- J K counter design, controlling the counter to count through more than one set of states. Asynchronous sequential circuit design.

UNIT–5

Diode transistor logic (DTL), transistor logic (TTL) as derived from the DTL gate, typical TTLNAN gate function of the input transistor, volt-ampere characteristics, fan-in and fan-out calculations, output stages-totem pole and modified totem pole. Emitter coupled logic (ECL), integrated injection logic (IIL). MOS logic and CMOS logic for basic gates.

TEXT/REFFERENCE BOOKS

[1] H Taub and D Schilling, ***Digital Integrated Electronics***, McGraw Hill Book Co, 1988.

[2] W H Gothman, ***Digital Electronics-An Introduction to Theory and Practice***, 2nd Edition, Prentice Hall of India, 1992.

[3] M Manno, ***Digital Circuits and Logic Design***, Prentice Hall of India Pvt. Ltd., New Delhi 1987.

[4] Ronald J Tocci, ***Digital Systems: Principles and Applications***, PHI Publication, Indian Reprint (Sixth Edition) August 2001.

BEE-204 ELECTRICAL MACHINES-II

UNIT-1

Open circuit test and short circuit test, zero power factor test, voltage regulation by synchronous impedance, mmf and Potier's triangle methods, synchronization and parallel operation of alternators, power-angle equation, synchronizing current, synchronizing power, synchronizing torque, effect of change of prime mover input and excitation on performance of generator, synchronous machine on infinite bus, time period of oscillation of synchronous machine connected to infinite bus..

UNIT-2

Construction and operation of synchronous machine, operation of synchronous machine as synchronous motor, power and torque relations, torque-angle characteristics, V-curves and O-curves, starting methods, synchronous condenser, salient pole theory of synchronous machines, determination of xd and xq , power-characteristics of salient pole synchronous machines.

UNIT-3

Poly-phase induction motors- introduction, general constructional features. Qualitative description of working of poly-phase induction motor from rotating field viewpoint. Steady state analysisequivalent 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.

UNIT-4

Single-phase induction motor- double revolving field theory, starting methods, split phase motor, capacitor type motors, shaded pole motor, characteristics and applications of series motor, universal motor and repulsion motor, reluctance motor, hysteresis motor and servomotor.

UNIT-5

Stepper motor, commutator (Schrage) motor, Rozenberg generator (for railway), Synchros, characteristics and applications, two-phase induction motor.

TEXT/REFFERENCE BOOKS

[1] AS Langsdorf, "***Theory of Alternating Current Machines***", Tata McGraw Hill, New Delhi.

[2] IJ Nagrath & D.P. Kothari, "***Electrical Machines***", Tata McGraw Hill, New Delhi.

[3] G McPherson, "***An Introduction to Electric Machines and Transformers***", John Wiley, New York.

[4] MG Say, "***Performance and Design of AC Machines***", CBS Publishers, Delhi.

[5] AE Fitzgerald, C. Kingsley & SD Umans, "***Electric Machinery***", McGraw Hill

[6] A Husain, "***Electric Machines***", Dhanpat Rai & Co., Delhi, 2014

BEE-205 ELECTROMAGNETIC FIELD THEORY

UNIT-1

Review of scalars and vectors, vector algebra, Cartesian coordinate system, vector components and unit vectors, vector field, dot product, cross product, cylindrical and spherical coordinate systems. Del-operator, gradient, divergence and curl. Experimental law of Coulomb, electric field intensity, field due to continuous volume charge distribution, field of a line charge and field of a sheet of charge.

UNIT-2

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

UNIT-3

Current and current density, continuity of current, conductor properties and boundary conditions, semiconductors, nature of dielectric materials, boundary conditions for perfect dielectric materials, capacitance, capacitance of two wire line, Poisson's and Laplace's equations, unique theorem, problems and solution of Laplace's and Poisson's equations.

UNIT - 4

Boit-Severt law, Ampere's circuital law, curl, Stoke's theorem, magnetic flux and magnetic flux density, force on a moving charge, force on differential current element, force between differential current elements, force and torque on a closed circuit.

UNIT - 5

Faraday's law, displacement current, Maxwell's equations in point form and in integral form, Application of Maxwell's equations, EM waves and propagation of energy, Wave equation for free space, Uniform plane waves, Poynting vector, intrinsic impedance of media for uniform plane wave.

TEXT/REFFERENCE BOOKS

[1] William H Hayt (Jr.), **Engineering Electromagnetic**, Sixth Edition, McGraw Hill Book Co., New Delhi.

[2] N Narayana Rao, **Elements of Engineering Electromagnetic**, Prentice Hall of India Pvt. Ltd., New Delhi, 1988

[3] JA Edminister, Electromagnetic, **Schaum's Outline Series in Engineering**, McGraw Hill Co., New Delhi, 1986

[4] K David, Gheng, **Field and Wave Electromagnetic**, Second edition, Addison Wesley Publishing Company, Inc., Reading Massachusetts, U.S.A., 1989.

[5] Fawwaz T. Ulaby, **Fundamentals of Applied Electromagnetic**, Prentice Hall of India Pvt. Ltd., New Delhi.

[6] Mathew NO Sadiku, **Elements of Electromagnetic**, Oxford, Second Edition.

BEE-206 SIGNALS AND SYSTEMS

UNIT- 1

Morphology of signals and their classifications. Basic operations on Signals. Elementary Signals: Step, impulse and ramp function, other non-sinusoidal signals and wave forms as the sum of standard functions. Even and odd functions, orthogonal function. Power and Energy signals.

UNIT- 2

Fourier series representation of signals. Fourier Integral and Fourier transform and its properties. Parsevel's theorem. Discrete Fourier Transform & its properties. Linear convolution, circular convolution and correlation of signals.

UNIT- 3

Time-domain representation & characterization of Linear Time Invariant (LTI) Systems. System representation using input/output differential equations, transfer function. System analysis using Laplace transform: impulse response, step response, response of LTI system. Stability criteria for LTI systems: pole criteria for stability, Routh's stability test.

UNIT- 4

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. Stability criteria for discrete time LTI systems, Jurry's Stability Test for Discrete-Time LTI System.

UNIT- 5

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

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.

BEE-301 COMMUNICATION SYSTEMS

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

UNIT- 1

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

UNIT- 2

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- 3

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- 4

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

UNIT- 5

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] Waye Tomasi, "***Electronics Communication System***", Pearson Education India.

BEE-302 CONTROL SYSTEMS

UNIT-' 1

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 control systems.

UNIT- 2

Transfer functions of linear systems, block diagram representation, block diagram reduction techniques, signal flow graphs and Mason's gain formula, sensitivity and reliability.

UNIT- 3

Time response analysis of first and second order systems, performance specifications in time domain. Introduction to design considerations, lead compensation, lag compensation, lead-lag compensation, stability concept, Routh-Hurwitz's stability criterion, steady state errors and error constants, static error coefficients, Root locus plots, general rules for constructing root loci, analysis of control system using root loci.

UNIT- 4

Relationship between time and frequency response, polar plots, Bode's plot, Nyquist plot and Nyquist stability criterion, relative stability, phase margin and gain margin, constant M circle and constant N circle, Nichol's chart.

UNIT- 5

Concept of state, state-variable, state space model, state space models for linear continuous-time function, control system analysis using state-variable approach, conversion of state-variable models to transfer functions, conversion of transfer function to canonical state-variable models, solution of state equations, concepts of controllability and observability, equivalence between transfer function and state variable representation.

TEXT/REFFERENCE BOOKS

[1] Gopal, M., ***Control Systems: Principles and Design***, Tata McGraw - Hill, 1997.
[2] Gopal, M., ***Digital Control Systems and State Variable Techniques***, Tata McGraw - Hill, 1997.
[3] Kou, B.C., ***Automatic Control Systems***, Prentice Hall of India, sixth edition, 1993.
[4] Ogata, K., ***Modern Control Engineering***. Prentice Hall of India, second edition, 1991.
[5] IJ Nagrath and M. Gopal, ***Modern Control Systems***, New Ages International.
[6] Norman S Nise, ***Control System Engineering***, John Wiley & Son Inc.
[7] Richard C Drof and Robert H. Bishop, ***Modern Control Systems***, Addison-Wesley, 1998.

BEE-303 ELECTRICAL MEASUREMENTS AND INSTRUMENTAION

UNIT- 1

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- surface and volume resistivity, insulation resistance, megger, and ohmmeters. Measurement of resistance of electrolytes. Galvanometer and other apparatus used in connection with resistance measurements.

UNIT -2

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, Wein's bridge, Universal bridge and bridge accessories, balance of bridge, locus diagrams, sensitivity.

Magnetic measurements, magnetometer, ballistic galvanometer, fluxmeter, Hall-effect devices. Separation of iron losses, methods of iron loss measurement.

UNIT -3

Wattmeter, energy meters, errors in wattmeter and energy meters. Measurement of power and energy. Power factor meters

Current Transformer (CT) and Potential transformer (P.T.) theory, ratio and phase angle errors, design considerations. Testing: Absolute and comparison methods.

UNIT -4

Digital volt meter (DVM), digital multimeter, data acquisition and processing systems, Q-meters, frequency meters.

Cathode ray oscilloscope (CRO), CRT, electron gun, deflection plates, screens for CRT, measurements of voltage, current, phase, B-H loop, diode testing using CRO. digital storage oscilloscope (DSO).

UNIT -5

Transducers, measurement of temperature, pressure, force, acceleration, strain gauges and applications, LVDT, proximity sensors, ultrasonic measurements.

TEXT/REFERENCE BOOKS:

[1] W D Cooper, A D Helfric, ***Electronic Instruments and Measurements***, Prentice Hall of India, New Delhi, 1988.

[2] EW Golding and F C Widdis, ***Electrical Measurements and Measuring Instruments***, JOBS Publications, 1989.

[3] AJ Bouwens, ***Digital Instrumentation***, McGraw Hill Book Co., New York, 1987.

[4] AK Sawhney, ***A Course in Electrical and Electronic Instruments and Measurements***, Dhanpat Rai and Sons, Delhi-6, 1990.

[5] DVS Murthy, ***Transducers and Instrumentation***, Prentice Hall of India, New Delhi.

BEE-304 POWER SYSTEM - I

UNIT- 1

Classification of lines- line parameters, calculation of resistance and inductance of single-phase and three-phase lines with equilateral and unsymmetrical spacing, transposition, GMD, GMR, calculation of capacitance of single phase and three-phase lines with symmetrical and unsymmetrical spacing. Skin effect and proximity effect. 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- 2

Representation of short and medium lines. Nominal T and methods. Analysis of long lines- ABCD parameters, receiving and sending-end voltages, regulation and efficiency, sending & Receiving end voltage circle diagram. Ferranti effect, corona, disruptive critical voltage, visual corona, corona power-loss. Interference between power and communication circuits. Introduction to travelling waves.

UNIT- 3

Typical transmission and distribution schemes, standard voltages, merits of high voltage transmission, types of towers and poles used, sag calculations in conductor suspended on level supports and supports at different levels, effect of wind, ice, tension and sag at erection, types and construction of cables, insulation resistance of a cable, capacitance and grading in cables.

UNIT- 4

One line diagram, impedance and reactance diagram, per unit system, selection of base, network reduction. Symmetrical 3-phase fault, short-circuit current, reactance of synchronous machines, fault current in unloaded systems, internal voltage of loaded machines, calculation of short-circuit currents by method of internal voltage and Thevenin's theorem.

UNIT- 5

Symmetrical components of three phase unbalanced phasors, power in terms of symmetrical components, phase shift in Y-Δ transformer banks, sequence impedance and sequence network, zero sequence equivalent circuits for various three phase transformer connections. Interconnection of sequence network for various faults, LG fault, LL fault, LLG fault and 3LG fault.

TEXT/REFFERENCE BOOKS

[1] William D Stevenson, Jr., ***Elements of Power Systems Analysis***, Third Edition, McGraw Hill Book Co., Singapore, 1986.

[2] Arthur R. Bergen, Vijay Mittal, ***Power System Analysis***, Pearson Education Inc., Second Edition, New Delhi.

[3] IJ Nagrath and D.P. Kothari, ***Modern Power System Analysis***, TMH Publishing Co., New Delhi, 1980.

[4] CL Wadhwa, ***Electrical Power Systems***, Wiley Eastern Ltd., New Delhi, 1983.

[5] L.P Singh, ***Advanced Power System Analysis and Dynamics***, New Age International Publishers, Fifth Edition, New Delhi.

[6] A Husain, ***Electrical Power Systems***, CBS Publishers. 2012

BEE-305 POWER ELECTRONICS

UNIT - 1

Silicon diodes, fast recovery diode, Schottky diode, diac, triac, SCR, GTO, PUT, IGBT. Static V-I characteristics of thyristor, its ratings, construction and manufacture, over-current and over voltage protection, snubber circuits. Two transistor model of SCR. Solid state switching circuits, methods of turning on (triggering) and turning off (commutation).

UNIT - 2

Uncontrolled Rectifier: Single Phase Half-wave and full-wave with R, R-L Load. Controlled Rectifier: Single phase and three phase rectifiers with R, R-L Load. Freewheeling diode, battery load. Detailed derivation of rms, average value. Performance parameters.

UNIT - 3

Voltage-driven inverter, current-driven inverter. Single-phase bridge inverter with resistive load, inductive load and use of feedback diode, parallel inverter with feedback diodes, center-tapped inverter with feedback diodes. Three phase voltage source bridge inverters: 120 degree, 180 degree conduction mode. Introduction of resonant inverters. Pulse width Modulation (PWM) and its various techniques.

UNIT - 4

Principle of chopper, Step down- Step up chopper, Step down chopper with R- L load without linear approximation. Chopper Classification: Type-I, II, III and IV Quadrant chopper. Buck, Boost, Buck-Boost DC – DC converters. Cycloconverter: Single phase to single phase, three phase to single phase. AC Voltage controllers: Single and three phase.

D. C drive: Revive of DC motor characteristic, Speed control of D. C motor by various schemes, single phase drive, three phase drive, DC-DC converter drive.

UNIT - 5

AC drive: Three phase induction motor: Revive of Performance characteristic, Stator voltage control, rotor voltage control, frequency control, Voltage/frequency control, Voltage/current/frequency control.

Synchronous motor drive: Cylindrical rotor, Salient pole, reluctance motor, permanent magnet. Battery charger, emergency lighting system, uninterruptible power supply (U.P.S).

TEXT/REFERENCE BOOKS:

[1] GK Dubey, "***Power Semiconductor Controlled Drives***" Prentice Hall Englewood Cliffs, New Jersey, 1998.

[2] PC Sen, "***Power Electronics***" Tata McGraw Hill Book Co., New Delhi, 1987

[3] MH Rashid, "***Power Electronics, Circuits and Application***", Pearson Education India, New Delhi, India, 2011.

BEE-306 MICROPROCESSOR AND APPLICATIONS

UNIT- 1

Introduction to microprocessor, 8085 microprocessor: Architecture, instruction set, interrupt structure, and assembly language programming, Machine cycles and timing diagrams.

UNIT-2

Introduction, instruction set of 8085: 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- 3

ASSEMBLY LANGUAGE PROGRAMMING:

Assembly Language Programming Basics, Addressing Modes, Instruction and Data Formats, Writing, Assembling & Executing a Program, Debugging a Program, Decision Making, Looping, Stack & Subroutines, Developing Counters and Time Delay Routines, Code Conversion, BCD arithmetic and 16-Bits Data Operations.

UNIT- 4

THE 8086 MICROPROCESSOR ARCHITECTURE: Pin diagram and description of various signals, architecture, block diagram and details of sub-blocks such as EU, BIU; memory segmentation and physical address computations, program relocation, addressing modes, Interrupts and their description.

UNIT- 5

Serial and parallel I/O Chips (8251 and 8255), Programmable DMA Controller (8257), Programmable interrupt controller (8259), keyboard display controller (8279), ADC/DAC interfacing. Introduction to DMA process, DMA controller (8237), USB.

TEXT/REFERENCE BOOKS:

[1] Krishna Kant, ***Microprocessors and Microcontrollers: Architecture, Programming and System Design 8085, 8086, 8057, 8096***, Prentice Hall of India, 2007.

[2] M Rafiquzzaman, ***Microprocessors-Theory and applications: Intel and Motorola***, Prentice Hall of India, 2001.

[3] Douglas, V. Hall, "***Microprocessors and Interfacing Programming and Hardware***", 2nd Edition, McGraw Hill Ind., 1992

[4] Badri Ram; "***Advanced Microprocessors and Interfacing: Intel 8086 to Pentium 4 Processors***", Tata McGraw Hill Company Ltd. 2002.

[5] RS Kaler, "***A text of Microprocessors and Microcontrollers***", published, I.K. Internationa! Publishing house Pvt. Ltd., New Delhi, India, 2011.

BEE-401 SWITCHGEAR AND PROTECTION

UNIT -1

Fuse, H.R.C. fuse, isolators, theory of arc formation, properties of arc, arc interruption theories. circuit constants and circuit conditions, re-striking voltage transient, rate of rise of re-striking voltage (RRRV), current chopping, duties of switch-gear, resistance switching , circuit breaker rating.

UNIT -2

Construction and operation of air-break circuit breakers (CBs), oil CBs, single and multi-breaker construction, air-blast CB, vacuum CB, sulpher hexa-phloride CB's, DC circuit breaker, comparative merits and demerits of CBs, recent development in circuit breakers.

UNIT -3

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, over current and earth fault relays, static relays.

UNIT -4

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 -5

Lightning and switching surges, ground wire, transmission reflection, refraction and attenuation of surges. spare gap, arresters, surge absorbers, SIL, insulation coordination, grounding of power systems.

TEXT/REFFERENCE BOOKS

[1] Sunil S Rao, ***Switchgear and Protection***, Khanna Publishers, New Delhi, 1988.

[2] CR Mession, ***The Art and Science of Protective Relaying***, Wiley Eastern Ltd., New Delhi, 1970.

[3] CL Wadhwa, ***Electrical Power Systems***, Wiley Eastern Ltd., New Delhi, 1983.

[4] Ravinder Nath Chander, ***Power System Protection***, Wiley Eastern Ltd., New Delhi, 1971.

BEE 402 POWER STATION PRACTICE

UNIT- 1

Cost of power generation- running cost and fixed cost, 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. Tariffs- flat-rate, two-parts, block rate, maximum demand and power factor tariff, economics of power factor improvements.

UNIT- 2

Steam generating plants- selection of site, types and their relative merits, boilers accessories, economizers, airpreheater and super heater, condensers, pumps, cooling towers. Layout of plant, pollution control equipments.

Nuclear fuel, nuclear reaction, elements of nuclear power plant, types of nuclear reactor, nuclear reactor components and their functions, boiling water, pressurized water, fast breeder reactor and CANDU reactor and their comparative merits and demerits.

UNIT- 3

Hydropower plant- selection of site, classification of hydropower plants based on quantity of water available, nature of load, available head, layout, construction and function reservoir, dam, spillways, intake, forebay, penstock, search tank , prime-mover, draft-tube. Governing of turbines, types of turbines & their characteristics and comparison of various types of plants.

UNIT- 4

Introduction of renewable energy sources, Potential of solar energy, solar thermal power generation, working principle, concentrating and non concentrating collectors, application of solar thermal energy- solar water heating, solar thermal power plants.

Solar photovoltaic system, solar cells and its I-V Characteristics, efficiency of solar cells, block diagram of stand-alone and grid connected SPV systems.

UNIT- 5

Introduction to wind power generation, choice of site of wind power plants, advantages and disadvantages, Potential available in India, Block diagram of wind energy conversation systems, HAWT and VAWT. Introduction of tidal, geothermal, magneto-hydro-dynamic (MHD) and fuel cells.

TEXT/REFFERENCE BOOKS

[1] MV Deshpandae, ***Elements of Electrical Power Station Design***, A.H. Wheeler & Co. Pvt. Ltd. Allahabad.

[2] BGA Shrotzki & WA Vopal, ***Power Plant Engineering and Economics***, McGraw Hill BookCo., 1980.

[3] CL Wadhva, ***Generation, Distribution and Utilization of Electrical Engineering***, Wiley Eastern Ltd., NewDelhi, 1989.

[4] CL Wadhwa, ***Electrical Power Systems***, Wiley Eastern Ltd., NewDelhi, 1991.

[5] DP Kothari, K.C. Singal and Rakesh Ranjan, ***Renewable Energy Sources and Emerging Technologies***, PHI

[4] S K Pillai, ***"A First Course in Electric Drives"***, New Age Publications, New Delhi, India, 2011.

BEE-403 POWER SYSTEM-II

UNIT -1

AC and DC transmission and distribution systems, economy and efficiency comparison, various types of distribution systems(AC & DC), cable v/s overhead lines, economic choice of conductor size, Kelvin's law, DC distribution fed at one end, distributor fed at both end, distributor fed at center, concentrated loading of distributors, uniformly loaded distributor, distributor loaded with concentrated and uniform loads, radial, ring and interconnected distribution systems, feeder, distributor and service mains, balancers.

UNIT -2

Formulation of Y-Bus by singular transformation, load flow equations, Gauss, Gauss-Seidal and Newton-Raphson method, Fast decoupled load flow method, comparison of solution methods, power flow through transmission line, receiving end and sending end circle diagrams, method of voltage control. Introduction to OPF.

UNIT -3

Introduction to automatic generation control and voltage control, load frequency control (single area case), Load Frequency Control and Economic Dispatch Control, Two-area load Frequency Control, Optimal (Two-area) Load Frequency Control, automatic voltage control. Voltage Control methods: conventional & Modern.

UNIT -4

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

UNIT -5

Power system constraints, economic dispatch with and without considering losses, exact transmission loss formula, Optimal load scheduling of Thermal Plants taking losses into account, Economic load scheduling of Hydro-Thermal Plants, coordination equation, automatic load dispatching. Unit Commitment.

TEXT/REFFERENCE BOOKS

[1] CL Wadhwa, ***Electrical Power System***, Wiley Eastern Ltd., New Delhi-110002.

[2] J Nagrath and D P Kothari, ***Modern Power System Analysis***, Tata McGraw Hill Publishing Co., N Delhi.

[3] A R. Bergen, Vijay Mittal, ***Power System Analysis***, Pearson Education Inc., Second Edition, N Delhi.

[4] L P Singh, ***Advanced Power System Analysis and Dynamics***, New Age International Publishers, 5th Edition, New Delhi.

[5] William D. Stevenson, Jr., ***Elements of Power Systems Analysis***, Fourth Edition, McGraw Hill Education (India) Private Limited, New Delhi.

[6] Hadi Saadat, ***Power System Analysis***, McGraw-Hill, International Edition, 1999.

[7] A Husain, ***Electrical power Systems***, CBS Publishers, 2012

BEE-404 UTILIZATION OF ELECTRICAL ENERGY

UNIT -1

Introduction, classification- group, individual, and multi-motor drives, manual, semi-automatic and automatic control. Quadrantal diagram. Speed-torque characteristics of different types of motors. Electric braking- dynamic, plugging, regenerative for DC and AC motors. Speed control methods. Recent trends.

UNIT -2

Introduction, speed time curves for urban, suburban services, simplified speed time curve, trapezoidal curve, quadrilateral curve, average and schedule speed, mechanism of train movement.

UNIT -3

Tractive effort during acceleration, tractive effort on gradient, tractive effort for resistance, power and energy output from the driving axles, factors affecting specific energy consumption, coefficient of adhesion, traction motors. Diesel electric equipments- characteristics, transmission of drive.

UNIT -4

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 lamp, 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 -5

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. Welding- classification, electric supply for arc welding, welding transformer, welding techniques. Electrolytic process- basic principles, electro-deposition, electrolysis, electric supply for electrolysis.

TEXT/REFFERENCE BOOKS

[1] H Partab, ***Art and Science of Utilization of Electrical Energy***, Pritam, Surat and Brothers.2nd edition, 1975.

[2] NN Hancock, ***Electric Power Utilization***, Wheeler Publications, 1979.

[3] Soni, Gupta and Bhatnagar, ***Electric Power Utilization***, Dhanpat Rai and Sons, 1989.

[4] E Openshaw Taylor, ***Utilization of Electrical Energy***, Orient Longman Publishers, 1962.

[5] CL Wadhwa, ***Generation, distribution and Utilization of Electric Energy***, Wiley Eastern Ltd., 1989.

BEE-405 SOFT COMPUTING

Unit -1

Soft Computing: Basic concept of intelligence, Artificial Intelligence (AI), Physical Symbol System Hypothesis, Achievements of AI, Limitations of AI. Need of Soft Computing, Premises and Guiding Principles, Difference between Hard Computing and Soft Computing.

Unit -2

Fuzzy Logic: Fuzzy Set Theory: fuzzy versus crisp sets, basic fuzzy set operations, linguistic variables, membership functions, fuzzy Cartesian product, fuzzy relations, and fuzzy rules.

Unit -3

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

Unit -4

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 -5

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.

TEXT/REFERENCE BOOKS:

[1] Fakhreddine O. Karray and Clarence W De Silva, "Soft Computing and Intelligent Systems Design: Theory, Tools and Applications" Pearson Education, 2011.

[2] S. Rajasekaran and G. A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications", Prentice Hall of India, New Delhi, 2011.

[3] George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and applications, Prentice Hall of India, New Delhi, 1997.

[4] Jyh-Shing Roger, Chuen-Tsai Sun, Eui Mizutani, Neuro-fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, Prentice Hall of India, New Delhi, 2005.

[5] Simon S Haykin, "Neural networks and learning machines", Prentice Hall of India, New Delhi, 2009.

BEE-406 DATA COMMUNICATIONS & COMPUTER NETWORKS

UNIT-1

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-2

Transmission Media: Guided Media: UTP and Co-Axial Cables, Unguided Media - Use of Frequency Spectrum, Radio Waves, Terrestrial Microwaves, Infrared and Millimetre 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-3

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-4

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-5

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 - 407: PROGRAMMING LOGIC CONTROLLER

Unit-1: PLC BASICS

The PLC- A look inside, General PLC programming Procedure, Devices to which PLC Input and Output Modules are connected: Input On/Off Switching Devices, Input Analog Devices, Output On/Off Devices, Output Analog Devices.

Unit-2: PLC Programming

Programming On/Off inputs to Procedure on-off outputs, Relation of Digital Gate to Contact/Coil logic, Creating Ladder Diagrams from Process Control Descriptions: Introduction, Ladder diagrams and sequence listings, Large Process Ladder diagram construction, Flowcharting as a programming Method.

Unit-3: PLC Functions

Register Basics: Introduction, General characteristics of Registers, Module addressing, Holding Registers, Input registers and Output Registers. PLC Timer Functions: Introduction, examples of Timer Function Industrial Applications, Industrial Process Timing Application. PLC Counter Functions: Introduction, PLC Counters with examples.

Unit-4: Intermediate Functions

PLC Arithmetic Functions: Introduction, PLC addition and subtraction, repetitive clock, PLC multiplication, division and square root, Trigonometric and Log function. PLC Number Comparison: Introduction, Basic comparison Function, its application. Numbering System: Intro to Decimal, Binary, BCD, Octal and Hexadecimal number system.

Unit-5: Data Handling Functions and Controlling a Robot with PLC

The PLC SKIP and Master Control Relay Functions, JUMP Functions, PLC data move system, PLC FIFO function, One Shot(ONS) and Clear (CLR). Controlling Robot: Intro, basic two axis robot with PLC sequencer control, Industrial three-axis Robot with PLC control.

Text Book / Reference Book:

[1] Programmable Logic Controllers: Principles and Applications, Fifth Edition, Prentice Hall, 2006

[2] PLC Programming For Industrial Automation by Kevin Collins

BEE-408 ELECTRICAL MACHINE DESIGN

UNIT- 1

Design factors, magnetic materials; Properties and types of insulating materials, construction of rotating machines, and choice of electric and magnetic loading.

UNIT- 2

D.C. Machine Design: Main dimensions, output equation, torque developed, choice of no. of poles, armature reaction-mmf distribution, commutator design, magnetic circuit.

UNIT- 3

Transformer Design: Construction of core type and shell type transformers, Main dimensions, core design, window design, winding, winding resistance and leakage reactance , no-load current, iron losses and copper losses, efficiency, regulation, temperature rise, tank design.

UNIT- 4

induction Machine Design: Output equation, main dimensions, turns per phase, stator slot, stator teeth, stator core, and air-gap. Rotor: slot, teeth, bar, core, end ring. No-load current, winding resistance, leakage reactance, dispersion coefficient, losses, efficiency, harmonic reduction, temperature rise.

UNIT- 5

Synchronous Machine Design: Output equation, main dimensions, short circuit ratio, shape of pole faces, armature turns per phase, leakage reactance, regulation, field poles, field winding, losses, efficiency, and temperature rise.

TEXT/REFFERENCE BOOKS

[1] MG Say, ***Performance and Design of A.C. Machines,*** CBS Publishers, Delhi.

[2] AK Sawhney, ***Electrical Machine Design,*** Dhanpat Rai and Sons, New Delhi.

[3] RK Agarwal, ***Electrical Machine Design***

[4] AE Clayton and NN Hancock, ***The Performance and Design of D.C. Machines,*** 3rd edition, Oxford N IBH Publishing Co., New Delhi, 1978

BEE-409 BIOMEDICAL INSTRUMENTATION

Unit 1: Introduction

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

Unit 2: 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 3: 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 4: 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 5: 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.

Books:

[1] Raja Rao, C; Guha, S.K. Principles of Medical Electronics and Biomedical Instrumentation. Universities Press (India) Limited 2013.

[2] Barbara Christe. Introduction to Biomedical Instrumentation: The Technology of Patient Care. Cambridge University Press, 2012.

[3] John G. Webster. Medical Instrumentation Application and Design. 4th Edition, John wiley & sons, 2009.

[4] Joseph J. Carr and John M. Brown. Introduction of Biomedical Equipment Technology. 4th Edition, Pearson Education Asia, 2001.

[5] John E, Susan B, Joseph B. Introduction to Biomedical Engineering. 2nd Edition, Academic Press, Indian Reprint 2009.