JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTAPURAMU

Academic Regulations 2013 (R13) for B. Tech (Regular)

(Applicable for the students admitted during the Academic Year 2013-2014 and onwards)

1. Award of B.Tech. Degree

A student will be declared eligible for the award of the B.Tech. degree if he/she fulfils the following academic regulations:

i. Pursue a course of study for not less than four academic years and in not more than eight academic years.

ii. Register for 180 credits and secure all 180 credits

2. Students who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech course and their admission is cancelled.

3. Courses of study

The following courses of study are offered at present for B. Tech. degree

S.No.	Branch
1.	Civil Engineering
2.	Electrical and Electronics Engineering.
3.	Mechanical Engineering.
4.	Electronics and Communication Engineering
5.	Computer Science and Engineering.
6.	Chemical Engineering

and any other course as approved by the authorities of the University from time to time.

4. Course pattern & Credits:

i. The entire course of study is of four academic years on semester pattern.

ii. Credits

	Semester	
	Periods / Week	Credits
Theory	04	03
Practical	03	02
Project Part A	03	02
Project Part B	15	10

5. Distribution and Weightage of Marks

i. The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks for theory and 75 marks for practical subject. In addition seminar, comprehensive viva-voce and project work shall be evaluated for 25, 50 and 200 marks respectively.

ii. For theory subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the External Evaluation.

iii. There shall be five units in each of the theory subjects.

iv. For practical subjects there shall be a continuous evaluation during the semester for 25 internal marks and 50 end examination marks

5.1 External Evaluation

A) The student shall answer six questions with following pattern in the End-Examination.

a) All Questions have to be answered compulsorily.

b) Question I shall contain 10 short Answer questions “a” to “j” each of 2 marks, with two questions from each unit. (Total 20 marks)

c) For the remaining five questions, two questions from each of the five units with Either/Or type have to be set for 10 marks each and they may contain two or more sub questions (Total 50 marks)

B) Further, whenever any theory subject with two parts is offered (combined subject), for ex: Electrical & Mechanical Technology, then there shall be only two parts Part A, Part B in the question paper.
Part – A: shall contain three questions, EITHER/OR type shall be followed, for 35 marks and for each question 12, 12, & 11 marks shall be allocated.
Part – B: shall also contain three questions, EITHER/OR type shall be followed, for 35 marks and for each question 12, 12, & 11 marks shall be allocated.

C) For the subjects having design and / or drawing, such as Engineering Drawing, Machine Drawing and Estimation, there shall be five questions for a total of 70 marks. Two questions from each of the five units with Either / Or type have to be set. Each question carries 14 marks and they may contain two or more sub questions.

D) For practical subjects the end examination shall be conducted for 50 marks by the concerned laboratory teacher and another examiner from the same department.

5.2 Internal Evaluation

A) For theory subjects, there shall be <u>two</u> midterm examinations during the semester. Each midterm examination shall consist of an objective paper for 10 marks and a subjective paper for 20 marks with duration of 20 and 90 minutes respectively.

Objective test paper is set for 20 multiple choice questions for 1 mark for each, then condensed for 10 marks. *Subjective test paper shall contain three questions, EITHER/OR type shall be evaluated for 10 marks for each, then condensed for 20 marks. First midterm examination shall be conducted for I, II & half of III unit syllabus and second midterm examination shall be conducted for the remaining syllabus. Both the midterm exams are compulsory. Final Internal marks for a total of 30 marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage to the better mid exam and 20% to the other, any fraction rounded off to the next higher mark.

*Subjective test changed to EITHER/OR type w.e.f. October, 2016

Note: The midterm examination shall be conducted first by distribution of the Objective test paper simultaneously marking the attendance, after 20 minutes the answered objective paper is collected back. The student is not allowed to leave the examination hall. Then the subjective question paper and the answer booklet shall be distributed. After 90 minutes the answered booklets are collected back.

B) For practical subjects day-to-day work in the laboratory shall be evaluated for 25 marks by the concerned laboratory teacher based on the report of experiments/jobs.

C) For the subject having design and / or drawing, such as Engineering Drawing, Machine Drawing and Estimation, the distribution shall be 30 marks for internal evaluation. The Internal evaluation will be for 15 marks for day-to-day work in the class that shall be evaluated by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm exams in a Semester for a duration of 2 hrs each, evenly distributed over the syllabi for 15 marks. The final mid exam marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage to the better mid exam and 20% to the other, any fraction rounded off to the next higher mark. The sum of day to day evaluation and the final mid exam marks will be the final internal marks for the subject.

v. There shall be an audit pass course in Human Values & Professional Ethics and Advanced Communication Skills lab with no credits. There shall be no external examination. However, attendance in the audit course shall be considered while calculating aggregate attendance.

vi. There shall be one Massively Open Online Course (MOOCs) in IV year I semester. Student shall register for MOOCs with specified MOOCs provider/s and need to submit proof of the same. The evaluation of MOOCs subject is same as that of theory subjects. Internal exam shall be conducted by mentor allotted and end semester exam shall be conducted along with other theory subjects.

vii. There shall be a Seminar presentation in IV year II Semester. For the Seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department before presentation. The report and the presentation shall be evaluated by the Departmental committee consisting of Head of the Department, Seminar Supervisor

and a senior faculty member. The Seminar shall be evaluated for 25 marks. There shall be no external examination for Seminar.

There shall be a Comprehensive viva-voce in IV year II Semester. The Comprehensive viva-voce will be conducted by a committee consisting of Head of the Department and two senior faculty members of the department. The Comprehensive viva-voce is aimed to assess the student's understanding of the various subjects he/she studies during the B.Tech. course. The Comprehensive viva-voce is evaluated for 50 marks by the committee.
A student shall acquire 3 credits assigned to the seminar & comprehensive viva-voce only when he/she secures 30 marks on aggregate out of 75 marks allocated.

viii. Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination (viva-voce). The viva-voce shall be conducted by a committee consisting of Head of the Department, Project Supervisor and an External Examiner nominated by the Principal. The project work shall start in IV year I semester (Part A) and shall continue in the semester break. The evaluation of project work shall be conducted at the end of the IV year II semester (Part B). The Internal Evaluation shall be made by the departmental committee, on the basis of two seminars given by each student on the topic of his project. **Out of the 60 marks for internal evaluation there shall be 30 marks for Part A and 30 marks for Part B of project respectively.**

ix. The laboratory records and internal test papers shall be preserved for minimum of 2 years in the respective departments and shall be produced to the Internal/External Committees as and when the same are asked for.

6. Attendance Requirements

i. A student shall be eligible to appear for end examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
ii. **Shortage of attendance below 65% in aggregate shall in <u>NO CASE</u> be condoned**.
iii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
iv. Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence.
v. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration for that semester shall stand cancelled.
vi. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. He/She may seek readmission for that semester when offered next.
vii. A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

7. Minimum Academic Requirements

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.**6**

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he/she secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal and external evaluation taken together. In the Seminar & Comprehensive viva-voce he/she should secure a minimum of 40% marks.
ii. A student shall be promoted from II to III year only if he/she fulfils the academic requirement of securing **26 credits (40%)** of the subjects that have been studied up to II year I semester from
   a. Two regular and one supplementary examinations of I year I semester
   b. One regular and one supplementary examination of I year II semester.
   c. One regular examination of II year I semester

   irrespective of whether the candidate takes the end examination or not as per the normal course of study.
iii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing 44 **credits (40%)** of the subjects that have been studied upto III year I semester from the following examinations,
   a. Three regular and two supplementary examinations of I year I semester.
   b. Two regular and two supplementary examination of I year II semester.

c. Two regular and one supplementary examinations of II year I semester.
d. One regular and one supplementary examinations of II year II semester.
e. One regular examination of III year I semester.

irrespective of whether the candidate takes the end examination or not as per the normal course of study.

And in case of getting detained for want of credits by sections ii and iii above, the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of Third or Fourth year I semester respectively.

iv. A student shall register and put up minimum attendance in all 180 credits and earn all the 180 credits. Marks obtained in all 180 credits shall be considered for the calculation of overall percentage of marks obtained.

v. Students who fail to earn 180 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

vi. A student who is eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

9. Transitory Regulations

Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section **2** and they will be in the academic regulations into which they are are presently readmitted.

10. With–holding of results

If the candidate has any dues not paid to the college or if any case of indiscipline or malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

11. Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree he/she shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	
First Class with Distinction	70% and above	From the aggregate marks secured for 180 credits
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

Further, the University, vide its University order RP/No. 164/2013 dt: 02.05.2013, has permitted for rounding of percentages to the extent of 0.5% to effect change of class from pass class to Second class, Second class to First class, First class to First class with distinction for all the courses being offered or to be offered by the University without adding any marks to the original marks secured by the students.

12. Minimum Instruction Days

The minimum instruction days including exams for each semester shall be 90 days.

13. There shall be no branch transfers after the completion of admission process.

14. There shall be no place transfer within the constituent colleges of Jawaharlal Nehru Technological University Anantapur during the entire course of the program.

15. General:

i. The academic regulations should be read as a whole for purpose of any interpretation.

ii. Malpractice rules - nature and punishments is appended

iii. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

v. **The College may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on roles with effect from the dates notified by the College.**

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., Act. No. 30 of 2008)
ANANTHAPURAMU – 515 002 (A.P) INDIA

Course Structure & Syllabus for B.Tech. (Regular)
R13 Regulations

ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year

Sl.No	Course code	Subject	Th	Tu/	Lab	Credits
1.	13A52101	Communicative English	2	-	-	3
2.	13A56101	Engineering Physics	2	-	-	3
3.	13A51101	Engineering Chemistry	2	-	-	3
4.	13A54101	Mathematics – I	3	1	-	5
5.	13A12101	Programming in C & Data Structures	3	1	-	5
6.	13A54102	Mathematics - II	3	1	-	5
7.	13A02101	Electrical Circuits	3	1	-	5
8.	13A12102	Programming in C & Data Structures Lab		-	3	4
9.	13A99102	Engineering Physics and Engineering Chemistry Lab *		-	3	4
10.	13A99103	Engineering & I.T. Workshop #		-	3	4
11.	13A52102	English Language Communication Skills Lab		-	3	4
Total Credits						45

Th = Theory; Tu = Tutorial & Lab = Laboratory

** The students shall attend the Physics lab and Chemistry lab in alternate weeks. The end exam shall be conducted separately and average of the two exams shall be recorded by the University exam section.*

 # The students shall attend Engineering and IT work shop as a single lab every week and the end exam is conducted as a single lab. Sharing the Maximum marks and time for one task each from Engineering workshop and IT workshop. The sum of the marks awarded shall be recorded.

B.Tech. II - I Semester

S.No	Course code	Subject	Theory	Tu / Drg / Lab	Credits
1.	13A54302	Mathematics - III	3	1 - -	3
2.	13A01403	Environmental Science	3	1 - -	3
3.	13A01307	Fluid Mechanics and Hydraulic Machinery	3	1 - -	3
4.	13A04301	Electronic Devices and circuits	3	1 - -	3
5.	13A03304	Engineering Graphics	1	- 3 -	3
6.	13A02301	Electrical Machines –I	3	1 - -	3
7.	13A01406	Fluid Mechanics and Hydraulic Machinery lab	-	- - 3	2
8.	13A02302	Electric circuits and Simulation lab	-	- - 3	2
Total Credits					22

B.Tech. II - II Semester

S.No	Course code	Subject	Theory	Tu / Lab	Credits
1.	13A02401	Electromagnetic Fields	3	1 -	3
2.	13A02402	Control Systems Engineering	3	1 -	3
3.	13A04407	Analog Electronic Circuits	3	1 -	3
4.	13A04303	Switching Theory and logic design	3	1 -	3
5.	13A02403	Electrical Power Generating Systems	3	1 -	3
6.	13A02404	Electrical Machines –II	3	1 -	3
7.	13A02405	Electrical Machines Lab -I	-	- 3	2
8.	13A04305	Electronic Devices & Circuits lab	-	- 3	2
Total Credits					22

B.Tech. III - I Semester

S.No.	Course code	Subject	Theory	Tu / Lab	Credits
1.	13A52501	Managerial Economics and Financial Analysis	3	1 -	3
2.	13A02501	Electrical & Electronic Measuring Instruments	3	1 -	3
3.	13A04508	Linear & Digital IC Applications	3	1 -	3
4.	13A02502	Electrical Power Transmission Systems	3	1 -	3
5.	13A02503	Power Electronics	3	1 -	3
6.	13A02504	Electrical Machines – III	3	1 -	3
7.	13A02505	Electrical Machines Lab – II	-	- 3	2
8.	13A02506	Control Systems and Simulation Lab	-	- 3	2
9.	13A52301	Human Values & Professional Ethics (Audit course)	2	- -	-
Total Credits					22

B.Tech. III - II Semester

S.No	Course code	Subject	Theory	Tu / Lab	Credits
1.	13A52601	Management Science	3	1 -	3
2.	13A02601	Power Semiconductor Drives	3	1 -	3
3.	13A02602	Power System Protection	3	1 -	3
4.	13A04601	Microprocessors and Microcontrollers	3	1 -	3
5.	13A02603	Power System Operation and Control	3	1 -	3
6.	13A02604	Power System Analysis	3	1 -	3
7.	13A02605	Power Systems and Simulation Lab	-	- 3	2
8.	13A02606	Electrical Measurements Lab	-	- 3	2
9.	13A52502	Advanced English Language Communication Skills Lab (Audit course)	-	- 3	-
Total Credits					22

B.Tech. IV - I Semester

S.No	Course code	Subject	Theory	Tu / Lab	Credits
1.	13A02701	Electrical Distribution Systems	3	1 -	3
2.	13A02702	Digital Signal Processing	3	1 -	3
3.	13A02703	HVDC Transmission	3	1 -	3
4.	13A02704	Flexible AC Transmission Systems	3	1 -	3
5.		**Elective – I** (Open Elective)	3	1 -	3
6.	13A02705 13A02706 13A04712 13A02707	**Elective – II** Instrumentation Design of Electrical Systems Communication Systems AI Applications to Electrical Systems	3	1 -	3
7.	13A04605	Microprocessors and microcontrollers lab	-	- 3	2
8.	13A02708	Power Electronics and Simulation Lab	-	- 3	2
Total Credits					22

B.Tech. IV - II Semester

S.No.	Course code	Subject	Theory	Tu / Lab	Credits
1.	13A02801	Power Quality	3	1 -	3
2.	13A02802	Utilization Of Electrical Energy	3	1 -	3
3.	13A02803 13A02804 13A02805 13A02806	**ELECTIVE – III** Modern Control Theory Special Electro Mechanical Systems Power System Deregulation Switch Mode Power Converters	3	1 -	3
4.	13A02807 13A02808 13A02809 13A028010	**ELECTIVE – IV** Reliability Engineering & Applications to Power Systems High Voltage Engineering Smart Grid Energy Auditing &Demand Side Management	3	1 -	3
5.	13A02811	Seminar & Comprehensive viva voce	-	- -	3
6.	13A02812	Project	-	- -	10
Total Credits					25

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year	Th	Tu	C
	2	0	3

Common to All Branches
(13A52101) COMMUNICATIVE ENGLISH

Preamble:

English is an international language as well as a living and vibrant one. People have found that knowledge of English is a passport for better career and for communication with the entire world. As it is a language of opportunities in this global age, English is bound to expand its domain of use everywhere. The syllabus has been designed to enhance communication skills of the students of Engineering and Technology. The prescribed books serve the purpose of preparing them for everyday communication and to face global competitions in future.

The first text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and student-centered. They should be encouraged to participate in the classroom activities keenly.

The text for non-detailed study is meant for extensive reading/reading for pleasure by the students. They may be encouraged to read some selected topics on their own, which could lead into a classroom discussion. In addition to the exercises from the texts done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

Course Objective:

- *To enable the students to communicate in English for academic and social purpose.*
- *To enable the students to acquire structure and written expressions required for their profession.*
- *To develop the listening skills of the students.*
- *To inculcate the habit of reading for pleasure.*
- *To enhance the study skills of the students with emphasis on LSRW skills.*

Learning Outcome:

- *The students will get the required training in LSRW skills through the prescribed texts and develop communicative competence.*

UNIT I
Chapter entitled 'Humour' from "Using English"
Chapter entitled 'Biography - (Homi Jehangir Bhabha)' from "New Horizons"
Listening - Techniques - Importance of phonetics
L- Meet & Greet and Leave taking, Introducing Oneself and Others (Formal and Informal situations)
R- Reading Strategies -Skimming and Scanning
W- Writing strategies- sentence structures
G-Parts of Speech –Noun-number, pronoun-personal pronoun, verb- analysis
V-Affixes-prefix and suffix, root words, derivatives

UNIT II
Chapter entitled 'Inspiration' from "Using English"
Chapter entitled 'Biography - (Jagadish Chandra Bose)' from "New Horizons"
L- Listening to details
S- Apologizing, Interrupting, Requesting and Making polite conversations

R- Note making strategies
W- Paragraph-types- topic sentences, unity, coherence, length , linking devices
G-Auxiliary verbs and question tags
V- synonyms-antonyms, homonyms, homophones, homographs, words often confused

UNIT III
Chapter entitled 'Sustainable Development' from "Using English"
Chapter entitled 'Short Story - (The Happy Prince)' from "New Horizons"
L- Listening to themes and note taking
S- Giving instructions and Directions, making suggestions, Accepting ideas, fixing a time and Advising
R- Reading for details -1
W- Resume and cover letter
G- Tenses – Present tense, Past tense and Future tense
V-Word formation and One-Word Substitutes

UNIT IV
Chapter entitled 'Relationships' from "Using English"
Chapter entitled 'Poem - (IF by Rudyard Kipling)' from "New Horizons"
L- Listening to news
S- Narrating stories, Expressing ideas and opinions and telephone skills
R- Reading for specific details and Information
W- Technical Report writing-strategies, formats-types-technical report writing
G- Voice and Subject–Verb Agreement
V- Idioms and prepositional Phrases

UNIT V
Chapter entitled 'Science and Humanism' from "Using English"
Chapter entitled 'Autobiography - (My Struggle for an Education by Booker T.Washington)' from "New Horizons"
L- Listening to speeches
S- Making Presentations and Group Discussions
R- Reading for Information
W- E-mail drafting
G- Conditional clauses and conjunctions
V- Collocations and Technical Vocabulary and using words appropriately

Text Books:

1. ***Using English*** *published by Orient Black Swan.*
2. ***New Horizons*** *published by Pearson.*

Reference Books:

1. ***Raymond Murphy's English Grammar with CD,*** *Murphy, Cambridge University Press, 2012.*
2. ***English Conversation Practice*** *–Grant Taylor, Tata McGraw Hill, 2009.*
3. ***Communication Skills,*** *Sanjay Kumar & Pushpalatha Oxford University Press, 2012.*
4. ***A Course in Communication Skills****- Kiranmai Dutt & co. Foundation Books, 2012.*
5. ***Living English Structures****- William Standard Allen-Pearson, 2011.*
6. ***Current English Grammar and Usage,*** *S M Guptha, PHI, 2013.*
7. ***Modern English Grammar****-Krishna SWAMI,.McMillan, 2009.*
8. ***Powerful Vocabulary Builder****- Anjana Agarwal, New Age International Publishers, 2011.*

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B.Tech. I Year	**Th**	**Tu**	**C**
	2	**0**	**3**

Common to All Branches

(13A56101) ENGINEERING PHYSICS

Preamble:

There has been an exponential growth of knowledge in the recent past opening up new areas and challenges in the understanding of basic laws of nature. This helped to the discovery of new phenomena in macro, micro and nano scale device technologies. The laws of physics play a key role in the development of science, engineering and technology. Sound knowledge of physical principles is of paramount importance in understanding new discoveries, recent trends and latest developments in the field of engineering.

To keep in pace with the recent scientific advancements in the areas of emerging technologies, the syllabi of engineering physics has been thoroughly revised keeping in view of the basic needs of all engineering branches by including the topics like optics, crystallography, ultrasonics, quantum mechanics, free electron theory. Also new phenomenon, properties and device applications of semiconducting, magnetic, superconducting and nano materials along with their modern device applications have been introduced.

Course Objective:

- *To evoke interest on applications of superposition effects like interference and diffraction, the mechanisms of emission of light, achieving amplification of electromagnetic radiation through stimulated emission, study of propagation of light through transparent dielectric waveguides along with engineering applications.*
- *To enlighten the periodic arrangement of atoms in crystals, direction of Bragg planes, crystal structure determination by X-rays and also to understand different types of defects in crystals adnoun-destructive evaluation using ultrasonic techniques.*
- *To get an insight into the microscopic meaning of conductivity , classical and quantum free electron model, the effect of periodic potential on electron motion, evolution of band theory to distinguish materials and to understand electron transport mechanism in solids.*
- *To open new avenues of knowledge and understanding on semiconductor based electronic devices, basic concepts and applications of semiconductor and magnetic materials have been introduced which find potential in the emerging micro device applications.*
- *To give an impetus on the subtle mechanism of superconductors in terms of conduction of electron pairs using BCS theory, different properties exhibited by them and their fascinating applications. Considering the significance of microminiaturization of electronic devices and significance of low dimensional materials, the basic concepts of nanomaterials, their synthesis, properties and applications in modern emerging technologies are elicited.*

Learning Outcome:

- *The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fibre optics.*
- *The important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction are focused along with defects in crystals and ultrasonic non-destructive techniques.*
- *The discrepancies between the classical estimates and laboratory observations of physical properties exhibited by materials would be lifted through the understanding of quantum picture of subatomic world.*

- *The electronic and magnetic properties of materials were successfully explained by free electron theory and focused on the basis for the band theory.*
- *The properties and device applications of semiconducting and magnetic materials are illustrated.*
- *The importance of superconducting materials and nanomaterials along with their engineering applications are well elucidated.*

UNIT I

PHYSICAL OPTICS, LASERS AND FIBRE OPTICS:

Physical Optics: Introduction - Interference in thin films by reflection – Newton's Rings – Fraunhofer diffraction due to single slit, double slit and diffraction grating.

Lasers: Introduction - Characteristics of laser – Spontaneous and stimulated emission of radiation – Einstein's coefficients - Population inversion – Excitation mechanisms and optical resonator - Ruby laser - He-Ne laser – Applications of lasers.

Fibre optics: Introduction– Construction and working principle of optical fiber –Numerical aperture and acceptance angle – Types of optical fibers – Attenuation and losses in fibers - Optical fiber communication system – Applications of optical fibers in communications, sensors and medicine.

UNIT II

CRYSTALLOGRAPHY AND ULTRASONICS:

Crystallography: Introduction – Space lattice –Unit cell – Lattice parameters –Bravias lattice – Crystal systems – Packing fractions of SC, BCC and FCC - Structures of NaCl and Diamond –Directions and planes in crystals – Miller indices – Interplanar spacing in cubic crystals – X-ray diffraction - Bragg's law –Laue and Powder methods – Defects in solids: point defects, line defects (qualitative) - screw and edge dislocation, burgers vector.

Ultrasonics: Introduction – Production of ultrasonics by piezoelectric method – Properties and detection – Applications in non-destructive testing.

UNIT III

QUANTUM MECHANICS AND FREE ELECTRON THEORY:

Quantum Mechanics: Introduction to matter waves – de'Broglie hypothesis - Heisenberg's uncertainty principle and its applications - Schrodinger's time independent and time dependent wave equation – Significance of wave function - Particle in a one dimensional infinite potential well - Eigen values and Eigen functions.

Free electron theory: Classical free electron theory –- Sources of electrical resistance - Equation for electrical conductivity - Quantum free electron theory – Fermi-Dirac distribution –Kronig-Penny model(qualitative) – Origin of bands in solids – Classification of solids into conductors, semiconductors and insulators.

UNIT IV

SEMICONDUCTORS AND MAGNETIC MATERIALS:

Semiconductor Physics: Introduction – Intrinsic and extrinsic semiconductors – Drift & diffusion currents and Einstein's equation – Hall effect - Direct and indirect band gap semiconductors – Working principle of p-n junction diode, LED, laser diode and photodiode.

Magnetic materials: Introduction and basic definitions – Origin of magnetic moments – Bohr magneton – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials – Hysteresis - Soft and hard magnetic materials and applications.

UNIT V

SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS:

Superconductivity: Introduction – Meissner effect - Properties of superconductors – Type I and type II superconductors – Flux quantization – London penetration depth – ac and dc Josephson effects – BCS theory(qualitative) – High T_c superconductors - Applications of superconductors.

***Physics of Nanomaterials*:** Introduction - Significance of nanoscale - Surface area and quantum confinement – Physical properties: optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterials: ball mill, chemical vapour deposition, sol-gel, plasma arcing and thermal evaporation – Properties of Carbon nanotubes – High strength applications – Properties of graphene – Graphene based Field Effect Transistor - Applications of nanomaterials.

Text Books:

1. Engineering physics – S. ManiNaidu, Pearson Education, I Edition, 2012.
2. Engineering Physics – V. Rajendran, MacGraw Hill Publishers, I Edition,2008.

Reference Books:

1. Engineering Physics – V. Rajendran, K.Thyagarajan Tata MacGraw Hill Publishers, III Edition, 2012.
2. Engineering Physics – RV.S.S.N. Ravi Kumar and N.V. Siva Krishna, Maruthi Publications , 2013
3. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish University Press, I Edition, 2009.
4. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning, I Edition, 2012
5. Engineering Physics – Hitendra K Mallik and AK Singh, McGraw Hill Education Pvt. Ltd, New Delhi , I Edition, 2010
6. Engineering Physics – M. Arumugam, Anuradha Publications II Edition, 1997.
7. Engineering physics – M.N. Avadhanulu and P.G. KshirSagar, Chand and Co, Revised Edition, 2013.
8. Solid State Physics – A.J. Dekkar, McMillan Publishers, Latest edition, 2012.
9. Engineering Physics – Gaur and Gupta Dhanapati, Rai Publishers , 7th Edition, 1992.
9. Text book of Nanoscience and Nanotechnology: B S Murthy, P.Shankar, Baldev Raj B B Rath, James Murday, University Press, I Edition, 2012.
10. Carbon Nanotubes and Graphene Device Physics – H.S. Philip Wong, Deji Akinwande, Cambridge University Press, 2011.

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B.Tech. I Year	**Th**	**Tu**	**C**
	2	**0**	**3**

Common to All Branches

(13A51101) ENGINEERING CHEMISTRY

Preamble:

Knowledge in chemistry serves as basic nutrient for the understanding and thereby design of materials of importance in life. Thus the advancement in Engineering is depend on the outcome of basic sciences. Many advances in engineering either produce a new chemical demand as in the case of polymers or wait upon chemical developments for their applications as in the case of implants and alloys. Currently the electronics and computer engineers are looking forward for suitable biopolymers and nano materials for use in miniature super computers, the electrical materials engineers are in search of proper conducting polymers, the mechanical engineers are on lookout for micro fluids and the civil engineers are looking for materials that are environmental friendly, economical but long lasting.

Course Objective:

- *The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.*
- *The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.*
- *The lucid explanation of the topics will help students understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.*
- *The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.*
- *After the completion of the course, the student would understand about the concepts of chemistry in respect of Electrochemical cells, fuel cells, mechanism of corrosion and factors to influence, polymers with their applications, analytical methods, engineering materials and water chemistry.*

Learning Outcome:

The student is expected to:

- *Understand the electrochemical sources of energy*
- *Understand industrially based polymers, various engineering materials.*
- *Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially.*

UNIT I

ELECTROCHEMISTRY:

Review of electrochemical cells, Numerical calculations, Batteries: Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries). Fuels cells: (Hydrogen-Oxygen and Methanol-Oxygen).

Electrochemical sensors: Potentiometric Sensors and voltammetric sensors. Examples: analysis of Glucose and urea.

Corrosion: Electrochemical Theory of corrosion, Factors affecting the corrosion. Prevention: Anodic and cathodic protection and electro and electroless plating.

UNIT II

POLYMERS:

Introduction to polymers, Polymerisation process, mechanism: cationic, anionic, free radical and coordination covalent, Elastomers (rubbers), Natural Rubber, Compounding of Rubber,

Synthetic Rubber: Preparation, properties and engineering applications of Buna-S, buna-N, Polyurethene, Polysulfide (Thiokol) rubbers. Plastomers: Thermosetting and Thermoplatics, Preparation, properties and Engineering applications , PVC, Bakelite, nylons.

Conducting polymers: Mechanism, synthesis and applications of polyacetyline, polyaniline. Liquid Crystals: Introduction, classification and applications.

Inorganic Polymers: Basic Introduction, Silicones, Polyphospazins (-(R)2-P=N-) applications.

UNIT III

FUEL TECHNOLOGY:

Classifications of Fuels – Characteristics of Fuels- Calorific Value – Units, Numerical Problems, Solid Fuels–Coal, Coke : Manufacture of Metallurgical Coke by Otto Hoffmann's by product oven processes.

Liquid Fuels: Petroleum: Refining of Petroleum, Gasoline: Octane Number, Synthetic Petrol: Bergius Processes, Fischer Troph's synthesis.

Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

Gaseous Fuels: Origin, Production and uses of Natural gas, Producer gas, Water gas, Coal gas and Biogas. Flue Gas analysis by Orsat's apparatus, Solving of problems on Combustion.

UNIT IV

CHEMISTRY OF ENGINEERING MATERIALS:

Semiconducting and Super Conducting materials-Principles and some examples, Magnetic materials – Principles and some examples, Cement: Composition, Setting and Hardening (Hydration and Hydrolysis), Refractories: Classification, properties and applications, Lubricants: Theory of lubrication , properties of lubricants and applications, Rocket Propellants: Classification, Characteristics of good propellant

UNIT V

WATER TREATMENT:

Impurities in water, Hardness of water and its Units, Disadvantages of hard water, Estimation of hardness by EDTA method, Numerical problems on hardness, Estimation of dissolved oxygen, Alkalinity, acidity and chlorides in water, Water treatment for domestic purpose (Chlorination, Bleaching powder, ozonisation)

Industrial Use of water: For steam generation, troubles of Boilers: Scale & Sludge, Priming and Foaming, Caustic Embrittlement and Boiler Corrosion.

Treatment of Boiler Feed water: Internal Treatment: Colloidal, Phosphate, Carbonate, Calgon and sodium aluminate treatment.External Treatment: Ion-Exchange and Permutit processes.

Demineralisation of brackish water: Reverse Osmosis and Electrodialysis

Text Books:

1. *Engineering Chemistry by KNJayaveera, GVSubba Reddy and C. Ramachandraiah, McGraw Hill Higher Education, New Delhi, Fourth Edition, 2012.*
2. *A Text book of Engineering Chemistry by S.S Dhara, S.S.Umare, S. Chand Publications, New Delhi, 12th Edition, 2010.*

Reference Books:

1. *A Text Book of Enigneering Chemistry, Jain and Jain, Dhanapath Rai Publishing Company, New Delhi, 15th Edition, 2010.*
2. *Engineering Chemistry by K.B.Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH, Publications India Pvt Limited, Chennai, 2nd Edition, 2012.*

3. *Concepts of Engineering Chemistry- Ashima Srivastava and N.N. Janhavi, Acme Learning Pvt Ltd, First Edition, 2013.*
4. *Text Book of Engineering Chemistry – C. Parameswara Murthy, C.V.Agarwal and Andra Naidu, BS Publications, Hyderabad, 3rd Edition, 2008.*
5. *Text Book of Engineering Chemistry, Shashichawla, Dhanapath Rai Publications, New Delhi, 4th Edition, 2011.*
6. *Engineering Chemistry, K. Sesha Maheswaramma and Mrudula Chugh, Pearson Education, First Edition, 2013.*

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B.Tech. I Year	**Th**	**Tu**	**C**
	3	**1**	**5**

Common to All Branches

(13A54101) MATHEMATICS – I

Course Objective:

- *To train the students thoroughly in Mathematical concepts of ordinary differential equations and their applications in electrical circuits, deflection of beams, whirling of shafts.*
- *To prepare students for lifelong learning and successful careers using mathematical concepts of differential, Integral and vector calculus, ordinary differential equations and Laplace transforms.*
- *To develop the skill pertinent to the practice of the mathematical concepts including the student abilities to formulate the problems, to think creatively and to synthesize information.*

Learning Outcome:

- *The students become familiar with the application of differential, integral and vector calculus, ordinary differential equations and Laplace transforms to engineering problems.*
- *The students attain the abilities to use mathematical knowledge to analyze and solve problems in engineering applications.*

UNIT I

Exact, linear and Bernoulli equations, Applications to Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, Sin ax, cos ax, polynomials in x, e^{ax} V(x), xV(x), method of variation of parameters. Applications to oscillatory electrical circuits, Deflection of Beams, whirling of shafts.

UNIT II

Taylor's and Maclaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrange's method of undetermined Multipliers with three variables only. Radius of curvature, center of curvature, Involutes evolutes, envelopes.

UNIT III

Curve tracing – Cartesian, polar and parametric curves. Length of curves.

Multiple integral – Double and triple integrals – Change of Variables – Change of order of integration. Applications to areas and volumes, surface area of solid of revolution in Cartesian and polar coordinates using double integral.

UNIT IV

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

Differentiation and integration of transform – Application of Laplace transforms to ordinary differential equations of first and second order.

UNIT V

Vector Calculus: Gradient – Divergence – Curl and their properties; Vector integration – Line integral - Potential function – Area – Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss's Divergence Theorem (Without proof). Application of Green's – Stoke's and Gauss's Theorems.

Text Books:

1. *Higher Engineering Mathematics, B.S.Grewal, Khanna publishers-42 Edition(2012)*
2. *Engineering Mathematics, Volume - I, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher 1st Edition (2010)*

Reference Books:

1. *Engineering Mathematics Volume-I, by T.K.V. Iyengar, S.Chand publication-12th Edition(2013)*
2. *Engineering Mathematics, Volume - I, by G.S.S.Raju, CENGAGE publisher.(2013)*
3. *Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India-10thEdition(2012)*
4. *Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers(2008)*
5. *Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier-1st Edition(2001)*

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B.Tech. I Year	**Th**	**Tu**	**C**
	3	**1**	**5**

(13A12101) PROGRAMMING IN C & DATA STRUCTURES

Course Objective:

- *To make the student understand problem solving techniques*
- *Students will be able to understand the syntax and semantics of C programming language and other features of the language*
- *Get acquaintance with data structures, searching and sorting techniques*

Learning Outcome:

- *Student can effectively apply problem solving techniques in designing the solutions for a wide-range of problems*
- *Student can choose appropriate data structure and control structure depending on the problem to be solved*
- *Student can effectively use existing data structures and design new data structures appropriate to the problem to be solved*
- *Student can modularize the problem and also solution*
- *Student can use appropriate searching and sorting technique to suit the application.*

UNIT I

Introductory Concepts: Introduction to computers, What is a Computer, Block diagram of Computer, Computer Characteristics, Hardware Vs Software, How to develop a program, Software development life cycle, Structured programming, Modes of operation, Types of programming languages, Introduction to C, Desirable program characteristics.

Introduction to Computer problem solving: Introduction, The problem solving aspect, Top down design, Implementation of algorithms.

Introduction to C programming: The C character set, Writing first program of C, Identifiers and key words, A more useful C program, Entering the program into the computer, Compiling and executing the program, Data types, Constants, Variables and arrays, Declarations, Expressions, Statements, Symbolic Constants.

Operators and Expressions: Arithmetic operators, Unary operators, Relational and Logical operators, Assignment operators, Conditional operator, Library functions.

Fundamental algorithms: Exchanging the values of two variables, Factorial computation, Sine function computation, Reversing the digits of an integer, Generating prime numbers.

UNIT II

Data Input and Output: Preliminaries, Single character input-getchar function, Single character output-putchar function, Entering input data-the scanf function, More about the scanf function, Writing output data-The printf function, More about the printf function, The gets and puts functions, Interactive(conversational) programming.

Preparing and running a complete C program: Planning a C program, Writing a C program, Error diagnostics, Debugging techniques.

Control statements: Preliminaries, Branching: if-else statement, Looping: The while statement, More looping: The do-while statement, Still more looping: The for statement, Nested control structures, The switch statement, Break statement, Continue statement, The comma operator, The goto statement.

Functions: A brief overview, Defining a function, Accessing a function, Function prototypes, Passing arguments to a function, Recursion

UNIT III

Program Structure: Storage classes, Automatic variables, External (global) variables, Static variables, Multi file programs, More about library functions.

Arrays: Defining an array, Processing an array, Passing arrays to functions, Multi dimensional arrays.

Array Techniques: Array order reversal, Removal of duplicates from an ordered array, Finding the K^{th} smallest element.

Merging, Sorting and Searching: The two way merge, Sorting by selection, Sorting by exchange, Sorting by insertion, Sorting by partitioning, Recursive Quick sort, Binary Search.

Strings: Defining a string, NULL character, Initialization of strings, Reading and Writing a string, Processing the strings, Character arithmetic, Searching and Sorting of strings, Some more Library functions for strings

UNIT IV

Pointers: Fundamentals, Pointer Declarations, Passing pointer to a function, Pointers and one dimensional array, Dynamic memory allocation, Operations on pointers, Pointers and multi dimensional arrays, Arrays of pointers, Passing functions to other functions, More about pointer declarations.

Structures and Unions: Defining a structure, Processing a structure, User defined data type (typedef), Structures and Pointers, Passing structures to functions, Unions.

File Handling: Why files, Opening and closing a data file, Reading and Writing a data file, Processing a data file, Unformatted data files, Concept of binary files, Accessing the file randomly (using fseek).

Additional Features: Register variables, Bitwise operations, Bit Fields, Enumerations, Command line parameters, More about Library functions, Macros, The C Preprocessor

UNIT V

Introduction to Data Structures: Data abstraction

Stacks and Queues: Stacks, Stacks using dynamic arrays, Queues, Circular Queues using dynamic arrays

Evaluations of expressions: Expressions, Evaluating postfix expressions, Infix to Postfix, Multiple Stacks and Queues.

Linked Lists: Singly Linked lists and chains, Representing chains in C, Linked Stacks and Queues.

Text Books:

1. *"Programming with C", Byron Gottfried, Third Edition, Schaum's Outlines, Mc Graw Hill.*
2. *"Fundamentals of Data Structures in C", Horowitz, Sahni, Anderson-freed, Second Edition, Universities Press.*
3. *"How to Solve it by Computer", R.G. Dromey, Pearson. (Pascal implementations may be considered without loss of generality or Instructors may replace them with C language programs)*

Reference Books:

1. *"Programming in C", Pradip Dey, Manas Ghosh, Oxford Higher Education*
2. *"Programming in C and Data Structures", Hanly, Koffman, Kamthane, Ananda Rao, Pearson.*
3. *"Programming in C", Reema Thareja, Oxford Higher Education.*

4. *"Computer Fundamentals and C Programming", First Edition, Dr.P.Chenna Reddy, Available at: www.pothi.com.*
5. *"Data Structure and Program Design in C", Second Edition, Kruse, Tondo, Leung, Mogalla, Pearson.*
6. *"Programming with C", R.S. Bichkar, University Press.*
7. *"Computer Science A Structured Programming Approach Using C", Third Edition, Fourouzan & Gilberg, Cengage Learning.*

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B.Tech. I Year	**Th**	**Tu**	**C**
	3	**1**	**5**

(13A54102) MATHEMATICS – II

Course Objective:

- *This course aims at providing the student with the concepts of Matrices, Fourier series, Fourier and Z-transforms and partial differential equations which find the applications in engineering.*
- *Our emphasis will be more on logical and problem solving development in Numerical methods and their applications.*

Learning Outcome:

- *The student becomes familiar with the application of Mathematical techniques like Fourier series, Fourier and z-transforms.*
- *The student gains the knowledge to tackle the engineering problems using the concepts of Partial differential equations and Numerical methods.*

UNIT I

Rank – Echelon form, normal form – Consistency of System of Linear equations. Linear transformations Hermitian, Skew-Hermitian and Unitary matrices and their properties. Eigen Values, Eigen vectors for both real and complex matrices. Cayley – Hamilton Theorem and its applications – Diagonolization of matrix. Calculation of powers of matrix. Quadratic forms – Reduction of quadratic form to canonical form and their nature.

UNIT II

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method.

Interpolation: Newton's forward and backward interpolation formulae – Lagrange's Interpolation formula.

Curve fitting: Fitting of a straight line – Second degree curve – Exponentional curve-Power curve by method of least squares. Numerical Differentiation and Integration – Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

UNIT III

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods – Predictor-Corrector Method – Milne's Method. Numerical solution of Laplace equation using finite difference approximation.

Fourier Series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

UNIT IV

Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

UNIT V

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one dimensional wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.

Text Books:

1. *Higher Engineering Mathematics, B.S.Grewal, Khanna publishers- 42 Edition(2012)*
2. *Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher 5th Edition (2012)*

Reference Books:

1. *Engineering Mathematics, Volume - II, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher-1st Edition (2010)*
2. *Engineering Mathematics, Volume - II, by G.S.S.Raju, CENGAGE publisher – 1st Edition(2013)*
3. *Mathematical Methods by T.K.V. Iyengar, S. Chand publication-8th Edition(2013)*
4. *Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers (2008)*
5. *Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India 10th Edition (2013)*

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B.Tech. I Year	**Th**	**Tu**	**C**
	3	**1**	**5**

(13A02101) ELECTRICAL CIRCUITS

Course Objective:

This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes Circuit concepts, magnetic circuits, theorems, transient analysis and network topology etc.

UNIT I

INTRODUCTION TO ELECTRICAL & MAGNETIC CIRCUITS:

Electrical Circuits: Circuit Concept–R-L-C Parameters-Voltage and Current Sources- Independent and Dependent Sources-Source Transformation-Voltage - Current Relationship for Passive Elements (For Different Input Signals-Square, Ramp, Saw Tooth, Triangular). Kirchhoff's Laws – Network Reduction Techniques-Series, Parallel, Series Parallel, Star-to-Delta or Delta-to-Star Transformation. Examples

Magnetic Circuits: Faraday's Laws of Electromagnetic Induction-Concept of Self and Mutual Inductance-Dot Convention-Coefficient of Coupling-Composite Magnetic Circuit-Analysis of Series and Parallel Magnetic Circuits, MMF Calculations

UNIT II

SINGLE PHASE AND THREE PHASE A.C CIRCUITS:

Single Phase Circuits: R.M.S, Average Values and Form Factor for Different Periodic Wave Forms – Sinusoidal Alternating Quantities – Phase and Phase Difference – Complex and Polar Forms of Representations, J-Notation, Steady State Analysis of R, L and C (In Series, Parallel and Series Parallel Combinations) With Sinusoidal Excitation- Concept of Power Factor-Concept of Reactance, Impedance, Susceptance and Admittance-Real and Reactive Power, Complex Power. Examples.

Three Phase Circuits: Phase Sequence- Star and Delta Connection-Relation Between Line and Phase Voltages and Currents in Balanced Systems-Analysis of Balanced Three Phase Circuits- Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems. Analysis of Three Phase Unbalanced Circuits-Loop Method- Application of Millman's Theorem- Star Delta Transformation Technique – Two Wattmeter Method of Measurement of Three Phase Power.

UNIT III

LOCUS DIAGRAMS & NETWORK TOPOLOGY:

Locus Diagrams: Series R-L, R-C, R-L-C and Parallel Combination with Variation of Various Parameters - Resonance-Series, Parallel Circuits, Concept of Band Width and Q Factor.

Network Topology: Definitions – Graph – Tree, Basic Cutset and Basic Tieset Matrices for Planar Networks – Loop and Nodal Methods of Analysis of Networks with Dependent & Independent Voltage and Current Sources – Duality & Dual Networks. Nodal Analysis, Mesh Analysis, Super Node and Super Mesh for D.C Excitations.

UNIT IV

NETWORK THEOREMS & TWO PORT NETWORKS:

Network Theorems: Thevenin's, Norton's, Maximum Power Transfer and Millman's Theorems for D.C and Sinusoidal Excitations. Tellegen's, Superposition, Reciprocity and Compensation Theorems for D.C And Sinusoidal Excitations.

Two Port Networks: Two Port Network Parameters – Impedance, Admittance, Transmission and Hybrid Parameters and Their Relations. Concept of Transformed Network - Two Port Network Parameters Using Transformed Variables.

UNIT V

TRANSIENT ANALYSIS & FOURIER TRANSFORMS:

D.C Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for D.C Excitation-Initial Conditions-Solution Method Using Differential Equation and Laplace Transforms, Response of R-L & R-C Networks to Pulse Excitation.

A.C Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for Sinusoidal Excitations-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms

Fourier Transforms: Fourier Theorem- Trigonometric Form and Exponential Form of Fourier Series – Conditions of Symmetry- Line Spectra and Phase Angle Spectra- Analysis of Electrical Circuits to Non Sinusoidal Periodic Waveforms. Fourier Integrals and Fourier Transforms – Properties of Fourier Transforms and Application to Electrical Circuits. Introduction to P-Spice

Text Books:

1. *Network Analysis by M.E Van Valkenburg, Prentice Hall (India), 3rd Edition, 2012.*
2. *Circuit Theory (Analysis & Synthesis) by A. Chakrabarti, Dhanpat Rai & Sons, 2010.*
3. *Electric Circuits- Schuam Series, 2012.*

Reference Books:

1. *Circuits & Networks by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill, 2010.*
2. *Electric Circuits by N.Sreenivasulu, REEM Publications, 2013.*
3. *Engineering circuit analysis by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition, 2005.*
4. *Electrical Circuit Theory and Technology by John Bird, Routledge, Taylor & Fransis, 2007.*

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B.Tech. I Year | **L** 3 | **C** 4

(13A12102) PROGRAMMING IN C & DATA STRUCTURES LAB

Course Objective:

- *To make the student learn C Programming language.*
- *To make the student solve problems, implement them using C language.*
- *To strengthen the ability to identify and apply the suitable data structure for the given real world problem.*

Learning Outcome:

- *Apply problem solving techniques to find solutions to problems.*
- *Able to use C language features effectively and implement solutions using C language.*
- *Be capable to identity the appropriate data structure for a given problem or application.*
- *Improve logical skills.*

LIST OF EXPERIMENTS/TASKS

1. Practice DOS and LINUX Commands necessary for design of C Programs.
2. Study of the Editors, Integrated development environments, and Compilers in chosen platform.
3. Write, Edit, Debug, Compile and Execute Sample C programs to understand the programming environment.
4. Practice programs: Finding the sum of three numbers, exchange of two numbers, maximum of two numbers, to read and print variable values of all data types of C language, to find the size of all data types, to understand the priority and associativity of operators using expressions, to use different library functions of C language.
5. Write a program to find the roots of a quadratic equation.
6. Write a program to compute the factorial of a given number.
7. Write a program to check whether the number is prime or not.
8. Write a program to find the series of prime numbers in the given range.
9. Write a program to generate Fibonacci numbers in the given range.
10. Write a program to find the maximum of a set of numbers.
11. Write a program to reverse the digits of a number.
12. Write a program to find the sum of the digits of a number.
13. Write a program to find the sum of positive and negative numbers in a given set of numbers.
14. Write a program to check for number palindrome.
15. Write a program to evaluate the sum of the following series up to 'n' terms e $^{x}=1+x+x^2/2!+x^3/3!+x^4/4!+$--------
16. Write a program to generate Pascal Triangle.
17. Write a program to read two matrices and print their sum and product in the matrix form.
18. Write a program to read matrix and perform the following operations.
    i. Find the sum of Diagonal Elements of a matrix.
    ii. Print Transpose of a matrix.
    iii. Print sum of even and odd numbers in a given matrix.
19. Write a program to accept a line of characters and print the count of the number of Vowels, Consonants, blank spaces, digits and special characters.
20. Write a program to insert a substring in to a given string and delete few characters from the string. Don't use library functions related to strings.

21. Write a program to perform the operations addition, subtraction, multiplication of complex numbers.
22. Write a program to split a 'file' in to two files, say file1 and file2. Read lines into the 'file' from standard input. File1 should consist of odd numbered lines and file2 should consist of even numbered lines.
23. Write a program to merge two files.
24. Write a program to implement numerical methods Lagrange's interpolation, Trapezoidal rule.
25. Write a program to read a set of strings and sort them in alphabetical order.
26. Write a program to sort the elements of an array using sorting by exchange.
27. Write a program to sort the elements of an array using Selection Sort.
28. Write a program to perform Linear Search on the elements of a given array.
29. Write a program to perform Binary Search on the elements of a given array.
30. Write a program to find the number of occurrences of each number in a given array of numbers.
31. Write a program to read two strings and perform the following operations without using built-in string Library functions and by using your own implementations of functions.
    i. String length determination ii .Compare Two Strings
    iii. Concatenate them, if they are not equal iv. String reversing
32. Write programs using recursion for Factorial of a number, GCD, LCM, Towers of Hanoi.
33. Write a program to convert infix expression to postfix expression and evaluate postfix expression.
34. Write a program to exchange two numbers using pointers.
35. Write a program to implement stack, queue, circular queue using array and linked lists.
36. Write a program to perform the operations creation, insertion, deletion, and traversing a singly linked list
37. Write a program to read student records into a file. Record consists of rollno, name and marks of a student in six subjects and class. Class field is empty initially. Compute the class of a student. The calculation of the class is as per JNTUA rules. Write the first class, second class, third class and failed students lists separately to another file.
38. A file consists of information about employee salary with fields employeeid, name, Basic, HRA, DA, IT, other-deductions, Gross and Net salary. Initially only employeeid, name, and basic have valid values. HRA is taken as 10% of the basic, DA is taken as 80% of basic, IT is 20% of the basic, other deductions is user specified. Compute the Gross and Net salary of the employee and update the file.
39. Write a program to perform Base (decimal, octal, hexadecimal, etc) conversion.
40. Write a program to find the square root of a number without using built-in library function.
41. Write a program to convert from string to number.
42. Write a program to generate pseudo random generator.
43. Write a program to remove duplicates from ordered and unordered arrays.
44. Write a program to sort numbers using insertion sort.
45. Write a program to implement quick sort using non-recursive and recursive approaches. Use randomized element as partitioning element.
46. Write a program to search a word in a given file and display all its positions.
47. Write a program to generate multiplication tables from 11 to 20.
48. Write a program to express a four digit number in words. For example 1546 should be written as one thousand five hundred and forty six.
49. Write a program to generate a telephone bill. The contents of it and the rate calculation etc should be as per BSNL rules. Student is expected to gather the required information through the BSNL website.
50. Write a program for tic-tac-toe game.
51. Write a program to find the execution time of a program.
52. Design a file format to store a person's name, address, and other information. Write a program to read this file and produce a set of mailing labels

***Note**: The above list consists of only sample programs. Instructors may choose other programs to illustrate certain concepts, wherever is necessary. Programs should be there on all the concepts studied in the Theory on C programming and Data structures. Instructors are advised to change atleast 25% of the programs every year until the next syllabus revision.*

References:

1. *"Programming with C", Byron Gottfried, Third Edition, Schaum's Outlines, Mc Graw Hill.*
2. *"Fundamentals of Data Structures in C", Horowitz, Sahni, Anderson-freed, Second Edition, Universities Press.*
3. *"How to Solve it by Computer", R.G. Dromey, Pearson.*
4. *"The C Programming Language", Brian W. Kernighan, Dennis M. Ritchie, Pearson.*
5. *"Classic Data Structures", Samantha, PHI*
6. *"Let us C", Yeswant Kanetkar, BPB publications*
7. *"Pointers in C", Yeswant Kanetkar, BPB publications*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year **L C**
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Common to All Branches

(13A99102) ENGINEERING PHYSICS & ENGINEERING CHEMISTRY LAB

ENGINEERING PHYSICS LAB

LIST OF EXPERIMENTS

Any 10 of the following experiments has to be performed:

1. Determination of wavelengths of various colours of mercury spectrum using diffraction grating in normal incidence method
2. Determination of dispersive power of the prism
3. Determination of thickness of thin object by wedge method
4. Determination of radius of curvature of lens by Newton's Rings
5. Laser : Diffraction due to single slit
6. Laser : Diffraction due to double slit
7. Laser: Determination of wavelength using diffraction grating
8. Determination of Numerical aperture of an optical fiber
9. Meldes experiment: Determination of the frequency of tuning fork
10. Sonometer: Verification of the three laws of stretched strings
11. Energy gap of a material using p-n junction diode
12. Electrical conductivity by four probe method
13. Determination of thermistor coefficients (α, β)
14. Hall effect : Determination of mobility of charge carriers in semiconductor
15. B-H curve
16. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
17. Determination of lattice constant using X-ray spectrum.

ENGINEERING CHEMISTRY LAB

Preamble:
The experiments are designed in a manner that the students can validate their own theory understanding in chemistry by self involvement and practical execution. Thus the execution of these experiments by the student will reinforce his/her understanding of the subject and also provide opportunity to refine their understanding of conceptual aspects. As a result, the student gets an opportunity to have feel good factor at the laboratory bench about the chemical principles that he/she learned in the classroom.

***Course Objective**:*

- *Will learn practical understanding of the redox reaction*
- *Will able to understand the function of fuel cells, batteries and extend the knowledge to the processes of corrosion and its prevention*
- *Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineer these to suit diverse applications*
- *Will also learn the hygiene aspects of water would be in a position to design methods to produce potable water using modern technology*

Learning Outcome:

- *Would be confident in handling energy storage systems and would be able combat chemical corrosion*
- *Would have acquired the practical skill to handle the analytical methods with confidence.*
- *Would feel comfortable to think of design materials with the requisite properties*
- *Would be in a position to technically address the water related problems.*

LIST OF EXPERIMENTS

Any 10 of the following experiments has to be performed:

1. Determination of total hardness of water by EDTA method.
2. Determination of Copper by EDTA method.
3. Estimation of Dissolved Oxygen by Winkler's method
4. Determination of Copper by Iodometry
5. Estimation of iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
6. Determination of Alkalinity of Water
7. Determination of acidity of Water
8. Preparation of Phenol-Formaldehyde (Bakelite)
9. Determination of Viscosity of oils using Redwood Viscometer I
10. Determination of Viscosity of oils using Redwood Viscometer II
11. Conductometric titration of strong acid Vs strong base (Neutralization titration).
12. Conductometric titration of Barium Chloride vs Sodium Sulphate (Precipitation Titration)
13. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
14. Estimation of Chloride ion using potassium Chromite indicator (Mohrs method)

References:

1. *Vogel's Text book of Quantitative Chemical Analysis, J. Mendham et al, Pearson Education, Sixth Edition, 2012.*
2. *Chemistry Practical – Lab Manual by K.B.Chandra Sekhar, G.V. Subba Reddy and K.N.Jayaveera, SM Publications, Hyderabad, 3rd Edition, 2012.*

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B.Tech. I Year **L C**
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Common to All Branches

(13A99103) ENGINEERING & I.T. WORKSHOP

ENGINEERING WORKSHOP

Course Objective:
The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc. There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials. Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work. Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students

1. TRADES FOR EXERCISES:

a. Carpentry shop– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock
b. Fitting shop– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock
c. Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 guage G.I. sheet
d. House-wiring– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
e. Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.
f. Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint.

2. TRADES FOR DEMONSTRATION:

a. Plumbing
b. Machine Shop
c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

References:

1. *Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009*
2. *Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.*
3. *Engineering Practices Lab Manual, Jeyapoovan, SaravanaPandian, 4/e Vikas*
4. *Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.*

I.T. WORKSHOP

Course Objective:

- *To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations*
- *To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system*
- *To learn about Networking of computers and use Internet facility for Browsing and Searching.*

Learning Outcome:

- *Disassemble and Assemble a Personal Computer and prepare the computer ready to use.*
- *Prepare the Documents using Word processors*
- *Prepare Slide presentations using the presentation tool*
- *Interconnect two or more computers for information sharing*
- *Access the Internet and Browse it to obtain the required information*
- *Install single or dual operating systems on computer*

Preparing your Computer (5 weeks)

Task 1: Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2: Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

Task 3: Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4: **Operating system features**: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

Networking and Internet (4 weeks)

Task 5: Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc should be done by the student. The entire process has to be documented.

Task 6: Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc.

If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

Task 7: Antivirus: Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

Productivity tools (6 weeks)

Task 8: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the color, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

Task 9: Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

Task 10: Presentations : creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

Optional Tasks:

Task 11: Laboratory Equipment: Students may submit a report on specifications of various equipment that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop computer
- Server computer
- Switch (computer science related)
- Microprocessor kit
- Micro controller kit
- Lathe machine
- Generators
- Construction material
- Air conditioner
- UPS and Inverter
- RO system
- Electrical Rectifier
- CRO
- Function Generator
- Microwave benches

Task 12: Software: Students may submit a report on specifications of various software that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. The software may be proprietary software or Free and Open source software. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop operating system
- Server operating system

- Antivirus software
- MATLAB
- CAD/CAM software
- AUTOCAD

References:

1. *Introduction to Computers, Peter Norton, Mc Graw Hill*
2. *MOS study guide for word, Excel, Powerpoint & Outlook Exams", Joan Lambert, Joyce Cox, PHI.*
3. *Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.*
4. *Networking your computers and devices, Rusen, PHI*
5. *Trouble shooting, Maintaining & Repairing PCs", Bigelows, TMH*

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B.Tech. I Year **L C**
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Common to All Branches
(13A52102) ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Course Objective:

- *To train students to use language effectively in everyday conversations.*
- *To expose the students to a varied blend of self-instructional learner-friendly modes of language learning through computer-aided multi-media instruction.*
- *To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.*
- *To help the second language learners to acquire fluency in spoken English and neutralize mother tongue influence*
- *To train students to use language appropriately for interviews, group discussion and public speaking*

Learning Outcome:

- *Becoming active participants in the learning process and acquiring proficiency in spoken English of the students*
- *Speaking with clarity and confidence thereby enhancing employability skills of the students*

PHONETICS
Importance of speaking phonetically correct English
Speech mechanism-Organs of speech
Uttering letters-Production of vowels sounds
Uttering letters -Production of consonant sounds
Uttering words-Stress on words and stress rules
Uttering sentences-Intonation-tone group
LISTENING
Listening as a skill
Listening activities
PRESENTATIONAL SKILLS
Preparation
Prepared speech
Impromptu speech
topic originative techniques
JAM (Just A Minute)
Describing people/object/place
Presentation-
Stage dynamics
Body language
SPEAKING SKILLS
Telephone skills
Role plays
Public Speaking

GROUP ACTIVITIES
Debates
Situational dialogues

MINIMUM REQUIREMENT FOR ELCS LAB:
The English Language Lab shall have two parts:

Computer Assisted Language Learning (CALL) Lab:

- The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
- The Communication Skills Lab with movable chairs and audio-visual aids with a P.A. system, Projector, a digital stereo-audio & video system and camcorder etc.

System Requirement (Hardware component):

- Computer network with LAN with minimum 60 multimedia systems with the following specifications:
  - P – IV Processor
  - Speed – 2.8 GHZ
  - RAM – 512 MB Minimum
  - Hard Disk – 80 GB
  - Headphones of High quality

SUGGESTED SOFTWARE:

- Clarity Pronunciation Power – Part I (Sky Pronunciation)
- Clarity Pronunciation Power – part II
- K-Van Advanced Communication Skills
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- *DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.*
- Lingua TOEFL CBT Insider, by Dreamtech
- English Pronunciation in Use (Elementary, Intermediate, Advanced) CUP
- Cambridge Advanced Learners' English Dictionary with CD.
- Oxford Advanced Learner's Compass, 8th Edition
- Communication Skills, Sanjay Kumar & Pushp Lata. 2011. OUP

References:

1. *Strengthen Your Steps, Maruthi Publicaions, 2012.*
2. *A Course in Phonetics and Spoken English, Dhamija Sethi, Prentice-Hall of India Pvt.Ltd.*
3. *A Textbook of English Phonetics for Indian Students 2nd Ed T. Balasubramanian. (Macmillian),2012.*
4. *Speaking English Effectively, 2nd Edition Krishna Mohan & NP Singh, 2011. (Mcmillan).*
5. *Listening in the Language Classroom, John Field (Cambridge Language Teaching Library),2011*
6. *A Hand Book for English Laboratories, E.Suresh Kumar, P.Sreehari, Foundation Books,2011*
7. *English Pronunciation in Use. Intermediate & Advanced, Hancock, M. 2009. CUP.*
8. *Basics of Communication in English, Soundararaj, Francis. 2012.. New Delhi: Macmillan*
9. *Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.*
10. *English Pronouncing Dictionary, Daniel Jones, Current Edition with CD.Cambridge, 17th edition, 2011.*

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B.Tech. II - I Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A54302) MATHEMATICS – III

Course Objective:

- *To enable the students to understand the mathematical concepts of special functions & complex variables and their applications in science and engineering.*

Learning Outcome:

- *The student achieves the knowledge to analysis the problems using the methods of special functions and complex variables.*

UNIT I

Special Functions: Gamma and Beta Functions – their properties – Evaluation of improper integrals. Series Solutions of ordinary differential equations (Power series and Frobenius Method).

UNIT II

Bessel functions – Properties – Recurrence relations – Orthogonality. Legendre polynomials – Properties – Rodrigue's formula – Recurrence relations – Orthogonality.

UNIT III

Functions of a complex variable – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thompson method.

Conformal mapping: Transformation of e^z, Inz, z^2, Sin z, cos z, Bilinear transformation - Translation, rotation, magnification and inversion – Fixed point – Cross ratio – Determination of bilinear transformation.

UNIT IV

Complex integration: Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

Complex power series: Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point – Isolated singular point – Pole of order m – Essential singularity.

UNIT V

Residue – Evaluation of residue by formula and by Laurent series – Residue theorem.

Evaluation of integrals of the type

(a) improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$

(c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$

Text Books:

1. *Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.*
2. *Advanced Engineering Mathematics, Peter V.O'Neil, CENGAGE publisher.*

Reference Books:

1. *Mathematics III by T.K.V. Iyengar, S.Chand publications.*
2. *Engineering Mathematics, Volume - III, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.*
3. *Complex variables by Raisinghania*
4. *Advanced Engineering Mathematics by M.C. Potter, J.L. Goldberg, Edward F.Aboufadel, and Oxford.*

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	3	**1**	**3**

(13A01403) ENVIRONMENTAL SCIENCE

Course Objective:

- *To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.*

UNIT I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT II

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological sucession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION: Introduction - Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-soports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT: Causes**,** effects and control measures of urban and industrial wates – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT IV

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT V

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Proggramme. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds – river, hill slopes, etc..

Text Books*:*

1. *Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press, 2005.*
2. *Environmental Studies by Palanisamy, Pearson education, 2012.*
3. *Environmental Studies by R.Rajagopalan, Oxford University Press, 2nd edition, 2011.*

Reference Books:

1. *Textbook of Environmental Studies by Deeksha Dave and E.Sai Baba Reddy, Cengage Pubilications, 2nd edition, 2012.*
2. *Text book of Environmental Science and Technology by M.Anji Reddy, BS Publication, 2009.*
3. *Comprehensive Environmental studies by J.P.Sharma, Laxmi publications, 2nd edition, 2006.*
4. *Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited, 2nd edition, 1996.*
5. *Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited, 3rd edition, 2007.*

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B.Tech. II - I Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A01307) FLUID MECHANICS AND HYDRAULIC MACHINERY

UNIT I

INTRODUCTION: Dimensions and units – physical properties of fluids, specific gravity, viscosity, surface tension and capillarity, vapor pressure and their influences on fluid motion. Newtonian and non Newtonian fluids. Fluid Pressure at a Point; Pascal's law, Hydrostatic law, , Atmospheric, Absolute and gauge pressure; Hydrostatic paradox, Pressure measurement manometers; Simple, differential and Micro Manometers

KINEMATICS OF FLUID MOTION: Methods of describing fluid motion; Classification of flow; Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; Three, two and one dimensional flows; Irrotational and rotational flows; Streamline; Pathline; Streakline; Equation for acceleration; Convective accelaration; Local acceleration; Continuity equation; Velocity potential and stream function; Flownet.

UNIT II

DYNAMICS OF FLUID FLOW: Forces acting on a Fluid in Motion; Euler's equation of motion; .Bernoulli's equation ; Energy correction factor; Momentum principle; Force exerted on a pipe bend. Discharge through Venturi Meter; Discharge through Orifice Meter; Discharge through flow nozzle; Measurement of velocity by Pitot tube,pitot-static tube.

CLOSED CONDUIT FLOW: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length; Hydraulic power transmission through a pipe; Siphon; Pipes in series, parallel & branched pipes.

UNIT– III

BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle, Torque and head transferred in roto dynamic machines.

HYDRAULIC TURBINES-I: Introduction, head and efficiencies of hydraulic turbines, Classification of turbines; pelton wheel: parts, Velocity triangles, work done and efficiency, working proportions, design of pelton wheel. Radial flow reaction turbines: velocity triangles and work done for inward radial flow turbine, degree of reaction, discharge, speed ratio, flow ratio.

UNIT IV

HYDRAULIC TURBINES-II: Francis turbine: main components and working, work done and efficiencies, design proportions; design of francis turbine runner. Kaplan turbine: main components and working, working proportions. Draft tube: theory and efficiency; specific speed, unit quantities, characteristic curves of hydraulic turbines. Cavitation: causes, effects.

CENTRIFUGAL PUMPS: Introduction, component parts and working of a centrifugal pump, work done by the impeller; heads, losses and efficiencies; minimum starting speed; Priming ;specific speed; limitation of suction lift, net positive suction head(NPSH);Performance and characteristic curves; Cavitation effects ;Multistage centrifugal pumps; troubles and remedies.

UNIT V

HYDRO ELECTRIC POWER STATION: Development of hydro power in Andhra Pradesh and India; Classification of hydel plants- runoff river plants, storage plants and pumped storage plants; low, medium and high head schemes ;Investigation and planning; components of hydel schemes – fore bay, intake structure, surge tanks, penstocks ,power house, turbines-selection of suitable type of turbine, Scroll casing ,draft tube and tail race; assessment of available power; definition of gross head ,operating head ,effective head; , hydrographs, Flow duration curve; Power duration curve; Load duration curve; Load curve ; primary power and secondary power; installed capacity, dependable capacity; firm power, secondary power; power factor ;load factor, capacity factor ,utilization factor and Diversity factor.

Text Books:

1. Hydraulics & Fluid Mechanics by P. N. Modi & S. N. Seth; Standard Book house, New Delhi
2. Fluid Mechanics & Hydraulic Machines by Dr. R. K. Bansal; Laxmi Publications, New Delhi.

Reference Books

1. Hydraulic Machines by Jagdish Lal, Metropolitan.
2. Fluid Mechanics by A. K. Jain; Khanna Publishers, Delhi
3. Fluid mechanics and fluid machines by Rajput, S.Chand &Co.
4. Fluid Mechanics & Fluid Power Engineering by D.S. Kumar Kataria & Sons.
5. Fluid Mechanics, Hydraulics and Hydraulic Machines by K R Arora, Standard Publishers
6. Engineering Fluid Mechanics by Kumar K.L., Eurasia Publishing House (P) Ltd., New Delhi

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B.Tech. II - I Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A04301) ELECTRONIC DEVICES AND CIRCUITS

Course Objective:

- *To give understanding on semiconductor physics of the intrinsic, p and n materials, characteristics of the p-n junction diode, diode's application in electronic circuits, Characteristics of BJT,FET,MOSFET, characteristics of special purpose electronic devices.*
- *To familiarize students with DC biasing circuits of BJT, FET and analyzing basic transistor amplifier circuits.*

Learning Outcome:

Upon completion of the course, students will:

- *Analyze the operating principles of major electronic devices, its characteristics and applications.*
- *Design and analyze the DC bias circuitry of BJT and FET.*
- *Design and analyze basic transistor amplifier circuits using BJT and FET.*

UNIT I

PN JUNCTION DIODE & ITS APPLICATIONS:

Review of semi conductor Physics n and p –type semi conductors, Mass Action Law, Continuity Equation, Hall Effect, Fermi level in intrinsic and extrinsic semiconductors, PN Diode Equation, Volt-Ampere (V-I) Characteristics, Temperature Dependence of V-I Characteristics, Ideal Versus Practical Static and Dynamic Resistances, Diode Equivalent circuits, Break down Mechanisms in semiconductor Diodes, Zener Diode Characteristics. PN Junction as a Rectifier, Half wave rectifier, ripple factor, full wave rectifier, Bridge Rectifier, Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L- section filter, π - section filter, Use of Zener Diode as a Regulator, Illustrative problems.

UNIT II

TRANSISTOR AND FET CHARECTERISTICS: Transistor construction, BJT Operation, BJT Symbol, Transistor as an Amplifier, Common Emitter, Common Base and Common Collector Configurations, Limits of Operation, BJT Specifications, The Junction Field Effect Transistor (Construction, Principle of Operation, Symbol) - Pinch-Off Voltage – Volt-Ampere Characteristics, FET as Voltage Variable Resistor, Comparison between BJT and FET, MOSFET- Basic Concepts, Construction, modes(depletion & enhancement), symbol, principle of operation, characteristics.

UNIT III

BIASING AND STABILISATION: Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Collector to Base Bias, Self Bias, Bias Stability, Stabilization against Variations in $I_{CO,}$ V_{BE} and β, Bias Compensation Using Diodes and Transistors, Thermal Runaway, Condition for Thermal Stability in CE configuration, Biasing of FET – Source self bias, Biasing for zero current Drift, Biasing against Devices variation, Illustrative problems.

UNIT IV

SMALL SIGNAL ANALYSIS OF AMPLIFIERS (BJT & FET):

BJT Modeling using h-parameters, Determination of h-Parameters from Transistor Characteristics, Measurement of h-Parameters, Analysis of CE, CB and CC configurations using h-Parameters, Comparison of CB, CE and CC configurations, Simplified Hybrid Model, Millers Theorem, Dual of

Millers Theorem. Small Signal Model of JFET & MOSFET ,Small signal analysis of Common Source, and Common Drain Amplifiers using FET, Illustrative problems.

UNIT V

SPECIAL PURPOSE ELECTRONIC DEVICES:

Principle of Operation, and Characteristics of Tunnel Diode, Varactor Diode, Schottky Barrier Diode, Silicon Control Rectifier, Diac, Triac & Uni-Junction Transistor (UJT),Semiconductor photo devices - LDR, LED, Photo diodes & Photo transistors.

Text Books:

1. J.Millman and Christos.C.Halkias, Satyabrata, "Electronic Devices and Circuits", TMH Third edition, 2012,

2. K .Lal kishore, "Electronic Devices and Circuits", BSP. 2nd edition, 2005,

Reference Books:

1. R.L. Boylestad, "Introductory Circuit Analysis", PEARSON,12th edition, 2013

2. B.P.Singh and Rekha Singh, "Electronic Devices and Circuits", PEARSON, 2nd Edition2013.

3. David A. Bell, "Electronic Devices and Circuits", Oxford University press ,5th Edition, 2008,.

4. Mohammad H.Rashid, "Electronic Devices and Circuits", CENGAGE Learning

5. N.Salivahanan, and N.Suresh Kumar, "Electronic Devices and Circuits", TMH ,3rd Edition, 2012

6. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Ed.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II - I Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A03304) ENGINEERING GRAPHICS

Course Objective:

- *By studying the engineering drawing, a student becomes aware of how industry communicates technical information. Engineering drawing teaches the principles of accuracy and clarity in presenting the information necessary about objects.*
- *This course develops the engineering imagination i.e., so essential to a successful design, By learning techniques of engineering drawing changes the way one things about technical images.*
- *It is ideal to master the fundamentals of engineering drawing first and to later use these fundamentals for a particular application, such as computer aided drafting. Engineering Drawing is the language of engineers, by studying this course engineering and technology students will eventually be able to prepare drawings of various objects being used in technology.*

UNIT I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance-Conventions in Drawing-Lettering – BIS Conventions. Curves used in Engineering Practice.

a) Conic Sections including the Rectangular Hyperbola- General method only,
b) Cycloid, Epicycloid and Hypocycloid

UNIT II

Projection of Points & Lines: Principles of orthographic projection – Convention – First angle projections, projections of points, lines inclined to one or both planes, Problems on projections, Finding True lengths.

UNIT III

Projections of Planes: Projections of regular plane surfaces- plane surfaces inclined to one plane.
Projections of Solids: Projections of Regular Solids with axis inclined to one plane.

UNIT IV

Sections and Developments of Solids: Section Planes and Sectional View of Right Regular Solids-Prism, cylinder, Pyramid and Cone. True shapes of the sections. Development of Surfaces of Right Regular Solids-Prism, Cylinder, Pyramid, Cone.

UNIT V

Isometric and Orthographic Projections: Principles of isometric projection- Isometric Scale- Isometric Views- Conventions- Isometric Views of lines, Planes Figures, Simple solids (cube, cylinder and cone). Isometric projections of spherical parts. Conversion of isometric Views to Orthographic Views.

Text Books:

1. *Engineering Drawing, N.D. Bhatt, Charotar Publishers*
2. *Engineering Drawing, K.L. Narayana& P. Kannaih, Scitech Publishers, Chennai*

Reference Books:

1. *Engineering Drawing, Johle, Tata McGraw-Hill Publishers*
2. *Engineering Drawing, Shah and Rana,2/e, Pearson Education*
3. *Engineering Drawing and Graphics, Venugopal/New age Publishers*
4. *Engineering Graphics, K.C. John, PHI,2013*
5. *Engineering Drawing, B.V.R. Guptha, J.K. Publishers*

Suggestions:

1. *Student is expected to buy a book mentioned under 'Text books' for better understanding.*
2. *Students can find the applications of various conics in engineering and application of involute on gear teeth. The introduction for drawing can be had on line from:*
   - *Introduction to engineering drawing with tools – youtube*
   - *Http-sewor. Carleton.ca /- g kardos/88403/drawing/drawings.html*
   - *Conic sections-online. red woods.edu*

The skill acquired by the student in this subject is very useful in conveying his ideas to the layman easily.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II - I Sem.	**Th**	**Tu**	**C**
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(13A02301) ELECTRICAL MACHINES -I

Course Objective:

- *Electrical machines course is one of the important courses of the Electrical discipline. In this course the different types of DC generators and motors which are widely used in industry are covered and their performance aspects will be studied.*

UNIT I
PRINCIPLES OF ELECTROMECHANICAL ENERGY CONVERSION
Electromechanical Energy Conversion – Forces and Torque In Magnetic Field Systems – Energy Balance – Energy and Force in A Singly Excited Magnetic Field System, Determination of Magnetic Force - Co-Energy – Multi Excited Magnetic Field Systems.

UNIT II
D.C. GENERATORS -I
D.C. Generators – Principle of Operation – Constructional Features – Armature Windings – Lap and Wave Windings – Simplex and Multiplex Windings – Use of Laminated Armature – E. M.F Equation– Numerical Problems – Prallel Paths-Armature Reaction – Cross Magnetizing and De-Magnetizing AT/Pole – Compensating Winding – Commutation – Reactance Voltage – Methods of Improving Commutation.

UNIT III
D.C GENERATORS – II
Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of E.M.F - Critical Field Resistance and Critical Speed - Causes for Failure to Self Excite and Remedial Measures-Load Characteristics of Shunt, Series and Compound Generators – Parallel Operation of D.C Series Generators – Use of Equalizer Bar and Cross Connection of Field Windings – Load Sharing.

UNIT IV
D.C. MOTORS
D.C Motors – Principle of Operation – Back E.M.F. – Circuit Model – Torque Equation – Characteristics and Application of Shunt, Series and Compound Motors – Armature Reaction and Commutation.
Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods. Ward-Leonard System–Braking of D.C Motors – Permanent Magnet D.C Motor (PMDC).
Motor Starters (3 Point and 4 Point Starters) – Protective Devices-Calculation of Starters Steps for D.C Shunt Motors.

UNIT V
TESTING OF DC MACHINES
Losses – Constant & Variable Losses – Calculation of Efficiency – Condition for Maximum Efficiency.
Methods of Testing – Direct, Indirect – Brake Test – Swinburne's Test – Hopkinson's Test – Field's Test – Retardation Test in a D.C. Motor Test

Text Books:

1. *Electric Machines by I.J. Nagrath & D.P. Kothari, Tata Mc Graw – Hill Publishers, 3rd Edition, 2004.*
2. *Electrical Machinery Fundamentals by Stephen J Chapman, Mc Graw Hills, 2005.*

Reference Books:

1. *Performance and Design of D.C Machines – by Clayton & Hancock, BPB Publishers, 2004.*
2. *Electrical Machines -S.K. Battacharya, TMH Edn Pvt. Ltd., 3rd Edition, 2009.*
3. *Electric Machinary – A. E. Fritzgerald, C. Kingsley and S. Umans, Mc Graw-Hill Companies, 5th Editon, 2003.*
4. *Electrical Machines – M.V Deshpande, Wheeler Publishing, 2004.*
5. *Electrical Machines – P.S. Bimbhra., Khanna Publishers, 2011.*
6. *Electromechanics – I - Kamakshaiah S., Overseas Publishers Pvt. Ltd, 3rd Edition, 2004.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II - I Sem. **L C**
3 2

(13A01406) FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Course Objective:

- *The object of the course to make the students understand the fluid flow concepts and get familiarity with flow measuring devices.*

LIST OF EXPERIMENTS:

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Calibration of contracted Rectangular Notch and /or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Varification of Bernoulli's equation.
8. Impact of jet on vanes.
9. Study of Hydraulic jump.
10. Performance test on Pelton wheel turbine.
11. Performance test on Francis turbine.
12. Efficiency test on centrifugal pump.

LIST OF EQUIPMENT:

1. Venturimeter Sutup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouthpiece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.
10. Pelton wheel and Francis turbines.
11. Centrifugal pumps.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech II - I Sem. **L C**
3 2

(13A02302) ELECTRICAL CIRCUITS AND SIMULATION LAB

PART-A: ELECTRICAL CIRCUITS

1) Verification of Thevenin's and Norton's Theorems
2) Verification of Superposition Theorem and Maximum Power Transfer Theorem
3) Verification of Compensation Theorem
4) Verification of Reciprocity , Millmann's Theorems
5) Locus Diagrams of RL and RC Series Circuits
6) Series and Parallel Resonance
7) Determination of Self, Mutual Inductances and Coefficient of Coupling
8) Z and Y Parameters
9) Transmission and Hybrid Parameters
10) Measurement of Active Power for Star and Delta Connected Balanced Loads
11) Measurement of Reactive Power for Star and Delta Connected Balanced Loads
12) Measurement of 3-Phase Power by Two Wattmeter Method for Unbalanced Loads

PART-B: PSPICE SIMULATION

1) Simulation of DC Circuits
2) DC Transient Response
3) Mesh Analysis
4) Nodal Analysis

NOTE:

- *PSPICE Software Package is Necessary.*
- *Eight Experiments are to be Conducted from PART-A and any two from PART-B*

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B.Tech. II - II Sem.	**T**	**Tu**	**C**
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(13A02401) ELECTROMAGNETIC FIELDS

Course Objective:

- *The objective of this course is to introduce the concepts of electric field and magnetic fields and their applications which will be utilized in the development of the theory for power transmission lines and electrical machines.*

UNIT I
ELECTROSTATICS

Electrostatic Fields - Coulomb's Law - Electric Field Intensity(EFI) due to Line, Surface and Volume charges- Work Done in Moving a Point Charge in Electrostatic Field-Electric Potential due to point charges, line charges and Volume Charges - Properties of Potential Functions-Potential Gradient - Gauss's Law-Application of Gauss's Law-Maxwell's First Law, Laplace's Equation and Poisson's Equations - Solution of Laplace's Equation in one Variable.
Electric Dipole - Dipole Moment - Potential and EFI due to Electric Dipole - Torque on an Electric Dipole in an Electric Field - Capacitance-Capacitance of Parallel Plate and Spherical Capacitors**.**

UNIT II
CONDUCTORS AND DIELECTRICS

Behavior of Conductors in an Electric Field-Conductors and Insulators – Electric Field Inside a Dielectric Material – Polarization – Dielectric Conductors and Dielectric Boundary Conditions – Energy Stored and Energy Density in a Static Electric Field – Current Density – Conduction and Convection – Current Densities – Ohm's Law in Point Form – Equation of Continuity**.**

UNIT III
MAGNETO STATICS

Static Magnetic Fields – Biot-Savart Law – Magnetic Field Intensity(MFI) due to a Straight Current Carrying Filament – MFI due to Circular, Square Filament – Solenoid Current Carrying Wire – Relation Between Magnetic Flux ,Magnetic Flux Density and MFI – Maxwell's Second Equation.
Ampere's Circuital Law and Its Applications Viz., MFI Due to an Infinite Sheet of Current and a Long Current Carrying Filament – Point Form of Ampere's Circuital Law – Maxwell's Third Equation.
Magnetic Force – Moving Charges in Magnetic Fields – Lorentz Force Equation – Force on Current Element in a Magnetic Field - Force on a Straight and Long Current Carrying Conductor in a Magnetic Field - Force Between two Straight and Parallel Current Carrying Conductor in a Magnetic Field – Magnetic Dipole and Dipole moment – A Differential Current Loop as a Magnetic Dipole – Torque on a Current Loop Placed in a Magnetic Field.

UNIT IV
MAGNETIC POTENTIAL

Scalar Magnetic Potential and Vector Magnetic Potential and its Properties - Vector Magnetic Potential due to Simple Configuration – Vector Poisson's Equations.
Self and Mutual Inductances – Neumann's Formulae – Determination of Self Inductance of a Solenoid and Toroid and Mutual Inductance Between a Straight, Long Wire and a Square Loop Wire in the Same Plane – Energy Stored and Intensity in a Magnetic Field.

UNIT V

TIME VARYING FIELDS

Time Varying Fields – Faraday's Law of Electromagnetic Induction – It's Integral and Point Forms – Maxwell's Fourth Equation. Statically and Dynamically Induced E.M.F's – Simple Problems – Modified Maxwell's Equations for Time Varying Fields – Displacement Current.
Wave Equations – Uniform Plane Wave Motion in Free Space, Conductors and Dielectrics – Velocity, Wave Length, Intrinsic Impedence and Skin Depth – Poynting Theorem – Poynting Vector and its Significance**.**

Text Books:

1. Engineering Electromagnetics by William.H.Hayt, Mc.Graw – Hill, 2010.
2. Electromagnetics by J.D.Kraus,Mc.Graw – Hill Inc,5th edition,1999.
3. Field Theory – Gangadhar, Khanna Publications, 2003.

Reference Books:

1. Electrodynamics by Griffith, PHI, 3rd Edition, 1999.
2. Electromagnetic Fields by Sadiku – Oxford University Press, 5th Edition, 2010.
3. Electromagnetics by Joseph Edminister, Tata Mc Graw Hill, 2006.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II - II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02402) CONTROL SYSTEMS ENGINEERING

Course Objective:

- *In this course it is aimed to introduce to the students the principles and applications of control systems in everyday life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.*

UNIT I

CONTROL SYSTEMS CONCEPTS

Open Loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback Characteristics, Effects of positive and negative feedback. Mathematical models – Differential equations of Translational and Rotational mechanical systems, and Electrical Systems, Block diagram reduction methods – Signal flow graph - Reduction using Mason's gain formula. Transfer Function of DC Servo motor - AC Servo motor - Synchro transmitter and Receiver

UNIT II

TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional, integral, derivative Controllers, Design of P, PD, PI, PID Controllers.

UNIT III

STABILITY ANALYSIS IN FREQUENCY DOMAIN

The concept of stability – Routh's stability criterion – Stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT IV

FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain margin-Stability Analysis.

Compensation techniques – Lag, Lead, Lead-Lag Compensators design in frequency Domain.

UNIT V

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from Schematic models, differential equations, Transfer function, block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models.

Text Books:

1. *Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 5th edition, 2010.*
2. *Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 5th edition, 2007.*

Reference Books:

1. *Control Systems Engineering - by NISE 5th Edition – John wiley & sons, 2010.*
2. *Control Systems – by – A. Nagoor Kani- First Edition RBA Publications, 2006.*
3. *Automatic Control Systems– by B. C. Kuo and Farid Golnaraghi – John wiley and son's, 8th edition, 2003.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II - II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A04407) ANALOG ELECTRONIC CIRCUITS

Course Objective:

- *The aim of this course is to familiarize the student with the analysis and design of basic transistor amplifier circuits, Oscillators, Multi-vibrators and wave shaping.*

Learning Outcome:

On completion of this course the student will be able to understand the

- *Methods of biasing transistors & Design of simple amplifier circuits.*
- *Mid – band analysis of amplifier circuits using small - signal equivalent circuits to determine gain, input impedance and output impedance.*
- *Method of calculating cutoff frequencies and to determine bandwidth.*
- *Design and analyse different Oscillator circuits.*
- *Design of circuits for linear wave shaping and Multi-vibrators.*

UNIT I Multistage Amplifiers

BJT and FET RC Coupled Amplifiers – Frequency Response. Cascaded Amplifiers. Calculation of Band Width of Single and Multistage Amplifiers. Concept of Gain Bandwidth Product.

UNIT II Feedback Amplifiers

Concept of Feedback Amplifiers – Effect of Negative feedback on the amplifier Characteristics. Four Feedback Amplifier Topologies. Method of Analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

UNIT III Sinusoidal Oscillators

Condition for oscillations –LC Oscillators – Hartley, Colpitts, Clapp and Tuned Collector Oscillators – Frequency and amplitude Stability of Oscillators – Crystal Oscillators – RC Oscillators -- RC Phase Shift and Weinbridge Oscillators.

UNIT IV Large Signal Amplifiers

Class A power Amplifier, Maximum Value of Efficiency of Class A Amplifier, Transformer coupled amplifier – Push-Pull Amplifier – Complimentary Symmetry Circuits (Transformer Less Class B Power Amplifier) – Phase Inverters, Transistor Power Dissipation, Thermal Runaway, Heat Sinks.

UNIT V

Linear wave shaping: High pass, Low pass RC circuits-response for sinusoidal, Step, Pulse, Square and Ramp inputs, Clippers and Clampers

Multi-Vibrators: Analysis of Diode and transistor switching times, Analysis and Design of Bistable, Monosatable and Astable Multi-vibrators, Schmitt trigger Using Transistors.

Text Books:

1. *Integrated Electronics – Millman and Halkias*
2. *Pulse, Digital & Switching Waveforms by Jacob Milliman, Harbert Taub and Mothiki S Prakash Rao, 2nd edition 2008, Tata McGraw Hill Companies*

Reference Books:

1. *K.Lal Kishore, "Electronic Circuit Analysis", Second Edition, BSP*
2. *Electronic Devices and Circuits, G.S.N. Raju, IK International Publications, New Delhi, 2006*
3. *Electronic Devices and Circuits – Mottershead*
4. *A. Anand Kumar, "Pulse and Digital Circuits", PHI, 2005.*
5. *David A. Bell, "Solid State Pulse Circuits", 4th edition, 2002 PHI.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II - II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A04303) SWITCHING THEORY AND LOGIC DESIGN

Course Objective:

- *To provide fundamental concepts used in the design of digital systems and learn the methods for the design of digital circuits.*

Learning Outcome*:*

- *To introduce basic postulates of Boolean algebra and the methods for simplifying Boolean expressions*
- *To illustrate the concepts and study the procedures for the analysis and design of combinational circuits and sequential circuits*
- *To introduce the concepts of programmable logic devices.*

UNIT I

NUMBER SYSTEM & BOOLEAN ALGEBRA

Digital systems, Binary Numbers, Number base conversions, Complements of numbers, Signed binary numbers, Binary codes. Boolean Algebra-Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, Other logic operations & Logic gates.

UNIT II

GATE LEVEL MINIMIZATION

The map method, four variable, K-map, Five variable map, POS & SOP Simplification, Don't care conditions, NAND & NOR Implementation, Other two level Implementation, Ex-or Function, Tabular Method- Simplification of Boolean function using tabulation Method.

UNIT III

ANALYSIS AND SYNTHESIS OF COMBINATIONAL CIRCUITS:

Combinational circuits, Analysis & Design procedure, Binary Adder-subtractor, Decimal Adder, Binary Multiplier, Magnitude comparator, Decoder, Encoders, Multiplexers.

UNIT IV

ANALYSIS AND SYNTHESIS OF SEQUNTIAL CIRCUITS:

Sequential Circuits, Latches Flips-Flops, Analysis of Clocked sequential circuits, State Reduction & Assignment, Design procedure, Registers & Counters – Registers, Shift Registers, Ripple Counters, Synchronous counters, other counters.

UNIT V

ASYNCHRONOUS SEQUENTIAL LOGIC & PROGRAMMABLE MEMORIES

Introduction, Analysis Procedure, Circuits with Latches, Design Procedure, Reduction of State flow tables, Race-free State Assignment, Hazards. Random Access Memory, Memory Decoding Error detection and correction, ROM,PLA, PAL.

Text Books:

1. M.Morris Mano & Michel D. Ciletti, "Digital Design" ,Pearson ,5th Edition.

2. Zvi KOhavi and Nirah K.Jha, "Switching theory and Finite Automata Theory" ,Cambridge,3rd Edition

Reference Books:

1. Subratha Goshal, "Digital Electronics", Cambridge.

2. Comer, "Digital & State Machine Design", Third Indian edition, OXFORD.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech II - II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02403) ELECTRICAL POWER GENERATING SYSTEMS

Course Objective:

- *Electrical Power plays significant role in day-to-day life of entire mankind. This course concerns the generation of conventional and non-conventional sources of energy along with the economic aspects.*

UNIT I
THERMAL POWER GENERATING SYSTEMS
Block Diagram of Thermal Power Station (TPS) showing paths of Coal, Steam, Water, Air, Ash and Flue Gasses - Brief Description of TPS Components: Economizers, Boilers, Super Heaters, Turbines, Condensers, Chimney and Cooling Towers.

UNIT II
HYDRO & NUCLEAR POWER GENERATING SYSTEMS
Hydro Power: Selection of Site, Classification, Layout, Description of Main Components.
Nuclear Power: Nuclear Fission and Chain Reaction.- Nuclear Fuels.- Principle of Operation of Nuclear Reactor.-Reactor Components: Moderators, Control Rods, Reflectors and Coolants.- Radiation Hazards: Shielding and Safety Precautions.- Types of Nuclear Reactors and Brief Description of PWR, BWR and FBR.

UNIT III
SOLAR & WIND POWER GENERATING SYSTEMS
Solar Power Generation: Role and Potential of Solar Energy Options, Principles of Solar Radiation, Flat Plate and Concentrating Solar Energy Collectors, Different Methods of Energy Storage – PV Cell- V-I Characteristics.
Wind Power Generation: Role and potential of Wind Energy Option, Horizontal and Vertical Axis Wind Mills- Performance Characteristics- Power- Speed & Torque- Speed Characteristics-Pitch & Yaw Controls – Power Electronics Application – Economic Aspects.

UNIT IV
BIOGAS & GEOTHERMAL POWER GENERATING SYSTEMS
Biogas Power Generation: Principles of Bioconversion, Types of Biogas Digesters – Characteristics of Bio-Gas- Utilization- Economic and Environmental Aspects.
Geothermal and Ocean Power Generation: Principle of Geothermal Energy Methods of Harnessing-Principle of Ocean Energy-Tidal and Wave Energy- Mini Hydel Plants- Economic Aspects.

UNIT V
ECONOMIC ASPECTS OF POWER GENERATION
Load Curve, Load Duration and Integrated Load Duration Curves-Load Demand, Diversity, Capacity, Utilization and Plant Use Factors- Numerical Problems. Costs Of Generation and their Division Into Fixed, Semi-Fixed and Running Costs. Tariff Methods: Desirable Characteristics of a Tariff Method.- Flat Rate, Block-Rate, Two-Part, Three –Part, and Power Factor Tariff Methods and Numerical Problems.

Text Books:

1. *A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.*
2. *Electric Power Generation Distribution and Utilization by C.L Wadhwa, New Age International (P) Ltd., 2005.*
3. *Non Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2000.*

Reference Books:

1. *Renewable Energy Resources – John Twidell and Tony Weir, Second Edition, Taylor and Francis Group, 2006.*
2. *Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.*
3. *Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND& COMPANY LTD., New Delhi 2004.*
4. *Wind Electrical Systems by S. N. Bhadra, D. Kastha & S. Banerjee – Oxford University Press, 2013.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II - II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02404) ELECTRICAL MACHINES – II

Course Objective:

- *As an extension of Electrical machines I course this subject facilitates to study of the performance of Transformers and Induction motors which are the major part of industrial drives and agricultural pump sets.*

UNIT I
SINGLE PHASE TRANSFORMERS
Single Phase Transformers- Constructional Details- Hystersis and Eddy Current Losses-Emf Equation - Operation on No Load and on Load - Phasor Diagrams
Equivalent Circuit - Losses and Efficiency-Regulation. All Day Efficiency - Effect of Variations of Frequency & Supply Voltage on Iron Losses.

UNIT II
PERFORMANCE OF SINGLE PHASE TRANSFORMERS
OC and SC Tests - Sumpner's Test - Predetermination of Efficiency and Regulation-Separation of Losses Test-Parallel Operation with Equal and Unequal Voltage Ratios - Auto Transformers-Equivalent Circuit - Comparison with Two Winding Transformers.

UNIT III
THREE PHASE TRANSFORMERS AND INDUCTION MOTORS
Three Phase Transformers - Connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and Open Δ, Third Harmonics in Phase Voltages-Three Winding Transformers-Tertiary Windings- Scott Connection.
Polyphase Induction Motors-Construction Details of Cage and Wound Rotor Machines-Production of a Rotating Magnetic Field - Principle of Operation - Rotor Emf and Rotor Frequency - Rotor Reactance, Rotor Current and Pf at Standstill and During Operation.

UNIT IV
3-PHASE INDUCTION MOTOR CHARACTERISTICS
Rotor Power Input, Rotor Copper Loss and Mechanical Power Developed and Their Inter Relation-Torque Equation-Deduction From Torque Equation - Expressions for Maximum Torque and Starting Torque - Torque Slip Characteristic –Generator Operation - Double Cage and Deep Bar Rotors - Equivalent Circuit - Phasor Diagram - Crawling and Cogging -Circle Diagram-No Load and Blocked Rotor Tests-Predetermination of Performance

UNIT V
STARTING AND SPEED CONTROL OF INDUCTION MOTORS
Starting Methods and Starting Current and Torque Calculations, Speed Control-Change of Frequency; Pole Changing and Methods of Consequent Poles; Cascade Connection. Injection of an EMF.

Text Books:
1. Electrical Machinery & Transformers by Irving Kosow –Pearson Publishers, Second Edition, 2012
2. Electric Machines –by I.J.Nagrath & D.P.Kothari,Tata Mc Graw Hill, 7th Edition.,2005

Reference Books:

1. *Performance and Design of AC Machines by MG.Say, BPB Publishers, 2002.*
2. *Theory of Alternating Current Machinery- by Langsdorf, Tata McGraw-Hill Companies, 2nd edition, 2008.*
3. *Electromechanics-II (transformers and induction motors) S. Kamakshaiah, Hitech publishers, 2005.*
4. *Electric Machinery - A.E. Fitzgerald, C.Kingsley and S.Humans, Mcgraw Hill Companies, 6th edition, 2003.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II - II Sem.	**L**	**C**
	3	**2**

(13A02405) ELECTRICAL MACHINES LAB – I

The following experiments are required to be conducted as compulsory experiments:

1. Magnetization Characteristics of DC Shunt Generator. Determination of Critical Field Resistance and Critical Speed.
2. Load Test on DC Shunt Generator. Determination of Characteristics.
3. Brake Test on DC Shunt Motor. Determination of Performance Curves.
4. Load Test on DC Compound Generator. Determination of Characteristics.
5. Hopkinson's Test on DC Shunt Machines. Predetermination of Efficiency.
6. Fields Test on DC Series Machines. Determination of Efficiency.
7. Swinburne's Test and Speed Control of DC Shunt Motor. Predetermination of Efficiencies.
8. Brake Test on DC Compound Motor. Determination of Performance Curves.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:

1. Load Test on DC Series Generator. Determination of Characteristics.
2. Retardation Test on DC Shunt Motor. Determination of Losses at Rated Speed.
3. Separation of Losses In DC Shunt Motor**.**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II - II Sem. **L** **C**
3 **2**

(13A04305) ELECTRONIC DEVICES AND CIRCUITS LABORATORY

Course Objective:

- *This Lab provides the students to get an electrical model for various semiconducter devices. Students can find and plot V_I characteristics of all semiconductor devices. Student learns the practical applications of the devices. They can learn and implement the concept of the feedback and frequency response of the small signal amplifier*

Learning Outcome:

- *Students able to learn electrical model for various semiconductor devices and learns the practical applications of the semiconductor devices*

PART A: Electronic Workshop Practice

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

PART B: List of Experiments
(For Laboratory Examination-Minimum of Ten Experiments)

1. P-N Junction Diode Characteristics
   Part A: Germanium Diode (Forward bias& Reverse bias)
   Part B: Silicon Diode (Forward bias only)
2. Zener Diode Characteristics
   Part A: V-I Characteristics
   Part B: Zener Diode act as a Voltage Regulator
3. Rectifiers (without and with c-filter)
   Part A: Half-wave Rectifier
   Part B: Full-wave Rectifier
4. BJT Characteristics(CE Configuration)
   Part A: Input Characteristics
   Part B: Output Characteristics
5. FET Characteristics(CS Configuration)
   Part A: Drain (Output) Characteristics
   Part B: Transfer Characteristics
6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

PART C: Equipment required for Laboratory

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires
12. CRO Probes etc.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III-I Sem.	**Th**	**Tu**	**C**
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(13A52501) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Objective:
The objectives of this course are to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to enrich analytical skills in helping them take sound financial decisions for achieving higher productivity.

Learning Outcome*:*
The thorough understanding of Managerial Economics and Analysis of Financial Statements facilitates the Technocrats – cum – Entrepreneurs to take-up decisions effectively and efficiently in the challenging Business Environment.

UNIT I
INTRODUCTION TO MANAGERIAL ECONOMICS
Managerial Economics - Definition, nature and scope – contemporary importance of Managerial Economics - Demand Analysis: Determinants- Law of Demand - Elasticity of Demand. Significance – types – measurement of elasticity of demand - Demand forecasting- factors governing demand forecasting- methods of demand forecasting –Relationship of Managerial Economics with Financial Accounting and Management.

UNIT II
THEORY OF PRODUCTION AND COST ANALYSIS
Production Function – Short-run and long- run production - Isoquants and Isocosts, MRTS, least cost combination of inputs - Cobb-Douglas production function - laws of returns - Internal and External economies of scale - **Cost Analysis**: Cost concepts - Break-Even Analysis (BEA) - Managerial significance and limitations of BEA - Determination of Break Even Point (Simple Problems)

UNIT III
INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT
Market structures: Types of Markets - Perfect and Imperfect Competition - Features, Oligopoly - Monopolistic competition. Price-Output determination - Pricing Methods and Strategies. Forms of Business Organization – Sole Proprietorship- Partnership – Joint Stock Companies – Public Sector Enterprises – New Economic Environment- Economic systems – Economic Liberalization – Privatization and Globalization

UNIT IV
CAPITAL AND CAPITAL BUDGETING
Concept of Capital - Over and Under capitalization – Remedial measures - Sources of Short term and Long term capital - Estimating Working Capital requirement – Capital budgeting – Features of Capital budgeting proposals – Methods and Evaluation of Capital budgeting – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

UNIT V
INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS
Financial Accounting – Concept - emerging need and importance - Double-Entry Book Keeping- Journal - Ledger – Trial Balance - Financial Statements - - Trading Account – Profit & Loss Account –

Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Techniques – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

Text Books:

1. *Aryasri: Managerial Economics and Financial Analysis, 4/e, TMH, 2009.*
2. *Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.*

Reference Books:

1. *Premchand Babu, Madan Mohan:Financial Accounting and Analysis,Himalaya, 2009*
2. *S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International,. 2009.*
3. *Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.*
4. *Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2009.*
5. *H.L.Ahuja: Managerial Economics, S.Chand, 3/e, 2009*

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B.Tech. III-I Sem.	**Th**	**Tu**	**C**
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(13A02501) ELECTRICAL & ELECTRONIC MEASURING INSTRUMENTS

Course Objective:

Electrical measurements course introduces the basic principles of all measuring instruments. It also deals with the measurement of RLC parameters voltage, current Power factor, power, energy and magnetic measurements and Digital Meters

UNIT I

MEASURING INSTRUMENTS

Classification – Ammeters and Voltmeters – PMMC, Dynamometer, Moving Iron Type Instruments – Expression for the Deflecting Torque and Control Torque – Errors and Compensations, Range Extension. Cathode Ray Oscilloscope- Cathode Ray tube-Time base generator-Horizontal and Vertical Amplifiers – Application of CRO – Measurement of Phase , Frequency, Current & Voltage- Lissajous Patterns

UNIT II

D.C & A.C BRIDGES

Method of Measuring Low, Medium and High Resistance – Sensitivity of Wheatstone's Bridge – Kelvin's Double Bridge for Measuring Low Resistance, Measurement of High Resistance – Loss of Charge Method. Measurement of Inductance - Maxwell's Bridge, Anderson's Bridge. Measurement of Capacitance and Loss Angle - Desauty Bridge. Wien's Bridge – Schering Bridge.

UNIT III

MEASUREMENT OF POWER AND ENERGY

Single Phase Dynamometer Wattmeter, LPF and UPF, Double Element and Three Element Dynamometer Wattmeter, Expression for Deflecting and Control Torques. Types of P.F. Meters – Dynamometer and Moving Iron Type – 1-ph and 3-ph Meters. Single Phase Induction Type Energy Meter – Driving and Braking Torques – Errors and Compensations. Three Phase Energy Meter.

UNIT IV

INSTRUMENT TRANSFORMERS AND POTENTIOMETERS

Current Transformers and Potential Transformers – Ratio and Phase Angle Errors – Methods for Reduction of Errors-Design Considerations.

Potentiometers: Principle and Operation of D.C. Crompton's Potentiometer –Standardization – Measurement of unknown Resistance, Current, Voltage.

A.C. Potentiometers: Polar and Coordinate types- Standardization – Applications.

UNIT V

MAGNETIC MEASUREMENTS

Ballistic Galvanometer – Equation of Motion – Flux Meter – Constructional Details, Comparison with Ballistic Galvanometer. Determination of B-H Loop Methods of Reversals - Six Point Method – A.C. Testing – Iron Loss of Bar Samples.

Text Books:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications, 2007.
2. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition, Reem Publications, 2011.

Reference Books:

1. Electronic Instrumentation by H. S. Kalsi, Tata Mcgrawhill, 3rd Edition, 2011.
2. Electrical Measurements – by Buckingham and Price, Prentice – Hall, 3rd Edition, 1970.
3. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, 2010.
4. Electrical & Electronic Measurement & Instrumentation by R. K. Rajput, 2nd Edition, S. Chand & Co., 2nd Edition, 2013.

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B.Tech. III-I Sem.	**Th**	**Tu**	**C**
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(13A04508) LINEAR & DIGITAL IC APPLICATIONS

Course Objective:

- *To make the student understand the basic concepts in the design of electronic circuits using linear integrated circuits and their applications. To introduce some special function ICs.*
- *To be able to use computer-aided design tools for development of complex digital logic circuits*
- *To be able to model, simulate, verify, analyze, and synthesize with hardware description languages*
- *To be able to design and prototype with standard cell technology and programmable logic*
- *To be able to design tests for digital logic circuits, and design for testability*

Learning Outcome:

- *Upon completion of the course, students will be able to:*
- *Understand the basic building blocks of linear integrated circuits and its characteristics.*
- *Analyze the linear, non-linear and specialized applications of operational amplifiers.*
- *Understand the theory of ADC and DAC.*
- *Able to use computer-aided design tools for development of complex digital logic circuits.*
- *Able to model, simulate, verify, analyze, and synthesize with hardware description languages.*
- *Able to design and prototype with standard cell technology and programmable logic.*
- *Able to design tests for digital logic circuits, and design for testability.*

UNIT I

OP-AMP CHARACTERISTICS:

Basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics - DC and AC characteristics, 741 Op-amp and its features, modes of operation-inverting, non-inverting, differential. Basic applications of Op-amp, instrumentation amplifier, AC amplifier, V to I and I to V converters, sample & Hold circuits, multiplier and divider, Differentiator and Integrator, Comparators, Schmitt trigger, Multivibrators, Introduction to voltage regulators, features of 723 General purpose regulator.

UNIT II

TIMERS, PHASE LOCKED LOOPS & D-A AND A-D CONVERTERS:

Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger, PLL – Introduction, block schematic, principles and description of individual blocks of 565.Basic DAC techniques, Weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel comparator type ADC, Counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC specifications.

UNIT III

ACTIVE FILTERS & OSCILLATORS:

Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation- RC, Wien, and quadraturetype, waveform generators- triangular, sawtooth, square wave and VCO.

UNIT IV

INTIGRATED CIRCUITS:

Classification, Chip size and circuit complexity, Classification of integrated circuits, comparison of various logic families, standard TTL NAND Gate-Analysis & characteristics, TTL open collector o/ps, Tristate TTL, MOS & CMOS open drain and tri-state outputs, CMOS transmission gate, IC interfacing-TTL driving CMOS & CMOS driving TTL.

UNIT V

COMBINATIONAL &SEQUENTIAL CIRCUITS

COMBINATIONAL: Code converters, Decoders, Demultiplexers, decoders & drives for LED & LCD display. Encoder, priority Encoder, Multiplexers & their applications, priority generators/checker circuits. Digital arithmetic circuits-parallel binary adder/subtractor circuits using 2's Complement system. Digital comparator circuits.

SEQUENTIAL: Latches, Flip-flops & their conversions. Design of synchronous counters, Decade counter, shift registers & applications, familiarities with commonly available 74XX and CMOS 40XX series of IC counters.

Text Books:

1. *Linear Integrated Circuits – D.RoyChowdhury, New Age International (p) Ltd, 2nd Edition., 2003.*
2. *Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.*

Reference Books:

1. *Operational Amplifiers & Linear Integrated Circuits – R.F.Coughlin& Fredric F.Driscoll, PHI.*
2. *Operational Amplifiers & Linear Integrated Circuits: Theory & Applications –Denton J.Daibey, TMH.*
3. *Design with Operational amplifiers & Analog Integrated circuits-Sergio Franco, Mc Graw Hill, 3rd Edition , 2002.*
4. *Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition 2005.*
5. *A VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.*
6. *Op-amps & Linear ICs – RamakanthA.Gayakwad, PHI, 1987.*

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(13A02502) ELECTRICAL POWER TRANSMISSION SYSTEMS

Course Objective:

This course is an extension of Generation of Electric Power course. It deals with basic theory of transmission lines modeling and their performance analysis. Also this course gives emphasis on mechanical design of transmission lines, cables and insulators.

UNIT I

TRANSMISSION LINE PARAMETERS

Types of Conductors – ACSR, Bundled and Standard Conductors- Resistance For Solid Conductors – Skin Effect- Calculation of Inductance for Single Phase and Three Phase, Single and Double Circuit Lines, Concept of GMR & GMD, Symmetrical and Asymmetrical Conductor Configuration with and without Transposition, Numerical Problems, Capacitance Calculations for Symmetrical and Asymmetrical Single and Three Phase, Single and Double Circuit Lines, Effect of Ground on Capacitance, Numerical Problems.

UNIT II

PERFORMANCE OF TRANSMISSION LINES:

Classification of Transmission Lines - Short, Medium and Long Line and Their Exact Equivalent Ciruits-Nominal-T, Nominal-Pie. Mathematical Solutions to Estimate Regulation and Efficiency of All Types of Lines. Long Transmission Line-Rigorous Solution, Evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations – Surge Impedance and Surge Impedance Loading - Wavelengths and Velocity of Propagation – Ferranti Effect , Charging Current-Numerical Problems.

UNIT III

MECHANICAL DESIGN OF TRANSMISSION LINES

Overhead Line Insulators: Types of Insulators, String Efficiency and Methods for Improvement, Capacitance Grading and Static Shielding.

Corona: Corona Phenomenon, Factors Affecting Corona, Critical Voltages and Power Loss, Radio Interference.

Sag and Tension Calculations: Sag and Tension Calculations with Equal and Unequal Heights of Towers, Effect of Wind and Ice on Weight of Conductor, Stringing Chart and Sag Template and Its Applications, Numerical Problems.

UNIT IV

POWER SYSTEM TRANSIENTS & TRAVELLING WAVES

Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of Lines with Different Types of Conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

UNIT V

CABLES

Types of Cables, Construction, Types of Insulating Materials, Calculations of Insulation Resistance and Stress in Insulation, Numerical Problems. Capacitance of Single and 3-Core Belted Cables, Numerical Problems. Grading of Cables - Capacitance Grading, Numerical Problems, Description of Inter-Sheath Grading.

Text Books:

1. *Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited, Publishers,4th Edition, 2005.*
2. *Power system Analysis-by John J Grainger, William D Stevenson, TMC Companies, 4th edition, 1994.*

Reference Books:

1. *Power System Analysis and Design by B.R.Gupta, S. Chand & Co, 6th Revised Edition, 2010.*
2. *Modern Power System Analysis by I.J.Nagrath and D.P.Kothari, Tata McGraw Hill, 3rd Edition, 2008.*
3. *Electric Power Transmission System Engineering: Analysis and Design, by Turan Gonen, 2nd Edition, CRC Press, 2009.*
4. *Electric Power Systems by S. A. Nasar, Schaum's Outline Series, TMH, 3rd Edition, 2008.*
5. *A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarti, Dhanpat Rai & Co Pvt. Ltd., 2003.*

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B.Tech. III-I Sem.	**Th**	**Tu**	**C**
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(13A02503) POWER ELECTRONICS

Course Objective:

With the advent of semiconductor devices, revolution is taking place in the power transmission distribution and utilization. This course introduces the basic concepts of power semiconductor devices, converters and choppers and their analysis.

UNIT I

POWER SEMI CONDUCTOR DEVICES

Semiconductor Power Diodes, Thyristors – Silicon Controlled Rectifiers (SCR's) – TRIACs, GTOs - Characteristics and Principles of Operation and other Thyristors – Classification of Switching Devices Based on Frequency and Power Handling Capacity-BJT – Power Transistor - Power MOSFET – Power IGBT –- Basic Theory of Operation of SCR – Static Characteristics – Turn On and Turn Off Methods-Dynamic Characteristics of SCR - Two Transistor Analogy – Triggering Circuits—– Series and Parallel Connections of SCR's – Snubber Circuits – Specifications and Ratings of SCR's, BJT, IGBT.

UNIT II

PHASE CONTROLLED CONVERTERS

Phase Control Technique – Single Phase Line Commutated Converters – Mid Point and Bridge Connections – Half Controlled Converters, Fully Controlled Converters with Resistive, RL Loads and RLE Load– Derivation of Average Load Voltage and Current – Line Commutated Inverters -Active and Reactive Power Inputs to the Converters without and with Free Wheeling Diode, Effect of Source Inductance – Numerical Problems.

Three Phase Line Commutated Converters – Three Pulse and Six Pulse Converters – Mid Point and Bridge Connections - Average Load Voltage with R and RL Loads – Effect of Source Inductance–Dual Converters (Both Single Phase and Three Phase) - Waveforms –Numerical Problems.

UNIT III

CHOPPERS

Commutation Circuits – Time Ratio Control and Current Limit Control Strategies – Step Down and Step up Choppers Derivation of Load Voltage and Currents with R, RL and RLE Loads- Step Up Chopper – Load Voltage Expression– Problems.

UNIT IV

INVERTERS

Inverters – Single Phase Inverter – Basic Series Inverter – Basic Parallel Capacitor Inverter Bridge Inverter – Waveforms – Simple Forced Commutation Circuits for Bridge Inverters – Single Phase Half and Full Bridge Inverters-Pulse Width Modulation Control-Harmonic Reduction Techniques-Voltage Control Techniques for Inverters – Numerical Problems, Three Phase VSI in 120^0 And 180^0 Modes of Conduction.

UNIT V

AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS

AC Voltage Controllers – Single Phase Two SCR's in Anti Parallel – With R and RL Loads – Modes of Operation of Triac – Triac with R And RL Loads – Derivation of RMS Load Voltage, Current and Power Factor Wave Forms – Firing Circuits -Numerical Problems - Thyristor Controlled Reactors; Switched Capacitor Networks.

Cyclo Converters – Single Phase Mid Point Cyclo Converters With Resistive and Inductive Load (Principle of Operation only) – Bridge Configuration Of Single Phase Cyclo Converter (Principle of Operation only) – Waveforms

Text Books:

1. *Fundamentals of Power Electronics – by Robert Erickson – Springer Publications, 2nd Edition, 2001.*
2. *Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 3rd edition, 2006.*
3. *Power Electronics – by Vedam Subramanyam, New Age International (P) Limited, 2008.*

Reference Books :

1. *Fundamentals of Power Electronics – by Issa Batarseh – John Wiley, 2004.*
2. *Power Electronics by M. D. Singh and K. B. Kanchandhani, Tata Mc Graw Hill, 1998.*
3. *Power Electronics by P. S. Bimbhra, Khanna Publications, 2012.*

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B.Tech. III-I Sem.	**Th**	**Tu**	**C**
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(13A02504) ELECTRICAL MACHINES – III

Course Objective:

This subject is the extension of Electrical Machines which was learned in the previous course. In this course basic principle of synchronous machines and their analysis, characteristics will be explained. And also it gives the various applications for domestic and industrial purpose. Finally principle of operation and applications of single phase motors are explained.

UNIT I

SYNCHRONOUS GENERATORS

Principle And Constructional Features of Salient Pole and Round Rotor Machines – Armature Windings – Concentrated and Distributed Windings – Integral Slot and Fractional Slot Windings – Pitch, Distribution, Winding Factors – E.M.F Equation- Harmonics in Generated E.M.F – Space and Slot Harmonics – Elimination of Harmonics- Armature Reaction – Synchronous Reactance and Impedance – Load Characteristics - Phasor Diagram –.

UNIT II

REGULATION OF SYNCHRONOUS GENERATORS

Regulation of Salient Pole Alternator – Voltage Regulation Methods – E.M.F Method- MMF Method – ZPF Method – ASA Method – Short Circuit Ratio (SCR) – Two Reaction Theory –Determination of X_d and X_q (Slip Test) – Phasor Diagrams

UNIT III

PARALLEL OPERATION OF SYNCHRONOUS GENERATORS

Power Flow Equation in Alternator (Cylindrical and Salient Pole Machine) – Synchronizing Power and Torque – Parallel Operation and Load Sharing – Effect of Change of Excitation and Mechanical Power Input – Synchronizing Alternators with Infinite Bus Bars – V and Inverted V Curves of Alternator - Determination of Sub-Transient, Transient and Steady State Reactance.

UNIT IV

SYNCHRONOUS MOTOR

Theory of Operation – Phasor Diagram – Power Flow Equations in Synchronous Motors- Variation of Current and Power Factor with Excitation – V and Inverted V Curves – Synchronous Condenser – Hunting and Methods to Eliminate Hunting – Starting Methods of Synchronous Motor – Synchronous Induction Motor.

UNIT V

SINGLE PHASE AND SPECIAL MOTORS

Single Phase Induction Motor - Constructional Features – Double Revolving Field Theory- Elementary Idea of Cross Field Theory – Split Phase Motors – Capacitor Start and Run Motors – Shaded Pole Motor. Principle And Performance of A.C Series Motor - Universal Motor – Single Phase Synchronous Motors – Reluctance Motor – Hysteresis Motor – Stepper Motor.

Text Books:

1. *Electrical Machinery Fundamentals, Stephen J Chapman, Mc Graw Hill, 4th Edition, 2005.*
2. *Electrical Machines – by P.S. Bimbhra, Khanna Publishers, 2011.*

3. *Electric Machines – by I.J. Nagarath & D.P.Kothari, Tata Mc Graw – Hill Publishers, 4th edition, 2010.*
4. *Electric Machinery – by A.E.Fitzgerald, C.Kingsley and S. Umans, Mc graw – Hill Companies, 5th edition,1990.*

Reference Books:

1. *The Performance and design of A.C. Machines – by M.G. say, ELBS and pitman &sons, 1999.*
2. *Theory of Alternating Current Machinery by Langsdorf, Tata Mc graw Hill, 2nd edition, 2001.*
3. *Electromachanics – III by S. Kamakashiah, Overseas publishers Pvt Ltd., 2005.*
4. *Electric Machines – by M.S. Sarma and M.K. Pathak, CENGAGE learning, 2009.*

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B.Tech. III - I Sem. **L C**
3 2

(13A02505) ELECTRICAL MACHINES LAB – II

The following experiments are required to be conducted as compulsory experiments:

1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner's Test on a Pair of Single Phase Transformers
3. Scott Connection of Transformers
4. No-Load & Blocked Rotor Tests on Three Phase Induction Motor
5. Regulation of a Three –Phase Alternator by Synchronous Impedance & M.M.F. Methods
6. V and Inverted V Curves of a 3 Phase Synchronous Motor.
7. Equivalent Circuit of a Single Phase Induction Motor
8. Determination of Xd and Xq of a Salient Pole Synchronous Machine

In addition to the above eight experiments, atleast any two of the following experiments are required to be conducted from the following list:

1. Parallel Operation of Single Phase Transformers
2. Separation of Core Losses of a Single Phase Transformer
3. Brake Test on Three Phase Induction Motor
4. Regulation of Three-Phase Alternator by Z.P.F. and A.S.A Methods

Text Books:

1. *Electrical Machines Lab manual with MATLAB Programs by Dr. D. K. Chaturvedi, University Science Press.*

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B.Tech. III - I Sem. **L** **C**
3 **2**

(13A02506) CONTROL SYSTEMS AND SIMULATION LAB

Any Eight of the following experiments are to be conducted:

1. Time Response of Second Order System
2. Characteristics of Synchros
3. Programmable Logic Controller – Study and Verification of Truth Tables of Logic Gates, Simple Boolean Expressions and Application of Speed Control of Motor.
4. Effect of Feedback on DC Servo Motor
5. Transfer Function of DC Machine
6. Effect of P, PD, PI, PID Controller on a Second Order Systems
7. Lag and Lead Compensation – Magnitude and Phase Plot
8. Temperature Controller Using PID
9. Characteristics of Magnetic Amplifiers
10. Characteristics of AC Servo Motor

Any two simulation experiments are to be conducted:

1. PSPICE Simulation of Op-Amp Based Integrator and Differentiator Circuits.
2. Linear System Analysis (Time Domain Analysis, Error Analysis) Using MATLAB.
3. Stability Analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant System Using MATLAB
4. State Space Model for Classical Transfer Function Using MATLAB – Verification.

References:

1. Simulation of Electrical and electronics Circuits using PSPICE – by M.H.Rashid, M/s PHI Publications.
2. PSPICE A/D user's manual – Microsim, USA.
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Books user's manual and – Mathworks, USA.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III - I Sem.

(13A52301) HUMAN VALUES & PROFESSIONAL ETHICS (AUDIT COURSE)

Course Objective:

This course deals with professional ethics which includes moral issues and virtues, social responsibilities of an engineer, right, qualities of Moral Leadership

UNIT I

ENGINEERING ETHICS

Senses of 'Engineering Ethics' – Variety of Moral Issues – Types of Inquiry – Moral Dilemmas – Moral Autonomy – Kohlberg's Theory – Gilligan's Theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

UNIT II

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as Responsible Experimenters – Research Ethics – Codes of Ethics – Industrial Standards – A Balanced Outlook on Law – The Challenger Case Study

UNIT III

ENGINEER'S RESPONSIBILITY FOR SAFETY

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk – Chernobyl Case Studies and Bhopal

UNIT IV

RESPONSIBILITIES AND RIGHTS

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality– Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights –Intellectual Property Rights (IPR) – Discrimination

UNIT V

GLOBAL ISSUES

Multinational Corporations – Business Ethics – Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty –Moral Leadership – Sample Code of Conduct

Text Books:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).

2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, (2000).

Reference Books:

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).

2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003)

3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001)

4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, (2004)

5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)

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B.Tech. III - II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A52601) MANAGEMENT SCIENCE

Course Objective:

The objectives of this course are to equip the student the fundamental knowledge of Management Science and its application to effective management of human resources, materials and operations of an organization. It also aims to expose the students about the latest and contemporary developments in the field of management.

Learning outcome:

This course enables the student to know the principles and applications of management knowledge and exposure to the latest developments in the field. This helps to take effective and efficient managerial decisions on physical and human resources of an organization. Besides, the knowledge of Management Science facilitates for his/her personal and professional development.

UNIT I

INTRODUCTION TO MANAGEMENT

Definition of Management- Function of Management- Management as a Science and Art-Management as a Profession- Universality of Management- Henri Faylo's Administrative Theory –Elton Mayo's Human Relations Movement- Systems theory – Contingency theory- Monetary and non-monetary incentives to motivate work teams- Leadership –Definition- Qualities of successful leaders- Different leadership styles.

UNIT II

ORGANIZATION DESIGN AND STRUCTURE

Organization design and structure- Principles—Types of organization structure-Mechanic and Organic Structures- Line organization- Line & Staff organization- Functional Organization – Matrix organization structures- merits and demerits- Departmentation and Decentralization-Power and Authority- Delegation of authority-Principles for effective delegation of authority.

UNIT III

HUMAN RESOURCE AND MATERIALS MANAGEMENT

Concept of HRM-functions – Human Resource Planning-Job Analysis-Recruitment and Selection-Training and Development- Performance appraisal –methods- Wage and Salary Administration-Grievances handling Procedure-Material Management- Need for Inventory control- Economic order quantity- ABC analysis- Management of purchase, stores and stores records.-Marketing Management – Concept- Channels of distribution- Marketing mix and product mix.

UNIT IV

MANAGEMENT OF OPERATIONS & PROJECT MANAGEMENT

Nature of organizational control- Marketing control- HR control- effective control systems- Operations Management- Essentials of operations management- Trends in operational management- Designing operation system for effective management of an organization-Project Management –Network Analysis-PERT and CPM-Project crashing (Simple problems)

UNIT V

CONTEMPORARY MANAGEMENT ISSUES

Strategic Management-Concept- Mission-Vision-Core values-Setting objectives-Corporate planning – Environmental scanning-SWOT analysis- Steps in strategy formulation & implementation- Management

Information System (MIS)- Enterprise Resource Planning (ERP)-Just-in-Time (JIT)- Total Quality Management (TQM) – Supply Chain Management-Six Sigma-Business Process Outsourcing (BPO).

Text Books:

1. *Stoner, Freeman, Gilbert, Management, Pearson, Six Edition 2008*
2. *Aryasri: Management Science, Fourth Edition TMH, 2012.*

Reference Books:

1. Vijay Kumar & Apparo, Introduction to Management Science, Cengage, 2011.
2. Kotler Philip & Keller Kevin Lane: Marketing Management, 14th Edition, Pearson, 2012.
3. Aswathappa, Human Resource Management, Himalaya, 2012.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2011.
5. Schermerhorn, Capling, Poole & Wiesner: Management, Wiley, 2012.
6. Joseph M Putti, Management Principles, Mc Millan Publishers, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III-II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02601) POWER SEMICONDUCTOR DRIVES

Course Objective:

This course is an extension of Power Electronics applications to AC and DC drives. Control of DC motor drives with single phase and three phase converters and choppers are given in detail. The control of AC motor drives with variable frequency converters and variable voltage are presented.

UNIT I

CONVERTER FED DC MOTORS

Introduction to Thyristor Controlled Drives, Single Phase, Three Phase Semi and Fully Controlled Converters Connected to D.C Separately Excited and D.C Series Motors – Continuous Current Operation – Output Voltage and Current Waveforms – Speed and Torque Expressions – Speed – Torque Characteristics- Problems.

UNIT II

FOUR QUADRANT OPERATION OF DC DRIVES

Introduction to Four Quadrant Operation – Motoring Operations, Electric Braking – Plugging, Dynamic and Regenerative Braking Operations. Four Quadrant Operation of D.C Motors by Dual Converters – Closed Loop Operation of DC Motor (Block Diagram Only)

UNIT III

CHOPPER FED DC MOTORS

Single Quadrant, Two –Quadrant and Four Quadrant Chopper Fed DC Separately Excited and Series Excited Motors – Continuous Current Operation – Output Voltage and Current Wave Forms – Speed Torque Expressions – Speed Torque Characteristics – Problems on Chopper Fed D.C Motors – Closed Loop Operation (Block Diagram Only)

UNIT IV

CONTROL OF INDUCTION MOTOR

Induction Motor Stator Voltage Control and Characteristics by AC Voltage Controllers – Waveforms – Speed Torque Characteristics - Stator Frequency Control and Characteristics by Voltage Source and Current Source Inverter and Cycloconverters- PWM Control – Comparison of VSI and CSI Operations – Speed Torque Characteristics – Numerical Problems on Induction Motor Drives – Closed Loop Operation of Induction Motor Drives (Block Diagram Only)

Static Rotor Resistance Control – Slip Power Recovery – Static Scherbius Drive – Static Kramer Drive – Their Performance and Speed Torque Characteristics – Advantages- Applications – Problems

UNIT V

CONTROL OF SYNCHRONOUS MOTORS

Separate Control & Self Control of Synchronous Motors – Operation of Self Controlled Synchronous Motors by VSI and CSI Cycloconverters. Load Commutated CSI Fed Synchronous Motor – Operation – Waveforms – Speed Torque Characteristics – Applications – Advantages and Numerical Problems – Closed Loop Control Operation of Synchronous Motor Drives (Block Diagram Only), Variable Frequency Control, Cycloconverter, PWM, VFI, CSI.

Text Books:

1. Power semiconductor controlled drives by G K Dubey, Prentice Hall, 1989.
2. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI, 2005.

Reference Books:

1. *Power Electronics – MD Singh and K B Khanchandani, Tata – McGraw-Hill Publishing company,1998*
2. *Modern Power Electronics and AC Drives by B.K.Bose, PHI, 1986.*
3. *Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications, 1988.*
4. *A First course on Electrical Drives – S K Pillai New Age International(P) Ltd. 2nd Edition, 1989.*
5. *Electric Drives by N. K. De, PHI Publications, 2006.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III-II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02602) POWER SYSTEM PROTECTION

Course Objective:

This course introduces all varieties of Circuit Breakers and Relays for protection of Generators, Transformers and feeder bus bars from over voltages and other hazards. It emphasis on Neutral grounding for overall protection.

UNIT I

RELAYS

Electromagnetic Relays - Basic Requirements of Relays – Primary and Backup Protection - Construction Details of – Attracted Armature, Balanced Beam, Inductor Type and Differential Relays – Universal Torque Equation – Characteristics of Over Current, Direction and Distance Relays. Static Relays – Advantages and Disadvantages – Definite Time, Inverse and IDMT Static Relays – Comparators – Amplitude and Phase Comparators. Microprocessor Based Relays – Advantages and Disadvantages – Block Diagram for Over Current (Definite, Inverse and IDMT) and Distance Relays and Their Flow Charts.

UNIT II

PROTECTION OF GENERATORS & TRANSFORMERS

Protection of Generators Against Stator Faults, Rotor Faults, and Abnormal Conditions. Restricted Earth Fault and Inter-Turn Fault Protection. Numerical Problems On percentage Winding Unprotected. Protection of Transformers: Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buchholtz Relay Protection, Numerical Problems.

UNIT III

PROTECTION OF FEEDERS & LINES

Protection of Feeder (Radial & Ring Main) Using Over Current Relays. Protection of Transmission Line – 3 Zone Protection Using Distance Relays. Carrier Current Protection. Protection of Bus Bars.

UNIT IV

CIRCUIT BREAKERS

Circuit Breakers: Elementary Principles of Arc Interruption, Recovery, Restriking Voltage and Recovery Voltages.- Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB Ratings and Specifications: Types and Numerical Problems. – Auto Reclosures. Description and Operation of Following Types of Circuit Breakers: Minimum Oil Circuit Breakers, Air Blast Circuit Breakers, Vacuum and SF6 Circuit Breakers.

UNIT V

OVER VOLTAGES IN POWER SYSTEMS

Generation of Over Voltages in Power Systems.-Protection Against Lightning Over Voltages - Valve Type and Zinc-Oxide Lighting Arresters - Insulation Coordination –BIL.

Text Books:

1. *Power System Protection and Switchgear by Badri Ram, D.N Viswakarma, TMH Publications, 2011.*
2. *Switchgear and Protection – by Sunil S Rao, Khanna Publishers, 1992.*
3. *Electrical Power Systems – by C.L.Wadhwa, New Age international (P) Limited, Publishers, 2012.*

Reference Books:

1. *Transmission network Protection by Y.G. Paithankar ,Taylor and Francis,2009.*
2. *Power system protection and switch gear by Bhuvanesh Oza, TMH, 2010.*
3. *Electrical power System Protection by C. Christopoulos and A. Wright, 2nd Edition, Springer International Edition, 1999.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III - II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A04601) MICROPROCESSORS AND MICROCONTROLLERS

Course Objective:

- *To understand the architecture of 8086 MICROPROCESSOR.*
- *To learn various 8086 Instruction set and Assembler Directives.*
- *To become skilled in 8086 Assembly Language programming.*
- *To understand programmable peripheral devices and their Interfacing.*
- *To understand and learn 8051 microcontroller.*
- *To learn 8051 Assembly Language programming*

Learning Outcome:

- *Becomes skilled in various 8086 Instruction set and Assembler Directives*
- *Able to write8086 Assembly Language programs.*
- *Able to understand programmable peripheral devices and their Interfacing.*
- *Able to write 8051 assembly Language programs.*

UNIT I
8085 ARCHITECTURE
Introduction-8085 Architecture-Block Diagram, Flag Register, Pin Diagram, Timing and Control Signals, System Timing Diagram, Instruction Set of 8085- Instruction & Data Formats- Addressing Modes-Instructions.

UNIT II
8086 ARCHITECTURE
8086 Overview-Internal Architecture- Register Organization, Memory Segmentation, Flag Register, Pin Configuration, Physical Memory Organization, General Bus Operation- Minimum and Maximum Mode Signals, Timing Diagrams - Interrupts Of 8086.

UNIT III
INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING OF 8086
Instruction Formats -Addressing Modes-Instruction Set, Assembler Directives-Macros, Programs Involving Logical, Branch Instructions – Sorting and Evaluating Arithmetic Expressions - String Manipulations-Simple ALPs.

UNIT IV
INTERFACING DEVICES
8255 PPI- Block Diagram, Various Modes of Operation-Programmable Interval Timer 8254-Architecture,Operating Modes – Key Board/Display Controller 8279- Architecture, Modes of Operation, Command Words and Key Code and Status Data Formats-Programmable Communication Interface8251 USART-Architecture, Description Of Operating Modes-DMA Controller 8257- Internal Architecture and Signal Description .

UNIT V

INTRODUCTION TO MICRO CONTROLLERS 8051

Introduction, Architecture, Registers, Pin Description, Connections, I/O Ports, Memory Organization, Addressing Modes, Instruction Set, Architectural features of Intels 16 bit Micro Controller.

Text Books:

1. *A.K.Ray and Bhurchandi, "Advanced Microprocessors and Peripherals", 2nd Edition, TMH Publications.*
2. *Ajay V. Deshmukh, "Microcontrollers, Theory and applications", Tata McGraw-Hill Companies – 2005*

Reference Books:

1. *Douglas V.Hall, "Microprocessors and Interfacing", 2nd Revised Edition, TMH Publications.*
2. *Liu & Gibson, "Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design", 2nd ed., PHI*
3. *Kenneth j.Ayala, Thomson, "The 8051 Microcontrollers", Asia Pte.Ltd*
4. *Krishna Kant, "Microprocessors and Microcontrollers", PHI Publishers*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III - II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02603) POWER SYSTEM OPERATION AND CONTROL

Course Objective:

This subject deals with Economic operation of Power Systems, Hydrothermal Scheduling and Modeling of Turbines, Generators and Automatic Controllers. It Emphasizes on Single Area and Two Area Load Frequency Control and Reactive Power Control.

UNIT I

ECONOMIC OPERATION

Optimal Operation of Thermal Power Units, - Heat Rate Curve – Cost Curve – Incremental Fuel and Production Costs, Input-Output Characteristics, Optimum Generation Allocation with Line Losses Neglected. Optimum Generation Allocation Including the Effect of Transmission Line Losses – Loss Coefficients, General Transmission Line Loss Formula.

UNIT II

HYDROTHERMAL SCHEDULING

Optimal Scheduling of Hydrothermal System: Hydroelectric Power Plant Models, Scheduling Problems-Short Term Hydrothermal Scheduling Problem. Modeling of Turbine: First Order Turbine Model, Block Diagram Representation of Steam Turbines and Approximate Linear Models. Modeling of Governor: Mathematical Modeling of Speed Governing System – Derivation of Small Signal Transfer Function – Block Diagram.

UNIT III

LOAD FREQUENCY CONTROL

Necessity of Keeping Frequency Constant. Definitions of Control Area – Single Area Control – Block Diagram Representation of an Isolated Power System – Steady State Analysis – Dynamic Response – Uncontrolled Case. Load Frequency Control of 2-Area System – Uncontrolled Case and Controlled Case, Tie-Line Bias Control. Proportional Plus Integral Control of Single Area and Its Block Diagram Representation, Steady State Response – Load Frequency Control and Economic Dispatch Control.

UNIT IV

REACTIVE POWER CONTROL

Overview of Reactive Power Control – Reactive Power Compensation in Transmission Systems – Advantages and Disadvantages of Different Types of Compensating Equipment for Transmission Systems; Load Compensation – Specifications of Load Compensator, Uncompensated and Compensated Transmission Lines: Shunt and Series Compensation.

UNIT V

POWER SYSTEM OPERATION IN COMPETITIVE ENVIRONMENT

Introduction – Restructuring models – Independent System Operator (ISO) – Power Exchange -
Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of Inter zonal/Intra zonal Congestion - Electricity Price Volatility Electricity Price Indexes – Challenges to Electricity Pricing – Construction of Forward Price Curves – Short-time Price Forecasting

Text Books:

1. *Power System Analysis Operation and Control – A. Chakravarthy and S. Halder, 3rd Edition, PHI, 2012.*

2. *Modern Power System Analysis – by I.J.Nagrath & D.P.Kothari Tata McGraw – Hill Publishing Company Ltd, 2nd edition, 2003.*
3. *An Introduction to: Reactive Power Control and Voltage Stability in Power Transmission Systems by Abhijit Chakrabarti, D. P. Kothari, A. K. Mukhopadhyay and Abhinandan De, Eastern Economy Edition, 2010.*

Reference Books:

1. *Power System Analysis and Design by J.Duncan Glover and M.S.Sharma., THOMSON, 3rd Edition, 2008.*
2. *Electric Power Systems by S. A. Nasar, Schaum's Outline Series, Revised 1st Edition, TMH, 2005.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III-II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02604) POWER SYSTEM ANALYSIS

Course Objective:

This course introduces formation of Y bus and Z bus of a Power System, Power flow studies by various methods. It also deals with short circuit analysis and analysis of power system for steady state and transient stability.

UNIT I

POWER SYSTEM NETWORK MATRICES

Representation of Power System Elements, Essential Characteristics of a Good Algorithm, Steps Involved in Solving a Problem Using Digital Computer - Graph Theory: Definitions, Bus Incidence Matrix, Y_{bus} Formation by Direct and Singular Transformation Methods, Numerical Problems. Formation of Z_{Bus}: Partial Network, Algorithm for the Modification of Z_{Bus} Matrix for Addition Element for the Following Cases: Addition of Element from a New Bus to Reference, Addition of Element from a New Bus to an Old Bus, Addition of Element Between an Old Bus to Reference and Addition of Element Between Two Old Busses (Derivations and Numerical Problems).- Modification of Z_{Bus} for the Changes in Network (Problems)

UNIT II

POWER FLOW STUDIES-I

Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static Load Flow Equations – Load Flow Solutions using Gauss Seidel Method: Acceleration Factor, Load Flow Solution with and without P-V Buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and Finding Line Flows/Losses for the given Bus Voltages.

UNIT III

POWER FLOW STUDIES-II

Newton Raphson Method in Rectangular and Polar Co-Ordinates Form: Load Flow Solution with or without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Different Methods – DC Load Flow

UNIT IV

SHORT CIRCUIT ANALYSIS

Per-Unit System of Representation. Per-Unit Equivalent Reactance Network of a Three Phase Power System, Numerical Problems. Symmetrical Fault Analysis: Short Circuit Current and MVA Calculations, Fault Levels, Application of Series Reactors, Numerical Problems. Symmetrical Component Theory: Symmetrical Component Transformation, Positive, Negative and Zero Sequence Components: Voltages, Currents and Impedances. Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems. Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without Fault Impedance, Numerical Problems.

UNIT V

POWER SYSTEM STABILITY ANALYSIS

Elementary Concepts of Steady State, Dynamic and Transient Stabilities. Description of: Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability and Methods to Improve Steady State Stability. Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area

Criterion, Critical Clearing Angle Calculation. Solution of Swing Equation by 4th Order Range – Kutta Method (up to 2 iterations) - Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

Text Books:

1. *Power Systems Analysis, by Grainger and Stevenson, Tata Mc Graw-hill Edition, 2005.*
2. *Modern Power system Analysis – by I.J.Nagrath & D.P.Kothari: Tata McGraw-Hill Publishing Company, 2nd edition, 2003.*

Reference Books:

1. *Computer Techniques in Power System Analysis by M A Pai, Second Edition, TMH, 2005.*
2. *Computer Techniques and Models in Power Systems by K. Uma Rao, I. K. International, 2007.*
3. *Electric Power Systems by S. A. Nasar, Schaum's Outline Series, Revised 1st Edition, TMH, 1997.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III-II Sem.	**L**	**C**
	3	**2**

(13A02605) POWER SYSTEMS AND SIMULATION LAB

1. Determination of Sequence Impedances of Cylindrical Rotor Synchronous Machine.
2. Fault Analysis – I
   LG Fault
   LL Fault
3. Fault Analysis – II
   LLG Fault
   LLLG Fault
4. Characteristics of Over Current Relay
5. Characteristics of Percentage Biased Differential Relay.
6. Gauss-Seidel load flow analysis using MATLAB
7. Newton Raphson method using MATLAB minimum of 6 bus system
8. Fast decoupled load flow analysis using MATLAB
9. Develop a Simulink model for a single area load frequency problem and Simulate the same.
10. Develop a PID controller for two-area power system and simulate the same.
11. Analysis of short circuit studies by using MiPower

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III-II Sem. **L** **C**

3 **2**

(13A02606) ELECTRICAL MEASUREMENTS LAB

The following experiments are required to be conducted as compulsory experiments:

1. Calibration and Testing of Single Phase Energy Meter
2. Calibration of Dynamometer Power Factor Meter
3. Crompton D.C. Potentiometer – Calibration of PMMC Ammeter and PMMC Voltmeter
4. Kelvin's Double Bridge – Measurement of Resistance – Determination of Tolerance.
5. Measurement of % Ratio Error and Phase Angle of Given C.T. by Comparison.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3 Phase Reactive Power with Single-Phase Wattmeter.
8. Measurement of Parameters of a Choke Coil Using 3 Voltmeter and 3 Ammeter Methods.

In addition to the above eight experiments, atleast any two of the experiments from the following list are required to be conducted:

9. Optical Bench – Determination of Polar Curve Measurement of MHCP of Filament Lamps
10. Calibration LPF Wattmeter – by Phantom Testing
11. Measurement of 3 Phase Power with Two Watt Meter Method (Balanced & Un balanced).
12. Dielectric Oil Testing Using H.T. Testing Kit
13. LVDT and Capacitance Pickup – Characteristics and Calibration
14. Resistance Strain Gauge – Strain Measurements and Calibration
15. Transformer Turns Ratio Measurement Using A.C. Bridge.
16. A.C. Potentiometer – Calibration of AC Voltmeter, Parameters of Choke

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III - II Sem.

(13A52502) ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB
(Audit Course)

Introduction:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- *Gathering ideas and information to organise ideas relevantly and coherently.*
- *Engaging in debates.*
- *Participating in group discussions.*
- *Facing interviews.*
- *Writing project/research reports/technical reports.*
- *Making oral presentations.*
- *Writing formal letters.*
- *Transferring information from non-verbal to verbal texts and vice-versa.*
- *Taking part in social and professional communication.*

Course Objective:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- *To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.*
- *Further, they would be required to communicate their ideas relevantly and coherently in writing.*
- *To prepare all the students for their placements.*

Learning Outcome:

- *Accomplishment of sound vocabulary and its proper use contextually*
- *Flair in Writing and felicity in written expression.*
- *Enhanced job prospects.*
- *Effective Speaking Abilities*

The following course content to conduct the activities is prescribed for the Advanced English Language Communication Skills (AELCS) Lab:

UNIT I

COMMUNICATIVE COMPETENCY

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary for competitive purpose
4. Spotting errors

UNIT II

TECHNICAL WRITING

1. Report writing
2. Curriculum vitae
3. Covering letter
4. E-mail writing

UNIT III

PRESENTATIONAL SKILLS

1. Oral presentation
2. Power point presentation
3. Poster presentation
4. Stage dynamics

UNIT IV

CORPORATE SKILLS

1. Dress code
2. Telephonic skills
3. Net Etiquettes

UNIT V

GETTING READY FOR JOB

1. Group discussions
2. Interview skills
3. Psychometric tests

Minimum Requirement:

The Advanced English Language Communication Skills (AELCS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:

- *Spacious room with appropriate acoustics.*
- *Round Tables with movable chairs*
- *Audio-visual aids*
- *LCD Projector*
- *Public Address system*
- *P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ*
- *T. V, a digital stereo & Camcorder*
- *Headphones of High quality*

Suggested Software:

The software consisting of the prescribed topics elaborated above should be procured and used.

K-VAN SOLUTIONS-Advanced communication lab

1. *DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.*
2. *TOEFL & GRE(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)*
3. *Train2success.com*

References:

1. *Objective English For Competitive Exams, Hari Mohana Prasad, 4th edition, Tata Mc Graw Hill.*
2. *Technical Communication by Meenakshi Raman & Sangeeta Sharma, O U Press 2009.*
3. *Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron's/DELTA/Cambridge University Press.2012.*
4. *Soft Skills for Everyone, Butterfield Jeff, Cengage Publications, 2011.*
5. *Practice Psychometric Tests: How to familiarize yourself with genuine recruitment tests, 2012.*
6. *Management Shapers Series by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.*
7. *Handbook for Technical Writing by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.*
8. *English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.*
9. *Word Power Made Handy, Shalini Verma, S Chand Publications, 2011.*
10. *Effective Technical Communication, Ashrif Rizvi, TataMcGrahill, 2011.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. IV-I Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02701) ELECTRICAL DISTRIBUTION SYSTEMS

Course Objective:

This course mainly focuses the distribution end of the power system in which the characteristics of load, classification of distribution systems, substations, protection of the distribution systems are introduced.

UNIT I

LOAD MODELING AND CHARACTERISTICS

Introduction to Distribution Systems, Load Modeling and Characteristics. Coincidence Factor, Contribution Factor Loss Factor - Relationship between the Load Factor and Loss Factor. Classification of Loads (Residential, Commercial, Agricultural and Industrial) and Their Characteristics.

UNIT II

CLASSIFICATION OF DISTRIBUTION SYSTEMS

Classification of Distribution Systems - Comparison of DC Vs AC and Under-Ground Vs Over - Head Distribution Systems- Requirements and Design Features of Distribution Systems

Design Considerations of Distribution Feeders: Radial and Loop Types of Primary Feeders, Voltage Levels, Feeder Loading, Basic Design Practice of the Secondary Distribution System.

Voltage Drop Calculations (Numerical Problems) In A.C. Distributors for The Following Cases: Power Factors Referred to Receiving End Voltage and With Respect to Respective Load Voltages.

UNIT III

SUBSTATIONS

Location of Substations: Rating of Distribution Substation, Service Area within Primary Feeders. Benefits Derived Through Optimal Location of Substations.

Classification of Substations: Air Insulated Substations - Indoor & Outdoor Substations: Substations Layout Showing the Location of All the Substation Equipment.

Bus Bar Arrangements in the Sub-Stations: Simple Arrangements Like Single Bus Bar, Sectionalized Single Bus Bar, Main and Transfer Bus Bar Double Breaker – One and Half Breaker System With Relevant Diagrams.

UNIT IV

POWER FACTOR IMPROVEMENT

Voltage Drop and Power-Loss Calculations: Derivation for Voltage Drop and Power Loss in Lines, Manual Methods of Solution for Radial Networks, Three Phase Balanced Primary Lines.

Causes of Low P.F -Methods of Improving P.F -Phase Advancing and Generation of Reactive KVAR Using Static Capacitors-Most Economical P.F. for Constant KW Load and Constant KVA Type Loads, Numerical Problems.

Capacitive Compensation for Power-Factor Control - Effect of Shunt Capacitors (Fixed and Switched), Power Factor Correction- Economic Justification - Procedure to Determine the Best Capacitor Location.

UNIT V

DISTRIBUTION AUTOMATION

Distribution Automation (DA) – Project Planning – Definitions – Communication – Sensors –

Supervisory Control and Data Acquisition (SCADA) – Consumer Information Service (CIS) – Geographical Information System (GIS) – Automatic Meter Reading (AMR) – Automation Systems.

Text Books:

1. *"Electric Power Distribution System, Engineering" – by Turan Gonen, Mc Graw-hill Book Company, 1986.*
2. *Electric Power Distribution – by A.S. Pabla, Tata Mc Graw-hill Publishing Company, 4th edition, 1997.*

Reference Books:

1. *Electric Power Distribution Automation by Dr. M. K. Khedkar and Dr. G. M. Dhole, University Science Press, 2010.*
2. *Electrical Power Distribution Systems by V. Kamaraju, Jain Book Depot. 2012.*
3. *Electrical Power Systems for Industrial Plants by Kamalesh Das, JAICO Publishing House, 2008.*
4. *Hand Book of Electric Power Distribution by G. Ramamurthy, 2nd Edition, Universities Press, 2009.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. IV- I Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02702)DIGITAL SIGNAL PROCESSING

Course Objective:

This course introduces the basic concepts of Signal Processing, Fourier Transformation, Laplace and Z-Transforms, Digital Filter Design and realization.

UNIT I

INTRODUCTION TO DIGITAL SIGNAL PROCESSING

Discrete Time Signals and Sequences, Linear Shift Invariant Systems, Stability and Causality, Linear Constant Coefficient Difference Equations. Frequency Domain Representation of Discrete Time Signals and Systems.

UNIT II

DISCRETE FOURIER SERIES AND FAST FOURIER TRANSFORMS

Properties of Discrete Fourier Series, DFS Representation of Periodic Sequences, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences Using DFT, Computation of DFT. Relation between Z-Transform and DFS, Fast Fourier Transforms (FFT)-Radix2 Decimation in Time and Decimation in Frequency FFT Algorithms, Inverse FFT and FFT for Composite N.

UNIT III

REALIZATION OF DIGITAL FILTERS

Review of Z-Transforms, Applications of Z-Transforms, Solution of Difference Equations of Digital Filters, Block Diagram Representation of Linear Constant-Coefficient Difference Equations, Basic Structures of IIR Systems, Transposed Forms, Basic Structures of FIR Systems, System Function.

UNIT IV

IIR AND FIR DIGITAL FILTERS

Analog Filter Approximations-Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Design Examples: Analog-Digital Transformations, Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Digital Filters Using Window Techniques, Frequency Sampling Technique, Comparison of IIR and FIR Filters, Illustrative Problems

UNIT V

MULTIRATE DIGITAL SIGNAL PROCESSING

Basic Sample Rate Alteration Devices, Multirate Structures for Sampling Rate Converters, Multistage Design of Decimator and Interpolator, Polyphase Decomposition, Nyquist Filters. Spectral Analysis of Nonstationary Signals, Musical Sound Processing, Signal Compression, Transmultiplexers, Discrete Multitone Transmission of Digital Data.

Text Books:

1. *Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 2007.*
2. *Digital signal processing , A computer base approach- Sanjit K Mitra, Tata McGraw Hill, 3rd edition, 2009.*

Reference Books*:*

1. *Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.*
2. *A Text book on Digital Signal processing – R S Kaler, M Kulkarni, Umesh Gupta, I K International Publishing House Pvt. Ltd., 2009.*
3. *Digital signal processing: M H Hayes, Schaum's outlines, TATA Mc-Graw Hill, 2007.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. IV - I Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02703) HVDC TRANSMISSION

Course Objective:

This subject gives the fundamental concepts of High Voltage Direct current. It mainly concentrates on converter configuration and analysis for the application of high voltage transmission system.

UNIT I

INTRODUCTION TO HVDC TRANSMISSION

HVDC Transmission: Technical And Economical Comparision of HVAC ond HVDC Transmission, Types of DC Links,Power Handling Capabilities of HVDC Lines, Basic Conversion Principles, Static Converter Configuration.

UNIT II

STATIC POWER CONVERTER ANALYSIS

Static Power Converters: 3 Pulse, 6 Pulse & 12 Pulse Converters, Converter Station and Terminal Equipment Commutation Process, Rectifier and Inverter Operation, Equivalent Circuit for Rectifier,Inverter and HVDC Link- Special Features of Converters.

UNIT III

CONTROL OF HVDC CONVERTER SYSTEMS

Control of HVDC Converter Systems: Principle of DC Link Control – Constant Current, Constant Extinction Angle and Constant Ignition Angle Control and Voltage Dependent Current Control.Individual Phase Control and Equidistant Firing Angle Control

UNIT IV

HARMONICS AND FILTERS

Origin of Harmonics in HVDC Systems, Classification of Harmonics, Harmonics Elimination, Suppression Methods, Harmonic Instability Problems, Design of HVDC AC & DC Filters etc.

UNIT V

TRANSIENTS, FAULTS AND PROTECTION OF HVDC SYSTEMS

Origin of over Voltages in HVDC Systems, Over Voltages due to DC and AC Side Line Faults - Converter Faults, Over Current Protection- Valve Group and DC Line Protection. Over Voltage Protection of Converters, Surge Arresters etc.

Text Books:

1. K.R.Padiyar, High Voltage Direct current Transmission, Wiley Eastern Ltd, 1993.
2. S.kamaksaiah, V.Kamaraju Mc Graw hill company ,2011.

Reference Books:

1. E.Uhlamann, Power Transmission by Direct Current Springer-Verlag, Berlin, 1975.
2. S Rao, EHVAC, HVDC Transmission & Distribution Engineering, Khanna Publishers, 2001.

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B.Tech. IV- I Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02704) FLEXIBLE AC TRANSMISSION SYSTEMS

Course Objective:

This subject gives the fundamental concepts of FACTS Devices. It mainly concentrates on reactive Power Compensation by Using Different Types of FACTS Controllers.

UNIT I

CONCEPTS OF FLEXIBLE AC TRANSMISSION SYSTEMS

Transmission line Interconnections, Power flow in parallel lines, Mesh systems, Stability considerations, Relative importance of controllable parameters, Basic types of FACTS controllers, Shunt controllers, Series controllers, Combined shunt and series controllers, Benefits of FACTS.

UNIT II

VOLTAGE AND CURRENT SOURCED CONVERTERS

Concept of Voltage Sourced Converters, Single Phase Full Wave Bridge Converter, Three Phase Full Wave Bridge Converter, Transformer Connections for 12-Pulse Operation, 24 and 48-Pulse Operation, Three Level Voltage Sourced Converter, Pulse Width Modulation (PWM) Converter, Converter Rating, Concept of Current Sourced Converters, Thyristor based converters, Current Sourced Converter with Turn off Devices, Current Sourced –Vs- Voltage Sourced Converters.

UNIT III

STATIC SHUNT COMPENSATORS

Objectives of Shunt Compensation, Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, Improvement of Transient Stability, Power Oscillation Damping, Methods of Controllable VAR Generation, Variable Impedance Type Static Var Generators, Switching Converter Type VAR Generators, Hybrid Var Generators, SVC and STATCOM, Transient Stability Enhancement and Power Oscillation Damping, Comparison Between STATCOM and SVC, V-I, V-Q Characteristics, Response Time.

UNIT IV

STATIC SERIES COMPENSATORS

Objectives of Series Compensation, Voltage Stability, Improvement of Transient Stability, Power Oscillation Damping, Subsynchronous Oscillation Damping, Variable Impedance Type Series Compensators, GTO Thyristor Controlled Type Series Capacitor (GCSC), Thyristor Switched Series Capacitor (TSSC), Thyristor-Controlled Series Capacitor(TCSC), Basic Operating Control Schemes for GCSC, TSSC, and TCSC, Switching Converter Type Series Compensators, The Static Synchronous Series Capacitor(SSSC), Transmitted Power Versus Transmission Angle Characteristic, Control Range and VA Rating, Capability to Provide Real Power Compensation.

UNIT V

POWER FLOW CONTROLLERS

The Unified Power Flow Controller-Basic Operating Principles, Conventional Transmission Control Capabilities, Independent Real and Reactive Power Flow Control. Control Structure, Basic Control System for P and Q Control, Dynamic Performance, The Interline Power Flow Controller (IPFC), Basic Operating Principles and Characteristics, Generalized and Multifunctional FACTS Controllers.

Text Books:

1. *Concepts and Technology of Flexible AC Transmission Systems - Understanding FACTS: Narain G. Hingorani, Laszlo Gyugyi - Standard Publishers Distributors - IEEE Press – First Edition – 2001.*

Reference Books:

1. *Thyristor-Based FACTS Controllers for Electrical Transmission Systems, IEEE Press Series on Power Engineering, R. Mohan Mathur, Rajiv K. Varma, 2002.*
2. *Flexible AC Transmission Systems, Yong Hua Song, Allan T Johns, Published by The Institute of Electrical Engineers, 1999, London, UK.*

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B.Tech. IV - I Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02705) INSTRUMENTATION
(Elective –II)

Course Objective:
Instrumentation is essential in monitoring and analysis of any Physical system and its control. This course deals with different types of transducers, digital voltmeters, oscilloscopes and measurement of non electrical quantities.

UNIT I
CHARACTERISTICS OF SIGNALS AND THEIR REPRESENTATION
Measuring Systems, Performance Characteristics - Static Characteristics, Dynamic Characteristics; Errors in Measurements – Gross Errors, Systematic Errors, Statistical Analysis of Random Errors. Signals and Their Representation: Standard Test, Periodic, Aperiodic, Modulated Signal, Sampled Data, Pulse Modulation and Pulse Code Modulation.

UNIT II
DATA TRANSMISSION , TELEMETRY AND DAS
Methods of Data Transmission – General Telemetry System . Frequency Modulation System (FM), Pulse Modulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Telemetry. Comparison of FM, PM, PAM and PCM. Analog and Digital Acquisition Systems – Components of Analog DAS – Types of Multiplexing Systems: Time Division and Frequency Division Multiplexing – Digital DAS – Block Diagram — Modern Digital DAS (Block Diagram)

UNIT III
SIGNAL ANALYZERS
Wave Analysers- Frequency Selective Analyzers, Heterodyne, Application of Wave Analyzers- Harmonic Analyzers, Total Harmonic Distortion, Spectrum Analyzers, Basic Spectrum Analyzers, Spectral Displays, Vector Impedance Meter, Q Meter. Peak Reading and RMS Voltmeters Digital Voltmeter-Successive Approximation, Ramp and Integrating Type-Digital Frequency Meter-Digital Multimeter-Digital Tachometer

UNIT IV
TRANSDUCERS
Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle Operation of Resistive, Inductive, and Capacitive Transducers; LVDT and its Applications, Strain Gauge and Its Principle of Operation, Guage Factor, Thermistors, Thermocouples, Synchros, Piezo Electric Transducers, Photovoltaic, Photo Conductive Cells, Photo Diodes.

UNIT V
MEASUREMENT OF NON-ELECTRICAL QUANTITIES
Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Flow, Liquid level.

Text Books:
1. *Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India, 2004.*
2. *A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpat Rai & Co., 2012.*

Reference Books:

1. Electronic Instrumentation-by H.S.Kalsi Tata MCGraw-Hill Edition, 3/e., 2010.
2. Modern Electronic Instrumentation and Measurement techniques – by A.D Helfrick and W.D.Cooper, Pearson/Prentice Hall of India., 1990.
3. Industrial Instrumentation – Principles and Design by T. R. Padmanabhan, Springer, 3rd reprint, 2009.

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B.Tech. IV- I Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02706) DESIGN OF ELECTRICAL SYSTEMS
(Elective – II)

Course Objective:

This course introduces the procedure for basic design of electrical installations for domestic and industrial applications. And also it concentrate on power system earthing for the protection of electrical devices which are generally used for domestic and industries.This will enable the procedure to maintain the protective system. It also learns the power quality issues and power factor improvement for domestic and industrial applications.

UNIT I

DESIGN ASPECTS & ELECTRICAL INSTALLATIONS IN DOMESTIC BUILDINGS

Role of Statutes in Electrical System Design, Classification of Building Services, Design Aspects of Lighting, Design Aspects of Ventilation, Design Aspects of Climate Control, Design Aspects of Vertical Transportation, Design Aspects of Minor Building Services- Classification, Estimation of Load Requirements, Selection of Type of Wiring, Special Features Applicable for High-Rise Apartment Buildings, Pre-commissioning Tests.

UNIT II

INDUSTRIAL INSTALLATIONS

Classification of Industrial Installation, General Characteristics, Selection of Distribution Architecture, Selection of Transformers and Sub Stations -Short Circuit Studies, Fault Current Calculations, Earthing Design, Selection of Switch Gears: Electrical Protection, Protection of Circuit Elements, Persons & Life stack, Equipment, Electrical Isolation, Switch Gear Control, Switching Devices, Uses, Selective Co-ordination, Circuit Breakers and Their Selection

UNIT III

POWER SYSTEM EARTHING

Introduction, Earthing, Types of System Earthing, Reasons for Grounding/ Earthing, TN System, TT System, IT System, Protective Measures and Protective Devices in IT System, Main Characteristics of Earthing Systems, Selection Criteria for Earthing, Design Considerations of Earting, Measurement of Earth Resistance, Earth Leakage Protection, Neutral Earthing for Generators and Transformers.

UNIT IV

LIGITINING PROTECTION SYSTEMS DESIGN

Introduction to Protection Methods and Risks- Risk Management-Lightening Protection Zones-Design Process-Material Requirement-Design Methods-Rolling Sphere-Mesh Method-Protection Angle Method-Air Terminations-Down Conductors

UNIT V

ENERGY ECONOMICS IN SYSTEM DESIGN

Introduction, Time Value of Money, Single Payment Compound Amount Model (SPCA), Uniform Series Compound Amount Model (USCA), Uniform Series Present Worth Model (USPW), Depreciation, Tax Considerations, After Tax Analysis.

Text Books:

1. *Electrical Systems Design – by M. K. Giridharan, I. K. International Publishing House Pvt. Ltd., 2011.*
2. *Design of Electrical Installations – by Er. V. K. Jain and Er. Amitabh Bajaj, University Science Press.*
3. *Lightening protection Hand book –ERITECH:*
   URL: igs.nigc.ir/STANDS/Book/LIGHTINING-ERITECH.pdf

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B.Tech. IV-I Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A04712) COMMUNICATION SYSTEMS
(Elective – II)

Course Objective:

This subject introduce different methods of analog communication and their significance, Digital Communication methods for high bit rate transmission, concepts of source and line coding techniques for enhancing rating of transmission of minimizing the errors in transmission, MAC used in communication systems for enhancing the number of users and various media for digital communication.

UNIT I

ANALOG COMMUNICATION

AM – Frequency spectrum – vector representation – power relations – generation of AM – DSB, DSB/SC, SSB, VSB AM Transmitter & Receiver; FM and PM – frequency spectrum – power relations : NBFM & WBFM, Generation of FM and DM, Amstrong method & Reactance modulations : FM & PM frequency.

UNIT II

DIGITAL COMMUNICATION

Pulse modulations – concepts of sampling and sampling theorems, PAM, PWM, PPM, PTM, quantization and coding: DCM, DM, slope overload error. ADM, DPCM, OOK systems – ASK, FSK, PSK, BSK, QPSK, QAM, MSK, GMSK, applications of Data communication.

UNIT III

SOURCE CODES, LINE CODES & ERROR CONTROL (Qualitative only)

Primary communication – entropy, properties, BSC, BEC, source coding: Shaum, Fao, Huffman coding: noiseless coding theorem, BW – SNR trade off codes: NRZ, RZ, AMI, HDBP, ABQ, MBnB codes: Efficiency of transmissions, error control codes and applications: convolutions & block codes.

UNIT IV

MULTIPLE ACCESS TECHNIQUES

SS&MA techniques: FDMA, TDMA, CDMA, SDMA application in wire and wireless communication: Advantages (merits).

UNIT V

SATELLITE, OPTICAL FIBER – POWERLINE, SCADA

Orbits: types of satellites: frequency used link establishment, MA techniques used in satellite communication, earth station; aperture actuators used in satellite – Intelsat and Insat: fibers – types: sources, detectors used, digital filters, optical link: power line carrier communications: SCADA

Text Books:

1. Taub & Schiling "Principles of communication systems" Tata McGraw hill 2007
2. J.Das "Principles of digital communication" New Age International, 1986

Reference Books:

1. Kennedy and Davis "Electronic communication systems" Tata McGraw hill, 4th edition, 1993.
2. Sklar "Digital communication fundamentals and applications"Pearson Education, 2001.
3. Bary le, Memuschmidt, digital Communication, Kluwer Publication, 2004.
4. B.P.Lathi "Modern digital and analog communication systems" Oxford University Press, 1998.

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B.Tech. IV-I Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02707) AI APPLICATIONS TO ELECTRICAL SYSTEMS
(Elective-II)

Course Objective:

This course deals with various Artificial Intelligent Techniques, i.e., Artificial Neural Networks, Fuzzy Logic and its basic concepts. It also deals with role of ANN and Fuzzy Logic in various Electrical Engineering Applications.

UNIT I
INTRODUCTION TO ARTIFICIAL INTILLEGENCE

Introduction and motivation – Approaches to AI – Architectures of AI – Symbolic Reasoning System – Rule based Systems – Knowledge Representation – Expert Systems.

UNIT II
ARTIFICIAL NEURAL NETWORKS

Basics of ANN - Comparison between Artificial and Biological Neural Networks – Basic Building Blocks of ANN – Artificial Neural Network Terminologies – McCulloch Pitts Neuron Model – Learning Rules – ADALINE and MADALINE Models – Perceptron Networks – Back Propagation Neural Networks – Associative Memories.

UNIT III
ANN APPLICATIONS TO ELECTRICAL SYSTEMS

ANN approach to: Electrical Load Forecasting Problem – System Identification – Control Systems – Pattern Recognition.

UNIT IV
FUZZY LOGIC

Classical Sets – Fuzzy Sets – Fuzzy Properties and Operations – Fuzzy Logic System – Fuzzification – Defuzzification – Membership Functions – Fuzzy Rule base – Fuzzy Logic Controller Design.

UNIT V
FUZZY LOGIC APPLICATIONS TO ELECTRICAL SYSTEMS

Fuzzy Logic Implementation for Induction Motor Control – Power System Control – Automatic Generation Control – Switched Reluctance Motor Control – Modelling and Control of DC Drive – Fuzzy Excitation Control Systems in Power System Stability Analysis - Transient Stability Analysis – Automatic Voltage Regulator - Fuzzy Logic Controller in an 18 Bus Bar System.

Text Books:

1. *S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Neural Networks using MATLAB", McGraw Hill Edition, 2006.*
2. *Timothy J. Ross, "Fuzzy Logic with Engineering Applications", Third Edition, WILEY India Edition, 2012.*

Reference Books:

1. *S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer International Edition, 2013.*
2. *Yung C. Shin and Chengying Xu, "Intelligent System – Modeling, Optimization & Control, CRC Press, 2009.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. IV-I Sem. **L** **C**
3 **2**

(13A04605) MICROPROCESSORS & MICROCONTROLLERS LAB

***Course Objective*:**

- To become skilled in 8086 Assembly Language programming.
- To understand programmable peripheral devices and their Interfacing.
- To understand and learn 8051 microcontroller.
- To learn 8051 assembly Language programming

***Learning Outcome*:**

- Able to write 8086 Assembly Language programs.
- Able to understand programmable peripheral devices and their Interfacing.
- Able to write 8051 assembly Language programs.

Minimum **Ten** Experiments to be conducted (**Five** from each section)

I) 8086 Microprocessor Programs using MASM/8086 kit.

1. Introduction to MASM Programming.
2. Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.
3. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Length of the string, String comparison.

Interfacing:

1. 8259 – Interrupt Controller and its interfacing programs
2. 8255 – PPI and its interfacing programs (A /D, D/A, stepper motor,)
3. 7-Segment Display.

II) Microcontroller 8051 Trainer kit

1. Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation.
2. Logic operations – Shift and rotate.
3. Sorting- Ascending and descending order.

Interfacing using 8051 Trainer kit:

1. Key board Interfacing
2. Seven Segment display
3. Switch Interfacing
4. Relay Interfacing
5. UART

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. IV-I Sem. **L** **C**
3 **2**

(13A02708) POWER ELECTRONICS AND SIMULATION LAB

Any Eight of the Experiments in Power Electronics Lab

1. Study of Characteristics of SCR, MOSFET & IGBT
2. Gate Firing Circuits for SCR's
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase Fully Controlled Bridge Converter with R and RL Loads
5. Forced Commutation Circuits (Class A, Class B, Class C, and Class D & Class E)
6. DC Jones Chopper with R And RL Loads
7. Single Phase Parallel, Inverter with R And RL Loads
8. Single Phase Cycloconverter with R and RL Loads
9. Single Phase Half Controlled Converter with R Load
10. Three Phase Half Controlled Bridge Converter with R-Load
11. Single Phase Series Inverter with R And RL Loads
12. Single Phase Bridge Converter with R And RL Loads
13. Single Phase Dual Converter with RL Loads

Any Two Simulation Experiments With PSPICE/PSIM

PSPICE Simulation of Single-Phase Full Converter Using RLE Loads and Single-Phase AC Voltage Controller Using RLE Loads

PSPICE Simulation of Resonant Pulse Commutation Circuit and Buck Chopper

PSPICE Simulation of Single Phase Inverter with PWM Control

References:

1. Simulation of Electric and Electronic circuits using PSPICE – by M.H.Rashid, PHI.
2. PSPICE A/D user's manual – Microsim, USA.
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Books user's manual and – Mathworks, USA.

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B.Tech. IV- II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02801) POWER QUALITY

Course Objective:

This course mainly focuses on the various power quality issues, monitoring and the enhancement of the power quality.

UNIT I

INTRODUCTION

Definition of Power Quality- Power Quality Terminology – Classification of Power Quality Issues-Magnitude Versus Duration Plot - Power Quality Standards - Responsibilities of The Suppliers and Users of Electric Power-CBEMA and ITIC Curves.

UNIT II

TRANSIENTS, SHORT DUARION AND LONG DURATION VARIATIONS

Categories and Characteristics of Electromagnetic Phenomena in Power Systems-Impulsive and Oscillatory Transients-Interruption - Sag-Swell-Sustained Interruption - Under Voltage – Over Voltage– Outage. Sources of Different Power Quality Disturbances- Principles of Regulating the Voltage-Conventional Devices for Voltage Regulation.

UNIT III

FUNDAMENTALS OF HARMONICS & APPLIED HARMONICS

Harmonic Distortion, Voltage Versus Current Distortion, Harmonics Versus Transients, Power System Qualities Under Non Sinusoidal Conditions, Harmonic Indices, Harmonic Sources From Commercial Loads, Harmonic Sources From Industrial Loads. Applied Harmonics**:** Effects Of Harmonics, Harmonic Distortion Evaluations, Principles of Controlling Harmonics, Devices for Controlling Harmonic Distortion.

UNIT IV

POWER QUALITY MONITORING

Power Quality Benchmarking-Monitoring Considerations- Choosing Monitoring Locations- Permanent Power Quality Monitoring Equipment-Historical Perspective of Power Quality Measuring Instruments-Power Quality Measurement Equipment-Types of Instruments- Assessment of Power Quality Measurement Data- Power Quality Monitoring Standards.

UNIT V

POWER QUALITY ENHANCEMENT USING CUSTOM POWER DEVICES

Introduction to Custom Power Devices-Network Reconfiguring Type: Solid State Current Limiter (SSCL) -Solid State Breaker (SSB) -Solid State Transfer Switch (SSTS) - Compensating Type: Dynamic Voltage Restorer (DVR)-Unified Power Quality Conditioner(UPQC)-Principle of Operation Only.

Text Books:

1. *Electrical Power Systems Quality, Roger C. Dugan, Mark F. McGranaghan, Surya Santoso, H.Wayne Beaty, 2nd Edition, TMH Education Pvt. Ltd., 2008.*
2. *Power quality by C. Sankaran, CRC Press, 2002.*

Reference Books:

1. *Understanding Power quality problems by Math H. J. Bollen IEEE Press, 2007.*
2. *Power quality enhancement using custom power devices by Arindam Ghosh,Gerard Ledwich,Kluwer academic publishers, 2002.*

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B.Tech. IV-II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02802) UTILIZATION OF ELECTRICAL ENERGY

Course Objective:

This course deals with the various utilization aspects like illumination, Electrical heating, Welding, Electrolytic Process and Electric Traction.

UNIT I

ILLUMINATION

Definition –Laws of Illumination–Polar Curves – Calculation of MHCP and MSCP. Lamps: Incandescent Lamp, Sodium Vapour Lamp, Fluorescent Lamp. Requirement of Good Lighting Scheme – Types, Design and Calculation of Illumination. Street Lighting and Factory Lighting – Numerical Problems.

UNIT II

ELECTRIC HEATING & WELDING

Electrical Heating: Advantages. Methods of Electric Heating – Resistance, Arc, Induction and Dielectric Heating.

Electric Welding: Types – Resistance, Electric Arc, Gas Welding. Ultrasonic, Welding Electrodes of Various Metals, Defects in Welding.

Electrolysis - Faraday's Laws, Applications of Electrolysis, Power Supply for Electrolysis.

UNIT III

ELECTRIC TRACTION – I

Introduction – Systems of Electric Traction. Comparison Between A. C And D. C Traction – Special Features of Traction Motors - The Locomotive – Wheel arrangement and Riding Qualities – Transmission of Drive – Characteristics and Control of Locomotives and Motor Coaches for Track Electrification – DC Equipment – AC Equipment – Electric Breaking with DC Motors and with AC Motors – Control Gear – Auxiliary Equipment – Track Equipment and Collector Gear – Conductor-Rail Equipment – Overhead Equipment – Calculation of Sags and Tensions – Collector Gear for Overhead Equipment.

UNIT IV

ELECTRIC TRACTION - II

Mechanics of Train Movement. Speed-Time Curves of Different Services – Trapezoidal and Quadrilateral, Speed-Time Curves – Numerical Problems. Calculations of Tractive Effort, Power, Specific Energy Consumption - Effect of Varying Acceleration and Braking Retardation, Adhesive Weight and Coefficient of Adhesion – Problems.

UNIT V

ECONOMIC ASPECTS OF UTILISING ELECTRICAL ENERGY

Power Factor Improvement, Improvement of Load Factor, Off Peak Loads- Use of Exhaust Steam, Waste Heat Stations, Pit Head Generation, Diesel Plant, General Comparison of Private Plant and Public Supply- Initial Cost and Efficiency, Capitalization of Losses, Choice of Voltage, Cost of Renewals.

Text Books:

1. *Utilization of Electric Energy – by E. Openshaw Taylor and V. V. L. Rao, Universities Press., 2009.*
2. *Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Co., 2004.*

Reference Books:

1. *Generation, distribution and utilization of electrical energy by C.L Wadhwa, Wiley Eastern Limited,1993*
2. *"Electrical Power", by S. L. Uppal, Khanna pulishers,1988.*

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B.Tech. IV-II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02803) MODERN CONTROL THEORY
(ELECTIVE – III)

Course Objective:
This subject deals with state space, describing function, phase plane and stability analysis including controllability and observability. It also deals with modern control and optimal control systems.

UNIT I
CONTROLLABILITY AND OBSERVABILITY
Review of State Space Analysis, Tests for Controllability and Observability for Continuous Time Systems – Principle of Duality, Controllability and Observability of State Models in Jordan Canonical Form and Other Canonical Forms. Effect of State Feedback on Controllability and Observability.

UNIT II
ANALYSIS OF NONLINEAR SYSTEMS
Introduction to Nonlinear Systems, Types of Nonlinearities, Concepts of Describing Functions, Derivation of Describing Functions for Dead Zone, Saturation, Backlash, Relay With Dead Zone and Hysteresis - Jump Resonance. Introduction to Phase-Plane Analysis, Method of Isoclines for Constructing Trajectories, Singular Points, Phase-Plane Analysis of Nonlinear Control Systems.

UNIT III
STABILITY ANALYSIS
Stability in the Sense of Lyapunov. Lyapunov's Stability and Lypanov's Instability Theorems. Direct Method of Lypanov for the Linear and Nonlinear Continuous Time Autonomous Systems.

UNIT IV
CONTROLLERS AND OBSERVERS DESIGN
Design of State Feedback Control Through Pole Placement. Full Order Observer and Reduced Order Observer. State Estimation Through Kalman Filters.

UNIT V
OPTIMAL CONTROL
Introduction to Optimal Control, Formulation of Optimal Control Problems, Calculus of Variations, Minimization of Functionals of Single Function, Euler Lagrange Equation, Constrained Minimization, Minimum Principle, Control Variable Inequality Constraints, Control and State Variable Inequality Constraints.

Text Books:
1. *Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996.*
2. *Systems and Control by Stainslaw H. Zak , Oxford Press, 2003.*

Reference Books:
1. *Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998.*
2. *Control Systems Engineering by I.J. Nagrath and M.Gopal, New Age International (P) Ltd. 2007.*
3. *Digital Control and State Variable Methods – by M. Gopal, Tata Mc Graw-Hill Companies, 1997.*

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B.Tech. IV-II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02804) SPECIAL ELECTRO MECHANICAL SYSTEMS
(Elective –III)

Course Objective:
This subject gives an extension of electrical machines which are already learned in the previous courses. It mainly concentrate on constructional details and principle of operation of special machines for various domestic and industrial applications which are widely used in the present days.

UNIT I
SPECIAL TYPES OF D. C. MACHINES
Series Booster – Shunt Booster – Non – Reversible Booster – Reversible Booster- Armature Excited Machines – Rosenberg Generator – The Amplidyne and Metadyne - Rototrol and Regulex– Third Brush Generator – Three – Wire Generator - Dynamometer.

UNIT II
STEPPER MOTORS
Constructional Features – Principle of Operation – Variable Reluctance Motor – Hybrid Motor – Single And Multi Stack Configurations – Torque Equations – Very Slow-Speed Synchronous Motor for Servo Control – Modes of Excitations – Characteristics – Drive Circuits – Microprocessor Control of Stepping Motors – An Open Loop And Closed – Loop Control of Step Motor - Application of Stepping Motors-5– Phase Hybrid Stepping Motor – Single – Phase Stepping Motor, The Construction, Operating

UNIT III
SWITCHED RELUCTANCE MOTORS
Constructional Features – Rotary And Linear SRMs - Principle of Operation – Torque Production – Differences Between SR and Conventional Reluctance Motors - Steady State Performance Prediction-Analytical Method - Design of Stator and Rotor and Pole Arcs in SR Motor, Determination Of $L(\Theta) - \Theta$ Profile – Power Converters and Their Controllers – Methods of Rotor Position Sensing – Sensor Less Operation – Closed Loop Control of SRM - Characteristics

UNIT IV
BRUSHLESS DC MOTOR
Types of Construction – Principle of Operation of BLDM – Sensing and Switching Logic Scheme, Sensing, Logic Controller, Lockout Pulses – Power Converter Circuit – Theoretical Analysis and Performance Prediction, Modeling and Magnet Circuit, D-Q Analysis of BLDM – Transient Analysis – Formulation in Terms of Flux Linkages As State Variables – Approximate Solutions for Current and Torque Under Steady State – Theory of BLDM As Variable Speed Synchronous Motor (Assuming Sinusoidal Flux Distribution) – Methods of Reducing Torque Pulsations, 180^0 Pole Arc and 120^0 Current Sheet.

UNIT V
PERMANENT MAGNET MATERIALS & LINEAR INDUCTION MOTOR
Introduction, Hysteresis Loops and Recoil Line – Stator Frames (Pole – And Yoke – Part) of Conventional PM DC Motors, Equivalent Circuit of a PM – Development of Electronically Commutated DC Motor From Conventional DC Motor . Development of a Double Sided LIM From Rotary Type IM – A Schematic of LIM Drive for Electric Traction – Development of One Sided LIM With Back Iron – Field Analysis of a DSLIM: Fundamental Assumptions.

Text Books:

1. *K. Venkataratnam, Special Electrical Machines, University Press, 2009.*

Reference Books:

1. *R. K. Rajput, Electrical machines, 4th Edition, Laxmi Publications, 2010. [For Chapters I and II refer Chapter VIII of this book]*
2. *V. V. Athani, Stepper Motors: Fundamentals, Applications and Design, New Age International Pub., 1997.*
3. *N. Mohan, Undeland & Robbins, Power Electronics - Converters, Applications & Design, Wiley India, Student Edition., 2002.*
4. *Johan E. Gibson and F. B. Teuter, Control System Components, Mc Graw Hill Edition.*
5. *M. G. Say & E. O. Taylor, D. C. Machines, 2nd Edition, ELBS., 1986.*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. IV-II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02805) POWER SYSTEM DEREGULATION
(Elective – III)

UNIT I
DEREGULATION OF ELECTRIC UTILITIES
Introduction – Traditional central utility model, reform motivations, separation of ownership and operation, competition and direct access in the electricity market, independent system operator (ISO), retail electric providers, different experiences.

UNIT II
COMPETITIVE WHOLESALE ELECTRICITY MARKETS & TRANSMISSION OPEN ACCESS
Introduction, ISO, wholesale electricity market characteristics, market model, challenges, trading arrangements, the pool and bilateral trades, multi lateral trades.

UNIT III
TRANSMISSION COST ALLOCATION METHODS
Introduction - Postage Stamp Rate Method - Contract Path Method - MW-Mile Method – Unused Transmission Capacity Method - MVA-Mile method – Comparison of cost allocation methods.

UNIT IV
MARKET POWER & ANCILLARY SERVICES MANAGEMENT
Introduction - Different types of market Power – Mitigation of Market Power – Examples - Introduction – Reactive Power as an Ancillary Service – a Review – Synchronous Generators as Ancillary Service Providers.

UNIT V
AVAILABLE TRANSFER CAPABILITY (ATC)
Transfer Capability Issues – ATC – TTC – TRM – CBM Calculations – Calculation of ATC based on power flow - Introduction – Electricity Price Volatility Electricity Price Indexes – Challenges to Electricity Pricing – Construction of Forward Price Curves – Short-time Price Forecasting.

Text Books:

1. *Power System Restructuring and Deregulation, Loi Lei Lai, John Wiley & Sons Ltd., England, 2001.*

Reference Books:

1. Operation of Restructured Power System, Kankar Bhattacharya, Math H.J. Boller and Jaap E.Daalder Kulwer Academic Publishers, 2001.

2. Restructured Electrical Power Systems, Mohammad Shahidehpour and Muwaffaq alomoush, Marcel Dekker, Inc., 2001.

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B.Tech. IV-II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02806) SWITCH MODE POWER CONVERTERS
(Elective-III)

UNIT I
NON-ISOLATED DC-DC CONVERTERS
Basic Types of Switching Power Supplies – Volt-Sec balance – Non-Isolated Switched-Mode DC-to-DC Converters – Buck Converter – Boost Converter – Buck-Boost Converter – Cuk Converter – SEPIC and Zeta Converters – Comparison of Non-Isolated Switched mode DC-to-DC Converters.

UNIT II
ISOLATED DC-DC CONVERTERS
Need of Transformer Isolations in high frequency Power conversion - Isolated Switched Mode DC-to-DC Converters – Single Switch Isolated DC-to-DC Converters – Forward, Flyback, Push-Pull, Flux Walking Phenomena, Half and Full Bridge Converters – Multi Switch Isolated DC-to-DC Converters – Comparison of Isolated and Non-Isolated Switched Mode DC-to-DC Converters.

UNIT III
RESONANT CONVERTERS
Classification of Resonant converters-Basic resonant circuits- Series resonant circuit-parallel resonant circuits- Resonant switches, Concept of Zero voltage switching, principle of operation, analysis of M-type and L-type Resonant Buck and boost Converters.

UNIT IV
DYNAMIC ANALYSIS OF DC-DC CONVERTERS
Formulation of dynamic equations of buck and boost converters, State-Space Models, Averaged Models, linearization technique, small-signal model and converter transfer functions, Significance of Small Signal Models, Dynamical Characterization.

UNIT V
CONTROLLER DESIGN
Review of frequency-domain analysis of linear time-invariant systems, controller specifications, Proportional (P), Proportional plus Integral (PI), Proportional, Integral plus Derivative controller (PID), selection of controller parameters for Isolated and Non-Isolated DC -DC Converters.

Text Books:

1. *Andrzej M. Trzynadlowski,* ***Introduction to Modern Power Electronics****, 2nd Edition, WILEY-INDIA Edition, 2012.*
2. *Robert Erickson and Dragon Maksimovic,* ***Fundamentals of Power Electronics****, Springer Publications., 2nd Edition, 2001.*
3. *Issa Batarseh****, Fundamentals of Power Electronics,*** *John Wiley Publications, 2009.*

Reference Books:

1. *Philip T.Krein* ***Elements of Power Electronics*** *- Oxford University Press, 1997.*
2. *L. Umanand* ***Power Electronics,*** *Tata Mc-Graw Hill, 2004.*

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B.Tech. IV-II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02807) RELIABILITY ENGINEERING AND APPLICATIONS TO POWER SYSTEMS (ELECTIVE-IV)

Course Objective:

This course mainly focus the reliability concepts like markov modeling, frequency and duration techniques and its applications to power systems which includes generation, transmission and distribution system reliability analysis.

UNIT I

BASICS OF PROBABILITY THEORY, DISTRIBUTION & NETWORK MODELLING

Basic Probability Theory – Rules for Combining Probabilities of Events – Bernoulli's Trials – Probability Density and Distribution Functions – Binomial Distribution – Expected Value and Standard Deviation of Binomial Distribution. Analysis of Series, Parallel, Series-Parallel Networks – Complex Networks – Decomposition Method.

UNIT II

RELIABILITY FUNCTIONS

Reliability Functions F(T), F(T), R(T), H(T) and Their Relationships – Exponential Distribution – Expected Value and Standard Deviation of Exponential Distribution – Bath Tub Curve – Reliability Analysis of Series Parallel Networks Using Exponential Distribution – Reliability Measures MTTF, MTTR, MTBF.

UNIT III

MARKOV MODELLING AND FREQUENCY & DURATION TECHNIQUES

Markov Chains – Concept of Stochastic Transitional Probability Matrix (STPM), Evaluation of Limiting State Probabilities – Markov Processes One Component Repairable System – Time Dependent Probability Evaluation Using Laplace Transform Approach – Evaluation of Limiting State Probabilities Using STPM – Two Component Repairable Models. Frequency and Duration Concept – Evaluation of Frequency of Encountering State, Mean Cycletime, for One , Two Component Repairable Models – Evaluation of Cumulative Probability and Cumulative Frequency of Encountering of Merged States.

UNIT IV

APPLICATIONS TO POWER SYSTEMS -I

Generation System Reliability Analysis: Reliability Model of a Generation System– Recursive Relation for Unit Addition and Removal – Load Modeling - Merging of Generation Load Model – Evaluation of Transition Rates for Merged State Model – Cumulative Probability, Cumulative Frequency of Failure Evaluation – LOLP, LOLE, LOEE.

UNIT V

APPLICATIONS TO POWER SYSTEMS - II

Transmission & Distribution System Reliability Analysis: System and Load Point Reliability Indices – Weather Effects on Transmission Lines, Weighted Average Rate and Markov Model. Basic Techniques - Radial Networks – Evaluation of Basic Reliability Indices, Performance Indices – Load Point and System Reliability Indices – Customer Oriented, Loss and Energy Oriented Indices -Examples.

Text Books:

1. *Reliability Evaluation of Engg. System – R. Billinton, R.N.Allan, Plenum Press, New York, reprinted in India by B.S.Publications, 2007.*
2. *Reliability Evaluation of Power systems – R. Billinton, R.N.Allan, Pitman Advance Publishing Program, New York, reprinted in India by B.S.Publications, 2007.*

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B.Tech. IV- II Sem.	**T**	**Tu**	**C**
	3	**1**	**3**

(13A02808) HIGH VOLTAGE ENGINEERING
(ELECTIVE-IV)

Course Objective:

This subject deals with the detailed analysis of Breakdown occur in gaseous, liquids and solid dielectrics. Information about generation and measurement of High voltage and current. In addition the High voltage testing methods are also discussed.

UNIT I
BREAK DOWN IN GASEOUS, LIQUID & SOLID DIELECTRICS

Introduction to HV Technology, Need for Generating High Voltages in Laboratory. Industrial Applications of High Voltage, Electrostatic Precipitation, Separation.

Gases As Insulating Media, Collision Process, Ionization Process, Townsend's Criteria Of Breakdown in Gases, Paschen's Law, Liquid As Insulator, Pure and Commercial Liquids, Breakdown in Pure and Commercial Liquids.

Intrinsic Breakdown, Electromechanical Breakdown, Thermal Breakdown, Breakdown of Solid Dielectrics in Practice, Breakdown in Composite Dielectrics, Solid Dielectrics Used in Practice.

UNIT II
GENERATION OF HV AC AND DC VOLTAGES

HV AC-HV Transformer: Need for Cascade Connection and Working of Transformers Units Connected in Cascade. Series Resonant Circuit- Principle of Operation and Advantages - Tesla Coil - HV DC-Voltage Doubler Circuit, Cockroft- Walton Type High Voltage DC Set - Calculation of High Voltage Regulation, Ripple and Optimum Number of Stages for Minimum Voltage Drop.

UNIT III
GENERATION OF IMPULSE VOLTAGES

Introduction to Standard Lightning and Switching Impulse Voltages - Analysis of Single Stage Impulse Generator-Expression for Output Impulse Voltage - Multistage Impulse Generator Working of Marx Impulse Generator, Rating of Impulse Generator - Components of Multistage Impulse Generator - Triggering of Impulse Generator By Three Electrode Gap Arrangement - Trigatron Gap and Oscillograph Time Sweep Circuits, Generation of Switching Impulse Voltage - Generation of High Impulse Current.

UNIT IV
MEASUREMENT OF HIGH VOLTAGES:

Electrostatic Voltmeter-Principle, Construction and Limitation - Chubb and Fortescue Method for HV AC Measurement - Generating Voltmeter- Principle, Construction - Series Resistance Micro Ammeter for HV DC Measurements - Standard Sphere Gap Measurements of HVAC, HVDC And Impulse Voltages - Factors Affecting The Measurements - Potential Dividers-Resistance Dividers Capacitance Dividers Mixed RC Potential Dividers. Measurement of High Impulse Currents-Rogowsky Coil.

UNIT V
HIGH VOLTAGE TESTING TECHNIQUES

Dielectric Loss and Loss Angle Measurements Using Schering Bridge - Transformer Ratio Arms Bridge. Need for Discharge Detection and PD Measurements Aspects - Factors Affecting The Discharge Detection, Discharge Detection Methods-Straight and Balanced Methods. Tests on Isolators, Circuit Breakers, Cables, Insulators and Transformers.

Text Books:

1. *High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 4th Edition, 2004.*
2. *High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.*

Reference Books:

1. *High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition, 2000.*
2. *High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited, 1995.*
3. *High Voltage Technology by L. L. Alston, OXFORD University Press, Second Edition, 2009.*
4. *High Voltage Engineering Problems & S*olutions, R. D. Begamudre, New Age *International Publishers, First Edt., 2010*

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B.Tech. IV-II Sem.	**T**	**Tu**	**C**
	3	**1**	**3**

(13A02809) SMART GRID
(ELECTIVE- IV)

UNIT I
THE SMART GRID
Introduction, Ageing Assets and Lack of Circuit Capacity, Thermal Constraints, Operational Constraints, Security of Supply, National Initiatives,
Early Smart Grid Initiatives, Active Distribution Networks, Virtual Power Plant, Other Initiatives and Demonstrations, Overview of The Technologies Required for The Smart Grid.

UNIT II
COMMUNICATION TECHNOLOGIES
Data Communications: Introduction, Dedicated and Shared Communication Channels, Switching Techniques, Circuit Switching, Message Switching, Packet Switching, Communication Channels, Wired Communication, Optical Fibre, Radio Communication, Cellular Mobile Communication, Layered Architecture and Protocols, The ISO/OSI Model, TCP/IP
Communication Technologies: IEEE 802 Series, Mobile Communications, Multi Protocol Label Switching, Power line Communication, Standards for Information Exchange, Standards For Smart Metering, Modbus, DNP3, IEC61850

UNIT III
INFORMATION SECURITY FOR THE SMART GRID
Introduction, Encryption and Decryption, Symmetric Key Encryption, Public Key Encryption, Authentication, Authentication Based on Shared Secret Key, Authentication Based on Key Distribution Center, Digital Signatures, Secret Key Signature, Public Key Signature, Message Digest, Cyber Security Standards, IEEE 1686: IEEE Standard for Substation Intelligent Electronic Devices(IEDs) Cyber Security Capabilities, IEC 62351: Power Systems Management And Association Information Exchange – Data and Communication Security.

UNIT IV
SMART METERING AND DEMAND SIDE INTEGRATION
Introduction, smart metering – evolution of electricity metering, key components of smart metering, smart meters: an overview of the hardware used – signal acquisition, signal conditioning, analogue to digital conversion, computation, input/output, communication.
Communication infrastructure and protocols for smart metering- Home area network, Neighbourhood Area Network, Data Concentrator, meter data management system, Protocols for communication. Demand Side Integration- Services Provided by DSI, Implementation of DSI, Hardware Support, Flexibility Delivered by Prosumers from the Demand Side, System Support from DSI.

UNIT V
TRANSMISSION AND DISTRIBUTION MANAGEMENT SYSTEMS
Data Sources, Energy Management System, Wide Area Applications, Visualization Techniques, Data Sources and Associated External Systems, SCADA, Customer Information System, Modelling and Analysis Tools, Distribution System Modelling, Topology Analysis, Load Forecasting, Power Flow Analysis, Fault Calculations, State Estimation, Applications, System Monitoring, Operation, Management, Outage Management System, Energy Storage Technologies, Batteries, Flow Battery, Fuel Cell and Hydrogen Electrolyser, Flywheels, Superconducting Magnetic Energy Storage Systems, Supercapacitors.

Text Books:

1. *Smart Grid, Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Wiley Publications, 2012.*
2. *Smart Grid: Fundamentals of Design and Analysis, James Momoh, Wiley, IEEE Press., 2012.*

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B.Tech. IV-II Sem.	**Th**	**Tu**	**C**
	3	**1**	**3**

(13A02810) ENERGY AUDITING & DEMAND SIDE MANAGEMENT
(Elective – IV)

Course Objective:
This course mainly focuses on the auditing and the management of the energy which includes energy efficient motors, power factor improvement and energy economic analysis.

UNIT I
ENERGY AUDITING
Energy Situation – World and India, Energy Consumption, Conservation, Codes, Standards and Legislation. Energy Audit- Definitions, Concept, Types of Audit, Energy Index, Cost Index, Pie Charts, Sankey Diagrams, Load Profiles, Energy Conservation Schemes. Measurements in Energy Audits, Presentation of Energy Audit Results.

UNIT II
ENERGY EFFICIENT MOTORS
Energy Efficient Motors , Factors Affecting Efficiency, Loss Distribution , Constructional Details , Characteristics - Variable Speed , Variable Duty Cycle Systems, RMS Hp- Voltage Variation-Voltage Unbalance- Over Motoring- Motor Energy Audit.

UNIT III
POWER FACTOR IMPROVEMENT
Power Factor – Methods of Improvement, Location of Capacitors, Pf With Non Linear Loads, Effect of Harmonics on P.F. ,P.F Motor Controllers.

UNIT IV
LIGHTING AND ENERGY INSTRUMENTS
Good Lighting System Design and Practice, Lighting Control ,Lighting Energy Audit - Energy Instruments- Watt Meter, Data Loggers, Thermocouples, Pyrometers, Lux Meters, Tongue Testers ,Application of PLC's

UNIT V
ENERGY ECONOMIC ANALYSIS & DEMAND SIDE MANAGEMENT
The Time Value of Money Concept, Developing Cash Flow Models, Payback Analysis, Depreciation, Taxes and Tax Credit – Numerical Problems. Introduction to DSM, Concept of DSM, Benefits of DSM, Different Techniques of DSM – Time of Day Pricing, Multi-Utility Power Exchange Model, Time of Day Models for Planning. Load Management, Load Priority Technique, Peak Clipping, Peak Shifting, Valley Filling, Strategic Conservation, Energy Efficient Equipment. Management and Organization of Energy Conservation Awareness Programs.

Text Books:

1. *Industrial Energy Management Systems, Arry C. White, Philip S. Schmidt, David R. Brown, Hemisphere Publishing Corporation, New York, 1994.*
2. *Fundamentals of Energy Engineering - Albert Thumann, Prentice Hall Inc, Englewood Cliffs, New Jersey, 1984.*
3. *Electrical Power distribution, A S. Pabla, TMH, 5th edition, 2004*
4. *Demand Side Management, Jyothi Prakash, TMH Publishers, 2004.*

Reference Books:

1. *Energy management by W.R. Murphy & G. Mckay Butter worth, Heinemann publications, 2007.*
2. *Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998*
3. *Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995.*
4. *Energy management hand book by W.C.Turner, John wiley and sons, 1986.*
5. *Energy management and good lighting practice : fuel efficiency- booklet12-EEO, 1993.*
6. *Recent Advances in Control and Management of Energy Systems, D.P.Sen, K.R.Padiyar, Indrane Sen, M.A.Pai, Interline Publisher, Bangalore, 1993.*
7. *Energy Demand – Analysis, Management and Conservation, Ashok V. Desai, Wiley Eastern, 2005.*
8. *Hand book on energy auditing - TERI (Tata Energy Research Institute), 1999.*