



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

**Academic Regulations 2013 (R13) for**  
**B. Tech (Regular-Full time)**

*(Effective for the students admitted into 1 year from the Academic Year 2013-2014 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. Pursues a course of study for not less than four academic years and in not more than eight academic years.
- ii. Registers 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 stands cancelled.**

**3. Courses of study**

The following courses of study are offered at present as specializations for the B. Tech. course for non-autonomous, constituent & affiliated colleges from 2013-14

S.No.	Name of the Branch	Branch Code
1.	Civil Engineering	01
2.	Electrical and Electronics Engineering	02
3.	Mechanical Engineering	03
4.	Electronics and Communication Engineering	04
5.	Computer Science and Engineering	05
6.	Chemical Engineering	08
7.	Electronics and Instrumentation Engineering	10
8.	Information Technology	12
9.	Electronics and Control Engineering	13
10.	Mechanical (Mechatronics) Engineering	14
11.	Computer Science & Systems Engineering	15
12.	Electronics and Computer Engineering	19
13.	Aeronautical Engineering	21

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

#### 4. Distribution and Weightage of Marks

4.1 The performance of a student in each semester / I year 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 75 and 200 marks respectively whereas audit courses shall be evaluated for a maximum of 30 internal marks.

- i. For theory subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
- ii. For practical subjects the distribution shall be 25 marks for Internal Evaluation and 50 marks for the End- Examination.

4.2 Internal Examinations:

- i. For theory subjects, during the semester, there shall be two midterm examinations and for first year there shall be three midterm examinations. Each midterm examination consists of objective paper for 10 marks and subjective paper for 20 marks with duration of 1 hour 50 minutes (20 minutes for objective and 90 minutes for subjective paper).

Objective paper shall be for 10 marks. Subjective paper shall contain 5 questions of which student has to answer 3 questions evaluated\* for 20 marks.

**\*Note 1:** The subjective paper shall contain 5 questions of equal weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 20 marks, any fraction(0.5 & above) shall be rounded off to the next higher mark.

**\*Note 2:** The midterm examination shall be conducted first by distribution of the Objective paper, simultaneously marking the attendance, after 20 minutes the answered objective paper shall be collected back. The student is not allowed to leave the examination hall. Then the descriptive question paper and the answer booklet shall be distributed. After 90 minutes the answered booklets are collected back.

If the student is absent for the internal examination, no re-exam shall be conducted and internal marks for that examination shall be considered as zero.

In semester pattern, first midterm examination shall be conducted for I,II units of syllabus and second midterm examination shall be conducted for III,IV & V units.

Final Internal 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.

For Ex:

Marks obtained in first mid: 25

Marks obtained in Second mid: 20

Final Internal Marks:  $(25 \times 0.8) + (20 \times 0.2) = 24$

If the student is absent for any one midterm examination, the final internal marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other. For Ex:

Marks obtained in first mid: Absent

Marks obtained in Second mid: 25

Final Internal Marks:  $(25 \times 0.8) + (0 \times 0.2) = 20$

- ii. For first year, first midterm examination, shall be from unit – I, second midterm examination shall be from II & III units, and third midterm examination shall be from IV & V units.

Final Internal marks shall be arrived at by considering the marks secured by the student in all the three mid examinations with 80% weightage to the average marks of the best two midterm examinations and 20% to the other. For Ex:

Marks obtained in First mid : 25

Marks obtained in Second mid: 20

Marks obtained in Third mid: 15

Average of Better mid exams:  $(25+20)/2 = 22.5$

Final Internal Marks:  $(22.5 \times 0.8) + (15 \times 0.2) = 21$

If the student is absent for any one mid examination, final internal marks shall be arrived at by considering 80% weightage to the average marks secured by the student in the appeared midterm examinations and zero to the other. For Ex:

Marks obtained in First mid: Absent

Marks obtained in Second mid: 25

Marks obtained in Third mid: 20

Average of Better mid exams:  $(25+20)/2 = 22.5$

Final Internal Marks:  $(22.5 \times 0.8) + (0 \times 0.2) = 18$

If the student is absent for two mid examinations, final internal marks shall be arrived as below:

Marks obtained in First mid: Absent

Marks obtained in Second mid: Absent

Marks obtained in Third mid: 25

Average of Better mid exams:  $(25+0.0)/2 = 12.5$

Final Internal Marks:  $(12.5 \times 0.8) + (0 \times 0.2) = 10$

#### 4.3 End Examinations:

i. End examination of theory subjects shall have the following pattern:

- a. There shall be 6 questions and all questions are compulsory.
- b. Question I shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. There shall be 2 short answer questions from each unit.
- c. In each of the questions from 2 to 6, there shall be either-or type questions of 10 marks each. Student shall answer any one of them.
- d. Each of these questions from 2 to 6 shall cover one unit of the syllabus.

ii. End examination of theory subjects consisting of two parts of different subjects, for ex: Electrical & Mechanical Technology, shall have the following pattern:

- a. Question paper shall be in two parts viz., Part A and Part B with equal weightage.
- b. In each part, there shall be 3 either-or type questions for 12, 12 and 11 marks.

Note: The answers for Part A & Part B shall be written in two separate answer books.

4.4 For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and end examination shall be for 50 marks. Day-to-day work in the laboratory shall be evaluated for 25 marks by the concerned laboratory teacher based on the regularity/record/ viva. The end examination shall be conducted by the concerned laboratory teacher and senior expert in the same subject of the department.

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In a practical subject consisting of two parts (ex: Electrical & Mechanical Lab), the end examination shall be conducted for 25 marks in each part. Internal examination shall be evaluated as above for 25 marks in each part and final internal marks shall be arrived by considering the average of marks obtained in two parts.

- 4.5 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 and student shall be declared pass in the audit course only when he/she secures 40% or more in the internal examinations.
- 4.6 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 and 70 marks for end examination.

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2hrs each for 15 marks with weightage of 80% to better mid marks and 20% for the other. However, when offered in the I year as 5 credit course, there shall be three midterm exams with weightage of 80% to average marks of the best two midterm examinations and 20% for the other. The subjective paper shall contain 5 questions of equal weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 15 marks, any fraction (0.5 & above) shall be rounded off to the next higher mark. There shall be no objective paper in internal examination. The sum of day to day evaluation and the internal test marks will be the final sessional marks for the subject.

In the end examination pattern for Engineering Drawing/ Engineering Graphics there shall be 5 questions, either-or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing is mentioned along with the syllabus.

- 4.7 There shall be an open elective in IV year I semester for all courses. Choice of subject as an open elective shall be either from the open electives offered by the same department or from other departments as per Annexure. Further, the colleges shall allot common time slot for all branches for open elective class work.
- 4.8 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/her 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. The seminar shall be conducted anytime during the semester as per the convenience of the department committee and students. 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 the committee consisting of Head of the Department and two senior faculty members of the department. The Comprehensive Viva – voce is aimed to assess the students' understanding in various subjects he/she studies during the B.Tech. course of study. The Comprehensive Viva- Voce shall be evaluated for 50 marks by the committee. There are no internal marks for the Comprehensive Viva-Voce.

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A student shall acquire 3 credits assigned to the seminar & comprehensive viva-voce only when he/she secures 40% or more marks for the combined total of 75 marks. In case, if a student fails in seminar & comprehensive viva-voce, he shall reappear as and when IV/II supplementary examinations are conducted.

- 4.9 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 HOD, Project Supervisor and an External Examiner nominated by the University. Project work shall start in IV- I and shall continue in the semester break. The evaluation of project work shall be conducted at the end of the IV year – II semester. 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/her project.
- 4.10 Laboratory marks and the sessional marks awarded by the college are not final. They are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the college will be referred to a committee. The committee will arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding.
- 4.11 The laboratory records and internal test papers shall be preserved for minimum of 2 years in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

### **5 Attendance Requirements:**

- 5.1 A student shall be eligible to appear for University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester/ I year.
- 5.2 Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- 5.3 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee.
- 5.4 Students whose shortage of attendance is not condoned in any semester / I year are not eligible to take their end examination of that class and their registration shall stand cancelled.
- 5.5 A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester / I year, as applicable. They may seek readmission for that semester / I year when offered next.
- 5.6 A stipulated fee shall be payable towards condonation of shortage of attendance to the University.

### **6 Minimum Academic Requirements:**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.5

- 6.1 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 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 evaluation and end examination taken together. In case of audit courses and the seminar & comprehensive viva – voce he/she should secure 40% of the total marks.
- 6.2 A student shall be promoted from II to III year only if he/she fulfils the academic requirement of securing 26 credits of the subjects that have been studied up to II year I semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

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One regular and one supplementary examinations of I year.

One regular examination of II year I semester

- 6.3 A student shall be promoted from III year to IV year only if he/she fulfils the academic requirements of securing 44 credits of the subjects that have been studied upto III year I semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and Three supplementary examinations of I year.

One regular and two supplementary examinations of II year I semester.

One regular and one supplementary examinations of II year II semester.

One regular examination of III year I semester.

And in case if student is already detained for want of credits for particular academic year by sections 6.2 and 6.3 above, the student may make up the credits through supplementary exams of the above exams before the commencement of third or fourth year I semester class work respectively of next year.

- 6.4 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 and audit courses shall be considered for the calculation of aggregate percentage of marks obtained.

- 6.5 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.

### 7. Course pattern:

- 7.1 The entire course of study is for four academic years. The first year shall be on yearly pattern and the second, third and fourth years shall be on semester pattern.

- 7.2 A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.

- 7.3 When a student is detained due to lack of credits/shortage of attendance he may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

### 8. Transitory Regulations:

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic 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 get readmitted.

### 9. With-holding of results:

If the candidate has any dues not paid to the university 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.

**10. 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 shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	From the aggregate marks secured from 180 credits and audit courses.
First Class with Distinction	70% and above	
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)

However while awarding the degree, rounding of percentages is permitted 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.

**11. Minimum Instruction Days:**

The minimum instruction days including exams for each semester / I year shall be 90/180 days respectively.

**12.** Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh from time to time.

**13. General:**

- 13.1 The academic regulations should be read as a whole for purpose of any interpretation.
- 13.2 Malpractices rules- nature and punishments are appended.
- 13.3 Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
- 13.4 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- 13.5 The University 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 rolls with effect from the dates notified by the University.

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## **ACADEMIC REGULATIONS FOR B. TECH.(R13) (LATERAL ENTRY SCHEME)**

*(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2014-2015 and onwards)*

### **1. Award of B.Tech. Degree**

A student admitted in LES will be declared eligible for the award of the B. Tech Degree if he fulfills the following academic regulations:

- i. Pursues a course of study for not less than three academic years and in not more than six academic years.
  - ii. Registers for 135 credits and secure all 135 credits from II to IV year of Regular B.Tech. program.
- 2.** Students, who fail to fulfil the requirement for the award of the degree in six consecutive academic years from the year of admission, shall forfeit their seat.
- 3.** The regulations **3** to **5** are to be adopted as that of B. Tech. (Regular).

### **6. Minimum Academic Requirements:**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.5

- 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 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 evaluation and end examination taken together. For the Seminar & Comprehensive viva-voce he should secure 40% in the internal evaluation.
- ii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of 26 credits from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.
  - a. One regular and Two supplementary examinations of II year I semester.
  - b. One regular and one supplementary examinations of II year II semester.
  - c. One regular examination of III year I semester.

And in case if student is already detained for want of credits for particular academic year , the student may make up the credits through supplementary exams of the above exams before the commencement of fourth year I semester class work of next year.

### **7. Course Pattern**

- i. The entire course of study is three academic years on semester pattern.
  - ii. A student 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.
  - iii. When a student is detained due to lack of credits/shortage of attendance he may be re-admitted when the semester is offered after fulfilment of academic regulations, he shall be in the academic regulations into which he is readmitted.
- 8.** The regulations **8** to **9** are to be adopted as that of B. Tech. (Regular).



**10. 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 shall be placed in one of the following four classes:

First Class with Distinction	70% and above	From the aggregate marks secured for 135 Credits and audit courses. (i.e. II year to IV year)
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)

However while awarding the degree, rounding of percentages is permitted 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.

**11.** The regulations **11** to **13** are to be adopted as that of B. Tech. (Regular). All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)

**RULES FOR  
DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS**

	<b>Nature of Malpractices/Improper conduct</b>	<b>Punishment</b>
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	<b>The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred for four consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.</b> <b>The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for four consecutive semesters from class work and all University examinations, if his involvement is established. Otherwise, The candidate is debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.</b> <b>If the imposter is an outsider, he will be handed over to the police and a case is registered against him.</b>
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University

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		examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject only.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	<b>In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. If the candidate physically assaults the invigilator/officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.</b>
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.

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11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	<b>Cancellation of the performance in that subject only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations, depending on the recommendation of the committee.</b>
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
  - (i) A show cause notice shall be issued to the college.
  - (ii) Impose a suitable fine on the college.
  - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

**Note: Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he has to register for End Examinations in that subject/subjects consequently and has to fulfill all the norms required for the award of Degree.**



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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

## 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 Gupta, PHI, 2013.
7. *Modern English Grammar*-Krishna SWAMI,.McMillan, 2009.
8. *Powerful Vocabulary Builder*- Anjana Agarwal, New Age International Publishers, 2011.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

**B.Tech. I Year**

<b>Th</b>	<b>Tu</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>3</b>

**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 and non-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 , 7<sup>th</sup> 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.

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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, Polyurethane, Polysulfide (Thiokol) rubbers. Plastomers: Thermosetting and Thermoplastics, Preparation, properties and Engineering applications, PVC, Bakelite, nylons.

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

**Inorganic Polymers:** Basic Introduction, Silicones, Polyphosphazins  $-(R)_2P=N-$  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, 12<sup>th</sup> Edition, 2010.

### Reference Books:

1. *A Text Book of Engineering Chemistry*, Jain and Jain, Dhanapath Rai Publishing Company, New Delhi, 15<sup>th</sup> Edition, 2010.
2. *Engineering Chemistry* by K.B.Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH, Publications India Pvt Limited, Chennai, 2<sup>nd</sup> 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, 3<sup>rd</sup> Edition, 2008.*
5. *Text Book of Engineering Chemistry, Shashichawla, Dhanapath Rai Publications, New Delhi, 4<sup>th</sup> Edition, 2011.*
6. *Engineering Chemistry, K. Sessa Maheswaramma and Mrudula Chugh, Pearson Education, First Edition, 2013.*

AMU

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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, Involute 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 1<sup>st</sup> Edition (2010)

**Reference Books:**

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

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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  $K^{\text{th}}$  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](http://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.*

MANU

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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 – Diagonalization 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 – Exponential 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 5<sup>th</sup> Edition (2012)

### **Reference Books:**

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

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year

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### (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), 3<sup>rd</sup> 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, 6<sup>th</sup> edition, 2005.
4. *Electrical Circuit Theory and Technology* by John Bird, Routledge, Taylor & Fransis, 2007.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year

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### (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 identify 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' into 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**

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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. Melde's 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 ( $\alpha$ ,  $\beta$ )
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, 3<sup>rd</sup> Edition, 2012.*

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year

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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:**

- 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
- 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
- Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 gauge G.I. sheet
- 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.
- Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.
- Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint.

#### **2. TRADES FOR DEMONSTRATION:**

- Plumbing
- Machine Shop
- 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. Crimping 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

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

**B.Tech. I Year**

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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 origination 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, 8<sup>th</sup> 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* 2<sup>nd</sup> Ed T. Balasubramanian. (Macmillian),2012.
4. *Speaking English Effectively*, 2<sup>nd</sup> 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, 17<sup>th</sup> edition, 2011.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech. II - I Sem.**

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**(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  $e^z$ ,  $\ln z$ ,  $z^2$ ,  $\sin z$ ,  $\cos z$ , 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.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

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**(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 succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- Forest ecosystem.
- Grassland ecosystem
- Desert ecosystem
- 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-spots 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 :

- Air Pollution.
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear hazards

**SOLID WASTE MANAGEMENT:** Causes, effects and control measures of urban and industrial wastes – 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 Programme. – 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, 2<sup>nd</sup> edition, 2011.

#### **Reference Books:**

1. *Textbook of Environmental Studies* by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications, 2<sup>nd</sup> 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, 2<sup>nd</sup> edition, 2006.
4. *Environmental sciences and engineering* – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited, 2<sup>nd</sup> edition, 1996.
5. *Introduction to Environmental engineering and science* by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited, 3<sup>rd</sup> edition, 2007.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II - I Sem.

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### (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 acceleration; 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



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II - I Sem.

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### (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,  $\pi$  - 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  $\beta$ , 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. 2<sup>nd</sup> edition, 2005,

#### **Reference Books:**

1. R.L. Boylestad, “Introductory Circuit Analysis”, PEARSON,12<sup>th</sup> edition, 2013
2. B.P.Singh and Rekha Singh, “Electronic Devices and Circuits”, PEARSON, 2<sup>nd</sup> Edition2013.
3. David A. Bell, “Electronic Devices and Circuits”, Oxford University press ,5<sup>th</sup> Edition, 2008,.
4. Mohammad H.Rashid, “Electronic Devices and Circuits”, CENGAGE Learning
5. N.Salivahanan, and N.Suresh Kumar, “Electronic Devices and Circuits”, TMH ,3<sup>rd</sup> 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.

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### (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 thinks 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. Kanniah, 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. Gupta, 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.*

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech. II - I Sem.**

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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 – Parallel 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, 3<sup>rd</sup> 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., 3<sup>rd</sup> Edition, 2009.
3. *Electric Machinery* – A. E. Fitzgerald, C. Kingsley and S. Umans, Mc Graw-Hill Companies, 5<sup>th</sup> Edition, 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, 3<sup>rd</sup> Edition, 2004.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech. II - I Sem.**

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**(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 Setup.
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.**

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**(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*



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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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, 5<sup>th</sup> edition, 1999.
3. *Field Theory* – Gangadhar, Khanna Publications, 2003.

#### **Reference Books:**

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

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II - II Sem.

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### (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., 5<sup>th</sup> edition, 2010.
2. *Control Systems Engineering* – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 5<sup>th</sup> edition, 2007.

#### Reference Books:

1. *Control Systems Engineering* - by NISE 5<sup>th</sup> 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

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### (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, Monostable 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, 2<sup>nd</sup> 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”, 4<sup>th</sup> edition, 2002 PHI.

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**(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 SEQUENTIAL 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, 5<sup>th</sup> Edition.
2. Zvi KOhavi and Nirah K.Jha, "Switching theory and Finite Automata Theory", Cambridge, 3<sup>rd</sup> 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.

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### (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.

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**(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- Hysteresis 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/ $\Delta$ ,  $\Delta$ /Y,  $\Delta$ / $\Delta$  and Open  $\Delta$ , 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, 7<sup>th</sup> 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, 2<sup>nd</sup> 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, 6<sup>th</sup> edition, 2003.

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(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.

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**(13A04305) ELECTRONIC DEVICES AND CIRCUITS LABORATORY**

**Course Objective:**

- *This Lab provides the students to get an electrical model for various semiconductor 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  $\pi$ -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.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

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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

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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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, 5<sup>th</sup> Edition, Reem Publications, 2011.

**Reference Books:**

1. Electronic Instrumentation by H. S. Kalsi, Tata Mcgrawhill, 3<sup>rd</sup> Edition, 2011.
2. Electrical Measurements – by Buckingham and Price, Prentice – Hall, 3<sup>rd</sup> 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, 2<sup>nd</sup> Edition, S. Chand & Co., 2<sup>nd</sup> Edition, 2013.

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## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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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, 1<sup>st</sup> order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation- RC, Wien, and quadrature type, waveform generators- triangular, sawtooth, square wave and VCO.

## UNIT IV

### INTEGRATED 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/p's, 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, 2<sup>nd</sup> Edition., 2003.
2. *Digital Design Principles & Practices* – John F. Wakerly, PHI/ Pearson Education Asia, 3<sup>rd</sup> 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, 3<sup>rd</sup> Edition , 2002.
4. *Digital Fundamentals* – Floyd and Jain, Pearson Education, 8<sup>th</sup> Edition 2005.
5. *A VHDL Primer* – J. Bhasker, Pearson Education/ PHI, 3<sup>rd</sup> Edition.
6. *Op-amps & Linear ICs* – RamakanthA.Gayakwad, PHI, 1987.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III-I Sem.

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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 Circuits- 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, 4<sup>th</sup> 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, 6<sup>th</sup> Revised Edition, 2010.
2. *Modern Power System Analysis* by I.J.Nagrath and D.P.Kothari, Tata McGraw Hill, 3<sup>rd</sup> Edition, 2008.
3. *Electric Power Transmission System Engineering: Analysis and Design*, by Turan Gonen, 2<sup>nd</sup> Edition, CRC Press, 2009.
4. *Electric Power Systems* by S. A. Nasar, Schaum's Outline Series, TMH, 3<sup>rd</sup> 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.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III-I Sem.

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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  $120^\circ$  And  $180^\circ$  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, 2<sup>nd</sup> Edition, 2001.
2. *Power Electronics: Circuits, Devices and Applications* – by M. H. Rashid, Prentice Hall of India, 3<sup>rd</sup> 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.**

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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, 4<sup>th</sup> 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, 5<sup>th</sup> 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, 2<sup>nd</sup> edition, 2001.
3. *Electromechanics – 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.**

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**(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  $X_d$  and  $X_q$  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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**(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.**

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**(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 Fayol'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*, 14<sup>th</sup> 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.**

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### **(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. 2<sup>nd</sup> Edition, 1989.*
5. *Electric Drives by N. K. De, PHI Publications, 2006.*

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## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III-II Sem.

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### (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, 2<sup>nd</sup> Edition, Springer International Edition, 1999.

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**(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 write 8086 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 Interface 8251 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”, 2<sup>nd</sup> 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”, 2<sup>nd</sup> Revised Edition, TMH Publications.*
2. *Liu & Gibson, “Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design”, 2<sup>nd</sup> 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.**

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**(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. Chakravorthy and S. Halder, 3<sup>rd</sup> Edition, PHI, 2012.

2. *Modern Power System Analysis* – by I.J.Nagrath & D.P.Kothari Tata McGraw – Hill Publishing Company Ltd, 2<sup>nd</sup> 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, 3<sup>rd</sup> Edition, 2008.
2. *Electric Power Systems* by S. A. Nasar, Schaum's Outline Series, Revised 1<sup>st</sup> Edition, TMH, 2005.

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## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III-II Sem.

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### (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 4<sup>th</sup> Order Runge – 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, 2<sup>nd</sup> 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 1<sup>st</sup> Edition, TMH, 1997.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

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

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**(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



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**(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 3<sup>rd</sup> 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, 4<sup>th</sup> 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

## Course Structure for Electrical and Electronics Engineering

### B. Tech Course (2013-14)

#### IV B. Tech – I Sem

S.No.	Course Code	Subject	Theory	Tu	Lab	Credits
1	13A02701	Electrical Distribution Systems	3	1	-	3
2	13A04602	Digital Signal Processing	3	1	-	3
3	13A52702	Management Science	3	1	-	3
4	13A02702	Utilization of Electrical Energy	3	1	-	3
5	13A02703 13A02704 13A02705	CBCC-2 (Department) 1. Modern Control Theory 2. Switched Mode Power Converters 3. Energy Auditing & Demand Side Management	3	1	-	3
6	13A02706 13A02707 13A02708	CBCC -3 (Department) 1. Smart Grid 2. Flexible AC Transmission Systems 3. Power Quality	3	1	-	3
7	13A02709	Microprocessors and Microcontrollers Laboratory	-	-	4	2
8	13A02710	Power Electronics and Simulation Laboratory	-	-	4	2
<b>Total</b>			<b>18</b>	<b>06</b>	<b>08</b>	<b>22</b>

## **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem. (E.E.E)**

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### **(13A02701) ELECTRICAL DISTRIBUTION SYSTEMS**

**OBJECTIVES:** The student has to acquire knowledge about:

- *The classification of distribution systems*
- The technical aspects and design considerations in DC and AC distribution systems and their comparison
- Technical issues of substations such as location, ratings and bus bar arrangements
- The causes of low power factor and methods to improve power factor
- The principles in Distribution automation

#### **UNIT – I      LOAD MODELING AND CHARACTERISTICS**

Introduction to Distribution Systems, Load Modelling 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: Substation 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.

**OUTCOMES:** Student should be able to:

- Compute the various factors associated with power distribution
- Make voltage drop calculations in given distribution networks
- Learn principles of substation maintenance
- Compute power factor improvement for a given system and load
- Understand implementation of SCADA for distribution automation

### **TEXT BOOKS:**

1. Electric Power Distribution Engineering, Turan Gonen, CRC Press, 3<sup>rd</sup> Edition, 2014.
2. Electric Power Distribution, A.S. Pabla, Tata Mc Graw Hill (India) Pvt. Ltd., 6<sup>th</sup> Edition, 2011.

### **REFERENCE BOOKS:**

1. Electric Power Distribution Automation, Dr. M. K. Khedkar and Dr. G. M. Dhole, University Science Press, 2010.
2. Electrical Power Distribution Systems, V. Kamaraju, Jain Book Depot. 2012.
3. Electrical Power Systems for Industrial Plants, Kamallesh Das, JAICO Publishing House, 2008.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem. (E.E.E)**

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**(13A04602) DIGITAL SIGNAL PROCESSING**

***Course Objectives:***

- To use Z transforms and discrete time Fourier transforms to analyze a digital system.
- To design and understand simple finite impulse response filters
- To understand stability of FIR filters
- To know various structures used in the implementation of FIR and IIR filters
- Window method design structure for implementation.

***Learning Outcomes:***

At the end of the course, the student should be able to:

- Describe the Sampling Theorem and how this relates to Aliasing and Folding.
- Determine if a system is a Linear Time-Invariant (LTI) System and Take the Z-transform of a LTI system.
- Find the frequency response of FIR and IIR filters through analysis.
- Understand the relationship between poles, zeros, and stability and determine the spectrum of a signal using the DFT, FFT, and spectrogram.
- Design, analyze, and implement various digital filters.

**UNIT-I**

**Introduction:** Review of discrete-time signals and systems – Time domain analysis of discrete-time signals & systems, Frequency domain analysis of discrete-time signals and systems. Discrete Fourier Transform: Frequency-domain sampling and reconstruction of discrete-time signals, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT, Linear filtering methods based on DFT, Frequency analysis of signals using the DFT.

**UNIT-II**

**Fast Fourier Transform Algorithms (FFTA):** Efficient computation of the DFT – Direct computation of DFT, Divide and conquer approach to computation of DFT, Radix-2, Radix-4, and Split radix FFT algorithms, Implementation of FFT algorithms, Applications of FFT algorithms – Efficient computation of the DFT of two real sequences, 2N point real sequences, Use of the FFT algorithm in linear filtering and correlation, A linear filtering approach to computation of the DFT- the Goertzel, and the Chirp-z transform algorithms, Quantization errors in the computation of DFT.

### UNIT-III

**Implementation of Discrete-Time Systems:** Structures for the realization of discrete-time systems, Structures for FIR systems - Direct form, Cascade form, Frequency sampling, and Lattice structures, Structures for IIR systems – Direct form, Signal flow graphs & Transposed, Cascade form, Parallel form and Lattice structures, Conversion from Lattice structure to direct form, lattice –Ladder structure.

### UNIT-IV

**Design of Digital Filters:** General considerations – Causality and its implications, Characteristics of practical Frequency Selective Filters, Design of Finite Impulse Response (FIR) filters – Symmetric and asymmetric FIR filters, Design of linear phase FIR filters using windows, Design of linear phase FIR filters by the frequency sampling method, Design of optimum equi-ripple linear phase FIR filters, Comparison of design methods for linear phase FIR filters, Design of Impulse Invariance Response (IIR) filters from analog filters – IIR filter design by approximation of derivatives, by Impulse invariance, and by bilinear transformation methods, Characteristics of commonly used analog filters, Design examples of both FIR and IIR filters, Frequency transformation in the analog and digital domains, Illustrative problems.

### UNIT-V

**Multirate Digital Signal Processing:** Introduction, Decimation, and interpolation, Sampling rate conversion by a rational factor, Implementation of sampling rate conversion, Multistage implementation of sampling rate conversion, Sampling rate conversion of bandpass signals, Sampling rate conversion by arbitrary factor, Applications of multirate signal processing.

### TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, “Digital signal processing, principles, Algorithms and applications,” Pearson Education/PHI, 4<sup>th</sup> ed., 2007.
2. Sanjit K Mitra, “Digital signal processing, A computer base approach,” Tata McGraw Hill, 3<sup>rd</sup> edition, 2009.

### REFERENCES:

1. A.V.Oppenheim and R.W. Schaffer, & J R Buck, “Discrete Time Signal Processing,” 2<sup>nd</sup> ed., Pearson Education, 2012.
2. B. P. Lathi, “Principles of Signal Processing and Linear Systems,” Oxford Univ. Press, 2011.
3. Li Tan, Jean Jiang, “Digital Signal Processing, Fundamentals and Applications,” Academic Press, Second Edition, 2013.
4. Andreas Antoniou, “Digital Signal Processing,” TATA McGraw Hill, 2006.
5. Schaum’s outlines M H Hayes, “Digital Signal Processing,” TATA Mc-Graw Hill, 2007.
6. A. Anand Kumar, “Digital Signal Processing,” PHI Learning, 2011.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

**B.Tech IV-I Sem. (E.E.E)**

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### **(13A52702) 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*, 14<sup>th</sup> 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 IV-I Sem. (E.E.E)

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## (13A02702) UTILIZATION OF ELECTRICAL ENERGY

**OBJECTIVES:** The objectives of the course are to make the students learn about:

- The laws of illumination and their application for various lighting schemes
- Principles and methods for electric heating and welding.
- Systems of electric traction, study of traction equipment, mechanics of train movement and associated calculations.

### UNIT-I ILLUMINATION

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

### UNIT-II ELECTRIC HEATING & WELDING

*Electrical Heating: Advantages. Methods of Electric Heating – Resistance, Arc, Induction and Dielectric Heating – Energy conservation methods.*

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

**OUTCOMES:** Student should be able to:

- Develop a lighting scheme for a given practical case.
- Analyze the performance of Heating and Welding methods
- Make all numerical calculations associated with electric traction.
- Assess the economic aspects in utilisation of electrical energy

### **TEXT BOOKS:**

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

### **REFERENCE BOOKS:**

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

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**B.Tech IV-I Sem. (E.E.E)**

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**(13A02703) MODERN CONTROL THEORY  
(CBCC-II)**

**OBJECTIVE :** The objectives of the course are to make the students learn about:

- Concepts of state vector, State transition matrix and solution of state equations.
- Importance of controllability and observability concepts.
- Pole placement, state estimation using observers
- Lyapunov criterion for stability analysis
- Types of nonlinearities, their effect on system performance

**UNIT – I STATE VARIABLE DESCRIPTION AND SOLUTION OF STATE EQUATION**

Concept of State – Derivation of State Space models for Linear Continuous time Systems from Schematic Models, Differential equations, Transfer functions and block diagrams – Non uniqueness of state model – State diagrams for continuous time state models – Solution of state equations – State transition matrix. Complete response of continuous time systems.

***UNIT – II : CONTROLLABILITY, OBSERVABILITY,***

Tests for controllability and observability for continuous time systems – Time varying case, minimum energy control, time invariant case, 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 – III: STATE FEEDBACK CONTROLLERS AND OBSERVERS**

Design of State Feedback Controllers through Pole placement. Full-order observer and reduced-order observer. State estimation through Kalman Filters.

***UNIT – IV ANALYSIS OF NONLINEAR SYSTEMS***

Introduction to nonlinear systems, Types of nonlinearities, Concept 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- V STABILITY ANALYSIS**

Stability in the sense of Lyapunov. Lyapunov's stability and Lyapunov's instability theorems. Direct method of Lyapunov for Linear and Nonlinear continuous time autonomous systems.

**TEXT BOOKS:**

1. Modern Control Engineering, Katsuhiko Ogata, Prentice Hall, 5<sup>th</sup> Edition, 2010.
2. Modern Control System Theory, M. Gopal, New Age International Publishers, Revised 2<sup>nd</sup> edition, 2005.

**REFERENCE BOOKS:**

1. Control Systems Engineering, I.J. Nagarath and M.Gopal, New Age International Publishers, 5<sup>th</sup> Edition, 2007, Reprint 2012.
2. Modern Control Engineering, D. Roy Choudhury, PHI Learning Private Limited, 9<sup>th</sup> Printing, January 2015.

**OUTCOMES:** At the end of studying the course, the student should be able to:

- Model a given dynamic system in state space and obtain the solution for the state equation
- Test whether a given system is controllable and/or observable
- Design a state feedback controller for pole placement
- Design an observer for state estimation
- Apply Lyapunov criterion and determine stability of a given system
- Analyze nonlinear systems

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**(13A02704) SWITCHED MODE POWER CONVERTERS**

**(CBCC-II)**

**OBJECTIVES:** The objectives of the course are to make the students learn about:

- The concepts of modern power electronic converters and their applications in electric power utility.
- Analyzing and control of various power converter circuits

**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 Weakening 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.

**OUTCOMES:** Upon completion of this course,

- The student learns the fundamental concepts of DC - DC Converters
- Student can explain the operation of different topologies of DC to DC converters and their differences
- Student will be able to model various converters as per state space, time average etc.
- Student can analyse in frequency domain with different P, PI and PID converters

### **TEXT BOOKS:**

1. Issa Batarseh, Fundamentals of Power Electronics, John Wiley Publications, 2009.
2. Robert Erickson and Dragomir Maksimovic, Fundamentals of Power Electronics, Springer Publications., 2<sup>nd</sup> Edition, 2001.

### **REFERENCE BOOKS:**

1. Switched Mode Power Supplies design and construction 2<sup>nd</sup> Edition, H W Whittington, B W Flynn and D E Macpherson, Universities Press, 2009.
2. Philip T. Krein Elements of Power Electronics - Oxford University Press, 1997.
3. L. Umanand Power Electronics, Tata Mc-Graw Hill, 2004.



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**(13A02705) ENERGY AUDITING & DEMAND SIDE MANAGEMENT**

**(CBCC-II)**

**OBJECTIVES:** The objectives of this course include

- To learn about energy consumption and situation in India
- To learn about Energy Auditing.
- To learn about Energy Measuring Instruments.
- To understand the Demand Side Management.

**UNI -I INTRODUCTION TO 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 AND POWER FACTOR IMPROVEMENT**

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.Power Factor – Methods of Improvement, Power factor With Non Linear Loads

**UNIT –III LIGHTING AND ENERGY INSTRUMENTS FOR AUDIT**

Good Lighting System Design and Practice, Lighting Control, Lighting Energy Audit - Energy Instruments- Watt Meter, Data Loggers, Thermocouples, Pyrometers, Lux Meters, Tong Testers, Application of PLC's

**UNIT –IV INTRODUCTION TO DEMAND SIDE MANAGEMENT**

*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.*

## ***UNIT – V ECONOMICS AND COST EFFECTIVENESS TESTS OF DSM PROGRAMS***

Basic payback calculations, Depreciation, Net present value calculations. Taxes and Tax Credit – Numerical Problems. Importance of evaluation, measurement and verification of demand side management programs. Cost effectiveness test for demand side management programs - Ratepayer Impact Measure Test, Total Resource Cost, Participant Cost Test, Program Administrator Cost Test

Numerical problems: Participant cost test, Total Resource Cost test and Ratepayer impact measure test.

**OUTCOMES:** After completion of the course the student should be able to:

- Conduct energy auditing and evaluate energy audit results
- Carry out motor energy audit
- Analyze demand side management concepts through case study

### **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.

### **REFERENCES:**

1. Economic Analysis of Demand Side Programs and Projects - California Standard Practice Manual, June 2002 – Free download available online  
[http://www.calmac.org/events/spm\\_9\\_20\\_02.pdf](http://www.calmac.org/events/spm_9_20_02.pdf)
2. Energy management by W.R. Murphy & G. McKay Butter worth, Heinemann publications, 2007.
3. Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998
4. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995.

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### **(13A02706) SMART GRID (CBCC-III)**

**OBJECTIVES:** The objectives of the course are to make the students learn about:

- Overview of the technologies required for the smart grid
- Switching techniques and different means for data communication
- Standards for information exchange and smart metering
- Methods used for information security on smart grid
- Smart metering, and protocols for smart metering
- Management systems for Transmission and distribution

#### **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.

**OUTCOMES:** The student should have learnt about:

- How to meet the standards for information exchange and for smart metering
- How to preserve data and Communication security by adopting encryption and decryption procedures.
- Monitoring, operating, and managing the transmission and distribution tasks under smart grid environment

### **TEXT BOOKS:**

1. Smart Grid, Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Wiley Publications, 2012, Reprint 2015.
2. Smart Grid: Fundamentals of Design and Analysis, James Momoh, Wiley, IEEE Press., 2012, Reprint 2016.

### **REFERENCES:**

1. The Smart Grid – Enabling Energy efficiency and demand response, Clark W. Gellings, P.E., CRC Press, Taylor & Francis group, First Indian Reprint. 2015.
2. Smart Grid – Applications, Communications, and Security Edited by Lars Torsten Berger, Krzysztof Iniewski, WILEY, 2012, Reprint 2015.
3. Practical Electrical Network Automation and Communication Systems, Cobus Strauss, ELSVIER, 2003.

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**(13A02707) FLEXIBLE AC TRANSMISSION SYSTEMS**

**(CBCC-III)**

**OBJECTIVES:** The objectives of the course are to make the students learn about:

- The basic concepts, different types, and applications of FACTS controllers in power transmission.
- The basic concepts of static shunt and series converters
- The working principle, structure and control of UPFC.

**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.

**OUTCOMES:** After completing this course the student will be able to:

- Understand various control issues, for the purpose of identifying the scope and for selection of specific FACTS controllers.
- Apply the concepts in solving problems of simple power systems with FACTS controllers.
- Design simple FACTS controllers and converters for better transmission of electric power.

### **TEXT BOOKS:**

1. Understanding FACTS – Concepts and technology of Flexible AC Transmission systems, Narain G. Hingorani, Laszlo Gyugyi, IEEE Press, WILEY, 1st Edition, 2000, Reprint 2015.
2. FACTS Controllers in Power Transmission and Distribution, Padiyar K.R., New Age International Publishers, 1<sup>st</sup> Edition, 2007.

### **REFERENCE BOOKS:**

1. Flexible AC Transmission Systems: Modelling and Control, Xiao – Ping Zhang, Christian Rehtanz, Bikash Pal, Springer, 2012, First Indian Reprint, 2015.
2. FACTS – Modelling and Simulation in Power Networks, Enrigue Acha, Claudio R. Fuerte – Esquivel, Hugu Ambriz – perez, Cesar Angeles – Camacho, WILEY India Private Ltd., 2004, Reprint 2012.

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### **(13A02708) POWER QUALITY**

#### **(CBCC-III)**

**OBJECTIVES:** The objectives of the course are to make the students learn about:

- Power quality issues and standards.
- The sources of power quality disturbances and power transients that occur in power systems.
- The sources of harmonics, harmonic indices, Devices for controlling harmonic distortion.
- The principle of operation of DVR and UPQC.

### **UNIT I INTRODUCTION**

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

### **UNIT II TRANSIENTS, SHORT DURATION 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 Quality 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.

## **UNITV 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.

**OUTCOMES:** After completion of the course the student should be able to:

- Address power quality issues to ensure meeting of standards
- Apply the concepts of compensation for sags and swells using voltage regulating devices
- Assess harmonic distortion and its mitigation.
- Explain the power measurement data according to standards

### **TEXT BOOKS:**

1. Electrical Power Systems Quality, Roger C. Dugan, Mark F. McGranaghan, Surya Santoso, H.Wayne Beaty, Mc Graw Hill Education (India) Pvt. Ltd., 3<sup>rd</sup> Edition, 2012.
2. Power quality, C. Sankaran, CRC Press, 2001.

### **REFERENCE BOOKS:**

1. Understanding Power quality problems – Voltage Sags and Interruptions, Math H. J. Bollen IEEE Press Series on Power Engineering, WILEY, 2007.
2. Power quality – VAR Compensation in Power Systems, R. Sastry Vedam, Mulukutla S. Sarma, CRC Press, 2009, First Indian Reprint 2013.
3. Fundamentals of Electric Power Quality, Surya Santoso, Create Space, 2012.



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**(13A02709) MICROPROCESSORS AND MICROCONTROLLERS LABORATORY**

**OBJECTIVES:** The student has to perform:

- Assembly language programming on 8086 Microprocessors
- Interfacing of various devices with 8086
- MASM Programming
- Interfacing 8051 Microcontroller with its peripheral devices

**I. Microprocessor 8086**

Introduction to MASM/TASM.

Arithmetic Operation – Multi Byte Addition and Subtraction, Multiplication and Division – Signed and Unsigned Arithmetic Operation, ASCII – Arithmetic Operation.

Logic Operations – Shift and Rotate – Converting Packed BCD to Unpacked BCD, BCD to ASCII Conversion.

By Using String Operation and Instruction Prefix: Move Block, Reverse String, Sorting, Inserting, Deleting, Length of The String, String Comparison.

Modular Program: Procedure, Near and Far Implementation, Recursion.

DOS/BIOS Programming: Reading Keyboard (Buffered With And Without Echo) – Display Characters, Strings.

**II. Interfacing**

8259 – Interrupt Controller.

8279 – Keyboard Display.

8255 – PPI.

8251 – USART.

**III. Microcontroller 8051**

1. Reading and Writing on a Parallel Port.
2. Timer in Different Modes.
3. Serial Communication Implementation.

4. Using External Interrupts
5. Programs Using Special Instructions like Swap, Bit/Byte, Set/Reset Etc.
6. Programs Based on Short, Page, Absolute Addressing.

**OUTCOMES:** The student should be able to perform:

- Assembly language programming on 8086 Microprocessors
- Interfacing of various devices with 8086
- MASM Programming
- Interfacing 8051 Microcontroller with its peripheral devices

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**(13A02710) POWER ELECTRONICS AND SIMULATION LABORATORY**

**OBJECTIVES:** The student will understand:

- The characteristics of power electronic devices with gate firing circuits
- Various forced commutation techniques
- The operation of single-phase voltage controller, converters and Inverters circuits with R and RL loads
- Simulation of power electronic circuits using  
PSPICE/PSIM/SEQUEL/MATLAB/SIMULINK

***Any Eight of the Experiments in Power Electronics Lab***

1. Gate Firing Circuits for SCRs
2. Single Phase AC Voltage Controller with R and RL Loads
3. DC Jones Chopper with R and RL Loads
4. Forced Commutation Circuits (Class A, Class B, Class C, Class D and Class E)
5. Three phase fully controlled Bridge converter with R- load
6. Single Phase Parallel Inverter with R and RL Loads
7. Single phase Cycloconverter with R and RL loads
8. Single Phase Series Inverter with R and RL Loads
9. Single Phase Dual Converter with RL Loads
10. Illumination control / Fan control using TRIAC

**Any Two Simulation Experiments with PSPICE / PSIM /SEQUEL / MATLAB /  
SIMULINK**

1. Simulation of 3-Phase Full Converter Using RLE Loads and Single-Phase AC Voltage Controller Using RLE Loads
2. Simulation of Single Phase Inverter with PWM Control
3. Simulation of 3-phase Bridge Inverter

**OUTCOMES:** Student should be able to:

- Test the turn on –turn off characteristics of various power electronic devices.
- Test and analyze firing circuits for SCRs
- Test different types of voltage controllers, converters and Inverters with R and RL loads
- Simulate a simple power electronic circuit using PSPICE / SEQUEL / PSIM / MATLAB / SIMULINK

**REFERENCE BOOKS:**

1. Simulation of Electrical and Electronic circuits using PSPICE – by M.H.Rashid, PHI.
2. PSPICE reference guide – Microsim, USA.
3. Simulation of Power Electronics Circuit, M B Patil, V Ramanarayan and V T Ranganat, Alpha Science International Ltd., 2009.
4. Web Address for SEQUEL [http:// www.ee.iitb.ac.in/~sequel](http://www.ee.iitb.ac.in/~sequel)
5. Modellimng and Simulation using MATLAB – Simulink, Dr. Shailendra Jain



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**Course Structure for Electrical and Electronics Engineering**

**B. Tech Course  
(2013-14)**

**IV B. Tech – II Sem**

S.N o.	Course Code	Subject	Theory	Tu	Lab	Credits
1	13A02801 13A02802	MOOC – I* (i) Instrumentation (ii) Power System dynamics and control	3	1	-	3
2	13A02803 13A02804 13A02805	MOOC – II* (i) HVDC Transmission (ii) Energy Resources & Technology (iii) Design Of Electrical Systems	3	1	-	3
3	13A04703 13A02806	MOOC – III* (i) Embedded Systems (ii) Industrial Automation & Control	3	1	-	3
4	13A02807	Technical Seminar	-	-	4	2
5	13A02808	Project Work	-	-	24	12
		<b>Total</b>	<b>9</b>	<b>03</b>	<b>28</b>	<b>23</b>

**3 Theory + 1 Technical Seminar + 1 Project work**

**\*Either by MOOCS manner or Self study or Conventional manner**

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**(13A02801) INSTRUMENTATION**  
**(MOOC-I)**

**OBJECTIVES :** *The objectives of the course are to make the students learn about:*

- Common errors that occur in measurement systems, and their classification
- Characteristics of signals, their representation, and signal modulation techniques
- Methods of Data transmission, telemetry, and Data acquisition.
- Working principles of different signal analyzers and Digital meters.
- Several types of transducers and their use for measurement of non-electrical quantities.

**UNIT-I: CHARACTERISTICS OF SIGNALS AND THEIR**

**REPRESENTATION**

Measuring Systems, Performance Characteristics, - Static Characteristics, Dynamic Characteristics; Errors in Measurement – 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 (FM), Pulse Modulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Telemetry. Comparison of FM, PM, PAM and PCM. Analog and Digital Data 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, DIGITAL METERS**

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 Voltmeters - 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 of Operation of Resistive, Inductive, Capacitive Transducers, LVDT, Strain Gauge and Its Principle of Operation, Gauge Factor, Thermistors,

Thermocouples, Synchros, Piezoelectric Transducers, Photovoltaic, Photo Conductive Cells, Photo Diodes.

### ***UNIT-V: MEASUREMENT OF NON-ELECTRICAL QUANTITIES***

Measurement of strain, Gauge Sensitivity, Measurement of Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Flow, Liquid level.

**OUTCOMES:** The student should be able to:

- Identify and explain the types of errors occurring in measurement systems
- Differentiate among the types of data transmission and modulation techniques
- Apply digital techniques to measure voltage, frequency and speed
- Choose suitable transducers for the measurement of non-electrical quantities

### **TEXT BOOKS:**

1. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpat Rai & Co., 2012.
2. Transducers and Instrumentation, D.V.S Murty, Prentice Hall of India, 2<sup>nd</sup> Edition, 2004.

### **REFERENCE BOOKS:**

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

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**B.Tech IV-II Sem. (E.E.E)**

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**(13A02802) Power System dynamics and control**  
**(MOOC-I)**

Objectives: The objectives of the course are to make the students learn about:

- The kinds of power stability problems
- The basic concepts of modelling and analysis of dynamical systems.
- Modelling of power system components - generators, transmission lines, excitation and prime mover controllers.
- Stability of single machine and multi-machine systems is analyzed using digital simulation and small-signal analysis techniques.
- The impact of stability problems on power system planning and operation.

**Unit – I Introduction to Power System Stability**

Power System Operation and Control - Stability Problems faced by Power Systems - Impact on Power System Operation and Control - Analysis of Dynamical Systems - Concept of Equilibria, Small and Large Disturbance Stability - Example: Single Machine Infinite Bus System - Modal Analysis of Linear Systems - Analysis using Numerical Integration Techniques - Issues in Modelling: Slow and Fast Transients, Stiff Systems

**Unit – II Modelling of a Synchronous Machine**

Physical Characteristics - Rotor Position Dependent model - D-Q Transformation - Model with Standard Parameters - Steady State Analysis of Synchronous Machine - Short Circuit Transient Analysis of a Synchronous Machine - Synchronous Machine Connected to Infinite Bus.

**Unit – III Modelling of power system components**

Physical Characteristics and Models - Control system components - Excitation System Controllers - Prime Mover Control Systems - Transmission Line Physical Characteristics - Transmission Line Modeling - Load Models - induction machine model - Other Subsystems - HVDC, protection systems.

**Unit – IV Stability Issues in Interconnected Power Systems**

Single Machine Infinite Bus System - Multi-machine Systems - Stability of Relative Motion - Frequency Stability: Centre of Inertia Motion - Concept of Load Sharing: Governors - Single Machine Load Bus System: Voltage Stability - Torsional Oscillations

**Unit – V Enhancing System Stability**

Planning Measures - Stabilizing Controllers (Power System Stabilizers) - Operational Measures- Preventive Control - Emergency Control - Power System Stability Analysis Tools: Small Signal Analysis Program - Transient Stability Program - Real-Time Simulators.



Outcomes: After completion of Course, the student should be able to

- Understand the power stability problems
- Understand the basic concepts of modelling of synchronous machine and power system components
- Analyse the stability issues in interconnected systems
- Understand the power system stability analysis tools and enhancement of power system stability

Reference Books:

1. K.R.Padiyar, Power System Dynamics, Stability & Control, 2nd Edition, B.S. Publications, Hyderabad, 2002.
2. P.Kundur, Power System Stability and Control, McGraw Hill Inc, New York, 1995.
3. P.Sauer & M.A.Pai, Power System Dynamics & Stability, Prentice Hall, 1997.
4. [Jan Machowski](#), [Janusz Bialek](#), [James Richard Bumby](#), Power system dynamics and control , John Wiley & Sons, 1997.

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**(13A02803) HVDC TRANSMISSION**  
**(MOOC-II)**

**OBJECTIVES:** The objectives of the course are to make the students learn about:

- Technical and economic aspects of HVAC and HVDC transmission and their comparison.
- Static power converters
- Control of HVDC converter systems
- Origin, effects, classification and elimination of harmonics
- The occurrence of faults, and transients in HVDC system and their protection.

**UNIT-I: INTRODUCTION TO HVDC TRANSMISSION**

HVDC Transmission: Technical And Economical Comparison of HVAC and HVDC Transmission, Types of DC Links, Power Handling Capabilities of HVDC Lines, static 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, Elimination of Harmonics, Suppression Methods, Harmonic Instability Problems, Design of HVDC AC & DC Filters.

**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.

**OUTCOMES:** After Completion of Course, the student should be able to:

- Compare HVDC and HVAC transmission systems
- Understand the operation of various converters used in HVDC transmission systems
- Devise means to suppress / eliminate harmonics.
- Design HVDC and AC Filters

**TEXT BOOKS:**

1. HVDC Power Transmission Systems, K.R.Padiyar, 3<sup>rd</sup> Edition, New Age International publishers, 2015.
2. HVDC Transmission, S.Kamakshaiah, V.Kamaraju, Mc Graw Hill Education (India) Pvt. Ltd., 2011.

**REFERENCES:**

1. Direct Current Transmission, Vol. 1, E. W. Kimbark, Wiley, 1971
2. High Voltage Direct Current Transmission, Jos Arrillaga, IEE Power and Energy series 29, 2<sup>nd</sup> Edition, 1998
3. EHV-AC, HVDC Transmission & Distribution Engineering, S Rao, Khanna Publishers, 4<sup>th</sup> Edition, 2008.

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**(13A02804) Energy Resources & Technology**  
**(MOOC-II)**

Objectives: The objectives of the course are to make the students learn about:

- Production of quality of energy
- Types of generation plants and their principle of operation
- Methods of energy storage
- Economics of generation

**Unit – I: Fundamentals principles of energy**

Fundamentals of energy- Quality of energy- Complete Cycle Analysis of Fossil Fuels - Other Fossil Fuels - Energy Economics : Input-Output Analysis.

**Unit – II: Thermal, Hydro and Nuclear power sources**

Thermal Power Plants - Hydroelectric Power plants - Nuclear Power Generation- Nuclear Fusion Reactors - Environmental Effects of Conventional Power

**Unit – III: Solar, wind and photo voltaic power sources**

Solar Thermal Energy Conversion - Solar Concentrating Collectors - Photovoltaic Power Generation- Wind Energy - Wind Electrical Conversion

**Unit – IV: Other sources of energy**

Tidal Energy - Ocean Thermal Energy Conversion - Solar Pond and Wave Power - Geothermal Energy - Solar Distillation and Biomass Energy

**Unit – V: Energy storage and Economy**

Energy Storage - Energy in Transportation - Magneto hydrodynamic Power Generation - Hydrogen Economy.

Outcomes: After completion of Course, the student should be able to:

- Understand different types of sources of energy
- Analyse the generation principles and operation of variety of sources of energy
- Understand energy storage and economy

Reference Books:

1. Renewable energy Resources – Jhon Twidell and tony Weir, Second edition, Taylor and Francis Group, 2006
2. Non- conventional energy sources by G. D. Rai, Khanna Publishers, 2000
3. Electrical power generation, Transmission and distribution by S. N. Singh, PHI, 2003
4. Wind electrical systems by S. N. Bhadra, D. Kastha & S. Banerjee – Oxford University Press, 2013

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**(13A02805) Design of Electrical Systems**  
**(MOOC-II)**

**Course Objective:** This course introduces the procedure for basic design of electrical installations for domestic and industrial applications. And also it concentrates 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 Coordination, 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 Earthing, Measurement of Earth Resistance, Earth Leakage Protection, Neutral Earthing for Generators and Transformers.

**UNIT IV LIGHTNING 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. Lightning protection Hand book –ERITECH:  
URL: [igs.nigc.ir/STANDS/Book/LIGHTINING-ERITECH.pdf](http://igs.nigc.ir/STANDS/Book/LIGHTINING-ERITECH.pdf)

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**(13A04703) EMBEDDED SYSTEMS  
(MOOC-III)**

**Course Outcomes:**

- ☐ Able to understand the fundamental concepts of embedded systems.
- ☐ Able to learn the architecture of Advanced ARM microcontrollers.
- ☐ Able to learn the architecture of Advanced MSP430 microcontrollers.
- ☐ Able to learn various programming techniques and interfacing using ARM and MSP430.

**UNIT I**

Embedded system overview, applications, features and architecture considerations - ROM, RAM, timers, data and address bus, I/O interfacing concepts, memory mapped I/O. CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture. Low power RISC MSP430 – block diagram, features and architecture, Instruction set, instruction formats, and various addressing modes of 16-bit microcontroller e.g. MSP430, Variants of the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x and their targeted applications, Sample embedded system on MSP430 microcontroller.

**UNIT-II**

MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. I/O ports pull up/down registers concepts, Interrupts and interrupt programming. Watchdog timer. System clocks. Low Power aspects of MSP430: low power modes, Active vs Standby current consumption, FRAM vs Flash for low power & reliability.

**UNIT-III**

Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

**Case Study:** MSP430 based embedded system application using ADC & PWM demonstrating peripheral intelligence. “Remote Controller of Air Conditioner Using MSP430”.

**UNIT-IV**

Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices.

**Case Study:** MSP430 based embedded system application using the interface protocols for communication with external devices: “A Low-Power Battery less Wireless Temperature and Humidity Sensor with Passive Low Frequency RFID”

**UNIT-V**

IoT overview and architecture, Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications, Building IoT applications using CC3100 user API for connecting sensors.

**Case Study:** MSP430 based Embedded Networking Application: “Implementing Wi-Fi Connectivity in a Smart Electric Meter”



**Text Books:**

1. MSP430 microcontroller basics 1st Edition by John H. Davies (Author), Newnes Publication ISBN-13: 978-0750682763
2. Getting started with the MSP430 Launchpad by Adrian Fernandez, Dung Dang, Newness publication ISBN-13: 978-0124115880
3. Embedded Systems 2E Raj Kamal, Tata McGraw-Hill Education, 2011 ISBN-0070667640, 9780070667648

**References:**

1. [http://processors.wiki.ti.com/index.php/MSP430\\_LaunchPad\\_Low\\_Power\\_Mode](http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode)
2. [http://processors.wiki.ti.com/index.php/MSP430\\_16-Bit\\_Ultra-Low\\_Power\\_MCU\\_Training](http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra-Low_Power_MCU_Training)
3. CC3100/CC3200 SimpleLink™ Wi-Fi® Internet-on-a-Chip User Guide Texas Instruments Literature Number: SWRU368A April 2014–Revised August 2015

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**(13A02806) Industrial Automation & Control**

**(MOOC-III)**

Objectives: The objectives of the course are to make the students learn about

- Sensors and types of measurement systems
- Process control and sequence control of different controllers
- Operation of actuators
- Types of electric drives and their principles

**Unit – I Introduction to sensors and measurement systems**

Introduction to Industrial Automation and Control - Architecture of Industrial Automation Systems - Introduction to sensors and measurement systems - Temperature measurement - Pressure and Force measurements - Displacement and speed measurement - Flow measurement techniques - Measurement of level, humidity, pH etc - Signal Conditioning and Processing - Estimation of errors and Calibration.

**Unit – II Introduction to Process Control**

P-- I -- D Control - Controller Tuning - Implementation of PID Controllers - Special Control Structures : Feed forward and Ratio Control - Special Control Structures : Predictive Control, Control of Systems with Inverse Response - Special Control Structures : Cascade Control, Overriding Control, Selective Control, Split Range Control.

**Unit – III Introduction to Sequence Control**

PLCs and Relay Ladder Logic - Sequence Control: Scan Cycle, RLL Syntax - Sequence Control: Structured Design Approach - Sequence Control: Advanced RLL Programming - Sequence Control: The Hardware environment

**Unit – IV Introduction to Actuators**

Flow Control Valves - Hydraulic Actuator Systems: Principles, Components and Symbols

- Hydraulic Actuator Systems: Pumps and Motors- Proportional and Servo Valves - Pneumatic Control Systems: System Components - Pneumatic Control Systems: Controllers and Integrated Control Systems - Networking of Sensors, Actuators and Controllers: The Fieldbus - The Field bus Communication Protocol

**Unit – V Electric Drives**

Introduction, Energy Saving with Adjustable Speed Drives - Step motors: Principles, Construction and Drives - DC Motor Drives: Introduction, DC--DC Converters, Adjustable Speed Drives - Induction Motor Drives: Introduction, Characteristics, Adjustable Speed Drives - Synchronous Motor Drives: Motor Principles, Adjustable Speed and Servo Drives.

Outcomes: After completion of Course, the student should be able to

- Understand the measurement of different quantities
- Apply principles of electric drives for different applications like speed control
- Understand the principles of process control and sequence control in relay ladder logic.
- Understand the operation of controller in integrated control systems

Reference Books:

1. S. Mukhopadhyay, S. Sen & A. K. Deb, Industrial instrumentation, control and automation, Jaico Publishing House, 2012
2. Madhuchhanda Mitra and Samarjit Sen Gupta, Programmable Logic Controllers And Industrial Automation An ntroduction,2008
3. David W. Pessen, Industrial Automation: Circuit Design and Components
4. Wiley India Publication, 2011
5. Rajput R.K, Robotics and Industrial Automation, S. Chand publications, 2008