**Academic Regulations**
**Programme Structure**
**&**
**Detailed Syllabus**

**Bachelor of Technology**
**(B. Tech)**
(Four Year Regular Programme)
(Applicable for Batches admitted from 2017-18)

**Department of Electrical and Electronics Engineering**

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**Bachupally, Kukatpally, Hyderabad, Telangana, India 500 090**

## Academic Regulations

# GOKARAJU RANGARAJU
# INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING (B. Tech)
## GR17 REGULATIONS

Gokaraju Rangaraju Institute of Engineering and Technology 2017 Regulations (GR17 Regulations) are given hereunder. These regulations govern the programmes offered by the Department of Electrical and Electronics Engineering with effect from the students admitted to the programmes in 2017-18 academic year.

1. **Programme Offered:** The programme offered by the Department is B. Tech in Electrical and Electronics Engineering, a four-year regular programme.

2. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.
3. **Admissions:** Admission to the B. Tech in Electrical and Electronics Engineering Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the State Government/University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the Government/University or on the basis of any other order of merit approved by the Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. **Programme Pattern:**
   a) Each Academic year of study is divided into two semesters.
   b) Minimum number of instruction days in each semester is 90.
   c) **Student is introduced to "Choice Based Credit System (CBCS)"**
   **d) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).**
   e) The total credits for the Programme is 192. Typically each semester has 24 credits.
   **f) A student has a choice of registering for credits from the courses offered in the programme ensuring the total credits in a semester are between 20 and 28.**
   g) **All the registered credits will be considered for the calculation of final CGPA.**
   h) Each semester has - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester

System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.

i) **Subject / Course Classification** All subjects/ courses offered for the under graduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows.

| S. No. | Broad Course Classification | Course Group/ Category | Course Description |
|---|---|---|---|
| 1 | Foundation Courses (FnC) | BS – Basic Sciences | Includes mathematics, physics and chemistry subjects |
| 2 | | ES - Engineering Sciences | Includes fundamental Engineering subjects |
| 3 | | HS – Humanities and Social sciences | Includes subjects related to humanities, social sciences and management |
| 4 | Core Courses (CoC) | PC – Professional Core | Includes core subjects related to the parent discipline/ department/ branch of Engineering. |
| 5 | Elective Courses (EℓC) | PE – Professional Electives | Includes elective subjects related to the parent discipline/ department/ branch of Engineering. |
| 6 | | OE – Open Electives | Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering. |
| 7 | Core Courses | Project Work | B.Tech. project or UG project or UG major project |
| 8 | | Industrial training/ Mini- project | Industrial training/ Internship/ UG Mini-project/ Mini-project |
| 9 | | Seminar | Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering. |
| 10 | Minor courses | - | 1 or 2 Credit courses (subset of HS) |
| 11 | Mandatory Courses (MC) | - | Mandatory courses<br>Credits/Marks are not counted for grading/pass percentage |

5. **Award of B. Tech Degree:** A student will be declared eligible for the award of B. Tech Degree if he/she fulfills the following academic requirements:
    a) He/She pursues the course of study and completes it successfully in not less than four academic years and not more than eight academic years.
    b) A student has to register for all the 192 credits and secure all credits.
    c) A student, who fails to fulfill all the academic requirements for the award of the degree within eight academic years from the date of admission, shall forfeit his/her seat in B. Tech course.
    d) The Degree of B. Tech in Electrical and Electronics Engineering shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, for the students who are admitted to the programme and fulfill all the requirements for the award of the degree.

**6. Attendance Requirements**

a) A student shall be eligible to appear for the semester-end examinations if he/she puts in a minimum of 75% of attendance in aggregate in all the courses concerned in the semester.

b) Condonation for shortage of attendance in aggregate up to 10% (65% and above and below 75%) in a semester may be granted. A committee headed by Dean (Academic Affairs) shall be the deciding authority for granting the condonation.

c) Students who have been granted condonation shall pay a fee as decided by the Academic Council.

d) Shortage of Attendance more than 10% (attendance less than 65% in aggregate) shall in no case be condoned.

e) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. They may seek re-registration for that semester when offered next with the academic regulations of the batch into which he/she gets re-registered.

**7. Paper Setting, Evaluation of Answer Scripts, Marks and Assessment**

a) Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Academic Council from time to time.

b) **Distribution and Weightage of marks**

| S. No | Components | Internal | External | Total |
|---|---|---|---|---|
| 1 | Theory | 30 | 70 | 100 |
| 2 | Practical | 25 | 50 | 75 |
| 3 | Engineering Graphics | 30 | 70 | 100 |
| 4 | Industry Oriented Mini Project | 25 | 50 | 75 |
| 5 | Comprehensive Viva | - | 100 | 100 |
| 6 | Seminar | 50 | - | 50 |
| 7 | Major Project | 50 | 150 | 200 |

**c) Continuous Internal Evaluation and Semester End Examinations:** The assessment of the student's performance in each course will be based on Continuous Internal Evaluation (CIE) and Semester-End Examination (SEE). The marks for each of the component of assessment are fixed as shown in the following Table.

**Assessment Procedure:**

| S. No | Component of Assessment | Marks Allotted | Type of Assessment | Scheme of Examinations |
|---|---|---|---|---|
| 1 | Theory | 30 | Internal Exams & Continuous Evaluation | 1) Two mid semester examinations shall be conducted for 20 marks each for a duration of 2 hours. Average of the two mid exams shall be considered<br>**i) Subjective - 15 marks**<br>**ii) Objective - 5 marks**<br>**2) Tutorials/Assignments - 5 marks**<br>**3) Continuous Assessment – 5 marks** |
| | | 70 | Semester-end examination | The semester-end examination is for a duration of 3 hours |
| 2 | Practical | 25 | Internal Exams & Continuous Evaluation | **i) Internal Exam-10 marks**<br>**ii) Record - 5 marks**<br>**iii) Continuous Assessment - 10 marks** |
| | | 50 | Semester-end examination | The semester-end examination is for a duration of 3 hours |

**d) Industry Oriented Mini Project:** The Mini Project is to be taken up with relevance to Industry and is evaluated for 75 marks. Out of 75 marks, 25 marks are for internal evaluation and 50 marks are for external evaluation. The supervisor continuously assesses the students for 15 marks (Continuous Assessment – 10 marks, Report – 5 marks). At the end of the semester, Mini Project shall be displayed in the road show at

the department level for the benefit of all students and staff and the same is to be evaluated by Mini Project Review Committee for 10 marks. The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for 50 marks. Mini Project Review Committee consists of HOD, Mini Project Coordinator and Supervisor.

**e) Comprehensive Viva:** The comprehensive viva shall be conducted by a Committee consisting of HOD and two senior faculty members of the department. The student shall be assessed for his/her understanding of various courses studied during the programme of study. The Viva-voce shall be evaluated for 100 marks.

**f) Seminar:** For the seminar, the student shall collect information on a specialized topic and prepare a technical report and present the same to a Committee consisting of HOD and two senior faculty and the seminar coordinator of the department. The student shall be assessed for his/her understanding of the topic, its application and its relation with various courses studied during the programme of study for **50 marks.**

**g) Major Project:** The project work is evaluated for 200 marks. Out of 200, 50 marks shall be for internal evaluation and 150 marks for the external evaluation. The supervisor assesses the student for 25 marks (Continuous Assessment – 15 marks, Report – 10 marks). At the end of the semester, projects shall be displayed in the road show at the department level for the benefit of all students and staff and the same is to be evaluated by the Project Review Committee for 25 marks. The external evaluation for Project Work is a Viva-Voce Examination which is conducted by the Project Review Committee in the presence of external examiner and is evaluated for 150 marks, Project Review Committee consists of HOD, Project Coordinator and Supervisor.

**h) Engineering Graphics:**

- Two internal examinations, each is of 10 marks. The average of the two internal tests shall be considered for the award of marks.
- Submission of day to day work - 15 marks.
- Continuous Assessment - 5 marks.

8. **Recounting of Marks in the End Examination Answer Books:** A student can request for re-counting of his/her answer book on payment of a prescribed fee.
9. **Re-evaluation of the End Examination Answer Books:** A student can request for re-evaluation of his/her answer book on payment of a prescribed fee.
10. **Supplementary Examinations:** A student who has failed to secure the required credits can appear for a supplementary examination, as per the schedule announced by the College.
11. **Malpractices in Examinations:** Disciplinary action shall be taken in case of malpractices during Mid / End-examinations as per the rules framed by the Academic Council.
12. **Academic Requirements and Promotion Rules:**

a) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or laboratories if he / she secures not less than 35% of marks in the Semester-end Examination and a minimum of 40% of the sum total of the Internal Evaluation and Semester-end examination taken together.

b) A student shall be promoted to the next semester only when he/she satisfies the requirements of all the previous semesters.

| S. No. | Promotion | Conditions to be fulfilled |
|---|---|---|
| 1 | First year first semester to first year second semester | Regular course of study of first year first semester. |
| 2 | First year second semester to second year first semester | Regular course of study of first year second semester. (ii) Must have secured at least 24 credits out of 48 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3 | Second year first semester to second year second semester | Regular course of study of second year first semester. |
| 4 | Second year second semester to third year first semester | Regular course of study of second year second semester. (ii) Must have secured at least 58 credits out of 96 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 5 | Third year first semester to third year second semester | Regular course of study of third year first semester. |
| 6 | Third year second semester to fourth year first semester | (i) Regular course of study of third year second semester.<br>(ii) Must have secured at least 86 credits out of 144 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takesthose examinations or not. |
| 7 | Fourth year first semester to fourth year second semester | Regular course of study of fourth year first semester. |

**13. Grade Points: A 10 - point grading system with corresponding letter grades and percentage of marks, as given below, is followed**

| Letter Grade | Grade Point | Percentage of marks |
|---|---|---|
| O (Outstanding) | 10 | Marks >= 90 |
| A+ (Excellent) | 9 | Marks >= 80 and Marks < 90 |
| A (Very Good) | 8 | Marks >= 70 and Marks < 80 |
| B+ (Good) | 7 | Marks >= 60 and Marks < 70 |
| B (Average) | 6 | Marks >= 50 and Marks < 60 |
| C (Pass) | 5 | Marks >= 40 and Marks < 50 |
| F (Fail) | 0 | Marks < 40 |
| Ab (Absent) | 0 | |

**Earning of Credit:**

**A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range O-C. Letter grade 'F' in any Course implies failure of the student in that course and no credits earned.**

**Computation of SGPA and CGPA:**

**The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):**

**i) $S_k$ the SGPA of $k^{th}$ semester(1 to 8) is the ratio of sum of the product of the number of credits and grade points to the total credits of all courses registered by a student, i.e.,**

**Where $C_i$ is the number of credits of the $i^{th}$ course and $G_i$ is the grade point scored by the student in the $i^{th}$ course and n is the number of courses registered in that semester.**

**ii) The CGPA is calculated in the same manner taking into account all the courses m, registered by student over all the semesters of a programme, i.e., upto and inclusive of $S_k$, where $k \geq 2$.**

**iii) The SGPA and CGPA shall be rounded off to 2 decimal points.**

14. **Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B. Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 192 credits.

| | Class Awarded | CGPA Secured |
|---|---|---|
| **14.1** | **First Class With Distinction** | **CGPA 8.00 with no F or below grade/ detention anytime during the programme** |
| **14.2** | **First Class** | **CGPA 8.00 with rest of the clauses of 14.1 not satisfied** |
| **14.3** | **First Class** | **CGPA ≥ 6.50 and CGPA < 8.00** |
| **14.4** | **Second Class** | **CGPA ≥ 5.50 and CGPA < 6.50** |
| **14.5** | **Pass Class** | **CGPA ≥ 5.00 and CGPA < 5.50** |

**15. Withholding of Results:** If the student has not paid dues to the Institute/ University, or if any case of indiscipline is pending against the student, the result of the student (for that Semester) may be withheld and the student will not be allowed to go into the next semester. The award or issue of the Degree may also be withheld in such cases.

**16. Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities:** Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities shall be considered only on case-to-case basis by the Academic Council of the Institute.

**17. Transitory Regulations:** Students who have discontinued or have been detained for want of attendance, or who have failed after having undergone the Degree Programme, may be considered eligible for readmission/re-registration to the same or equivalent subjects as and when they are offered.

**18. General Rules**

a) The academic regulations should be read as a whole for the purpose of any interpretation.
b) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.
c) In case of any error in the above rules and regulations, the decision of the Academic Council is final.
d) The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

**Academic Regulations for B.Tech (Lateral Entry) under GR17**

**(Applicable for Batches Admitted from 2018-19)**

1. **All regulations as applicable for B.Tech Four year degree programme (Regular) will hold good for B.Tech (Lateral Entry Scheme) except for the following rules**

a) Pursued programme of study for not less than three academic years and not more than six academic years.

b) A student should register for all 144 credits and secure all credits. The marks obtained in all 144 credits shall be considered for the calculation of the final CGPA.

c) Students who fail to fulfil all the academic requirements for the award of the degree within six academic years from the year of their admission, shall forfeit their seat in B.Tech programme.

2. **Academic Requirements and Promotion Rules:**

a) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or laboratories if he / she secures not less than 35% of marks in the Semester-end Examination and a minimum of 40% of the sum total of the Internal Evaluation and Semester-end examination taken together.

b) A student shall be promoted to the next semester only when he/she satisfies the requirements of all the previous semesters.

| S. No. | Promotion | Conditions to be fulfilled |
|---|---|---|
| 1 | Second year first semester to second year second semester. | Regular course of study of second year first semester. |
| 2 | Second year second semester to third year first semester. | (i) Regular course of study of second year second semester.<br>(ii) Must have secured at least 29 credits out of 48 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3 | Third year first semester to third year second semester. | Regular course of study of third year first semester. |
| 4 | Third year second semester to | (i) Regular course of study of third year |

| | | |
|---|---|---|
| | **fourth year first semester.** | **second semester.**<br>**(ii) Must have secured at least 58 credits out of 96 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.** |
| **5** | **Fourth year first semester to fourth year second semester.** | **Regular course of study of fourth year first semester.** |

**3. Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B. Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 144 credits.

| | **Class Awarded** | **CGPA Secured** |
|---|---|---|
| **3.1** | **First Class With Distinction** | **CGPA 8.00 with no F or below grade/ detention anytime during the programme** |
| **3.2** | **First Class** | **CGPA 8.00 with rest of the clauses of 3.1 not satisfied** |
| **3.3** | **First Class** | **CGPA ≥ 6.50 and CGPA < 8.00** |
| **3.4** | **Second Class** | **CGPA ≥ 5.50 and CGPA < 6.50** |
| **3.5** | **Pass Class** | **CGPA ≥ 5.00 and CGPA < 5.50** |

**EEE I. B.Tech** **I-SEMESTER**

| Group | Subject code | Name of subject | Credits | | | Total credits | Hours | | | Total Hours | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | L | T | P | | |
| BS | GR17A1001 | Linear Algebra and Single Variable Calculus | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| BS | GR17A1002 | Advanced Calculus | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| BS | GR17A1007 | Engineering Physics | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| ES | GR17A1009 | Computer Programming | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| ES | GR17A1018 | Basic Electrical Engineering | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| HS | GR17A1005 | English | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| ES | GR17A1025 | Engineering Workshop | | | 2 | 2 | | | 4 | 4 | 75 |
| BS | GR17A1029 | Engineering Physics lab | | | 2 | 2 | | | 4 | 4 | 75 |
| ES | GR17A1027 | Computer Programming lab | | | 2 | 2 | | | 4 | 4 | 75 |
| | | **Total credits/Hours/Marks** | **12** | **6** | **6** | **24** | **12** | **12** | **12** | **36** | **825** |

**EEE I. B.Tech** **II-SEMESTER**

| Group | Subject code | Name of subject | Credits | | | Total credits | Hours | | | Total Hours | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | L | T | P | | |
| BS | GR17A1003 | Transform Calculus and Fourier Series | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| BS | GR17A1004 | Numerical Methods | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| BS | GR17A1008 | Engineering Chemistry | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| ES | GR17A1010 | Data Structures | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| ES | GR17A1023 | Engineering Graphics | 1 | | 2 | 3 | 1 | | 4 | 5 | 100 |
| ES | GR17A1019 | Fundamentals of Electronics Engineering | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| HS | GR17A1024 | Business Communication and Soft Skills | | | 2 | 2 | | | 4 | 4 | 75 |
| ES | GR17A1026 | IT Workshop | | | 2 | 2 | | | 4 | 4 | 75 |
| BS | GR17A1030 | Engineering Chemistry lab | | | 2 | 2 | | | 4 | 4 | 75 |
| | | **Total credits/Hours/Marks** | **11** | **5** | **8** | **24** | **11** | **10** | **16** | **37** | **825** |

**EEE II. B.Tech** **I-SEMESTER**

| Group | Subject code | Name of subject | Credits | | | Total credits | Hours | | | Total Hours | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | L | T | P | | |
| BS | GR17A2058 | Special functions and Complex variables | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| PC | GR17A2034 | Electromagnetic Fields | 3 | 1 | | 4 | 3 | 2 | | 5 | 100 |
| PC | GR17A2035 | Network Theory | 3 | 1 | | 4 | 3 | 2 | | 5 | 100 |
| PC | GR17A2036 | DC Machines and Transformers | 3 | 1 | | 4 | 3 | 2 | | 5 | 100 |
| PC | GR17A2076 | Computer Organization | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| PC | GR17A2037 | DC Machines Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| PC | GR17A2038 | Electrical Networks Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| PC | GR17A2039 | Electrical Simulation Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| | | **Total credits/Hours/Marks** | **13** | **5** | **6** | **24** | **13** | **10** | **12** | **35** | **725** |
| MC | GR17A2001 | Environmental Science | | | 2 | 2 | | | 2 | 2 | 100 |

**EEE II. B.Tech** **II-SEMESTER**

| Group | Subject code | Name of subject | Credits | | | Total credits | Hours | | | Total Hours | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | L | T | P | | |
| HS | GR17A2104 | Managerial Economics and Financial Analysis | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| PC | GR17A2040 | Power Generation and Distribution | 3 | 1 | | 4 | 3 | 2 | | 5 | 100 |
| PC | GR17A2041 | AC Machines | 3 | 1 | | 4 | 3 | 2 | | 5 | 100 |
| PC | GR17A2042 | Control Systems | 3 | 1 | | 4 | 3 | 2 | | 5 | 100 |
| PC | GR17A2105 | Principles of Digital Electronics | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| PC | GR17A2044 | AC Machines Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| PC | GR17A2045 | Control Systems Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| PC | GR17A2046 | Analog and Digital Electronics Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| | | **Total credits/Hours/Marks** | **13** | **5** | **6** | **24** | **13** | **10** | **12** | **35** | **725** |
| MC | GR17A2002 | Value Education and Ethics | | | 2 | 2 | | | 2 | 2 | 100 |
| MC | GR17A2106 | Gender sensitization Lab | | | 2 | 2 | | | 2 | 2 | 75 |

**III B Tech** **I Semester**

| Group | Subject code | Name of subject | Credits | | | Total credits | Hours | | | Total Hours | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | L | T | P | | |
| PC | GR17A3016 | Power Transmission System | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| PC | GR17A2055 | Microcontrollers | 3 | 1 | | 4 | 3 | 2 | | 5 | 100 |
| PC | GR17A3018 | Power Electronics | 3 | 1 | | 4 | 3 | 2 | | 5 | 100 |
| **Open elective 1** | | | **2** | **1** | | **3** | **2** | **2** | | **4** | **100** |
| **Professional Elective 1** | | | **3** | **1** | | **4** | **3** | **2** | | **5** | **100** |
| PE | GR17A3015 | Operational Amplifiers | | | | | | | | | |
| PE | GR17A3017 | Electrical Measurements and Instrumentation | | | | | | | | | |
| PE | GR17A2049 | Signals & Systems | | | | | | | | | |
| PC | GR17A3019 | Sensors, Measurements and Instrumentation Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| PC | GR17A3020 | Power Electronics Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| PC | GR17A2059 | Microcontrollers Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| | | **TOTAL** | **13** | **5** | **6** | **24** | **13** | **10** | **12** | **35** | **725** |

**III B Tech** **II Semester**

| Group | Subject code | Name of subject | Credits | | | Total credits | Hours | | | Total Hours | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | L | T | P | | |
| PC | GR17A3021 | Computer Methods in Power Systems | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| PC | GR17A3022 | Switch Gear and Protection | 3 | 1 | | 4 | 3 | 2 | | 5 | 100 |
| PC | GR17A3102 | Management Science | 3 | 1 | | 4 | 3 | 2 | | 5 | 100 |
| **Open Elective 2** | | | **2** | **1** | | **3** | **2** | **2** | | **4** | **100** |
| **Professional Elective 2** | | | **3** | **1** | | **4** | **3** | **2** | | **5** | **100** |
| PE | GR17A3023 | Utilization of Electrical Energy | | | | | | | | | |
| PE | GR17A3024 | Non Conventional Sources of Energy | | | | | | | | | |
| PE | GR17A3106 | Neural and Fuzzy Systems | | | | | | | | | |
| PC | GR17A3025 | Power Systems Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| PC | GR17A3100 | Advanced English Communication Skills Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| PC | GR17A3101 | Industry Oriented Mini Project | | | 2 | 2 | | | 4 | 4 | 75 |
| | | **TOTAL** | **13** | **5** | **6** | **24** | **13** | **10** | **12** | **35** | **725** |

| IV B Tech | | | | | | | | | | | I Semester |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Subject code | Name of subject | Credits | | | Total credits | Hours | | | Total Hours | Total Marks |
| | | | L | T | P | | L | T | P | | |
| PC | GR17A4022 | Power Semiconductor Drives | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| PC | GR17A4023 | Power System Operation And Control | 3 | 1 | | 4 | 3 | 2 | | 5 | 100 |
| PC | GR17A4024 | HVDC Transmission | 3 | 1 | | 4 | 3 | 2 | | 5 | 100 |
| **Open Elective 3** | | | **2** | **1** | | **3** | **2** | **2** | | **4** | **100** |
| **Professional Elective 3** | | | **3** | **1** | | **4** | **3** | **2** | | **5** | **100** |
| PE | GR17A4147 | High Voltage Engineering | | | | | | | | | |
| PE | GR17A4026 | Electrical Distribution Systems | | | | | | | | | |
| PE | GR17A4148 | Principles of signal processing | | | | | | | | | |
| PC | GR17A4027 | DSP Based Electrical Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| PC | GR17A4028 | Power System Simulation Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| PC | GR17A4029 | Power Electronics And Drives Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| | | **TOTAL** | **13** | **5** | **6** | **24** | 13 | 10 | 12 | **35** | **725** |

| IV B Tech | | | | | | | | | | | II Semester |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Subject code | Name of subject | Credits | | | Total credits | Hours | | | Total Hours | Total Marks |
| | | | L | T | P | | L | T | P | | |
| PC | GR17A4030 | Programmable Logic Controllers | 2 | 1 | | 3 | 2 | 2 | | 4 | 100 |
| **Professional Elective 4** | | | **3** | **1** | | **4** | **3** | **2** | | **5** | **100** |
| PE | GR17A4032 | Flexible AC Transmission Systems | | | | | | | | | |
| PE | GR17A4035 | EHV AC Transmission | | | | | | | | | |
| PE | GR17A4031 | Power System Automation | | | | | | | | | |
| **Professional Elective 5** | | | **2** | **1** | | **3** | **2** | **2** | | **4** | **100** |
| PE | GR17A4036 | Modern Power Electronics | | | | | | | | | |
| PE | GR17A4149 | DSP Based Electromechanical Systems | | | | | | | | | |
| PE | GR17A4037 | Advanced Control Systems | | | | | | | | | |
| PC | GR17A4038 | Programmable Logic Controllers Lab | | | 2 | 2 | | | 4 | 4 | 75 |
| SPW | GR17A4143 | Seminar | | | 1 | 1 | | | 2 | 2 | 100 |
| SPW | GR17A4142 | Comprehensive Viva | | | 1 | 1 | | | 2 | 2 | 100 |
| SPW | GR17A4144 | Major Project | | | 10 | 10 | | | 14 | 14 | 200 |
| | | **TOTAL** | **7** | **3** | **14** | **24** | 7 | 6 | 22 | **35** | **775** |

| Open Elective 1 | | Course Title | Department Offering |
|---|---|---|---|
| OE - I | GR17A3151 | Water Resources Engineering | CE |
| | GR17A3152 | Solar & Wind Energy Systems | EEE |
| | GR17A3153 | Applied Thermodynamics | ME |
| | GR17A3154 | Principles of E- Commerce | CSE |
| | GR17A3155 | Datamining and Applications | IT |
| | GR17A3156 | Computer Architecture and Organization | ECE |
| **Open Elective 2** | | **Course Title** | **Department Offering** |
| OE - II | GR17A3161 | Transportation Engineering | CE |
| | GR17A3162 | Sensors & Transducers | EEE |
| | GR17A3163 | Automobile Engineering | ME |
| | GR17A3164 | Human Computer Interaction | CSE |
| | GR17A3165 | Essentials of Big Data Analytics | IT |
| | GR17A3166 | Principles of Operating Systems | ECE |
| **Open Elective 3** | | **Course Title** | **Department Offering** |
| OE - III | GR17A4161 | Green Building Technology | CE |
| | GR17A4162 | Soft Computing Techniques | EEE |
| | GR17A4163 | Operations Research | ME |
| | GR17A4164 | Mobile Computing and Applications | CSE |
| | GR17A4165 | Business Intelligence | IT |
| | GR17A4166 | Principles Of Satellite Communications | ECE |

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# POWER TRANSMISSION SYSTEM

**Course Code: GR17A3016** **LTPC**
**III Year I Sem** 2103

## UNITI

**TRANSMISSION LINE PARAMETERS:** Types of conductors-calculation of resistance for solid conductors - 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.

Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

## UNITII

## PERFORMANCE OF SHORT &MEDIUM LENGTH TRANSMISSION LINES:

Classification of Transmission Lines - Short, medium and long line and their model representations- Nominal-T, Nominal-πand A,B,C,D Constants for symmetrical &Asymmetrical Networks, Numerical Problems. Mathematical Solutions to estimate regulation and efficiency of all types of lines -Numerical Problems.

## UNITIII
## PERFORMANCE OF LONG LENGTH TRANSMISSION LINES:

Long Transmission Line-Rigorous Solution, evaluation of A, B, C, D Constants, Interpretation of the Long Line Equations, Incident, Reflected and Refracted Waves-Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves- Representation of Long Lines - Equivalent-T and Equivalent π- network models (numerical problems).

Skin, Proximity and Ferranti effects - Charging Current - Effect on Regulation of the Transmission Line.

## UNITIV
## POWER SYSTEM TRANSIENTS, CORONA & SAG:

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).

**Corona**-Description of the 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, Numerical Problems.

**UNITV**

**OVER HEAD LINE INSULATORS:** Types of Insulators, String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding.

**UNDER GROUND CABLES:** Types of Cables, Construction, Types of Insulating materials, Calculation 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, HV cables.

**TEXT BOOKS:**

1. M.L. Soni, P.V.Gupta, U.S. Bhatnagar, A. Chakrabarthy, "Power System Engineering", Dhanpat Rai &Co Pvt.Ltd.

2. C.L.Wadhwa, "Electrical power systems" New Age International (P) Limited, Publishers, 1998.

**REFERENCES**

1. I.J.Nagarath &D.P Kothari, "Power System Engineering", TMH2/e, 2010

2. B.R.Gupta, "Power System Analysis and Design", Wheeler Publishing.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# MICROCONTROLLERS

**Course Code: GR17A2055** **LTPC**
**III Year I Sem** 3104

## UNIT- I

**Microprocessors:** Introduction to microprocessors, 8086 Architecture, Register organization ,Memory segmentation, Programming Model, Timing diagrams, Interrupts, Instruction formats, Addressing modes, Instruction set, Macros Program, 8255 PPI, Various modes of operation, Interfacing to 8086.

**Interfacing:** keyboard, Display, stepper Motor, D/A converter, Memory, Interrupt structure of 8086, Interrupt service routine, Serial communication standards .

## UNIT-II

**Introduction and 8051 Architecture:**Introductiontomicrocontrollers,comparing microprocessors and microcontrollers, 4,8,16 and 32 bit microcontrollers, Development systems for Microcontrollers, Architecture;Architectureof8051, pin configuration of 8051microcontroller, hardware input pins, output pins ports and external memory, counters and timers, serial data input/output and interrupts.

## UNIT-III

**Moving Data and LogicalOperations:**Introduction,Addressingmodes,External Data moves, Code Memory Read-only Data Moves, PUSH and POPOp codes, Data Exchanges, Logical Operations ;Introduction, Byte-Level Logical Operations, Bit- Level Logical Operations, Rotate and Swap Operations

## UNIT-IV

**Arithmetic Operations, Jump and Call Opcodes:** Introduction, Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Jump and Callop codes; introduction, The jump and call program range, Jumps, Calls and Subroutines, call and returns, Interrupts and Returns

## UNIT-V

**8051 Microcontroller Design:** Introduction, Microcontroller specification, Microcontroller Design, Testing the Design, Timing subroutines, Serial Data Transmission.

**Applications and Serial Data Communication:** Keyboards, Displays, Pulse Measurement, D/A and A/D Conversions, Multiple Interrupts, Serial data Communication;

**Teaching methodologies:**

- Power Point presentations
- Tutorial Sheets
- Assignments

**TEXTBOOKS**

1. D.V.Hall, Microprocssors and Interfacing, TMH, 2nd edition 2006.
2. KennethJ.Ayala,The 8051 Microcontroller Architecture Programming and Applications, 2ndEdition,PenramInternationalPublishers(I), 1996.

**REFERENCES**

1. A.K.Ray and K.M. Bjurchandani, TMH, 2nd edition, Advanced Microprocessors and Peripherals TMH, 2006.
2. Mohammed Ari Mazidi and JanciGillispie,The 8051 Microcontroller and EmbeddedSystems,PearsonEducationAsia,NewDelhi,2003.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# POWER ELECTRONICS

**Course Code: GR17A3018** **LTPC**
**III Year I Sem** 3104

## UNIT I
## POWER SEMI CONDUCTOR DEVICES

Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors – Basic theory of operation of SCR – Static characteristics – Turn on and turn off methods- Dynamic characteristics of SCR - Turn on and Turn off times-Salientpoints

Two transistor analogy of SCR, SCR - UJT firing circuit —– Series and parallel connections of SCR's – Snubber circuit details – Specifications and Ratings of SCR's, BJT, IGBT - Numerical problems–Line Commutation and Forced Commutation circuits.

## UNIT II

## SINGLE PHASE HALF CONTROLLED CONVERTERS

Phase control technique – Single phase Line commutated converters – Mid point and Bridge connections – Half wave controlled converters with Resistive, RL loads and RLE load– Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Freewheeling Diode–Numerical problems

## SINGLE PHASE FULLY CONTROLLED CONVERTERS

Fully controlled converters, Mid point and Bridge connections with Resistive, RL loads and RLE load– Derivation of average load voltage and current – Line commutated inverters -semi-converters, Active and Reactive power inputs to the converters, Effect of source inductance – Expression for load voltage and current, Dual converters–Numerical problems.

## UNIT III

## THREE PHASE LINE COMMUTATED CONVERTERS

Three phase converters – Three pulse and six pulse converters – Mid point and bridge connections average load voltage With R and RL loads ,Semi converters,– Effect of Source inductance– - Waveforms –Numerical Problems.

## INVERTERS

Inverters – Single phase inverter – Basic series inverter – Basic parallel Capacitor inverter, bridge inverter – Waveforms – Voltage control techniques for inverters Pulse width modulation techniques – Numerical problems, Basics of Resonant Inverters.

**UNIT IV**

**AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS**

AC voltage controllers – Single phase two SCR's in antiparallel – 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 -Numerical problems -Cyclo converters – Single phase midpoint cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only)–Waveforms.

**UNIT V**

**CHOPPERS**

Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression. Morgan's chopper – Jones chopper (Principle of operation only) Waveforms —AC-Chopper-Problems.

**TEXT BOOKS**

1. P.S.Bhimbra,"Power Electronics",Khanna publications.

2. M.D.Singh & K.B.Kanchandhani, Power Electronics, Tata McGrawHill Publishing company, 1998.

**REFERENCES**

1. Vedam Subramanyam, Power Electronicsby New Age International (P) Limited, Publishers

2. P.C.Sen, Power Electronics, Tata McGraw-Hill Publishing.

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# OPERATIONAL AMPLIFIERS
## (Professional Elective- I)

**Course Code: GR17A3015** **LTPC**
**III Year I Sem** 3104

### UNIT I

Integrated Circuits: Classification, Chip Size and Circuit Complexity, Ideal and Practical Op-Amp, Op-amp characteristics-DC and AC Characteristics. 741 Op-Amp and its Features, Modes of operation-inverting, non-inverting, differential.

### UNIT II

OP-AMP Applications: Basic Applications of Op-Amp, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converters, Sample & Hold Circuits. Differentiators and Integrators. Comparators. Schmitt Trigger. Multi vibrators, Introduction to Voltage Regulators Features of 723 Regulators.

### UNIT III

Active Filters & Oscillators: Introduction. First Order and Second Order Low Pass. High Pass and Band Pass Filters. Active Band Reject and All Pass Filters. Principle of Operation and Types of Oscillators RC, Wien Bridge and quadrature type. Wave form Generators- Triangular, Saw Tooth, Square Wave.

### UNIT IV

Timers & Phase Locked Loops: 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, VCO

### UNIT V

D-Aand A-D Converters: Introduction, Basic DAC Techniques- Weighted Resistor Type. R-2R Ladder Type, inverted R-2R Type. Different types of ADCs- Parallel Comparator Type. Counter Type. Successive Approximation Register Type and Dual Slope Type DAC and ADC Specifications.

### TEXT BOOKS:

1. Linear Integrated CircuitsD Roy Chowdhury. New age International (P) Ltd.2003
2. Op Ams and Linear ICs Ramakanth A Gayakwad PHI1987

## REFERENCES

1. Operational Amplifiers and Linear Integrated Circuits: William D Stanely PEI 2009

2. Operational Amplifiers and Linear Integrated Circuits K Lal Kishore pearson 2008

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**ELECTRICAL MEASUREMENTS AND INSTRUMENTATION**
**(Professional Elective- I)**

| **Course Code: GR17A3017** | **LTPC** |
|---|---|
| **III Year I Sem** | 3 104 |

**UNIT I**

**Fundamentals of Electrical Measurements:** Ammeters & Voltmeters PMMC & Moving Iron Instruments C.T.s and PTs Ratio and Phase angle errors.
Measurement of Power and power factor. Measurement of Active and Reactive power.

**UNIT II**

**Measurement of Energy and Other Electrical Qualities:** Single phase & Three phase energy meters. Crompton's Potentiometer, AC potentiometers.Measurement of resistance, Inductance and Capacitance by bridges. Wheatstone bridge, Carey Foster Bridge, Maxwell's Bridge, De sauty bridge, Schering Bridge.

**UNIT III**

**CRO and Digital Voltmeters:** Cathode Ray Oscilloscope, Time base Horizontal & Vertical Amplifier, Measurement of phase, frequency, Sampling Oscilloscope, Digital storage Oscilloscope. Digital Voltmeters- Successive Approximation, Ramp, Dual slope Integration, Micro processor based Ramp type DVM, Digital Frequency and phase Angle Meters.

**UNIT IV**

**Instrumentation Fundamentals:** Transducers, Classification,Resistive Inductive and Capacitive type transducers, LVDT, Strain Gauge, gauge factor, Thermistors, Thermo couples, Piezo electric transducers, Photo- voltaic, photo conductive transducers, and photo diodes

**UNIT V**

**Measurement of non Electrical Quantities:** Measurement of Displacement, Velocity, RPM, Acceleration, Flow.

**TEXT BOOKS**

1. Electrical & Electronic Measurement & Instruments by A.K.Shawney Dhanpat Rai & Sons Publications.
2. Electrical Measurements and measuring Instrumentsby E.W.Golding and F.C.Widdis, FifthEdition, WheelerPublishing.

**REFERENCES**

1. D.V.SMurthy, “Transducers and Instrumentation”, Prentice Hall of India, 2nd edition,2009.
2. H.S.Kalsi, “Electronic Instrumentation”, Tata McGraw-Hill Edition, 1995,1st Edition, 1995

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# SIGNALS AND SYSTEMS

## (Professional Elective- I)

**Course Code: GR17A2049** **LTPC**

**III Year I Sem** **3104**

**Unit I**

**Introduction to Continuous-time Signals and Systems:** Typical signals (impulse, step, ramp,sinusoid, exponential, signum, sinc); Time-domain scaling, shifting, and folding; Continuous-time signal characteristics (periodicity, frequency, deterministic, random, symmetry, energy and power); Properties of continuous-time systems (linearity, time invariance, causality and stability). Analogy between vectors and signals; Orthogonal signal space; Signal approximation using orthogonal functions; Mean squared error; Closed set of orthogonal functions; Orthogonality in complex functions.

**Unit II**

**Fourier Series, Fourier Transform, and Laplace Transform:** Representation of continuous-timeperiodic signals by Fourier series; Dirichlet's conditions; Properties of Fourier series, Parseval's theorem; Trigonometric and Exponential Fourier series; Complex Fourier spectrum; Fourier transform via Fourier series; Fourier transform of periodic and aperiodic signals; Convergence of Fourier transform; Properties of Fourier transforms, Parseval's theorem; Fourier transforms involving impulse function and Signum function; Introduction to Hilbert Transform; Definition of two-& one-sided Laplace transform, Region of convergence (ROC); Relation between LT and FT.

**Unit III**

**Signal Transmission through Linear Systems:** Continuous-time Linear Time-Invariant system,Representation by differential equations, Transforms and State-variables; Impulse response, Convolution; Transfer function, frequency response; Ideal vs. realizable LPF, HPF and BPF characteristics; Signal bandwidth, system bandwidth, rise-time, gain-bandwidth; Distortion; Causality and Paley-Wiener criterion for physical realization.

**Unit IV**

**Sampling & Discrete-time Signals:** Sampling theorem – Graphical and analytical proof for BandLimited Signals; Impulse-train sampling; Natural and Flat-top Sampling; Reconstruction of signal from its samples; Under-sampling and Aliasing; Band-pass Sampling Theorem; DT signal characteristics (periodicity, frequency, deterministic, random, symmetry, energy and power).

**Unit V**

**Z-Transform:** Discrete time signal representation using complex exponential and sinusoidalcomponents; z-Transform of a discrete sequence; Region of convergence of z-Transform, Constraints on ROC for various classes of signals; Relationship between z-Transform and DTFT (Fourier spectrum); Transfer function of a LTI system (No difference equations); Properties of z-Transform**,** Inverse z-Transform by Partial Fractions (simple poles only) .

**TEXT BOOKS**


1. Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, "Signals and Systems",Second Edition, PHI Learning, New Delhi, 2007.
2. B. P. Lathi, Signals, Systems and Communications-B.S. Publications, 2003.


**REFERENCES**


1. M. J. Roberts, "Signals and Systems", Second Edition, Tata-McGraw Hill, 2012.
2. Simon Haykin and Barry Van Veen, "Signals and Systems", Edition, John Wiley and Sons, 2002.

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# SENSORS MEASUREMENTS AND INSTRUMENTATION LAB

**Course Code: GR17A3019** **LTPC**
**III Year I Sem** 0022

## List of Experiments

**Task1:** Voltage and Current Detection Circuitry
**Task2:** Temperature and Pressure Detection Circuitry
**Task3:** Water flow and Level detection Circuitry
**Task4:** Position Indication (LVDT,Pot)
**Task5:** Proximity sensors(inductive)
**Task6:** Distance(Ultrasonic) sensor
**Task7:** Light sensor
**Task8:** Humidity sensor
**Task9:** Rainfall sensor& Soil moisture sensor
**Task10:** Motion sensor
**Task11:** Measurement of Power and Energy
**Task12:** Accelerometer sensor
**Task13:** Measurement of Resistance by bridge
**Task14:** Measurement of Inductance by bridge
**Task15:** Measurement of Capacitance by bridge

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# POWER ELECTRONICS LAB

**Course Code: GR17A3020** **LTPC**
**III Year I Sem** 0022

## LIST OF EXPERIMENTS:

## SIMULATION CIRCUITS

**Task1:** 1-Phase Half Wave Controlled Converter With R, RL& RLE Load
**Task2:** 1-Phase Semi Converter With R, RL & RLE-Load
**Task3:** 1-Phase Full Controlled Converter With R, RL & RLE–Load
**Task4:** 1-Phase Ac Voltage Controller With R, RL &RLE – Load
**Task5:** 1-Phase Cycloconverter
**Task6:** Phase Half & Full Bridge Inverter
**Task7:** 3- Phase Full Controlled Converter with R, RL & RLE –Load
**Task8:**3- Phase Bridge Inverter
**Task9:** Buck converter
**Task10:** Boost converter

## HARDWARE

**Task11:** Thyristorised Drive for PMDC Motor with Speed Measurement and Closed Loop Control
**Task12:** IGBT Based 4 Quadrant Drive for PMDC Motor with Speed Measurement & Closed Loop Control
**Task13:** Three Phase Input Thyristorised Drive For Dc Motor With Closed Loop Control
**Task14:** Closed Loop control of Dc Motor Using Three Phase Fed Four Quadrant Chopper Drive
**Task15:** Speed Control of Three Phase Wound Induction Motor
**Task16:** Single Phase Fully Controlled Bridge Converter
**Task17:** Single Phase Half Controlled Bridge Converter
**Task18:** Single Phase Cyclo Converter

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# MICROCONTROLLERS LAB

**Course Code: GR17A2059** **LTPC**
**III Year I Sem** 0022

**Listofexperimentson2Gkit**

**Task1.**LEDpatterns

a)BlinkingLEDs, b)Seriallights, c)Half on/Half off, d)Alternate

on/off **Task2.**Switches&LEDs

a) Press switch to make corresponding LED on, b)Press switch to make corresponding LEDoff c)First switch press, last LED on, d)First switch press, last LED off

**Task3.**LCD

a)Character & string display on LCD, b)SW1-Display strring1 on first line of LCD, c)SW2-Display strring1 on first line of LCD, SW2

**Task4**.UART

a)Echo Program, b) Take command from PC & glow corresponding LED, c)Press Switch & display switch number on PC, d)Display data received by UART on LCD

**Task5**.TRIAC

a)220VAC bulb switch on /off, b)220VAC fan speed control with fixed step size,

**Task6**.ADC

a)Raw ADC value display on LCE, b)Raw ADC value display on Hyper Terminal, c)Engineering unit conversion and display on LCD, d)Engineering unit conversion and display on Hyper Terminal e)Limit checking for temperature value and switching on fan using triac f)Limit checking for ambient light value and switching on light using triac.

**Task7**.DAC

a) Fixed step incremented DAC, output seen on multi-meter, b)DAC input value received from Hyper Terminal c)DAC input value taken from switches

**Task8.**DCmotor

a)DC motor control-CW, CCW and stop using switches, b)DC motor control- CW, CCW and stop using commands received from Hyper Terminal

**Task9**.ZigBee

a)Receive data on Zig Bee from PC Zig Bee dongle and display data on LEDs b)Receive data on Zig Bee from PC Zig Bee dongle and display data on LCD c)Read ADC and transmit data using Zig Bee d) TRIAC based control off and light using data received on Zig Bee

**Task10**.RF433MHz

a)Receive data on RF from another kit with RF transmitter. Connect PCs to bothkits.TypeindatainHyperTerminalofTransmitterkit&seeonHyperTerminal of Receiver kit b) Read switches on transmitter kit, send their status on RF to receiver kit and control motor using switch status

**Task11.**Bluetooth

a) Transfer data to PC using Blue link ,b)Receive data from PC using Blue Link &display on LCD c)Transfer data from mobile phone(using aJ2ME app) and receive using Blue link and control motor operation d)Transfer data from mobile phone(using a J2ME app) and receive using Blue Link and control electrical appliance operation

**Task12.**Ethernet

a)Transfer data to PC using WIZI05SR and display on Hyper Terminal, b)Implement an embedded web server

**Task13.**RTC

a)Read and display RTC data on LCD, b)Read and display RTC data on Hyper Terminal, c)Set RTC using Hyper terminal and display data on Hyper Terminal, d)Implement an Event Logger with Time Stamp display

**Task14.**SDcard

a) Transfer data to PC, store on SDcard and retrieve it back(block transfer) b)ImplementFATfilesystemonSDcardc)Implementdataacquisitionsystemand store data ina CSV file on SD card with time stamp

**Note: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Practical Examination**

**Lab methodologies:**

- Assignments
- Lab experiments with Arduino software

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# WATER RESOURCES ENGINEERING

**(Open Elective-1)**

**Course Code: GR17A3151** **LTPC**
**III Year. I Semester** **2103**

## UNIT I

**Introduction to Engineering Hydrology and its applications:** Hydrologic Cycle, types and forms of precipitation, rainfall measurement, types of Rain gauges, computation of average rainfall over a basin, processing of rainfall data-adjustment of record-Rainfall Double Mass Curve. Runoff-Factors affecting Runoff over a Catchment- Empirical and Rational Formulae.

**Abstraction from rainfall:** Evaporation, factors effecting evaporation, Measurement of evaporation-Evapotranspiration- Penman and Blaney & Criddle Methods -Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices'.

## UNIT II

**Distribution of Runoff:** Hydrograph Analysis Flood Hydrograph – Effective Rainfall - Base Flow-Base Flow Separation - Direct Runoff Hydrograph– Unit Hydrograph, definition and limitations of application of Unit hydrograph, Derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa S- hydrograph, Synthetic Unit Hydrograph.

## UNIT III

**Ground water Occurrence:** Types of aquifers, aquifer parameters,' porosity' Specific yield, permeability, transmissivity and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers, Types of wells, Well Construction - Well Development.

## UNIT IV

**Necessity and importance of irrigation:** Advantages and ill-effects of irrigation, Types of irrigation, Methods of application of irrigation water, Indian Agriculture soils, Methods of improving soil fertility-Crop rotation, preparation land for irrigation, Standards of quality for irrigation water.

**Soil-water-plant relationship:** Vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, Duty and delta, factors Affecting duty- design discharge for a water course. The depth and frequency of Irrigation, Irrigation efficiencies-Water Logging.

## UNITV

**Classification of canals:** Design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, IS standards for canal design canal lining.

**Design discharge over a catchment:** computation of design discharge–rational formula, SCS curve number method, flood frequency analysis introductory part only. Stream gauging-measurement and estimation of stream flow.

**TEXT BOOKS**

1. A text book of hydrology by P. Jaya Rami Reddy, laxmi publications pvt limited
2. Irrigation and water power engineering- B.C. Punmia, PandeB. B.Lal, Ashok kumarjain, Arun kumarjain- Laxmi publications 16th edition

**REFERENCE**


l. Elementary hydrology by V.P. Singh PHI publications
2. Irrigation and Water- Resources &Water Power by P'N 'Modi' StandardBook House.
3. Irrigation Water Management by D'K' Majundar' Printice Hall ofIndra.
4. Irrigation and Hydraulic structures by S'K'Grag'
5. Applied Hydrology by VenTe Chow' David R' Maidmentlarry W'MaysTataMC. GrawHill'
6. Introduction to Hydrology by Warren Viessman' Jr' Garyl' Lewis'
7. Irrigation and Water Power Engineering – Dr. B. C. Punmia, Dr.Lal et.al
8. Water Resources engineering – Larry W. Mays, John Willey & Sons
9. Irrigation engineering theory and practice – A. M. MichealVikas Publishers
10. NPTEL web and video courses

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# SOLAR AND WIND ENERGY SYSTEMS
## (Open Elective- I)

**Course Code:GR17A3152** **LTPC**
**III Year I Sem** 210 3

**UNIT I**

**Solar Energy Basics:** The sun as a source of energy, The Earth Sun, Earth Radiation Spectrums,Extra-terrestrial and Terrestrial Radiations, Spectral Energy Distribution of Solar Radiation, Depletion of Solar Radiation, Solar Radiation Data, Measurement of Solar Radiation, Solar Time(Local Apparent Time), Solar Radiation Geometry, Solar Day Length, Empirical Equations for Estimating Solar Radiation Availability on Horizontal Surface For Cloudy skies, Hourly Global, Diffuse and Beam Radiation on Horizontal Surface Under Cloudless Skies, Solar Radiation on Inclined Plane Surface

**UNIT II**

**Solar Thermal Systems:** Solar Collectors, Solar Water Heater, Solar Passive Space-Heating andCooling Systems, Solar Ustrial Heating Systems, Solar Refrigeration and Air-Conditioning Systems, Solar Cookers, Solar Furnaces, Solar Green House, Solar Dryer, Solar Distillation(or Desalination of Water), Solar Thermo-Mechanical Systems.

**UNIT III**

**Solar Photovoltaic Systems:** Solar Cell Fundamentals, Solar Cell Characteristics, Solar CellClassification, Solar Cell, Module, Panel and Array Construction, Maximizing The Solar PV Output and Load Matching, Maximizing Power point tracker(MPPT),Balance of System Components, Solar PV Systems, Solar PV Applications

**UNIT IV**

**Wind Energy:** Origin of Winds, Nature of Winds, Wind Turbine Siting, Major Applications of WindPower, Basics of Fluid Mechanics, Wind Turbine Aerodynamics.

**UNIT V**

**Wind Energy Conversion Systems:** Wind Energy Conversion Systems (WECS), Wind-DieselHybrid System, Effects of Wind Speed and Grid Condition (System Integration), Wind Energy Storage, Environmental Aspects.

**TEXT BOOKS**

- B.H.Khan, “Non- Conventional Energy Resources”, 2nd edition, Tata McGraw-Hill, New Delhi

**REFERENCE**

1. SP Sukhatme, Solar Energy - Principles of thermal collection and storage, 2nd edition, Tata McGraw-Hill, New Delhi

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# APPLIED THERMODYNAMICS

**(Open Elective-I)**

**Course Code:GR17A3153** **LTPC**

**III B. Tech I Semester** **2103**

## UNIT I

**Steam Power Cycles:** Carnot cycle, Rankine cycle, Modified Rankine - Schematic layouts, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration &Reheating. Binary vapour cycle

**Combustion:** Fuels and combustion, basic chemistry, combustion equations, stochiometric air fuel ratio, volumetric and mass basis conversion, Flue gas analysis by Orsat apparatus.

## UNIT II

**Boilers :** Classification – Working principles – with sketches including H.P. Boilers, L.P. Boilers and Modern H.P. Boilers – Mountings and Accessories – Working principles, Boiler horse power, equivalent of evaporation, efficiency and heat balance. Draught, classification – Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – Artificial draught: induced, forced, balanced and steam jet draught,

## UNIT III

**Steam Nozzles:** Function of a nozzle – applications - types, Flow through nozzles, thermodynamic analysis, assumptions -velocity of nozzle at exit-Ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape: Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line.

**Steam Condensers:** Requirements of steam condensing plant – Classification of condensers – working Principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects, Air pump- cooling water requirement. Cooling towers.

## UNIT IV

**Steam Turbines:** Classification – Impulse turbine ,De-Laval Turbine its features; Mechanical details – Velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency.-.

**Reaction Turbine:** Mechanical details – principle of operation, thermodynamic analysis of a stage.- Degree of reaction –velocity diagram – Parson's reaction turbine – condition for maximum efficiency.

**Compounding:** Methods to reduce rotor speed-Velocity compounding and pressure compounding, pressure velocity compounding, Velocity and Pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine.

**UNIT V**

**Gas Turbines:** Simple gas turbine plant – Ideal cycle, essential components – actual cycle –methods for improvement of performance - regeneration, inter cooling and reheating –Closed and Semi-closed cycles – merits and demerits, Brief concepts about compressors, combustion chambers and turbines of Gas Turbine Plant.

**Jet Propulsion:** Principle of Operation –Classification of jet propulsive engines – Working Principles with Schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency– Turbo jet engines – Needs and Demands met by Turbo jet – Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – Methods.

**Rockets:** Working Principle – Classification – Propellant Type – Thrust, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines.

**TEXT BOOKS:**


1.Thermal Engineering / R.K. Rajput / Lakshmi Publications
2.Thermal Engineering-P.L.Ballaney/ Khanna publishers
3. Thermal Engineering/R.S.Khurmi/JS Gupta/S.Chand.


**REFERENCES:**


1. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot

2. Gas Turbines and Propulsive Systems – P.Khajuria&S.P.Dubey - /Dhanpatrai

3. Gas Turbines / Cohen, Rogers and SaravanaMuttoo / Addison Wesley – Longman

4. Thermal Engineering-M.L.Marthur& Mehta/Jain bros

5. Gas Turbines – V.Ganesan /TMH


**Teaching Methodology:**Power Point Presentations, Working models, White Board & Marker

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# PRINCIPLES OF E-COMMERCE

## (OPEN ELECTIVE- I)

| **Course Code: GR17A3154** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **III Year I Semester** | **2** | **1** | **0** | **3** |

**UNIT I**

**INTRODUCTION TO E-COMMERCE**

E-commerce, Difference between E-commerce and E-business, Purpose of E-Commerce, Eight Unique Features of E-commerce Technology, Web 2:0, Types of E-commerce, Growth of the Internet and the Web, Origins and Growth of E-commerce, Understanding E-commerce.

**UNIT II**

**E-COMMERCE BUSINESS MODELS AND CONCEPTS**

E-commerce Business Models, Business-to-Consumer (B2C) Business Models, Business-to-Business (B2B) Business Models, Business Models in Emerging E-commerce Areas.

**UNIT III**

**BUILDING AN E-COM WEB SITE**

Building an E-commerce Web Site, Choosing Software, Choosing the Hardware, E-commerce Site Tools.

**UNIT IV**

**ONLINE SECURITY AND PAYMENT SYSTEMS**

Security Threats in the E-commerce Environment, Technology Solutions, payment systems, E-commerce Payment System, Electronic Billing Presentment and Payment.

**UNIT V**

**ONLINE CONTENT AND MEDIA**

Online Content, Online Publishing Industry, Online Entertainment Industry.

**TEXT BOOKS:**

Kenneth C. Laudon Carol GuercioTraver, “E-commerce: business, technology, society”, Fifth edition, Pearson Prentice Hall, 2009. (Unit-1:Chapter -1, Unit-II: Chapter-2, Unit-III: Chapter-4, Unit-IV: Chapter-5, Unit-V:Chapter-10)

## REFERENCES


1. Dave Chaffey, "E-Business and E-Commerce Management: Strategy, Implementation and Practice", Fifth edition, Pearson Education, 2013.
2. K.K. Bajaj, Debjani Nag, "E-Commerce: The Cutting Edge of Business", Second edition, McGraw Hill Education (India) Private Limited, 2005.
3. David Whiteley ,“E-Commerce: Strategy, Technologies And Applications”, McGraw Hill Education (India) Private Limited, 2001.

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# DATA MINING AND APPLICATIONS

**(Open Elective – I)**

| | |
|---|---|
| **Course Code: GR17A3155** | **L T P C** |
| **III Year I Semester** | **2 1 0 3** |

## UNIT I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

## UNIT II

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint- Based Association Mining

## UNIT III

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor.

Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Outlier Analysis - Distance-Based Outlier Detection, Density-Based Local Outlier Detection

## UNIT IV

Mining World Wide Web: Mining web page layout structure, Identification of authoritative web pages using web link structures, Automatic Classification of Web Documents, Web Usage Mining.

Spatial Mining: Mining spatial association and colocation patterns, spatial clustering methods, spatial classification and spatial trend analysis.

**UNIT V**

Text Mining: Text Data analysis and Information retrieval, Dimensionality reduction for text, text mining approaches.

Applications and trends in Data Mining : Data Mining for Financial Data Analysis, , Data Mining for Telecommunication Industry, Data Mining for Intrusion Detection, Various themes on Data Mining, Social impacts of data mining

**TEXT BOOKS**


1. Data Mining – Concepts and Techniques - Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition, 2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.
3. Data Mining – Introductory and advanced topics – Margaret H. Dunham &S.Sridhar, Pearson Education.


**REFERENCES**


1. Data Mining Techniques – Arun K. Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Anahory and Dennis Murray, Pearson Edn Asia.

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# COMPUTER ARCHITECTURE AND ORGANIZATION (OPEN ELECTIVE-I)

**Course Code: GR17A3156** **LTPC**

**III Year I Semester** **2 1 0 3**

## UNIT I

### Introduction

Computing and Computers, Evolution of Computers, VLSI Era, System Design;
Register Level, Processor Level, CPU Organization, Data Representation, Fixed Point Numbers , Floating Point Numbers, Instruction Formats, Instruction Types, addressing modes.

## UNIT II

### Data Path Design

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequ entialALUs, Carry look ahead adder, Robertson algorithm, booth's algorithm, non-
restoring division algorithm,Floating Point Arithmetic, Coprocessor, Pipeline Processing, Pipeline de sign, Modified booth's Algorithm

## UNIT III

### Control Design

Hardwired Control, Microprogrammed Control, Multiplier Control Unit, CPU Control Unit, Pipeline ControlInstruction Pipelines, Pipeline Performance, Superscalar Processing, Nano Programming.

## UNIT IV

### Memory Organization

Random Access Memories, Serial Access Memories, RAM Interfaces, Magnetic Surface Record ing,Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associa tive Memory.

## UNIT V

### System Organization

Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and system control, IOinterface circuits, Handshaking, DMA and interrupts, vectored interrupts, PCI interrupt s, pipelineinterrupts, IOP organization, operation systems, multiprocessors, fault tolera-- nce, RISC and CISC processors, Superscalar and vector processor.

**TEXT BOOKS:**

1. John P.Hayes, 'Computer architecture and Organisation', TMHThird edition, 1998.
2. V. Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", V edition, McGraw-Hill Inc, 1996.

**REFERENCES:**

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Paraami, "Computer Architecture", BEH R002, Oxford Press.
3. P.Pal Chaudhuri, "Computer organization and design", 2nd Ed., Prentice Hall of India, 2007.
4. G.Kane & J.Heinrich, "MIPS RISC Architecture", Englewood cliffs, New Jersey, Prentice Hall, 1992.

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# COMPUTER METHODS IN POWER SYSTEMS

**Course Code:GR17A3021** **LTPC**
**III Year II Sem** 2103

## UNIT I

**Power flow Studies-1:** Per-Unit System of Representation. Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems. Ybus formation by Direct Transformation Method, Numerical Problems.

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 II

**Power flow Studies-2:** Newton Raphson Method in Rectangular and Polar Co-Ordinates Form, Load Flow Solution with and without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart.

Decoupled and Fast Decoupled Methods.- Comparison of Different Methods – DC load Flow.

## UNIT III

**Formation of Zbus**: Partial network, Algorithm for the Modification of Zbus Matrix for addition of an element for the following cases: Addition of an element from a new bus and 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 buses (Derivations and Numerical Problems)-Modification of Zbus for the changes in network (Problems).

**Short Circuit Analysis:** 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.

**UNITIV**

**Steady State 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.

**UNIT V**

**Power System Transient State Stability Analysis:** 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: Point-by-Point Method and Modified Euler's method. Multi machine stability. Methods to improve Transient Stability.

**TEXT BOOKS:**

1.Electric Power Systems by C. L. Wadhwa, New Age International.
2. Modern Power System Analysis by I.J.Nagrath & D.P.Kothari, Tata McGraw-Hill.

**REFERENCES**

1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
2. Power System Analysis by Hadi Saadat, TMH Edition.

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# SWITCH GEAR AND PROTECTION

**Course Code:GR17A3022** **LTPC**
**III Year II Sem** **3**104

**UNIT I**

**INTRODUCTION TO 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.

**Description and Operation of following types of circuit breakers:**Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

**UNITII**

**ELECTRO MAGNETIC AND STATIC RELAYS:**

**Electromagnetic Relays:** Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays. **Application of relays:**Over current, Under voltage relays, Directional relays, Differential Relays.

**Universal torque equation, Distance relays:**Impedance, Reactance and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison. Static Relays:Static Relays verses ElectromagneticRelays.

**Static Relays:** static Vs Electromagnetic relays, static over current relays.

**UNITIII**

**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.

**Protection of lines:**Over Current, Carrier Current and Zonal Protection,Transley Relay.

**Protection of Bus bars**: Differential protection, Frame Leakage Protection.

**UNIT IV**

**NEUTRAL GROUNDING:** Grounded and Ungrounded Neutral Systems.-Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance-Arcing Grounds and Grounding Practices.

**UNIT V**

**PROTECTION AGAINST OVER VOLTAGES:** Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages-Valve type and Zinc- Oxide Lightning Arresters-Insulation Coordination-BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

**TEXT BOOKS:**

1. Sunil S Rao, Switch gear and Protection–Khanna Publishers.

2. Badri Ram, D.N.Viswakarma, Power System Protection and Switch gear, TMH Publications.

**REFERENCES**

1. C.L.Wadhwa, Electrical Power Systems–New Age international (P) Limited, Publishers, $6^{th}$edition

2. B.L.Soni, Gupta, Bhatnagar, Chakrabarthy, A Text book on Power System Engineering, Dhanpat Rai &Co.

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# MANAGEMENT SCIENCE

**Course Code: GR17A3102** **LTPC**
**III Year II Semester** **3 1 0 4**

**UNIT I**

**Introduction to Management &Organisation: Concepts of Management and Organization**: Nature, Importance, Functions and Theories of Management; Systems Approach to Management; Leadership Styles; Social Responsibilities of Management. ***Designing Organisational Structures:*** Basic concepts relating to Organisation; Departmentation and Decentralisation, Types and Evolution of mechanistic and organic structures of organisation and suitability.

**UNIT II**

**Operations &Marketing Management:** Principles and Types of Plant Layout, Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement.***Statistical Quality Control***: Control Charts for Variables and Attributes (Simple Problems) and Acceptance Sampling, Deming's contribution to quality. Objectives of InventoryControl, EOQ, ABC Analysis, Purchase Procedures, Stores Management and Stores Records - Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle, Channels of Distribution.

**UNIT III**

**Human Resources Management (HRM):** Concepts of Personnel Management, HRM and HRD and Industrial Relations (IR), HRM vs. PMIR. Basic functions of HR Manager: Manpower planning, Recruitment and Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Analysis, Job Description, and Job Evaluation.

**UNIT IV**

**Project Management *(PERT/CPM*):** Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing (simple problems).

**UNIT V**

**Strategic Management and Contemporary Strategic Issues:** Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Contemporary Management Practices: Basic concepts of MIS, End User Computing, Materials Requirement Planning (MRP), Just-In-Time (JIT) System, Total Quality Management (TQM), Six Sigma and Capability Maturity Model (CMM) Levels, Supply Chain Management, Enterprise Resource Planning (ERP), Performance Management, Business Process

Outsourcing (BPO), Business Process Re-engineering and Bench Marking, Balanced Score Card.

**Teaching Methodologies:**

a) Lecture Method
b) Use of OHP
c) Power Point Presentation
d) Tutorials and Assignments

**TEXT BOOKS**:

1. Aryasri: *Management Science*, TMH, 2009.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# UTILIZATION OF ELECTRICAL ENERGY
## (Professional Elective – II)

**Course Code: GR17A3023** **LTPC**
**III Year II Sem** 3104

**UNIT I**

**ELECTRIC DRIVES**

Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

**UNIT II**

**ELECTRIC HEATING**

Advantages and methods of electric heating, resistance heating induction heating and dielectric heating .

**ELECTRIC WELDING**

Electric welding, resistance and arc welding , electric welding equipment, comparison between A.C and D.C Welding.

**UNIT III**

**ILLUMINATION**

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light., Various Illumination Methods: Discharge lamps, MV and SV lamps, comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of street lighting and flood lighting.

**UNIT IV**

**ELECTRIC TRACTION – I**

System of electric traction and track electrification, Review of existing electric traction systems in India, Special features of traction motor, methods of electric braking, plugging rheostatic braking and regenerative braking., Mechanics of train movement, Speed-time curves for different services, trapezoidal and quadrilateral speed time curves.

**UNIT V**

**ELECTRIC TRACTION-II**

Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and coefficient of adhesion.

**TEXT BOOKS:**


1) J.B.Gupta ,Utilization of Electric Power & Electric Traction
2) Partab,Art & Science of Utilization of Electrical Energy Dhanpat Rai & Sons


**REFERENCES**


1) N.V.Suryanarayana, Utilization of Electric Power including Electrical Drives & Electric Traction, New Age International(P) Limited, Publishers,1996.
2) C.L.Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International(P) Limited, Publishers, 1997.

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## NON CONVENTIONAL ENERGY SOURCES
**(Professional Elective – II)**

**Course Code: GR17A3024** **LTPC**
**III Year II Sem** 3104

### UNIT I

Fundamentals of Solar Energy-Solar spectrum-Solar Radiation on Earth's surface- Solar radiation geometry-Solar radiation measurements-Solar radiation data-Solar radiation on horizontal and tilted surfaces. Solar Thermal conversion-Flat plate collectors- concentrated collectors-construction and thermal analysis- Solar applications-Solar ponds-Heliostat systems-water heater-air heater-solar still.

### UNITII

Solar-Electric Power generation-Photo voltaic cells-Equivalent circuit- V-I Characteristics-Photovoltaic modules – constructional details- design considerations-Tracking-Maximum power point tracking–algorithms-PV solar system design with energy backup-Solar Thermo electric conversion.

### UNITIII

Wind Energy-Fundamentals of wind energy-power available in wind-BetzLimit- Aero dynamics of wind turbine-Wind turbines-Horizontal and vertical axis turbines –their configurations-Wind Energy conversion systems.

### UNITIV

Energy from Bio Mass- Various fuels-Sources-Conversion technologies-Wet Processes–Dry Processes-Bio Gas generation–Aerobic and an aerobic digestion- Factors affecting generation of bio gas –Classification of bio gas plants-Different Indian digesters- Digester design considerations-Gasification process-Gasifiers – Applications. Geo thermal Energy-sources-Hydro thermal convective-Geo-pressure resources-Petro-thermal systems (HDR)-Magma Resources-Prime Movers.

### UNIT V

OTEC Systems-Principle of operation-Open and closed cycles, Energy from Tides- Principle of Tidal Power- Components of tidal Power plants-Operation Methods- Estimation of Energy in Single and double basin systems-Energy and Power from Waves-Wave energy conversion devices-Fuel Cells-Design and Principle of operation-Types of Fuel Cells-Advantages and disadvantages-Types of Electrodes- Applications-Basics of Batteries –Constructional details of Lead acid batteries- Ni-Cd Batteries.

### TEXT BOOKS

1. John Twidell &Wier, Renewable Energy Resouces, CRC Press,2009.

2. D.P. Kothari, Singal, Rakesh, Ranjan, Renewable Energy sources and Emerging Technologies, PHI, 2009.

**REFERENCES**

1. G.D. Rai–Non Conventional Energy sources, Khanna publishers.
2. B.H.Khan, Non Conventional Energy Sources, PHI

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# NEURAL AND FUZZY SYSTEMS

**(Professional Elective – II)**

**Course Code: GR17A3106** **LTPC**
**III Year II Sem** 3104

## UNIT I

**INTRODUCTION TO NEURAL NETWORKS:** Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and- Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

## UNIT II

**ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS:** Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

**FEED FORWARD NEURAL NETWORKS:** Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

## UNIT III

**MULTILAYER FEED FORWARD NEURAL NETWORKS:** Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

**ASSOCIATIVE MEMORIES:** Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem

Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

## UNIT IV

**SELF-ORGANIZING MAPS (SOM) AND ADAPTIVE RESONANCE THEORY (ART):** Introduction, Competitive Learning, Vector Quantization, Self-Organized Learning Networks,

Kohonen Networks, Training Algorithms, Linear Vector Quantization, Stability-Plasticity Dilemma, Feed forward competition, Feedback Competition, Instar, Outstar, ART1, ART2, Applications.
**CLASSICAL AND FUZZY SETS:** Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

**UNIT V**

**FUZZY LOGIC SYSTEM COMPONENTS:** Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

**APPLICATIONS:**

**NEURAL NETWORK APPLICATIONS:** Process identification, Function Approximation, control and Process Monitoring, fault diagnosis and load forecasting.

**FUZZY LOGIC APPLICATIONS:** Fuzzy logic control and Fuzzy classification.

**TEACHING METHODOLOGIES:**

1. White board
2. PPTs
3. Seminars

**TEXT BOOKS:**


1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.


**REFERENCES**


1. Neural Networks – Simon Hykins , Pearson Education
2. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
3. Neural Networks and Fuzzy Logic System by Bork Kosko, PHI Publications

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# POWER SYSTEMS LAB

**Course Code: GR17A3025** **LTPC**
**III Year II Sem** 0022

**Task1:** Tripping Characteristics of an MCB of 1Ampere rating

**Task2:** Tripping sequence of protective devices

**Task3:** Tripping characteristics of protective devices

**Task4:** Testing of Instantaneous Over Current relay

a) Phase Faults

b) Earth Faults

**Task5:** a) Testing of differential relay

b) Testing of percentage biased differential Relay

**Task6:** Testing of Negative sequence Relay

**Task7:** Model of a Transmission Line with Lumped Parameters

**Task8:** a) Testing of Over Voltage Relay

b) Testing of Under Voltage Relay

**Task9:** Current time Characteristics of Induction Disc type relay

**Task10:** Short circuit Analysis

**Task11:** Protection of Motor, transformer and bus

**Task12:** Protection of generator in parallel configuration

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**ADVANCED ENGLISH COMMUNICATION SKILLS LAB**

**Course Code: GR15A3100** **LTP C**
**III Year I Semester** **0022**

**Task-I**

## Functional English

Introduction to public speaking, analyzing and assimilating ideasrole play, formal and informal expressions and conversations

## Task-II

## Vocabulary

Synonyms and Antonyms**,** Word Roots**,** One word substitutes**,** Prefixes and Suffixes**,** Idiomatic expressions and Phrasal verbs**,** Analogy.

## Task- III

## Group Discussion

Assimilation of ideas, analysis, sharing of ideas, initiation, leadership skill, team spirit and conclusion.

## Task-IV

## Presentation Skills

Scope, features, sources to be explored, role of non-verbal communication, audience perspective, feedback .

## Task-V

## Résumé Writing and Letter Writing

Types and formats, tips to draft resume manual and emailing, types and formats for letter writing, content and body of the letter, email etiquette.

## Task-VI

## Interview Skills

Introduction, types of interviews, model questions and answering strategies, mockinterviews, check list for preparing for an interview.

**Task-VII**

**Reading comprehension**

Types of reading, techniquesqualities of a good reader.

**Task-VIII**

**Report Writing**

Introduction, importance, structure, formats and types of reports.

**Reference Books:**


1. Effective Technical Communication, M. Ashraf Rizvi, Tata McGraw Hill.
2. Business Communication; HorySankarMukerjee;OUP.
3. Business Communication; Meenakshi Raman, Praksh Sing; Oxfor University Press.
4. English and Soft Skills; SP Dhanavel; Orient Black Swan.
5. Soft Skills for everyone; Jeff Butterfield; Cengage Learning.
7. Personality Development and Soft Skills; Barun K Mitra; Oxford University Press.
8. English for Engineers Made Easy, AedaAbidi, Ritu Chaudhry, Cengage Learning.
9. Communication Skills, Sanjay Kumar, PushpLatha, Oxford Higher Education.
10. Professional Presentations; Malcom Goodale; Cambridge University Press.

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# TRANSPORTATION ENGINEERING

## (Open Elective-II)

**Course Code: GR17A3161** **LTPC**
**III Year II Semester** **210 3**

**UNIT I**

**Highway development and planning:** Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

**UNIT II**

**Highway geometric design:** Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distances- Stopping sight Distance, Overtaking Sight Distance, intermediate Sight Distance and Head light sight distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical alignment-Gradients- Vertical curves.

**UNIT III**

**Traffic engineering**: Traffic flow parameters-Volume, Speed, Density and headway- Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies, Parking types and Parking characteristics- Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams.

**Traffic regulation and management**: Road Traffic Signs – Types and Specifications – Road markings-Need for Road Markings-Types of Road Markings- Design of Traffic Signals – Webster Method –IRC Method.

**UNIT IV**

**Intersection design:** Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections- Channelization: Objectives –Traffic Islands and Design criteria-Types of Grade Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria-Advantages and Disadvantages of Rotary Intersection.

**UNIT V**

**Introduction to railway and airport engineering:** Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – Crossings and Turn outs.

Factors affecting Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system.

**TEXT BOOKS:**


1. Highway Engineering – S.K.Khanna&C.E.G.Justo, Nemchand& Bros., 9th edition (2011).

2. Railway Engineering – A text book of Transportation Engineering – S.P.Chandola – S.Chand& Co. Ltd. – (2001).

3. Highway Engineering Design – L.R.Kadiyali and Lal- Khanna Publications.

4. Airport Planning and Design- S.K.Khanna and Arora,Nemchand Bros.

5. Railway engineering- A Textbook of Railway Engineering- Subhash C. Saxena, Satyapal Arora – DhanpatRai S Sons – (2012)


**REFERENCES:**


1. Highway Engineering – S.P.Bindra ,DhanpatRai& Sons. – 4th Edition (1981)

2. Traffic Engineering & Transportation Planning – Dr.L.R.Kadyali, Khanna publications – 8th Edition – 2011.

3. Railway Engineering –Prabha& Co., 15th Edition – August 1994.

4. 4. Air Transportation Planning & design – Virendhra Kumar &StatishChandhra – Gal Gotia Publishers (1999).

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# SENSORS AND TRANSDUCERS

**(Open Elective – II)**

**Course Code: GR17A3162** **LTPC**
**III Year II Sem** 2103

## UNIT I

**Introduction**: Sensors / Transducers, principles, classification, parameters, characterizations

## UNIT II

**Introduction to mechanical & Electro Mechanical Sensors:** Resistive Potentiometer, Inductive sensors, Capacitive Sensors, Ultrasonic Sensors

## UNIT III

**Basics of Thermal and Magnetic Sensors**: Gas thermometric sensors, Thermal expansion type thermometric sensors, acoustic temperature sensors, dielectric constant and refractive index thermo sensors. Sensors and principles: Yoke coil sensor, coaxial type sensor, Force and displacement sensor

## UNIT IV

**SMART Sensors:** Introduction, Primary sensors, Excitation, Amplification, Filters, Converters, Compensation, Information coding / processing, Data Communication, The Automation

## UNIT V

**Sensors their Applications:** Flow - rate sensors, Pressure Sensors, Temperature Sensors, Torque & Position Sensors, Home Appliance Sensors - Distance Sensing Medical Diagnostic sensors, Sensors for Environmental Monitoring

## TEXT BOOKS:

1.Sensors & Transducers By D. Patranabis , PHI Publications

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# AUTOMOBILE ENGINEERING
## (Open Elective-II)

**Course code:GR17A3163** **LTPC**
**III B. Tech II Semester** **2 10 3**

**UNIT I**

**INTRODUCTION, ENGINE AND LUBRICATION SYSTEM**

Components of four wheeler automobile – chassis and body – power unit –power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, Engine construction, turbo charging and super charging, Engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reboring, decarbonisation, Nitriding of crank shaft.

**Emissions :** Emission from Automobiles – Pollution standards National and international – Pollution Control – Techniques – Energy alternatives – Photovoltaic, hydrogen, Biomass, alcohols, LPG and CNG.

**UNIT II**

**FUEL SYSTEM AND COOLING SYSTEM**

**Fuel System in S.I. Engine** : Fuel supply systems, Mechanical and electrical fuel pump – filters– carburetor – types – air filters – petrol injection-Multi point fuel injection(MPFI).

**Fuel System in C.I. Engines:** Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps. CRDI engines.

**Cooling System:** Cooling Requirements, Air Cooling, Liquid Cooling, Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporative cooling – pressure sealed cooling – anti freeze solutions.

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**UNIT III**

**IGNITION SYSTEM AND ELECTRICAL SYSTEM**

**Ignition System:** Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser and sparkplug – Magneto

coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

**Electrical System :** Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

**UNIT IV**

**TRANSMISSION AND STEERING SYSTEM**

**Transmission System:** Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, constant mesh, synchro mesh gear boxes, epicyclic gear box, over drive, torque converter. Propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and tyres.

**Steering System:** Steering geometry – camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

**UNIT V**

**SUSPENSION AND BRAKING SYSTEM**

**Suspension System:** Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

**Braking System:** Mechanical brake system, Hydraulic brake system, Master cylinder, wheel Cylinder, tandem master cylinder, Requirement of brake fluid, Pneumatic and vacuum brakes.

**TEXT BOOKS:**

1.Automobile Engineering -R B Gupta

2.Automotive Mechanics – William Crouse

3.Automobile Engineering Vol. 1 & Vol. 2 / Kripal Singh

**REFERENCES**

1. Automotive Engineering / Newton Steeds & Garrett
2. Automotive Mechanics / G.B.S. Narang
3. Automotive Mechanics / Heitner
4. Automotive Engines / Srinivasan
5. Automobile Engineering – K.K. Ramalingam / Scitech Publications (India) PVT.

**Teaching Methodology:**

Power point Presentations, Working models, white board & marker

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# HUMAN COMPUTER INTERFACE
## (Open Elective-II)

**Course Code: GR17A3164** **LTPC**
**IIIYear II Semester** **2 1 03**

**UNIT I**

**Introduction:** Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

**UNIT II**

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

**UNIT III**

Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow.

**UNIT IV**

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls,Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors,Software tools – Specification methods, interface – Building Tools.

**UNIT V**

Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

**TEXT BOOKS:**

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamaTech.

2. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia.

**REFERENCES:**

1. Human – Computer Interaction. ALAN DIX, JANET FINCAY, GRE GORYD, ABOWD, RUSSELL BEALG, PEARSON.

2. Interaction Design PRECE, ROGERS, SHARPS. Wiley Dreamtech,

3. User Interface Design, Soren Lauesen Pearson Education

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**ESSENTIALS OF BIG DATA ANALYTICS**

**(Open Elective – II)**

**Course Code: GR17A3165** **L T PC**

**III Year II Semester** **2 1 0 3**

**UNIT I**

**INTRODUCTION TO BIG DATA AND HADOOP:** Introduction to Big Data Platform – Big Data definition, Challenges of Conventional Systems: Enterprise/structured data, Social/unstructured Data, Unstructured data needs for Analytics, Analytics vs Reporting, Data Analytic Tools, History of Hadoop, Components of Hadoop, Analyzing the Data with Hadoop, Different Echo systems of Hadoop, IBM Big Data Platform Strategy and Introduction to Infosphere Big Insights.

**UNIT II**

**HDFS (Hadoop Distributed File System):** Significance of HDFS in Hadoop, Design of HDFS, HDFS Architecture overview, 5 daemons of Hadoop: Name Node, Data Node, Secondary Node, Job Tracker and Task Tracker, their functionality, Data Storage in HDFS: Introduction about Blocks, Data replication, Accessing HDFS: CLI (Command Line Interface) and admin commands, How to store various types of data in HDFS using CLI-command.

**UNIT III**

Map Reduce Map Reduce Architecture, Map Reduce Programming Model, Map Reduce Java API, Anatomy of Map Reduce Job run, Failures, Job Scheduling, Sort & Shuffle phase, Task Execution. Map Reduce Program using IBM BigInsights. Adaptive Map Reduce. **Introduction to Oozie:** Overview of Managing job Execution.

Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Pig Latin : Structure, statements, Expressions, Types, Schemas,

Functions and Macros. Pig User Defined Functions, Data Processing operators.

**UNIT IV**

**Data Stores on Hadoop Hive:** Introduction, architecture, Integration with Hadoop, Hive Tables: Managed Tables, External Tables, Hive Query Language (Hive QL) Hbase: Introduction to HBase, Architecture, HBaseVs RDBMS, HBaseUseCasesHmaster. Introduction to Zookeeper.

**UNIT V**

**BM APPLICATIONS ON HADOOP**

**Big SQL:** Introduction to Big SQL, Datatypes, Big SQL Statistics.

**Big Sheets:** Introduction, Processing and Accessing BigSheets, Big SQL Integration.

**TEXT BOOKS**


1. Tom White “Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012.
2. Seema Acharya, SubhasiniChellappan, “Big Data Analytics” Wiley 2015


**REFERENCES**


1. Michael Berthold, David J. Hand, "Intelligent Data Analysis”, Springer, 2007.
2. Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013)
3. Tom Plunkett, Mark Hornick, “Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop”, McGraw-Hill/Osborne Media (2013), Oracle press.

4. AnandRajaraman and Jefrey David Ulman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
5. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
6. Glen J. Myat, “Making Sense of Data”, John Wiley & Sons, 2007
7. Pete Warden, “Big Data Glossary”, O’Reily, 2011.
8. Michael Mineli, Michele Chambers, AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
9. ArvindSathi, “Big Data Analytics: Disruptive Technologies for Changing the Game”, MC Press, 2012
10. Paul Zikopoulos, Dirk De Roos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corigan, "Harness the Power of Big Data The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# PRINCIPLES OF OPERATING SYSTEMS

## (OPEN ELECTIVE-II)

**Course Code: GR17A3166** **LTPC**
**III Year II Semester** **2103**

**UNIT I**

**Computer System and Operating System Overview:** Overview of computer operating systems, operating systems functions, operating systems structures and systems calls, Evaluation of Operating Systems.

**UNIT II**

**Process Management** – Process concept- process scheduling, operations, Inter process communication. Multi Thread programming models. Process scheduling criteria and algorithms, and their evaluation.

**UNIT III**

**Concurrency:** Process synchronization, the critical- section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors and Synchronization examples

**Memory Management:** Swapping, contiguous memory allocation, paging, structure of the page table, segmentation

**UNIT IV**

**Virtual Memory Management:** virtual memory, demand paging, page-Replacement, algorithms, Allocation of Frames, Thrashing

**Principles of deadlock** – system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery form deadlock,

**UNIT V**

**File system Interface-** the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

**File System implementation-** File system structure, allocation methods, free-space management

**Mass-storage structure** overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, Introduction to Storage Area Networks (SAN), Introduction to Network Attached Storage.

**TEXT BOOKS:**

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.

**REFERENCES:**


1. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
2. Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhere, TMH.
3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.
4. Operating Systems, A. S. Godbole, 2nd Edition, TMH
5. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
6. Operating Systems, S, Haldar and A. A. Arvind, Pearson Education.
7. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.
8. Operating Systems in depth, T. W. Doeppner, Wiley.

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**POWER SEMICONDUCTOR DRIVES**

**Course Code:GR17A4022** **L T P C**
**IV Year I Sem** **2 1 0 3**

**UNIT I**

**Phase controlled converter fed DC motor :**introduction to thyristor cotrolled drives, single phase semi and full controlled converters d.c separately excited and d.c. series motors, continous current operation, output voltage and current waveforms, speed and torque expressions, speed torque characteristics – problems on converter fed d.c motors. Three phase semi and fully controlled converters connected to d.c separately excited and d.c series motors, output voltage and current waveforms, speed torque expressions and characteristics, problems.

**UNIT II**

**Four quadrant operation of DC Drives**: introduction to four quadrant operation, motoring operations, electric breaking-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**

**Control of DC motors by choppers:** single quadrant , two quadrant and four quadrant chopper fed dc separately excited and series motors, continuous current operation, voltage and current waveforms, speed torque expressions and characteristics, problems, closed loop operation only(Block diagram)

**UNIT IV**

**Control of induction motor:**variable voltage characteristics – control of induction motors by AC voltage controllers, waveforms, speed torque characteristics. Variable frequency characteristics – variable frequency control of induction motor by voltage source and current source inverters .PWM control of VSI, problems on induction motor drives. Closed loop operation of induction motor drives(block diagram only). Static 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 motor:**separate control & self control of synchronous motor operation of self controlled synchronous motors by VSI. speed torque characteristics, applications, advantages and problems, closed loop control operation of synchronous motor drives(block diagram only)

**TEXT BOOKS**

1. GK Dubey, Fundamentals of Electric Drives Narosa Publications

2. M.H. Rashid, Power Electronic Circuits, Devices and applications, PHI.

**REFERENCES**

1. MD Singh and KB Khanchandani, Power Electronics Tata Mc Graw-Hil Publishing company, 1998.

2. B.K.Bose, Modern Power Electronics and AC Drives by PHI.

3. Vedam Subramanyam, Thyristor Control of Electric drives Tata Mc Graw Hill Publications

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# POWER SYSTEM OPERATION AND CONTROL

| | |
|---|---|
| **Course Code: GR17A4023** | **L T P C** |
| **IV Year I Sem** | **3 1 0 4** |

## UNIT I

### Economic Operation of Power Systems

Optimal operation of Generators in Thermal Power Stations, - 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.Numerical problems.

## UNIT II

**Unit commitment and economic dispatch:**Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority- list methods, forward dynamic programming approach

## UNIT III

### Modelling of Turbine, Generator and Automatic Controllers

Modelling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.
Modelling of Generator (Steady State and Transient Models): Description of Simplified Network Model of a Synchronous Machine (Classical Model), Description of Swing Equation (No Derivation) and State-Space II-Order Mathematical Model of Synchronous Machine.
Modelling of Governor: Mathematical Modelling of Speed Governing System – Derivation of small signal transfer function.
Modelling of Excitation System: Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model

## UNIT IV

### 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.Proportional plus Integral control of single area and its block diagram representation, steady state response.
Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias control.Load Frequency Control and Economic dispatch control.Numerical problems.

## UNIT V

### Reactive Power Control

Overview of Reactive Power control – Reactive Power compensation in transmission systems: Uncompensated and compensated transmission lines: shunt and Series Compensation.– advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator.Numerical problems.

### TEXT BOOKS:


1. D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Fourth Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011.
2. C.L.Wadhwa, 'Power System Analysis', New Age International-6th Edition, 2010.


### REFERENCES


1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill,2011.
2. Abhijit Chakrabarti, Sunitha Halder, " Power System Analysis, Operation and Control, PHI,3/e,2010.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# HVDC TRANSMISSION

**Course Code:GR17A4024** **L T P C**
**IV Year I Sem** 3 1 0 4

**UNIT I**

**HVDC Transmission**:

Introduction, equipment required for HVDC system, Comparison of AC and DC Transmission, limitations of HVDC transmission lines, reliability of HVDC systems, comparison of HVDC link with EHVAC link, HVDC converters.

**UNIT II**

**HVDC converter operation and analysis:**

Thyristors and their characteristics, silicon control rectifier, 6 pulse converter configuration, Ideal commutation process without gate control, DC output voltage, gate control of valves, analysis of voltage wave forms with overlap angle, analysis of commutating circuit, equivalent circuit of rectifier, Inverter operation with overlap, Equivalent circuit of inverter, complete equivalent circuit of HVDC link, power factor and reactive power of converters.

**UNIT III**

**HVDC Converter Control**:

AC transmission and its control, necessity of DC link control, rectifier control, inverter control, constant beta control, constant gamma control, compounding of rectifiers, current compounding of inverter, complete HVDC system characteristics, power reversal in a DC link, Voltage Dependent Current Order Limit (VDCOL), system control hierarchy, Individual phase control, cosine control of phase delay, linear control phase delay, equidistance pulse control, pulse frequency control, constant current control.

**UNIT IV**

**Harmonics in HVDC System**:

Harmonics due to converter, characteristic current harmonic in the 12 pulse converter, Harmonic model and equivalent circuit, design of AC filters, Single tune and double tune high pass filter, second order filter and C-type filter. Reactive power considerations of AC filters.

**UNIT V**

**Faults on AC Side of Converter Station**: 3-phase symmetrical faults and asymmetrical faults, commutation failure, DC circuit breaker.

Ground Electrodes for HVDC Systems: Advantage and problems with ground return, HVDC system grounding, Resistance of electrodes-Electric current filed, resistance of electrode in uniform earth and non-uniform earth, distribution of current field between electrodes.

**TEXT BOOKS:**

1. HVDC transmission by S Kamakshaiah and V kamaraju, Tata McGraw Hills Publications.

## REFERENCES


1. Arillaga J., High Voltage Direct Transmission, (London) Peter Peregrinus, 1981.
2. K.R. Padiyar., HVDC Power Transmission Systems (English) 2nd Edition.

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# HIGH VOLTAGE ENGINEERING
## (Professional Elective-III)

**Course Code: GR17A4147** **L T P C**
**IV Year I Sem** **3** 1 0 4

**UNIT I**

**Introduction to High Voltage Engineering**: Electric Field Stresses, Gas / Vacuum as Insulator, Liquid

Di electrics, Solids and Compotes, Estimation and Control of Electric Stress, Numerical methods for electric field Computation, Surge voltages, their distribution and control, Applications of insulating materials in transformer, rotating machines, circuit breakers, cable power capacitors and bushings.

**UNIT II**

**Break Down in Dielectric Materials**: Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law. Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids. Intrinsic breakdown, electro mechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

**UNIT III**

**Generation & Measurement of High Voltages & Currents**: Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators. Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

**UNIT IV**

**Over Voltages & Insulation Co-Ordination**: Natural causes for over voltages — Lightning phenomenon, over Voltage due to switching surges, systems faults and other abnormal conditions, Principals of insulation Coordination on high voltage and Extra High Voltage power systems.

**UNIT V**

**Testing Of Materials & Electrical Apparatus:** Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements. Testing of Insulators and bushings, Testing of Isolators and circuit breakers, testing of cables, Testing of Transformers, Testing of Surge Arresters, and Radio Interference measurements.

**TEXT BOOKS**


1. High Voltage Engineering, M.S.Naidu and V. Kamaraju, TMH Publications.
2. High Voltage Engineering, C.L.Wadhwa, New Age Internationals (P) Limited.


**REFERENCES**


1. High Voltage Engineering: Fundamentals, E.Kuffel, W.S.Zaengi, J.Kuffel by Elsevier.
2. High Voltage Insulation Engineering, Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited.

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# ELECTRICAL DISTRIBUTION SYSTEMS
## (Professional Elective-III)

**Course Code: GR17A4026** **L T P C**
**IV Year I Sem** **3** 1 0 4

### UNIT I

**Distribution system planning:** Introduction to distribution system, Distribution system planning, Factors effecting the system planning, Load modeling and characteristics: Coincidence factor, contribution factor, Loss factor,Relationship between the load factor and loss factor. Load growth, Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

### UNIT II

**Design Considerations of primary systems**: Distribution feeders, Types of feeders, primary feeder voltage levels, feeder loading, Radial feeders with uniformly and non uniformly distributed loads, Applications of general circuit constants to radial feeders.
**Design Considerations of secondary systems:** Secondary voltage levels, secondary banking, one line diagram of secondary network system, secondary mains, limiters, network protectors.

### UNIT III

**Distribution Substations:** Substation bus schemes, substation location, Rating of distribution substation, substation service area with 'n' primary feeders, comparison of 4&6 feeder patterns.
**Supervisory control& data acquisition system(SCADA):**Substation functions by SCADA, advanced SCADA concepts

### UNITIV

**Distribution system Protection:** Objectives of distribution system protection, over current Protective Devices-Fuses, Automatic Circuit Re-closer, Automatic Line sectionalizers and Automatic circuit breakers.
**Coordination of protective devices:** Objectives of co-ordination, general coordination procedure, Fuse to Fuse coordination, Re-closer to fuse coordination, fuse to circuit breaker coordination, Re-closer to circuit breaker coordination.

### UNITV

**Applications of capacitors to Distribution systems:** Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), effect of series capacitors, Power factor correction,Applications of capacitors,capacitor allocation- Economic justification of capacitors, Procedure to determine the optimum capacitor location.

**Distribution system Voltage Control:** Importance of voltage control, methods of voltage control, Equipment for voltage control, AVB/ AVR for voltage control, Line drop compensation, voltage fluctuations.

**TEXT BOOKS:**

1. Turan Gonen, Electric Power Distribution system Engineering– CRC Press.

2. V.Kamaraju, Electrical Power Distribution Systems, Tata McGraw-Hill Publishing company,

**REFERENCES**

1. G. RamMurthy, Electrical Power Distribution hand book, University press.

2. A.S.Pabla, Electric Power Distribution, Tata McGraw-Hill Publishing company

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# PRINCIPLES OF SIGNAL PROCESSING
**(Professional Elective-III)**

**Course Code: GR17A4148** **L T P C**
**IV Year I Sem** 3 1 0 4

**UNIT I**

**SIGNAL TRANSMISSION THROUGH LINEAR SYSTEM:** Linear System, Impulse Response, Response of a linear system, Linear Time Invariant (LTI), Transfer Function of a LTI system, Filter Characteristics of linear systems, Distortion less transmission through a system, Physical realizability of LTI systems, Ideal LPF, HPF and BPF characteristics, Relation between input and output Power Spectral Densities, Sampling Theorem and Signal Reconstruction.

**UNIT II**

**INTRODUCTION TO DSP**: Introduction to Digital Signal Processing: Discrete time signals & sequences, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

**DISCRETE FOURIER SERIES**: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT. Relation between Z-transform and DFS

**UNIT III**

**FAST FOURIER TRANSFORMS:** Fast Fourier transforms (FFT) – Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT, and FFT for composite N

**UNIT IV**

**REALIZATION OF DIGITAL FILTERS:** Review of Z-transforms, Applications of Z – transforms, solution of difference equations of digital filters, Block diagram representation of linear constant-coefficient difference equations, Basic structures of IIR systems, Transposed forms, Basic structures of FIR systems, System functions.

**UNIT V**

**IIR DIGITAL FILTERS**: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples: Analog-Digital transformations,

**FIR DIGITAL FILTERS** : Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR and FIR filters.

**TEXT BOOKS:**


1. Salivahana and Gnanapriya , " Digital Signal Processing" , TMH 2nd edition.
2. Ramesh Babu , " Digital Signal Processing" , Scitech Publications, 4th edition.


**REFERENCES**


1.S.K.Mitra, " Digital Signal Processing" , TMH Publication, 4th edition.

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# DSP BASED ELECTRICAL LAB

**Course Code: GR17A4027** **L T P C**
**IV Year I Sem** 0 0 2 2

**List of Experiments:**

**Task1:** Blinking on-board LED

**Task2:**Watchdog with CPU Timer interrupts

**Task3:** Implementing a For Loop

**Task4:** Generation of a Square wave

**Task5:** Generation of a Triangular wave

**Task6:** Interfacing an external LED

**Task7:** Acquisition of signal from ADC

**Task8:** Initializing the GPIO

**Task9:** Generation of 1 kHz PWM pulses at 75% & 50% Duty cycles

**Task10:** Generation of 5 kHz PWM pulses at 25% Duty cycle

**Task11:** Generation of ePWM pulses with a dead-band

**Task12:** Programing in FLASH

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## POWER SYSTEMS SIMULATION LAB

**Course Code: GR17A4028** **L T P C**
**IV Year I Sem** 0 0 2 2

**Task1:** Sinusoidal Voltages and Currents

**Task2:** Computation of line parameters

**Task3:** Modelling of transmission lines

**Task4:** Formation of bus Admittance matrix

**Task5:** Load Flow solution using Gauss Siedel method.

**Task6:** Load Flow solution using Newton Raphson method in polar coordinates

**Task7:** Load Flow solution using Newton Raphson method in Rectangular coordinates

**Task8:** Transient stability analysis of single-machine infinite bus system

**Task9:** Power flow solution of 3 – bus system

**Task10:** a)Optimal dispatch neglecting losses

b) Optimal dispatch including losses

**Task11:** Three phase short circuit Analysis in a synchronous machine(Symmetrical fault Analysis)

**Task12:**Unsymmetrical fault Analysis: LG, LL, LLG Fault

**Task13:** Z–Bus Building Algorithm

**Task14:**a)Obtain Symmetrical Components of a set of Unbalanced currents.

b)Obtain the original Unbalanced phase voltages from Symmetrical Components.

**Task15:** Short circuit Analysis of a power system with IEEE 9 bus system.

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## POWER ELECTRONICS AND DRIVES LAB

**Course Code: GR17A4029** **L T P C**
**IV Year I Sem** 0 0 2 2

**Task1:** Firing angle control of thyristor based DC drive connected to DC motor using LabVIEW.

**Task2:** Closed loop speed control of DC motor using PI,PID, PD controllers using LabVIEW.

**Task3:** Closed loop speed control of DC motor- generator set with load using PI,PID controllers using LabVIEW.

**Task4:** Step,ramp,parabolic response of second order DC motor system using LabVIEW.

**Task5:** Closed loop speed control of dc motor with step, ramp,parabolic inputs and PI,PID controllers using LabVIEW.

**Task6:** Indirect speed control of DC motor using armature voltage control with PI,PID controllers using LabVIEW.

**Task7:** V/F control of AC drive connected to AC motor using LabVIEW.

**Task8:**Closed loop speed control of AC motor using PI,PID, PD controllers using LabVIEW.

**Task9:** Closed loop speed control of AC motor- DC generator set with load using PI,PID controllers using LabVIEW.

**Task10:** Step,ramp,parabolic response of second order AC motor system using LabVIEW.

**Task11:** Closed loop speed control of AC motor with step, ramp,parabolic inputs and PI,PID controllers using LabVIEW.

**Task12:** Indirect speed control of AC motor using armature V/F control with PI,PID controllers using LabVIEW.

**Task13:** Closed loop torque control of DC motor with PI,PID controllers using LabVIEW.

**Task14:** Closed loop torque control of AC motor with PI,PID controllers using LabVIEW.

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# GREEN BUILDING TECHNOLOGY

**(Open Elective-III)**

| | |
|---|---|
| **Course Code: GR17A4161** | **L T P C** |
| **IV Year I Semester** | **2 1 0 3** |

**UNIT 1**

**Concept of Green Buildings:**

Green building Definition, Features, Necessity,Initiatives, Green buildings in India, Green building Assessment- Green Building Rating Systems (BREEAM,USGBC,LEED,IGBC,TERI-GRIHA, GREEN STAR),Criteria for rating, Energy efficient criteria ,environmental benefits economic benefits, health and social benefits , Major energy efficiency areas for building, Contribution of buildings towards Global Warming. Life cycle cost of buildings, Codes and Certification Programs

**UNITII**

**Sources of Energy:**

Renewable and Non-renewable sources of energy ; Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources; potential of these sources, hazards, pollution; Global scenario with reference to demand and supply in India, Global efforts to reduce carbon emissions, Performance testing (new and existing): Building modeling , Energy analysis, Commissioning, Metering, Monitoring.

**Carbon emission**: Forecasting, Control of carbon emission, Air quality and its monitoring carbon foot print; Environmental issues, Minimizing carbon emission, Energy retrofits and Green Remodels.

**UNIT III**

**Green Building Materials**: Sustainably managed Materials,Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; Embodied Energy of Materials , Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds (VOC's), Natural Non-Petroleum Based Materials, Recycled materials,Renewable and Indigenous Building Materials, Engineering evaluation of these materials.

**Green Building Planning** Methods, Energy Conservation Measures in Buildings, Waste &Water management and Recycling in Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar & Daylight,Plumbing and its Effect on Energy Consumption

**UNIT IV**

**Design of Green Buildings**; Sustainable sites, Impact of building on environment, Life cycle assessment, Principles of sustainable development in Building Design ,Design on Bioclimatic **and Specifications:** Environment friendly and cost effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green Strategies for Building Systems, Alternative

Construction and solar passive architecture, Considerations of energy consumption, water use, and system reliability, indoor air quality, noise level, comfort, cost efficiency in building design, Advanced Green building technologies and innovations.

**UNIT V**

**Construction of Green Buildings**: Energy efficient construction, Practices for thermal efficiency and natural lighting. Eco- friendly water proofing; ECB codes building rating, Maintenance of green buildings, Cost and Performance Comparisons and Benchmarking, Green Project Management Methods and Best Practices, Cost/benefit analysis of green buildings,Life-cycle analysis of green buildings, Case studies of rated buildings (new and existing)

**TEXT BOOKS:**


1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkatta Rama Reddy & K SNanjunda Rao – New Age International Publishers
2. Integrated Life Cycle Design of Structures – By AskoSarja – SPON Press
3. Non-conventional Energy Resources – By D S Chauhan and S K Sreevasthava – New Age InternationalPublishers
4. Green Buildings (McGraw hill publication): by Gevorkian
5. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design
6. Understanding Green Building Guidelines: For Students and Young Professionals, Traci Rose Rider ,W. W. Norton & Company Publisher.
7. Understanding Green Building Materials,Traci Rose Rider, W. W. Norton & Company Publisher.


**REFERENCES**


1. IGBC reference guide
2. Free abridged versions of LEED reference guides
3. ECBC latest version
4. US GBC's Reference Material:

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# SOFT COMPUTING TECHNIQUES
## (Open Elective-III)

**Course Code:GR17A4162** **L T P C**
**IV Year I Sem** **2 1 0 3**

**UNIT I**

**Neural Networks-I**(Introduction & Architecture) Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetero-associative memory.

**UNIT II**

**Neural Networks-II** (Back propagation networks) Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting back propagation training, applications.

**UNIT III**

**Fuzzy Logic-I** (Introduction) Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

**UNIT IV**

**Fuzzy Logic –II** (Fuzzy Membership, Rules) Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

**UNIT V**

**Genetic Algorithm**(GA) Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.

**TEXT BOOKS:**


1. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications" Prentice Hall of India.
2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.
3. N.P.Padhy,"Artificial Intelligence and Intelligent Systems" Oxford University Press.


**REFERENCES**


1. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India

2. P. Vas: Artificial-Intelligence-Based Electrical Machines and Drives: Application of Fuzzy, Neural, Fuzzy- Neural, and Genetic-Algorithm-Based Techniques, Oxford University Press, 1999.

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# OPERATIONS RESEARCH
## (Open Elective-III)

**Course Code: GR17A4163** **L T P C**
**IV B. Tech I Semester** **2 1 0 3**

**UNIT I**

**INTRODUCTION:** Development – Definition– Characteristics and Phases of operations Research– Types of models – operation Research models– applications.

**ALLOCATION:** Linear Programming Problem Formulation – Graphical solution – Simplex method –Artificial variables techniques -Two–phase method, Big-M method – Duality Principle.

**UNIT II**

**TRANSPORTATION MODELS:** Formulation – Methods for finding feasible solution, Optimal solution, unbalanced transportation problem –Degeneracy.

**ASSIGNMENT MODELS -** Formulation – Optimal solution - Variants of Assignment Problem

**UNIT III**

**SEQUENCING:** Introduction – Flow **–**Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines.

**INVENTORY :** Introduction – Single item – Deterministic models – Purchase inventory models with one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be discrete variable or continuous variable – Instantaneous production. Instantaneous demand and continuous demand and no set up cost.

**UNIT IV**

**THEORY OF GAMES:** Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – dominance principle– m X 2 & 2 X n games -graphical method.

**WAITING LINES:** Introduction – Single Channel – Poisson arrivals – exponential service times – with infinite population and finite population models– Multichannel – Poisson arrivals – exponential service times with infinite population single channel Poisson arrivals.

**UNIT V**

**REPLACEMENT:** Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, group replacement.

**DYNAMIC PROGRAMMING:** Introduction – Bellman's Principle of optimality – Applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

**TEXT BOOKS :**

**1.** Operations Research/ Prem Kumar Gupta,Dr.D.S. Hira

2. Operations Research / S. D.Sharma-Kedarnath
3. Operation Research /J.K.Sharma/MacMilan.

**REFERENCES:**

1. Operations Research / R.Pannerselvam,PHI Publications.
2. Introduction to O.R /Taha/PHI
3. Operations Research / Wagner/ PHI Publications.
4. Introduction to O.R/Hiller &Libermann (TMH).
5. Operations Research /A.M.Natarajan,P.Balasubramani,A. Tamilarasi/Pearson Education.
6. Operations Research: Methods & Problems / Maurice Saseini, ArhurYaspan& Lawrence Friedman
7. O.R/Wayne L.Winston/Thomson Brooks/cole

**Teaching Methodology:**

Power point Presentations, Working models, white board & marker

**GOKARAJU RANGARAJUINSTITUTE OF ENGINEERING AND TECHNOLOGY**
**MOBILE COMPUTING AND APPLICATIONS**
**(Open Elective III)**

**Course Code: GR17A4164** **L T P C**
**IV Year I Semester** **2 1 0 3**

**UNIT I**

**Introduction to Mobile Computing:** Introduction, applications, simplified referenced model.

**Medium Access Control:** Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Comparison.

**UNIT II**

**Telecommunication systems:** GSM:Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

**UNIT III**

**Mobility and location-based services:** Introduction, Data Acquisition of Location Information, GIS, Location Information Modeling, Location-Based Services Applied, Utilizing Location-Based Services with Mobile Applications, Representing Location with UML, Security and Privacy of Location Information, Localization and Internationalization, Latest Developments in Location-Based Efforts

**UNIT IV**

**The Mobile Development Process:** Introduction, Back to the Dimensions of Mobility, Applying the Wisdom Methodology to Mobile Development, UML-Based Development Cycle for Mobile Applications

**Architecture, Design, and Technology Selection for Mobile Applications:** Introduction, Practical Concerns with Architectures, Architectural Patterns for Mobile Applications

**UNIT V**

**Mobile Application Development Hurdles:** Introduction, Voice User Interface Hurdles, Hurdles with Multimodal Applications, Problems with Building Location-Based Applications, Power Use.

**Testing Mobile Applications:** Introduction, Validating the Mobile Use Cases before Development, The Effect of the Dimensions of Mobility on Software Testing, Stress Testing and Scalability Issues, Testing Location-Based Functionality.

**Support for Mobility: File systems:** Consistency, coda, little work, Ficus, Mio-NFS, Rover.

**Outlook:** Architecture of future networks.

**TEXT BOOKS**


1. **Jochen Schiller**, "Mobile Communications", Second Edition, Pearson education, 2004. (Unit I-All chapters, Unit II-All chapters, & Unit V: Last two chapters)
2. **Reza B'far, "**Mobile Computing Principles: Designing And Developing Mobile Applications With UML And XML", Cambridge University Press, 2005. (Unit III-All chapters, Unit IV-All chapters and Unit V - First two chapters).


**REFERENCES**


1. **Adelstein, Frank, Gupta, Sandeep KS, Richard, Golden, Schwiebert, Loren,** "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-Hill Professional, 2005.
2. **Hansmann, Merk, Nicklous, Stober**, "Principles of Mobile Computing", Springer, second edition, 2003.
3. **Martyn Mallick,** "Mobile and Wireless Design Essentials", Wiley DreamTech, 2003.

**GOKARAJU RANGARAJUINSTITUTE OF ENGINEERING AND TECHNOLOGY**
**BUSINESS INTELLIGENCE**
**(Open Elective – III)**

**Course Code:GR17A4165** **L T P C**
**IV Year I Semester** **2 1 0 3**

**UNIT I**

**Business Data and Business Intelligence:** An Introduction: What is data? Data and business, Big Data, Information and insight, challenges in data decision, operational and informational data, Data decision challenge, Decision Support System, understanding Business Intelligence, Business Intelligence and its components, Importance of Business Intelligence, Business Intelligence areas, Business Intelligence Implementation, Business Intelligence and Integration Implementation, Overview of IBM Cognos BI.

**UNIT II**

**Data warehouse:** An Overview Data warehouse architecture, Data warehouse Modelling and Design, Challenges , Data Modelling requirements, Modelling Techniques; Entity relationship Modelling, Dimensional Modelling, Temporal Modelling, Multidimensional data modelling, ERM Vs MDDM, What is Metadata, Types of metadata, Benefits of metadata, Data Analytics Techniques: OLAP and OLTP systems

**UNIT III**

**Building and Accessing a Data Warehouse:** Enterprise data warehouse, Challenges of Building a Warehouse, Data warehouse for decision support system, Data Analytics, Data analytics techniques, Information Mining Vs Data mining, Usage of Data Mining, Information Integration, Data warehouse Master Data Management System, MDM Logical Architecture, DB2 UDB Warehouse

**UNIT IV**

**IBM Cognos BI:** IBM Cognos Framework Manager, Connection of Framework Manager to Cognos Business Intelligence, Framework Manager Query Model, Frame work manager Model Types, Enterprise Components, Architecture, Security, Query Modes, Model types, Framework Manager Workflow, Administration Workflow, Cognos Configuration

**UNIT V**

**Query and Reporting:** Query and Process flow, Report studio, Generation of different reports such as List, cross tab ,Charts, Prompts etc, Focus reports using prompts and filters, Drilling from one report to another, Report using Relational Data

**TEXT BOOKS**


1. Chuck Ballard, Dirk Herreman, Don Schau, Rhonda Bell,Data Modeling Techniques for Data Warehousing , IBM [ebook]
2. Business Analytics : Data Analytics & Decision Making by S. Christian Albright and Wayne L. Winston.
3. Analytics at Work by Morisson
4. Competing on Analytics - Davenport
5. IBM Cognos 10 Report Studio : Practical Examples by Philip & Roger
6. IBM Cognos BI 10.2 Administration Essentials by Mehmood Awan Khalid

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# PRINCIPLES OF SATELLITE COMMUNICATIONS

**(OPEN ELECTIVE-III)**

| **Course Code: GR17A04166** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **IV Year I Semester** | **2** | **1** | **0** | **3** |

**UNIT-I**

**Introduction:** Origin of satellite communications, Historical background, basic concepts of satellite communications, frequency allocations for satellite services, applications, future trends of satellite communications.

**UNIT-II**

**Orbital Mechanics and Launchers:** Orbital Mechanics look angle determination, orbital perturbations, orbit determination, launches and launch vehicles, orbital effects in communication systems performance.

**UNIT-III**

**Satellite Subsystems:** Attitude and orbital control system, Telemetry, Tracking, command and monitoring, power systems, communication subsystems, satellite antenna equipment reliability and space qualification.

**UNIT-IV**

**Satellite Link Design:** Basic transmission theory, system noise temperature and G/T ratio, design of down links, uplink design, design of satellite links for specified C/N, system design example.

**UNIT-V**

**Earth Station Technology:** Introduction, transmitters, receivers, Antennas, tracking systems, terrestrial interface, primary power test methods.

**Low Earth Orbit and Geo-stationary Satellite Systems:** Orbit consideration, coverage and frequency considerations, delay and throughput considerations, system considerations, operational NGSO constellation designs.

**Text Books:**

1. Satellite communications-Timothi Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite communications Engineering-Wilbur L.Prichard, Robert A. Nelson & Henry G. Suyderhoud, 2nd Edition, Pearson Publications, 2003.

**References**:

1. Satellite communications: Design principles-M. Richharia, BS publications, 2nd Edition, 2003.
2. Fundamentals of Satellite communications-K.N.Rajarao, PHI, 2004.
3. Satellite communications-Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

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# PROGRAMMABLE LOGIC CONTROLLERS

**Course Code: GR17A4030** **L T P C**
**IV Year II Sem** 2 1 0 3

## UNIT I

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/0 modules.

## UNIT II

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.

Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

## UNIT III

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers PLC Functions Timer functions and industrial applications counters counter function industrial applications. Architecture functions, Number comparison functions, number conversion functions.

## UNIT IV

Data Handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications.

Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axis and three axis Robots with PLC, Matrix functions.

## UNIT V

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing, analog output application examples. PID principles position indicator with PID control, PID modules, PID tuning, PID functions

## TEXT BOOKS

I. Programmable Logic Controllers — Principle and Applications by John W Webb and Ronald A Reiss Filth edition, PHI

2. Programmable Logic Controllers — Programming Method and Applications by JR Hackworth and ED Hackworth — Jr- Pearson, 2004.

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# FLEXIBLE AC. TRANSMISSION SYSTEMS
## (Professional Elective-IV)

**Course Code: GR17A4032** **L T P C**
**IV Year II Sem** 3 1 0 4

**UNIT I**
**FACTS Concepts:**
Transmission line inter connections, Power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters, basic types of FACTS controllers, benefits from FACTS controllers.

**UNIT II**
**Voltage Source Converters:**
Single phase three phase full wave bridge converters, transformer connections for 12pulse 24 and 48pulse operation.Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, comparison of current source converters with voltage Source converters.

**UNIT III**
**Static Shunt Compensation:**
Objectives of shunt compensation, midpoint voltage regulation, voltage instability prevention, 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.

**UNIT IV**
**SVC and STATCOM:**
The regulation and slope transfer function and dynamic performance, transient Stability enhancement and power oscillation damping, operating point control and summary of compensator control.

**UNIT V**
**Static Series Compensation:**
Concept of series capacitive Compensation, improvement of transient stability, power oscillation damping, Functional requirements, GTO Thyristor controlled series capacitor (GSC), Thyristor switched series capacitor (TSSC) and Thyristor controlled series capacitor (TCSC), control schemes for GSC, TSSC and TCSC.

**TEXT BOOKS:**
1. “Understanding FACTS Devices ’N.G. Hingorani and L.Guygi IEEE Press Publications 2000.

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**EHV AC TRANSMISSION**
**(Professional Elective-IV)**

**Course Code: GR17A4035** **L T P C**
**IV Year II Sem** 3 1 0 4

**UNITI**
Transmission line trends and preliminary aspect standard transmission voltages – Estimation at line and ground parameters-Bundle conductor systems-Inductance and Capacitance of E.H.V. lines – Positive, negative and zero sequence impedance – Line Parameters for Modes of Propagation.

**UNIT II**
Electrostatic field and voltage gradients – Calculations of electrostatic field of AC lines – Effect of high electrostatic field on biological organisms and human beings - Surface voltage gradients and Maximum gradients of actual transmission lines – Voltage gradients on sub conductor.

**UNIT III**
Electrostatic induction in un energized lines – Measurement of field and voltage gradients for three phase single and double circuit lines – Un energized lines. Power Frequency Voltage control and over-voltages in EHV lines: No load voltage – Charging currents at power frequency-Voltage control – Shunt and Series compensation – Static VAR compensation.

**UNIT IV**
Corona in E.H.V. lines – Corona loss formulae- Attention of traveling waves due to Corona – Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona - properties of radio noise – Frequency spectrum of RI fields – Measurements of RI and RIV.

**UNIT V**
Design of EHV lines based on steady state and transient limits - EHV cables and their characteristics.

**TEXT BOOKS:**
1. EHVAC Transmission Engineering by R. D. Begamudre, New Age International (p) Ltd.

**REFERENCES**
1.HVAC and DC Transmission by S. Rao.

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# POWER SYSTEM AUTOMATION
## (Professional Elective-IV)

**Course Code: GR17A4031** **L T P C**
**IV Year II Sem** 3 1 0 4

**UNIT I**

**SCADA fundamentals**:Evolution of Automation Systems, SCADA in Power Systems, Advantages of SCADA in Power Systems, Power System Field, flow of data from the field to SCADA control center, open system - need and advantage, building blocks of SCADA systems, Remote terminal unit(RTU), Intelligent electronic devices(IEDs), Data concentrators and merging units.

**UNIT II**

**SCADA Communication:** SCADA communication systems, Master station, human machine interface(HMI), Building the SCADA systems, legacy, hybrid, and new systems. Classification of SCADA systems.

SCADA communication requirements, smart grid communication infrastructure, SCADA communication topologies. SCADA data communication techniques, Data communication, SCADA communication protocol architecture, evolution of SCADA communication protocol, SCADA and smart grid protocols, media for SCADA and smart grid communication. Guided, unguided(wireless) and Communication media, security and challenges for SCADA and smart grid communication.

**UNIT III**

**Substation Automation(SA):** Introduction, conventional substations, new smart devices for substation automation, the new integrated digital substation, substation automation technical issues, the new digital substation, substation automation architecture, new Vs existing substation, SA application functions, data analysis: benefits of data warehousing.

**UNIT IV**

**Energy management systems(EMS) for control centres:** Introduction, Energy control centres, EMS frame work, Data acquisition and communication(SCADA systems),general operation and management, Transmission operations and management: real time, study mode simulations, post event analysis and energy scheduling and accounting, dispatching training simulator.

**UNIT V**

**Distribution automation and distribution management(DA/DMS)system:** introduction to distribution automation, subsystems in a distribution control centre, DMS framework: integration with subsystems, MS application functions, advanced real time DMS applications, DMS coordination with other systems.

**TEXTBOOKS**

1. Power system SCADA and Smart Grids by Mini S.Thomas and John D. Mc Donald, CRC Press.

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# MODERN POWER ELECTRONICS
## (Professional Elective-V)

**Course Code: GR17A4036** **L T P C**
**IV Year II Sem** 2 1 0 3

**UNIT I**

**Modern power semiconductor devices:** Modern power semiconductor devices- MOS turn Off Thyristor (MTO) - Emitter Turn Off Thyristor (ETO) Integrated Gate- Commutated Thyristor (IGCTs)-MOS-controlled Thyristors (MCTs)-Static Induction circuit comparison of their features.

**UNITII**

**Resonant Pulse Inverters:** Resonant pulse inverters-series resonant inverters-series resonant inverters with unidirectional switches series resonant inverters with bidirectional Switches-analysis of half bridge resonant inverter - evaluation of currents and Voltages of a simple resonant inverter-analysis of half bridge and full bridge resonant inverter with bidirectional switches

**UNIT III**

**Multilevel Inverters:** Multi level concept-Classification of multilevel inverters- Diode clamped multilevel inverter- principle of operation-main features improved diode Clamped inverter-principle of operation-Flying capacitors multilevel inverter principle of operation-main features.

**UNIT IV**

**DC Power Supplies:** DC power supplies-classification-switched mode dc power supplies-fly back Converter -forward converter- push pull converter-half bridge converter-Full bridge converter-Resonant dc power supplies-bidirectional dc power supplies-Applications.

**UNITV**

**AC Power Supplies:** AC power supplies classification-switched mode ac power supplies-Resonant AC power supplies-bi directional ac power supplies-multi stage conversions-control circuits-applications.

Introduction-power line disturbances-power conditioners-uninterruptible Power supplies-applications.

**TEXT BOOKS:**

1 Power Electronics—Mohammed H.Rashid Pearson Education—Third Edition

2. Power Electronics—Ned Mohan, Tore M.Undeland and William P. Robbins —John Wiley and Sons Second Edition.

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**DSP BASED ELECTRO MECHANICAL SYSTEMS**
**(Professional Elective-V)**

**Course Code: GR17A4149** **L T P C**
**IV Year II Sem** 2 1 0 3

**UNIT I**

Introduction, Brief Introduction to Peripherals, Types of Physical Memory, Software Tools, Introduction to the C2xxDSP Core and Code Generation, The Components of the C2xx DSP Core, Mapping External Devices to the C2xx Core and the Peripheral Interface, System Configuration Registers, Memory, Memory Addressing Modes, Assembly Programming Using the C2xxDSP Instruction Set

**UNITII**

General Purpose Input/output (GPIO) Functionality, Pin Multiplexing (MUX) and General Purpose I/O Overview, Multiplexing and General Purpose I/O Control Registers, Using the General Purpose I/O Ports, General Purpose I/O Exercise, Introduction to Interrupts, Interrupt Hierarchy, Interrupt Control Registers, Initializing and Servicing Interrupts in Software, 5 Interrupt Usage Exercise,

**UNITIII**

ADC Overview, Operation of the ADC, Analog to Digital Converter Usage Exercise, Overview of the Event Manager, Event Manager Interrupts, General Purpose(GP) Timers, Compare Units, Capture Units and Quadrature Encoded Pulse (QEP) Circuitry, General Event Manager Information, Exercise: PWM Signal Generation.

**UNITIV**

**DSP-Based Implementation of DC-DC Buck-Boost Converters:** Introduction, Converter Structure, Continuous Conduction Mode, Discontinuous Conduction Mode, Connecting the DSP to the Buck-Boost Converter, Controlling the Buck- Boost Converter, Main Assembly Section Code Description, Interrupt Service Routine, The Regulation Code Sequences,

**UNIT V**

**DSP-Based Control of Stepper Motors**: Introduction, The Principle of Hybrid Stepper Motor, The Basic Operation, The Stepper Motor Drive System, The Implementation of Stepper Motor Control System Using the, LF2407DSP, The Subroutine of Speed Control Module

**TEXT BOOKS:**

1. DSP based Electro –Mechanical Motion Control by – Hamid A TOLIYAT, STEVEN CAMPBELL 2004 CRC Press,llc

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# ADVANCED CONTROL SYSTEMS
## (Professional Elective-V)

**Course Code: GR17A4037** **L T P C**
**IV Year II Sem** 2 1 0 3

**UNIT I**
**NON-LINEAR SYSTEMS**
Definition of nonlinear systems**,** Characteristics of nonlinear systems**,**Common physical non-linearities, trajectories, phase portrait, singular points and theirclassification, limit cycle and behavior of limit cycle, Derivation of generalDescribing functions(DF), DF for different nonlinearities, Linearization by small signalanalysis (Taylor series expansion), linearization by nonlinearfeedback, linearization by inverse non-linearity

**UNIT II**
**IDENTIFICATION OF PLANT DYNAMICS**
Relay control systems-Characteristics of relays, existence of limit cycles, stability of limit cycles. Frequency domain based identification-Identification of dynamic models of plants, Off-line identification of process dynamics, On-line identification of plant dynamics. Time domain based identification-State space based identification, Identification of simple systems.

**UNIT III**
**ADAPTIVE CONTROL**
Definition of adaptive control system, functions of adaptive control, gain scheduling, model reference- Mathematical description - Direct and indirect model reference adaptive control, Multivariable systems - Stability andconvergence studies, series and parallel schemes and their industrial applications.

**UNIT IV**
**SELF TUNING REGULATORS**
Different approaches to self-tuning - Recursive parameter estimation Implicit and explicit STR - LQG self-tuning - Convergence analysis Minimum variance and pole assignment approaches to multivariable self tuning regulators.

**UNIT V**
**Sliding mode Control**
Introduction, Concept of variable - structure controller and sliding control, reachability condition, properties of sliding motion, implementation of switching control laws. Reduction of chattering in sliding and steady state mode. Some design examples of nonlinear systems.

**TEXT BOOKS:**

1. M. Vidyasagar, "Nonlinear Systems Analysis", 2nd Ed., Prentice Hall,1993.
2. Karl J. Astrom, B. Wittenmark, .Adaptive Control, 2nd Edition, PearsonEducation Asia, First Indian Reprint, 2001
3. A. Johnson and H. Moradi, New Identifications and Design Methods, Springer -Verlag, 2005.
4. Christopher Edwards, Sarah K. Spurgeon, .Sliding Mode control: Theory andApplication, 1998.

**REFERENCES**

1. Hassan K. Khalil, Nonlinear Systems, Third Edition, Prentice Hall, 2002.
2. Chalam, V.V., Adaptive Control Systems, Techniques & Applications,Marcel Dekker, Inc. NY and Basel. 1987
3. Eveleigh, V.W., Adaptive Control and Optimisation Techniques, McGraw-Hill, 1967.
4. Shankar Sastry, Marc Bodson, Adaptive Control, Prentice Hall of India (P) Ltd.,1993.
5. S. Majhi, Advanced Control Theory-Relay Feedback Approach, Cengage Asia/IndiaPvt.Ltd, 2009.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

# PROGRAMMABLE LOGIC CONTROLLERS LAB

**Course Code: GR17A4038** **L T P C**

**IV Year II Sem** 0 0 2 2

**List of Experiments**

**Task1:** Different applications of Push buttons.
**Task2:** Working of different types of Timers.
**Task3:**Working of different types of Counters.
**Task4:**Sequential operation of ON/OFF of a set of lights.
**Task5:**Latching and Unlatching of a Motor.
**Task6:**Automatic indication of water tank level.
**Task7:**Traffic lights indication.
**Task8:**Logic Gates
**Task9:**Interlocking
**Task10:**Forward and Reverse direction control of Motors.

- **Introduction on Millenium PLC**
- **Introduction on Simens PLC**