Academic Regulations
Programme Structure
and
Detailed Syllabus

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

(Four Year Regular Programme)

(Applicable for Batches admitted from 2024-25)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Bachupally, Kukatpally, Hyderabad- 500 090

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD

Academic Regulations for B.Tech (Regular) under GR24

(Applicable for Batches Admitted from 2024-25)

Under Graduate Degree Programme in Engineering and Technology (UG)

Gokaraju Rangaraju Institute of Engineering and Technology (GRIET) offers a 4-year (8 Semesters) Bachelor of Technology (B.Tech) degree programme. The following programmes are offered in GRIET.

S.No	Department	Programme Code	Programme
1	Civil Engineering	01	B.Tech Civil Engineering
2	Electrical and Electronics Engineering	02	B.Tech Electrical and Electronics Engineering
3	Mechanical Engineering	03	B.Tech Mechanical Engineering
4	Electronics and Communication Engineering	04	B.Tech Electronics and Communication Engineering
5	Computer Science and Engineering	05	B.Tech Computer Science and Engineering
6	Computer Science and Business System	32	B.Tech Computer Science & Business System
7	Computer Science and Engineering (AIML)	66	B.Tech Computer Science and Engineering (Artificial Intelligence & Machine Learning)
8	Computer Science and Engineering (Data Science)	67	B.Tech Computer Science and Engineering (Data Science)

GR24 Regulations shall govern the above programmes offered by the Departments with effect from the students admitted to the programmes in 2024-25 academic year is given below.

1. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.

2. **Admissions:** Admission to the undergraduate (UG) Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the Telangana State Government/JNTUH 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.

3. **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) 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).

d) The total credits for the Programme are 160.

e) A student has a choice to register for all courses in a semester / one less or one additional course from other semesters provided the student satisfies prerequisites.

f) All the registered credits except Mandatory and Value-added Courses will be considered for the calculation of final CGPA.

g) 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. The terms 'subject' and 'course' imply the same meaning.

h) All courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/ course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.

- One credit for one hour/week/semester for Theory/Lecture (L) courses and Tutorials (T).
- One credit for two hours/week/semester for Laboratory/Practical (P) courses.
- Mandatory Courses will not carry any credits.

i) Course Classification: All courses offered for all undergraduate programmes in B.Tech degree programmes are broadly classified as follows.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	BS	Basic Science	Includes Basic Science Courses
2	ES	Engineering Science	Includes Engineering Courses
3	HS	Humanities and Social Sciences	Includes Management Courses
4	PC	Professional Core	Includes Core Courses related to the parent discipline/department/ branch of Engineering
5	PE	Professional Elective	Includes Elective Courses related to the parent discipline/ department/ branch of Engineering
6	OE	Open Elective	Elective Courses from other technical and/or emerging subjects
7	PW	Project Work	Project work, seminar and internship in industry or elsewhere
8	MC	Mandatory Courses	Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge, Co and Extra Curricular Activities
9	VAC	Value Added Courses	Courses on current industry relevant topics improving breadth and depth in domain

4. **Award of B.Tech Degree:** The Undergraduate Degree of B.Tech shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfill all the following academic requirements for the award of the degree

   a) A student 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 160 credits and secure all credits (with CGPA ≥ 5).
   c) A student must fulfill all the academic requirements for the award of the degree.

5. Courses to be offered

a) Open Electives: Students are to register an Open Elective (OE-I) during III year I semester, an Open Elective (OE-II) during III-year II semester, and a Open Elective (OE–III) in IV year I semester from the list of Open Electives given. OE-I and OE-II are to be selected from SWAYAM courses (MOOCs platform).

b) Professional Electives: The students have to choose six Professional Electives from the list of Professional Electives given in the course structure.

c) A course may be offered to the students, only if a minimum of 15 students opts for it.

d) More than one faculty member may offer the same subject.

e) A lab/practical may be included with the corresponding theory subject in the same semester) in any semester.

f) If more students opt for a particular course, then the priority shall be given to students firstly on 'first come first serve' basis and secondly based on CGPA (student who has higher CGPA is given more preference).

g) If more students opt for a particular course, then the concerned Head of the Department shall decide whether or not to offer such a course for two or more sections.

h) In case of options coming from students of other departments, priority shall be given to the student of the 'parent department'.

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 of 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 Finance Committee.

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 get detained and their registration for that semester shall stand cancelled**, including all academic credentials (internal marks etc.,) of that semester. **They will not be promoted to the next semester**. They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re- admission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be reregistered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

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	40	60	100
2	Practical	40	60	100
3	Graphics for Engineers	40	60	100
4	Mini Project	40	60	100
5	Project Work	40	60	100

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	Componentof Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Theory	40	Internal Examination & Continuous Evaluation	1) Two mid semester examination shall be conducted for 30 marks each for a duration of 120 minutes. Average of the two mid exams shall be considered **i) Subjective – 20 marks** **ii) Objective – 10 marks** 2) Continuous Evaluation is for each unit using **i) Assignment – 05 marks** **ii) Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks**
		60	Semester end examination	The semester-end examination isfor a duration of 3 hours
2	Practical	40	Internal Examination & Continuous Evaluation	One internal lab examination towards the end of course for a duration of 90 minutes with a viva of 5 minutes. **i) Internal Exam-10 marks** **ii) Viva voce – 10 marks** **iii) Continuous Assessment- 10 marks** **iv) G-Lab on Board(G-LOB) (Case study inter threading of all experiments of lab)/ Laboratory Project/Prototype Presentation/App Development -10 marks**
		60	Semester end examination	The semester-end examination isfor a duration of 3 hours. **i) write-up (algorithm/flowchart/procedure) as per the task/experiment/program - 10 marks** **ii) task/experiment/program-15 marks** **iii) evaluation of results -15 marks** **iv) write-up (algorithm/flowchart/procedure) for another task/experiment/program- 10 marks** **v) viva-voce on concerned laboratory course - 10 marks**

3	Graphics for Engineers	40	Internal Examination & Continuous Evaluation	1) Two mid semester examination shall be conducted for 15 marks each for a duration of 90 minutes. Average of the two mid exams shall be considered 2) Day-to-Day activity -15 marks 3) Continuous Evaluation using • **Assignment – 05 marks** • **Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks**
		60	Semester end examination	The semester-end examination is for a duration of 3 hours

d) Mini Project:

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Mini Project	40	Continuous Evaluation & Internal Evaluation	1) The supervisor continuously assesses the students for 20 marks **i) Continuous Assessment – 15 marks** • Abstract Presentation - 3 marks • Architectural Design Presentation - 3 marks • Modules Presentation - 3 marks • Execution Cycle 1 Presentation - 3 marks • Execution Cycle 2 Presentation - 3 marks **ii) Report – 5 marks** 2) At the end of the semester, Mini Project shall be displayed in the road show at the department level. Mini Project is evaluated by Mini Project Review Committee for **10 marks**. 3) Technical Event Participation in project area/MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/ Book Publication – **10 marks**
		60	External Evaluation	The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for **60 marks**.

Note:

i) Mini Project Review Committee consists of HoD, Mini Project Coordinator and Supervisor.

ii) Plagiarism check is compulsory for mini project report as per the plagiarism policy of GRIET.

e) Internship/Skill Development Course/ Industrial Training: Internship/Skill Development Course/Industrial Training shall be done by the student immediately after II-Year II Semester Examinations and pursue it during summer vacation/semester break & during III Year without effecting regular course work. Internship/Skill Development Course/Industrial Training at reputed organization shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination.

f) Project Work (Phase–I and Phase-II):

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Project Work (Phase- I and Phase -II)	40	Continuous Evaluation & Internal Evaluation	1) The supervisor continuously assesses the students for 20 marks **i) Continuous Assessment – 15 marks** • Abstract Presentation - 3 marks • Architectural Design Presentation - 3 marks • Modules Presentation - 3 marks • Execution Cycle 1 Presentation - 3 marks • Execution Cycle 2 Presentation – 3 marks **ii) Report – 5 marks** 2) At the end of the semester, Project work shall be displayed in the road show at the department level. Project work is evaluated by Project Review Committee for **10 marks**. 3) Technical Event Participation in project area/ MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/Book Publication – **10 marks.**
		60	External Evaluation	The Project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for **60**

				marks.

Note:

i) Project Review Committee consists of HoD, Project Coordinator and Supervisor.

ii) Plagiarism check is compulsory for project work report (Phase I and Phase II) as per the plagiarism policy of GRIET.

iii) The above rules are applicable for both Phase I and Phase II.

- A student is deemed to have satisfied the academic requirements and earned the credits allotted to **Project Stage-I** if the student secures not less than 40% of marks (40 marks out of 100 marks) in the evaluation of the same.
- A student is deemed to have failed if the student does not submit a report on work carried out during Project Stage-I or does not make a presentation of the same before the evaluation committee as per schedule or secures less than minimum marks in the evaluation.
- A student who has failed may reappear once for evaluation when it is scheduled again; if the student fails in the evaluation of 'one such reappearance', the student has to reappear for the same in the subsequent semester, as and when it is offered.
- A student is deemed to have satisfied the academic requirements and earned the credits allotted to **Project Stage-II** if the student secures not less than 35% (14 marks out of 40 marks) in the Continuous Internal Evaluation (CIE), not less than 35% (21 marks out of 60 marks) in the Semester End Examinations (SEE), and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing **'C'** grade or above in that subject/ course.
- The student is deemed to have failed if the student does not submit a report on work carried out during Project Stage-II or does not make a presentation of the same before the evaluation committee as per schedule or secures less than minimum marks in either CIE or SEE or CIE+SEE taken together.
- A student who has failed may reappear once for the evaluation when it is scheduled again; if the student fails again in the evaluation of "once such reappearance", the student has to reappear for the same in the subsequent semester as and when the evaluation is scheduled.

g) The evaluation of courses having ONLY **CIE** is as follows:

- **Elements of CE/EEE/ME/ECE/CSE as a Theory Course,** in I year I semester is evaluated for **50 marks**. The CIE for 50 marks shall be done through first and second mid-term examinations. The average marks of two mid-term examinations are taken as final marks in CIE. Student shall have to earn 40% i.e. 20 marks out of 50 marks in the average of two mid-term examinations. **There shall be no external evaluation.** The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

  CIE is done for 50 marks as follows:

- There shall be two mid-term examinations during the semester conducted for 40 marks consisting of two parts with a total duration of 2 hours: Part A for 20 marks and Part B for 20 marks.
- Part A is an objective paper or a quiz and shall consist of multiple-choice questions, fill-in-the blanks, match the following, etc. for a total of 20 marks.
- Part B is a descriptive paper and shall contain 6 questions out of which, the student needs to answer 4 questions each carrying 5 marks.
- While the first mid-term examination shall be conducted for the first 50% syllabus, the second mid-term examination shall be conducted for the remaining 50% of the syllabus. The average of the two mid-term examinations shall be taken as final marks.
- Two assignments are evaluated for 5 marks each. The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The assignments shall be given by the subject teachers. The average of the two assignments shall be taken as the final marks.
- The remaining 5 marks may be evaluated by conducting viva-voce in the subject or by evaluating the performance of the student in PPT/Poster/Case-Study presentation on a topic in the concerned subject before second mid-term examination**.**

- **Elements of CE/EEE/ME/ECE/CSE as a Lab Course,** in I year I semester is evaluated for **50 marks**.

  CIE is done for 50 marks as follows:
  - A write-up on day-to-day experiments in the laboratory (in terms of aim, components/procedure, expected outcome) shall be evaluated for 10 marks
  - 10 marks are awarded either for the performance in viva-voce (or) case study presentation (or) application development (or) poster presentation.
  - Internal practical examination shall be conducted by the concerned laboratory teacher for 15 marks.
  - The remaining 15 marks are awarded for laboratory project, which consists of the design (or) model presentation (or) prototype presentation at the end of the completion of laboratory course and before semester end practical examination.

- **Real-Time/Field-based Research Project C**ourse in II-year II Semester is evaluated for **50 marks.** The internal evaluation is for 50 marks shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be **NO external evaluation**.

  A student is deemed to have satisfied the academic requirements and earned the credits allotted to "Real-Time/Field-Based Research Project" if the student secures not less than 40% marks (i.e. 20 marks out of 50 marks) in the evaluation of the same.

  A student is deemed to have failed in Real-Time/Field-Based Research Project, if he (i) does not submit a report on the same or (ii) does not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in evaluation of the same.

  A student who is failed in either Real-Time/Field-Based Research Project may reappear once for the evaluation when they are scheduled again; if the student fails again in the

evaluation of 'one such reappearance', the student has to reappear for the same in the subsequent semester, as and when it is offered.

- **Mandatory Courses** are evaluated for **50 marks.** The CIE for 50 marks shall be done through first and second mid-term examinations. The average marks of two mid-term examinations are taken as final marks in CIE. Student shall have to earn 40% i.e. 20 marks out of 50 marks in the average of two mid-term examinations. There shall be **NO external evaluation**. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

  A mandatory course is not graded and does not carry credits. Only Pass/Fail shall be indicated in Grade Card

  The evaluation pattern for mandatory courses shall be done similar to **Elements of CE/EEE/ME/ECE/CSE as a Theory Course.**

8. **Recounting of Marks in the End Examination Answer Books:** A student can request for recounting 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 register for a supplementary examination, as per the schedule announced by the College for a prescribed fee.

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. **Re-registration for mid examination:** A student shall be given one time chance to re-register for a maximum of two subjects in a semester:
    - If the internal marks secured by a student in Continuous Internal Evaluation marks for 40 (sum of average of 2 mid-term examinations, average of all assignments and Subject Viva-voce/ PPT/Poster Presentation/Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects.
    - A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork when the course is offered next, it could be semester for first years and a year for others.
    - In the event of the student taking this chance, his/her Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

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

a) A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40), not less than 35% (21 marks out of 60 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

The student is eligible to write Semester End Examination of the concerned subject/course if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.
In case, the student appears for Semester End Examination (SEE) of the concerned subject/course but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his/her performance in that subject/course in SEE shall stand cancelled inspite of appearing the SEE.

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

S.No	Promotion	Conditions to be fulfilled
1	First year first semester toFirst year second semester	Regular course of study of First year first semester.
2	First year second semester toSecond year first semester	**(i)** Regular course of study of First y ear second semester. **(ii)** Must have secured at least 50% credits up to First year secondsemester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Second year first semester toSecond year second semester	Regular course of study of Second year firstsemester.
4	Second year second semester to Third year first semester	**(i)** Regular course of study of Second year second semester **(ii)** Must have secured at least 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 semesterto Fourth year first semester	**(i)** Regular course of study of Third year second semester. **(ii)** Must have secured at least 60% credits upto Third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.

7	Fourth year first semester toFourth year second semester	Regular course of study of Fourth year firstsemester.

14. 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	

Letter grade 'F' in any Course implies failure of the student in that course and no credits of the above table are 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) **Sk** 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.,

$$SGPA\ (S_k) = \sum_{i=1}^{n} (C_i * G_i) / \sum_{i=1}^{n} C_i$$

Where **Ci** is the number of credits of the **i**th course and **Gi** 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., up to and inclusive of **Sk**, where **k ≥ 2**.

$$CGPA = \sum_{i=1}^{m} (C_i * G_i) / \sum_{i=1}^{m} C_i$$

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

15. 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 160 credits.

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA >= 8.00 with no F or below grade/detention anytime during the programme
2	First Class	CGPA >= 8.00 with rest of the clauses of S.No 1 not satisfied
3	First Class	CGPA ≥ 7.00 and CGPA <8.00
4	Second Class	CGPA ≥ 6.00 and CGPA <7.00
5	Pass Class	CGPA ≥ 5.00 and CGPA <6.00

Equivalence of grade to marks

Marks % = (CGPA -0.5)*10

16. Award of 2-Year B.Tech Diploma Certificate

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) upto B.Tech – II Year – II Semester if the student want to exit the 4-Year B.Tech program and requests for the 2-Year B.Tech (UG) Diploma Certificate.

2. The student **once opted and awarded for 2-Year UG Diploma Certificate, the student will be permitted to join** in B.Tech III Year – I Semester and continue for completion of remaining years of study for 4-Year B.Tech Degree. ONLY in the next academic year along with next batch students. However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of classwork for that semester.

3. The students, who exit the 4-Year B.Tech program after II Year of study and wish to re-join the B.Tech program, must submit the 2 -Year B.Tech (UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.

4. A student may be permitted to take one year break after completion of II Year II Semester or B.Tech III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

17. 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.

18. Transitory Regulations

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of GR22 Regulations due to lack of attendance, shall be permitted to join I year I Semester of GR24 Regulations and he is required to complete the study of B.Tech programme within the stipulated period of eight academic years from the date of first admission in I Year.

2. A student who has been detained in any semester of II, III and IV years of GR22 regulations for want of attendance, shall be permitted to join the corresponding semester of GR24 Regulations and is required to complete the study of B.Tech within the stipulated period of eight academic years from the date of first admission in I Year. The GR24 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

3. A student of GR22 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of GR24 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both GR22 & GR24 regulations. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission. The GR24 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in GR24 Regulations:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.

5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including GR24 Regulations. **There is NO exemption of credits in any case**.

6. If a student is readmitted to GR24 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in GR24 Regulations will be substituted by another subject to be suggested by the college academic administration.

Note:

If a student readmitted to GR24 Regulations and has not studied any courses/topics in his/her earlier regulations of study which is prerequisite for further subjects in GR24 Regulations, then the college shall conduct remedial classes to cover those courses/topics for the benefit of the students.

19. Transfer of students from the Constituent Colleges of JNTUH or from other Colleges / Universities:

a) Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities shall be considered only on case-to-case basis.

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

c) The students seeking transfer to GRIET from various other Universities/institutions have to pass the failed courses which are equivalent to the courses of GRIET, and also pass the courses of GRIET which the students have not studied at the earlier institution. Further, though the students have passed some of the courses at the earlier institutions, if the same courses are prescribed in different semesters of GRIET, the students have to study those courses in GRIET in spite of the fact that those courses are repeated.

d) The transferred students from other Universities/institutions to GRIET who are on rolls are to be provided one chance to write the CBT (internal marks) in the **equivalent course**(s) as per the clearance (equivalence) letter issued by the University.

20. 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 andthe 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 GR24

(Applicable for Batches Admitted from 2025-26)

1. All regulations as applicable for B.Tech 4-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 120 credits and secure all credits. The marks obtained in all 120 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 year 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. (ii) Must have secured at least 50% credits up to Second year second semesterfrom 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 Fourth year first semester.	(i) Regular course of study of Thirdyear second semester. (ii) Must have secured at least 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 120 credits.

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA >= 8.00 with no F or below grade/ detention anytime during the Programme
2	First Class	CGPA >= 8.00 with rest of the clauses of S.no 1 not satisfied
3	First Class	CGPA $\geq$ 7.00 and CGPA <8.00
4	Second Class	CGPA $\geq$ 6.00 and CGPA <7.00
5	Pass Class	CGPA $\geq$ 5.00 and CGPA <6.00

Academic Regulations for B.Tech with Minors Programme under GR24
(Applicable for Batches Admitted from 2024-25)

1. Objectives

The key objectives of offering B.Tech with Minor program are:

- To expand the domain knowledge of the students in one of the other programmes of engineering.
- To increase the employability of undergraduate students keeping in view of better opportunity in interdisciplinary areas of engineering & technology.
- To provide an opportunity to students to pursue their higher studies in the inter-disciplinary areas in addition to their own programme of study.
- To offer the knowledge in the areas which are identified as emerging technologies/thrust areas of Engineering.

2. Academic Regulations for B.Tech Degree with Minor programmes

a) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4 -Years B.Tech programme.

b) For B.Tech with Minor, a student needs to earn additional 18 credits (over and above the required 160 credits for B.Tech degree). All these 18 credits need to be completed in III year and IV year only.

c) After registering for the Minor programme, if a student is unable to earn all the required 18 credits in a specified duration (twice the duration of the course), he/she shall not be awarded Minor degree. However, if the student earns all the required 160 credits of B.Tech, he/she will be awarded only B.Tech degree in the concerned programme.

d) There is no transfer of credits from Minor programme courses to regular B.Tech degree course and vice versa.

e) These 18 credits are to be earned from the additional Courses offered by the host department in the college as well as from the MOOCs platform.

f) For the course selected under MOOCs platform following guidelines may be followed:

- **i)** Prior to registration of MOOCs courses, formal approval of the courses, by the University is essential. University before the issue of approval considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.
- **ii)** Minimum credits for MOOCs course must be equal to or more than the credits specified in the Minor course structure provided by the University.
- **iii)** Only Pass-grade/marks or above shall be considered for inclusion of grades in minor grade memo.
- **iv)** Any expenses incurred for the MOOCs courses are to be met by the students only.

g) The option to take a Minor programme is purely the choice of the student.

h) The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Minor programme at any time; and in that case the student will be awarded only B.Tech degree in the concerned programme on earning the required credits of 160.

i) The student can choose only one Minor programme along with his/her basic engineering degree. A student who chooses an Honors programme is not eligible to choose a Minor programme and vice-versa.

j) A student can graduate with a Minor if he/she fulfils the requirements for his/her regular B.Tech programme as well as fulfils the requirements for Minor programme.

k) The institute shall maintain a record of students registered and pursuing their Minor programmes, minor programme-wise and parent programme -wise. The same report needs to be sent to the University once the enrolment process is complete.

l) The institute / department shall prepare the time-tables for each Minor course offered at their respective institutes without any overlap/clash with other courses of study in the respective semesters.

3. Eligibility conditions for the student to register for Minor programme

a) A student can opt for B.Tech programme with Minor programme if she/he has no active backlogs till II Year I Semester (III semester) at the time of entering into III year I semester.

b) Prior approval of mentor and Head of the Department for the enrolment into Minor programme, before commencement of III year I Semester (V Semester), is mandatory

c) If more than 50% of the students in a programme fulfil the eligibility criteria (as stated above), the number of students given eligibility should be limited to 50%.

4. Registration for the courses in Minor Programme

a) At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in that semester.

b) The students should choose a course from the list against each semester (from Minors course structure) other than the courses they have studied/registered for regular B.Tech programme. No course should be identical to that of the regular B.Tech course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

c) The maximum No. of courses for the Minor is limited to two (three in case of inclusion of lab) in a semester along with regular semester courses.

d) The registration fee to be collected from the students by the College is **Rs. 1000/-** per one credit.

e) A fee for late registration may be imposed as per the norms.

5. Minor courses and the offering departments

S. No.	Minor Programme	Eligible programme of students	@Offering Department	Award of Degree
1.	Artificial Intelligence & Machine Learning	All programmes, except B.Tech in CSE (AI&ML) /B.Tech (AI&ML)/ B.Tech (AI)/ B.Tech CSE(AI)	CSE	"B.Tech in programme name with Minor in Artificial Intelligence & Machine Learning"

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Bachupally, Kukatpally, Hyderabad–500090, India.

ELECTRICAL AND ELECTRONICS ENGINEERING
B. Tech (EEE) – GR24 Course Structure

I B. Tech (EEE) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Int.	Ext	Total Marks
					L	T	P	Total			
1	Maths	BS	GR24A1001	Linear Algebra and Function Approximation	3	1	0	4	40	60	100
2	Chemistry	BS	GR24A1004	Engineering Chemistry	3	1	0	4	40	60	100
3	EEE	ES	GR24A1010	Fundamentals of Electrical and Electronics Engineering	2	0	0	2	40	60	100
4	CSE	ES	GR24A1006	Programming for Problem Solving	2	0	0	2	40	60	100
5	EEE	ES	GR24A1011	Elements of Electrical and Electronics Engineering Lab	0	0	2	1	50	--	50
6	Chemistry	BS	GR24A1019	Engineering Chemistry Lab	0	0	3	1.5	40	60	100
7	CSE	ES	GR24A1021	Programming for Problem Solving Lab	0	0	3	1.5	40	60	100
8	ME	ES	GR24A1025	Engineering Workshop	1	0	3	2.5	40	60	100
9	ME	ES	GR24A1016	Graphics for Engineers	1	0	4	3	40	60	100
		TOTAL			**12**	**2**	**15**	**21.5**	**370**	**480**	**850**
10	Mgmt	MC	GR24A1028	Design Thinking	2	0	0	0	50	--	50

I B. Tech (EEE) - II Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Int.	Ext	Total Marks
					L	T	P	Total			
1	Maths	BS	GR24A1002	Differential Equations and Vector Calculus	3	1	0	4	40	60	100
2	Physics	BS	GR24A1003	Applied Physics	3	1	0	4	40	60	100
3	English	HS	GR24A1005	English	2	0	0	2	40	60	100
4	CSE	ES	GR24A1017	Data Structures	2	0	0	2	40	60	100
5	EEE	ES	GR24A1014	Electrical Circuit Analysis	2	0	0	2	40	60	100
6	Physics	BS	GR24A1018	Applied Physics Lab	0	0	3	1.5	40	60	100
7	CSE	ES	GR24A1024	Data Structures Lab	0	0	2	1	40	60	100
8	English	HS	GR24A1020	English Language and Communication Skills Lab	0	0	2	1	40	60	100
9	EEE	ES	GR24A1022	Electrical Circuit Analysis Lab	0	0	2	1	40	60	100
		TOTAL			**12**	**2**	**9**	**18.5**	**360**	**540**	**900**

II B.Tech(EEE) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Int.	Ext	Total Marks
					L	T	P	Total			
1	Maths	BS	GR24A2008	Computational Mathematics for Engineers	3	0	0	3	40	60	100
2	EEE	PC	GR24A2023	Sensors Measurements and Instrumentation	2	1	0	3	40	60	100
3	EEE	PC	GR24A2024	Principles of Analog Electronics	3	0	0	3	40	60	100
4	EEE	PC	GR24A2025	DC Machines and Transformers	3	0	0	3	40	60	100
5	EEE	PC	GR24A2026	Electromagnetic Fields	3	0	0	3	40	60	100
6	CSE	PC	GR24A2027	Database for Engineers	2	0	0	2	40	60	100
7	EEE	PC	GR24A2028	Principles of Analog Electronics Lab	0	0	2	1	40	60	100
8	EEE	PC	GR24A2029	DC Machines and Transformers Lab	0	0	2	1	40	60	100
9	EEE	PC	GR24A2030	Sensors Measurements and Instrumentation Lab	0	0	2	1	40	60	100
		TOTAL			**16**	**1**	**6**	**20**	**360**	**540**	**900**
10	CSE	MC	GR24A2007	Java Programming for Engineers	2	0	0	0	50	--	50
11	Mgmt	MC	GR24A2002	Value Ethics and Gender Culture	2	0	0	0	50	--	50

II B.Tech (EEE) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Int.	Ext	Total Marks
					L	T	P	Total			
1	EEE	PC	GR24A2031	Power Generation and Distribution	3	0	0	3	40	60	100
2	EEE	PC	GR24A2032	AC Machines	2	1	0	3	40	60	100
3	EEE	PC	GR24A2033	Control Systems	3	0	0	3	40	60	100
4	EEE	PC	GR24A2034	Principles of Digital Electronics	3	0	0	3	40	60	100
5	EEE	PC	GR24A2035	Microprocessors and Microcontrollers	3	0	0	3	40	60	100
6	EEE	PC	GR24A2036	Principles of Digital Electronics Lab	0	0	2	1	40	60	100
7	EEE	PC	GR24A2037	AC Machines Lab	0	0	2	1	40	60	100
8	EEE	PC	GR24A2038	Control Systems Lab	0	0	2	1	40	60	100
9	EEE	PW	GR24A2106	Real-time Research Project/ Societal Related Project	0	0	4	2	50	--	50
		TOTAL			**14**	**1**	**10**	**20**	**370**	**480**	**850**
10	Chemistry	MC	GR24A2001	Environmental Science	2	0	0	0	50	--	50

III YEAR I SEMESTER

S.No	BOS	Group	Course Code	Course Name	Credits				Int.	Ext	Total Marks
					L	T	P	Total			
1	EEE	PC		Power Transmission Systems	2	1	0	3	40	60	100
2	EEE	PC		Power Electronics	3	0	0	3	40	60	100
3	EEE	PC		Power System Protection	3	0	0	3	40	60	100
4	EEE	PE		Professional Elective I	3	0	0	3	40	60	100
5	EEE	OE		Open Elective I	3	0	0	3	40	60	100
6	EEE	PC		Power System Protection Lab	0	0	3	1.5	40	60	100
7	EEE	PC		Power Electronics Lab	0	0	3	1.5	40	60	100
8	EEE	PC		Microprocessors and Microcontrollers Lab	0	0	2	1	40	60	100
9	English	HS		Effective Technical Communication	1	0	0	1	40	60	100
		TOTAL			**15**	**1**	**8**	**20**	**360**	**540**	**900**
10	Mgmt	MC		Constitution of India	2	0	0	0	50	--	50

Professional Elective –I			
S.No	**BOS**	**Course Code**	**Course Name**
1	EEE		Wide Band GapPower Devices
2	EEE		Solar and Wind Energy Systems
3	EEE		Electrical Machine Design
4	MECH		Operations Research

Open Elective I			
S.No.	**BOS**	**Course Code**	**COURSE**
1	EEE		Non-Conventional Energy Sources

III YEAR II SEMESTER

S.No	BOS	Group	Course Code	Course Name	Credits				Int.	Ext	Total Marks
					L	T	P	Total			
1	EEE	PC		DSP based Electromechanical Systems	3	0	0	3	40	60	100
2	EEE	PC		Power System Analysis	2	1	0	3	40	60	100
3	Mgnt	HS		Economics and Accounting for Engineers	3	0	0	3	40	60	100
4	EEE	PE		Professional Elective II	3	0	0	3	40	60	100
5	EEE	OE		Open Elective II	3	0	0	3	40	60	100
6	EEE	PC		Power System Analysis Lab	0	0	3	1.5	40	60	100
7	EEE	PC		DSP based Electrical Lab	0	0	3	1.5	40	60	100
8	EEE	PW		Mini Project	0	0	4	2	40	60	100
		TOTAL			**14**	**1**	**10**	**20**	**320**	**480**	**800**

Professional Elective -II			
S.No	**BOS**	**Course Code**	**Course Name**
1	EEE		Modelling and Simulation of Power Electronic Converters
2	EEE		HVDC Transmission Systems
3	EEE		Advanced Control Systems
4	CSE		Operating Systems

Open Elective II			
S.No.	**BOS**	**Course Code**	**COURSE**
1	EEE		Concepts of Control Systems

IV YEAR I SEMESTER

S.No	BOS	Group	Course Code	Course Name	Credits				Int.	Ext	Total Marks
					L	T	P	Total			
1	EEE	PC		Power Semiconductor Drives	2	1	0	3	40	60	100
2	EEE	PC		Electric and Hybrid Vehicles	3	0	0	3	40	60	100
3	EEE	PE		Professional Elective III	3	0	0	3	40	60	100
4	EEE	PE		Professional Elective IV	3	0	0	3	40	60	100
5	Mgnt	HS		Fundamentals of Management and Entrepreneurship	3	0	0	3	40	60	100
7	EEE	OE		Open Elective III	3	0	0	3	40	60	100
8	EEE	PC		Power Semiconductor Drives Lab	0	0	2	1	40	60	100
9	EEE	PW		Project Work Phase-I	0	0	12	6	40	60	100
		TOTAL			**17**	**1**	**14**	**25**	**320**	**480**	**800**

Professional Elective -III			
S.No	**BOS**	**Course Code**	**Course Name**
1	EEE		Modern PowerElectronics
2	EEE		High Voltage Engineering
3	EEE		Digital Control Systems
4	EEE		Industrial Automation
Professional Elective -IV			
S.No	**BOS**	**Course Code**	**Course Name**
1	EEE		Power Quality and FACTS
2	EEE		Utilization of Electrical Energy
3	EEE		Special Electrical Machines
4	ECE		VLSI Design

Open Elective III			
S.No.	**BOS**	**Course Code**	**COURSE**
1	EEE		Artificial Neural Networks and Fuzzy Logic

IV YEAR II SEMESTER

S.No	BOS	Group	Course Code	Course Name	Credits				Int.	Ext	Total Marks
					L	T	P	Total			
1	EEE	PC		Power System Monitoring and Control	2	1	0	3	40	60	100
2	EEE	PE		Professional Elective V	3	0	0	3	40	60	100
3	EEE	PE		Professional Elective VI	3	0	0	3	40	60	100
4	EEE	PW		Project Work Phase-II	0	0	12	6	40	60	100
		TOTAL			**8**	**1**	**12**	**15**	**160**	**240**	**400**

Professional Elective -V			
S.No	**BOS**	**Course Code**	**Course Name**
1	EEE		Advanced Electric Drives
2	EEE		Energy Storage Systems
3	EEE		Modern Control Theory
4	EEE		Industrial IoT
Professional Elective -VI			
S.No	**BOS**	**Course Code**	**Course Name**
1	EEE		AI and ML applications to Power Electronics
2	EEE		Electric Smart Grid
3	ECE		Embedded Systems Design
4	CSE		Big Data Analytics

PROFESSIONAL ELECTIVES – 4 THREADS

S. No.	Thread 1: Power Electronics	Thread 2: Power Systems	Thread 3: Machines and Control Systems	Thread 4: Computer and Electronics
1	Wide Band Gap Power Devices	Solar and Wind Energy Systems	Electrical Machine Design	Optimization Techniques
2	Modelling and Simulation of Power Electronic Converters	HVDC Transmission Systems	Advanced Control Systems	Operating Systems
3	Modern Power Electronics	High Voltage Engineering	Digital Control Systems	Industrial Automation
4	Power Quality and FACTS	Utilization of Electrical Energy	Special Electrical Machines	VLSI Design
5	Advanced Electric Drives	Energy Storage Systems	Modern Control Theory	Industrial IoT
6	AI and ML applications to Power Electronics	Electric Smart Grid	Embedded Systems Design	Big Data Analytics

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
LINEAR ALGEBRA AND FUNCTION APROXIMATION

(COMMON TO CSE, ECE, EEE, CE, ME, CSE(DS), CSE(AIML))

Course Code: GR24A1001 **L/T/P/C: 3/1/0/4**
I Year I Semester

Prerequisites: Elementary knowledge of vectors, matrices and pre-calculus

COURSE OUTCOMES

1. Work with the essential tools of vector and matrix algebra
2. Compute eigenvalues and vectors for engineering applications
3. Illustrate matrix decomposition techniques to determine the exact or approximate solutions of a linear algebraic system.
4. Illustrate the concepts of function approximation with measurement of error
5. Develop the skill of finding multivariable function optima

UNIT I
FUNDAMENTALS OF VECTOR AND MATRIX ALGEBRA
Operations on vectors and matrices- Orthogonal projection of vectors- Exact and generalized inverse of a matrix- Rank of a matrix- Linear independence of vectors- Structured square matrices (Symmetric, Hermitian, skew-symmetric, skew-Hermitian, orthogonal and unitary matrices)- Vector and matrix norms

Solution of a linear algebraic system of equations (homogeneous and non-homogeneous) using Gauss elimination

UNIT II
MATRIX EIGENVALUE PROBLEM AND QUADRATIC FORMS
Determination of eigenvalues and eigenvectors of a matrix, properties of eigenvalues and eigenvectors (without proof)- Similarity of matrices- Diagonalization of a matrix- Orthogonal diagonalization of a symmetric matrix- Definiteness of a symmetric matrix

Quadratic Forms- Definiteness and nature of a quadratic form- Reduction of a quadratic form to the canonical form using an orthogonal transformation

UNIT III
MATRIX DECOMPOSITION AND LEAST SQUARES SOLUTION OF ALGEBRAIC SYSTEMS
LU decomposition- Cholesky decomposition- Gram-Schmidt orthonormalization process- QR factorization- Eigen decomposition of a symmetric matrix- Singular value decomposition

Least squares solution of an over determined system of equations using QR factorization and the generalized inverse- Estimation of the least squares error

UNIT IV
FUNCTION APPROXIMATION TOOLS IN ENGINEERING
Mean value theorems- Lagrange's mean value theorem, Taylor's theorem (without proof), Approximation off a function by Taylor's series

The principle of least squares- Function approximation using polynomial, exponential and power curves using matrix notation- Estimating the Mean squared error

UNIT V
MULTIVARIABLE DIFFERENTIAL CALCULUS AND FUNCTION OPTIMIZATION
Partial Differentiation- Chain rule- Total differentiation- Jacobian- Functional dependence

Multivariable function Optimization- Taylor's theorem for multivariable functions- Unconstrained optimization of functions using the Hessian matrix- Constrained optimization using the Lagrange multiplier method

TEXTBOOKS
1. Advanced Engineering Mathematics, 5^{th} edition, R.K.Jain and S.R.K.Iyengar, Narosa publishing house
2. Higher Engineering Mathematics- B.S.Grewal- Khanna publications

REFERENCES
1. Introduction to Linear Algebra, Gilbert Strang, 5^{th} edition, Wellesley,2017.

2. Numerical methods for scientific and engineering computation, M.K.Jain, S.R.K.Iyengar, R.K.Jain- 3rd edition- New Age publishers
3. Applied Mathematics, Vol. I & II, P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan,2010

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
ENGINEERING CHEMISTRY
(Common to all Branches)

Course Code: GR24A1004 **L/T/P/C: 3/1/0/4**
I Year I Semester

COURSE OUTCOMES

1. Assess the specification of water regarding its usage in domestic & Industrial scenarios.
2. Learn the working principles of various energy storage devices, and electrochemical reactions involved in corrosion.
3. Analyse the efficacy of polymers in diverse applications.
4. Distinguish various energy sources to prioritize eco-friendly fuels for environmentally sustainable development.
5. Interpret the role of engineering materials in various sectors.

UNIT I
WATER AND ITS TREATMENT:
Introduction to the hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break-point chlorination. Boiler troubles: Sludges, Scales, and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning, External treatment methods - Softening of water by ion-exchange processes. Desalination of water – Reverse osmosis

UNIT II
BATTERY CHEMISTRY AND CORROSION
Introduction - Classification of **Batteries**- primary, and secondary batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of Zn-air and Lithium-ion battery, Applications of Li-ion battery to electric vehicles.
Fuel Cells - Definition, Construction, working principle and applications of Hydrogen-Oxygen fuel cell and Solid oxide fuel cell, Differences between battery and a fuel cell.
Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods-Cathodic protection – Sacrificial anode and impressed current methods.

UNIT III
POLYMERS
Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples – Nylon 6:6
Plastics: Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Compounding and fabrication of plastics - compression moulding and injection moulding. Fiber-reinforced

plastics (FRP).

Conducting Polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.
Biodegradable Polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

UNIT V
ENERGY RESOURCES
Introduction, Calorific value of fuel – HCV, LCV- Dulong's formula. Classification- solid fuels: **Coal** – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – **Petroleum** and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

UNIT V
ENGINEERING MATERIALS
Smart materials and their engineering applications: Shape memory materials- Poly L-Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinyl amides.
Biosensors: Definition, characteristics, classification-, construction & working, applications and advantages of biosensors. Biochips -Definition, advantages, and applications.
Semiconductors: Si and Ge - Preparation, Ultra-purification and Crystal Growth by Zone Refining and Czochralski Crystal Pulling methods, Doping – Epitaxy, Diffusion and Ion-implantation.

TEXTBOOKS

1. Engineering Chemistry by P.C. Jain and M. Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. Engineering Chemistry, Rama Devi, Venkata Ramana Reddy and Rath, Cengage Learning, 2016

REFERENCES

1. A Textbook of Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. Engineering Chemistry by O.G.Palanna, Tata McGraw Hills Private Ltd.
3. Engineering Chemistry, Shikha Agarwal, Cambridge University Press, 2015

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING
(EEE)

Course Code: GR24A1010 **L/T/P/C: 2/0/0/2**
I Year I Semester

COURSE OUTCOMES

1. Summarize the basic fundamental laws of electric circuits.
2. Distinguish the single phase and three phase circuits.
3. Analyze the basics and principle of PN junction diode.
4. Illustrate the principle and operation of BJT and MOSFET transistors
5. Outline the protection principles using Switchgear components.

UNIT I
DC FUNDAMENTALS
Passive components, Voltage and Current sources, dependent and independent sources, fundamentals of circuit Laws, Source Transformation, Passive components in series and parallel, Delta – star conversion, Nodal and Mesh Analysis.

UNIT II
AC FUNDAMENTALS
Representation of sinusoidal waveforms, average and rms values, phasor representation, real power, reactive power, apparent power, power factor, impedance, Admittance. Introduction to three-phase circuits, types of connection. voltage and current relations in star and delta connections, analysis of balanced and unbalanced circuits, measurement of power by three- and two-wattmeter methods, measurement of reactive power by single wattmeter.

UNIT III
DIODE CIRCUITS
P-N junction diode, biasing, V-I characteristics of a diode, diode equivalent circuits, static resistance, dynamic resistance, Zener breakdown, & Avalanche breakdown. Working principle of Half-wave and full-wave rectifiers.

UNIT IV
TRANSISTORS
BJT Structure, construction, Principle and Operation of BJT, Types NPN, PNP, Common Emitter, Common Base and Common Collector Configurations, Input characteristics and Output Characteristics of a BJT.
MOSFET: Construction, Principle and Operation of Enhancement mode, Depletion mode devices, NMOS, PMOS, CMOS transistors, CMOS Inverter, Inverter characteristics.

UNIT V
ELECTRICAL INSTALLATION COMPONENTS
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB (Miniature Circuit Breaker), ELCB (Earth Leakage Circuit Breaker), MCCB (Moulded Case Circuit Breaker),RCCB, Earthing: Plate and pipe earthing ,Types of batteries: Primary and secondary, UPS(Uninterrupted power supply):Components, Calculation of ratings for UPS components to specific load, power factor improvement methods.

TEXTBOOKS

1. "Basic Electrical Engineering",D.P. Kothari and I.J. Nagrath, Third edition 2010, Tata McGraw Hill.
2. "Electrical Engineering Fundamentals", Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

REFERENCES

1. "A Textbook of Electrical Technology",-BL Theraja volume-I, S.Chand Publications.
2. "Electronic Devices and circuits" by Jacob Milliman, McGraw-Hill, 1967
3. "Electrical and Electronics Technology", E. Hughes, 10th Edition, Pearson, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

PROGRAMMING FOR PROBLEM SOLVING

Course Code: GR24A1006 **L/T/P/C: 2/0/0/2**
I Year I Semester

COURSE OUTCOMES

1. Design algorithms and flowcharts for problem solving and illustrate the fundamentalsof C language.
2. Apply control structures and arrays to solve problems.
3. Discover the need for strings and functions in problem solving and apply it.
4. Analyze the need for pointers and structures in C and implement for solutions.
5. Demonstrate file handling mechanism, preprocessor directives and command line arguments in C.

UNIT I
INTRODUCTION TO PROGRAMMING

Introduction to Algorithms: Representation of Algorithm, Flowchart, Pseudo code with examples, compiling and executing programs, syntax and logical errors.

Introduction to C Programming Language: Structure of C program, keywords, variables, constants, datatypes, operators, precedence and associativity, expression evaluation, implicit and explicit type conversion, formatted and unformatted I/O.

UNIT II
DECISION MAKING AND ARRAYS

Branching and Loops: Conditional branching with simple if, if-else, nested if else, else if ladder, switch-case, loops: for, while, do-while, jumping statements: goto, break, continue, exit.

Arrays: One and two dimensional arrays, creating, accessing and manipulating elements ofarrays. **Searching:** Introduction to searching, Linear search and Binary search.

UNIT III
STRINGS AND FUNCTIONS

Functions: Introduction to structured programming, function declaration, signature of a function, parameters and return type of a function, categories of functions, parameter passing techniques, passing arrays and strings to functions, recursion, merits and demerits of recursive functions, storage classes.

Strings: Introduction to strings, operations on characters, basic string functions available in C -strlen, strcat, strcpy, strrev, strcmp, String operations without string handling functions, arrays of strings.

UNIT IV
POINTERS AND STRUCTURES

Pointers: Idea of pointers, declaration and initialization of pointers, pointer to pointer, voidpointer, null pointer, pointers to arrays and structures, function pointer.

Structures and Unions: Defining structures, declaring and initializing structures, arrays within structures, array of structures, nested structures, passing structures to functions,

unions, typedef.

UNIT V

FILE HANDLING AND PREPROCESSOR IN C

Files: Text and binary files, creating, reading and writing text and binary files, random access tofiles, error handling in files.

Preprocessor: Commonly used preprocessor commands like include, define, undef, if, ifdef,ifndef, elif, command line arguments, enumeration data type.

Teaching methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

TEXTBOOKS

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCES

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB

(EEE)

Course Code: GR24A1011 **L/T/P/C:0/0/2/1**
I Year I Semester

COURSE OUTCOMES

1. Demonstrate the common electrical components and their ratings.
2. Summarize the basic fundamental laws of electric circuits.
3. Distinguish the measurement and relation between the basic electrical parameters
4. Examine the response of different types of electrical circuit connections with three phase excitation.
5. Illustrate the characteristics of BJT and MOSFET.

LIST OF EXPERIMENTS

Any ten experiments should be conducted.

1. Verification of Ohms Law, KVL and KCL
2. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits.
3. Verification of relationship between three phase voltages and currents in star and delta connection.
4. Measurement of Active & Reactive Power for star and delta connected balanced loads.
5. Power factor improvement by using capacitor bank in parallel with inductive load.
6. Measurement of Earth Electrode Resistance.
7. Volt ampere Characteristics of a PN Junction Diode.
8. Single Phase Half & Full wave diode Rectifier**.**
9. Input & Output Characteristics of NPN Bipolar Junction Transistor.
10. Drain Characteristics of MOSFET.
11. Breakdown Characteristics of a Zener Diode.
12. Transfer Characteristics of MOSFET.

TEXTBOOKS

1. “Basic Electrical Engineering”, D.P. Kothari and I.J. Nagrath, Third edition 2010, Tata McGraw Hill.

2. “Electrical Engineering Fundamentals”, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

REFERENCES

1. “A Textbook of Electrical Technology”, -BL Theraja volume-I, S.Chand Publications.
2. “Electronic Devices and circuits” by Jacob Milliman, McGraw-Hill, 1967
3. “Electrical and Electronics Technology”, E. Hughes, 10th Edition, Pearson, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
ENGINEERING CHEMISTRY LAB

Course Code: GR24A1019 **L/T/P/C: 0/0/3/1.5**
I Year I Semester

COURSE OUTCOMES

1. Determination of parameters like hardness of water chloride content in water
2. Able to handle instruments like conductometer and potentiometer to find out the concentrations of acids and bases.
3. Estimate the amount of metal ion present in a given sample.
4. Prepare polymers like bakelite, nylon-6, and aspirin in the laboratory.
5. Find out the physical properties of fluids like adsorption, surface tension, and viscosity.

List of Experiments

1. Determination of Total Hardness of water by a complexometric method using EDTA.
2. Determination of Chloride content of water by Argentometry.
3. Redox titration: Estimation of Ferrous ion using standard $KMnO_4$ by Permanganometry.
4. Estimation of HCl by Conductometric titrations.
5. Estimation of Ferrous ion by Potentiometry using dichromate.
6. Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.
7. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
8. Determination of Viscosity of liquid by using Ostwald's Viscometer.
9. Determination of Surface tension of liquid by using Stalagmometer.
10. Determination of Partition Coefficient of Acetic acid between n-butanol and water.
11. Preparation of phenol-formaldehyde resin (Bakelite).
12. Synthesis of Aspirin.

REFERENCES

1. Vogel's textbook of Practical Organic Chemistry, 5th Edition.
2. A Textbook on Experiments and Calculations in Engineering Chemistry-S. S. Dara, S Chand & Company; 9th edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING LAB

Course Code: GR24A1021 **L/T/P/C: 0/0/3/1.5**
I Year I Semester

COURSE OUTCOMES

1. Translate algorithms into a working program and analyze and debug the codes usingbasics of C language.
2. Develop programs by choosing appropriate control structures.
3. Select and apply the concept of arrays and strings for problem solving.
4. Demonstrate problem solving using modular programming and pointers.
5. Solve the problems using structures, files and pre-processor directives.

TASK 1

a. Write a C program to convert days into years, weeks and days.(Assume a year has 365days).
b. Write a C program to find greatest and smallest among three numbers using conditionaloperator.
c. Write a C program to enter P, T, R and calculate Compound Interest.

TASK 2

a. Write a C program to swap two numbers using the following:
(i) Using third variable
(ii) Without using third variable
(iii) Using bitwise operators
b. Write a C program to do the following using implicit and explicit type conversion
(i) Convert Celsius temperature to Fahrenheit
(ii) Convert Fahrenheit temperature to Celsius
(iii) Find area of a triangle given sides a,b,c

TASK 3

a. Write a C program to add two numbers without using arithmetic operators in C.
b. Write a C program to determine whether a number is a power of 2 or not using bitwiseoperator and ternary operator.
c. Write a C program to check whether a number is even or odd using bitwise operator andternary operator.

TASK 4

a. Write a C program to find the roots of a quadratic equation using if-else.
b. Write a C program to input electricity unit charges and calculate total electricity bill according to the given condition:
   For first 50 units Rs. 0.50/unit
   For next 100 units Rs. 0.75/unit
   For next 100 units Rs. 1.20/unit
   For unit above 250 Rs. 1.50/unit
   An additional surcharge of 20% is added to the bill
c. Write a menu driven C program to implement a simple arithmetic calculator.

d. Write a C program to display number of days in month using switch case (The input is month number 1 -12).

TASK 5

a. Write a C program check whether a given number is Perfect number or not.
b. Write a C program check whether a given number is Palindrome number or not.
c. Write a C program check whether a given number is Armstrong number or not.
d. Write a C program check whether a given number is Strong number or not.

.

TASK 6

a. Write a C program to display the following patterns:

(ii)

```
* * * *
*     *
*     *
* *   *
*
```

(iii)

```
1
2  3
4  5  6
7  8  9  10
```

```
1
2  2
3  3 3
4  4  4
4
```

b. Write a C program to generate the prime numbers between x and y where x and y arestarting and ending values to be supplied by the user.
c. Write a C program to calculate the sum of following series:(i) S1=1+x/1!-x^2/2!+x^3/3!-x^4/4!+…..xn/n!
(ii) S2= x^1/1+x^3/3+x^5/5+….+x^n/n

TASK 7

a. Write a C program to find sum, average and minimum and maximum in a list of numbers.
b. Write a C program to implement Linear search.
c. Write a C program to implement Binary search.

TASK 8

a. Write a C program to implement matrix addition.
b. Write a C program to implement matrix multiplication.

TASK 9

a. Write a C program to display binary equivalent of a given decimal number usingfunctions.
b. Write a C program to implement transpose of a matrix using functions
c. Write a C program using functions that compares two strings to see whether they areidentical or not. The function returns 1 if they are identical, 0 otherwise.

TASK 10

a. Write a C program to implement factorial of a given integer using recursive and non-recursive functions.

b. Write a C programto find the GCD (greatest common divisor) of two given integers usingrecursive and non-recursive functions.
c. Write a C program to print first 'n' terms of Fibonacci series using recursive and non- recursive functions.

TASK 11

a. Write a C program to implement the following with and without string functions:
(i) Reverse a string (ii) Concatenate 2 strings.
b. Write a C program to read a string and determine whether it is palindrome or not.
c. Write a C program to sort the 'n' strings in the alphabetical order.

TASK 12

a. Write a C program to implement function pointer to find sum and product of two numbers.
b. Write a C program to sort list of numbers using pointers.

TASK 13

a. Define a structure Student, to store the following data about a student: rollno(int), name(string) and marks. Suppose that the class has 'n' students. Use array of type Studentand create a function to read the students data into the array. Your program should be menu driven that contains the following options :
(i) Print all student details
(ii) Search student by rollno
(iii) Print the names of the students having the highest test score
b. Write a C program that uses structures and functions to perform addition and product oftwo complex numbers? (use structures and functions)

TASK 14

a. Write a C program to merge two files into a third file.
b. Write a C program to count number of characters in a file and also convert all lower casecharacters to upper case and display it
c. Write a C program to append a file and display it

TASK 15

a. Write a C program to find sum of 'n' numbers using command line arguments.
b. Write a C program to implement following pre-processor directives:
i. define ii. undef iii. ifdef iv. ifndef.
c. Write a C program to create a user defined header file to find sum, product and greatestof two numbers.

TEXTBOOKS

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, CengageLearning, (3rd Edition)

REFERENCE BOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHall of India
2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)

3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education
4. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4th Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

ENGINEERING WORKSHOP

Course Code: GR24A1025 **L/T/P/C: 1/0/ 3/2.5**
I Year I Semester

COURSE OUTCOMES

1. Identify workshop tools and their operational capabilities
2. Practice on manufacturing of components using workshop trades including Carpentry, Fitting, Tin Smithy, Welding, Foundry and Black Smithy
3. Apply basic electrical engineering knowledge for House Wiring Practice
4. Develop various trades applicable to industries
5. Create hands on experience for common trades with taking safety precautions

TRADES FOR EXERCISES: At least two tasks from each trade

1. **Carpentry:** Demonstration and practice of carpentry tools
   Task 1: Preparation of T- Lap Joint
   Task 2: Preparation of Dove Tail Joint.

2. **Fitting -** Demonstration and practice of fitting tools
   Task 3: Preparation of Straight Fit
   Task 4: Preparation of V-Fit

3. **Tin-Smithy -** Demonstration and practice of Tin Smithy tools
   Task 5: Preparation of Rectangular Tray
   Task 6: Preparation of Open Scoop

4. **Welding :** Demonstration and practice on Arc Welding tools
   Task 7: Preparation of Lap joint,
   Task 8: Preparation of Butt Joint

5. **House-wiring:** Demonstration and practice on House Wiring tools
   Task 9: Exercise on One way switch controlled two bulbs in series one bulb in Parallel.
   Task 10: Exercise on Stair Case connection.

6. **Foundry :** Demonstration and practice on Foundry tools
   Task 11: Preparation of Mould using Single Piece Pattern.
   Task 12: Preparation of Mould using Split Piece Pattern.

7. **Black Smithy:** Demonstration and practice on Black Smithy tools
   Task 13: Preparation of U-Hook
   Task 14: Preparation of S-Hook

8. Preparation of a prototype model of any trade under G-LOBE activity

TEXTBOOKS

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019.
2. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5thEdn. 2015.
3. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

REFERENCES

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Elements of Workshop Technology, Vol. II by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 12th edition
3. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
4. Technology of machine tools, Steve F. Krar, Arthur R. Gill and Peter Smid, McGraw Hill Education (India) Pt. Ltd., 2013.
5. Engineering Practices Laboratory Manual, Ramesh Babu.V., VRB Publishers Private Limited, Chennai, Revised edition, 2013 – 2014.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

GRAPHICS FOR ENGINEERS

Course Code: GR24A1016 **L/T/P/C: 1/0/4/3**
I Year I Semester

COURSE OUTCOMES

1. Generate two dimensional drawings and apply AutoCAD commands.
2. Interpret projection methods and draw projections of line or point objects.
3. Imagine and generate multi-view projections of planes and solid objects in different positions
4. Construct and interpret sectional views and develop solid surfaces.
5. Create isometric drawings from given orthographic views and familiar with isometric to orthographic transformations.

UNIT I

Introduction to AutoCAD software: user interface, tool bar -draw, modify, dimension, layers, setting drawing area, status bar, print setup, generation of two-dimensional drawings. **Construction of Engineering Curves**- Ellipse, Parabola and Hyperbola -general method only.

UNIT II

Orthographic projection – Introduction, definition, and classification of projections; pictorial and multi-view, significance of first and third angle methods of projections; **Projections of points** -in all quadrants and **straight lines** -inclined to one reference plane only.

UNIT III

Projections of planes - definition and types of regular plane figures like triangle, square, pentagon, hexagon, and circle; projections of planes -inclined to one reference plane only.
Projections of solids - definition and types of right regular solids objects like prism, cylinder, pyramid, and cone; projections of solids -axis inclined to one reference plane only.

UNIT IV

Sections of solids- Section and sectional views of right regular solids like Prism, Cylinder, Pyramid and Cone – Auxiliary Views.
Development of surfaces- Development of surfaces of Right Regular Solids like Prism, Pyramid, Cylinder and Cone.

UNIT V

Isometric views– isomeric views of lines, planes (polygons) and solids (prism, cylinder, pyramid, and cone); generation of Isometric line diagrams. World Coordinate System, User Coordinate System.
Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.

TEXTBOOKS

1. Engineering Drawing by N. D. Bhatt, Fiftieth Revised and Enlarged Edition:2011, Charotar Publishing House Pvt. Ltd.
2. Engineering Graphics by Basant Agrawal and C M Agrawal, fifth re-print 2011, Tata McGraw Hill Education Private Limited, New Delhi.

REFERENCES

1. Engineering Graphics with AutoCAD 2020 by James D. Bethune, Copyright © 2020 by Pearson Education, Inc. All rights reserved.
2 Engineering Graphics by M. B. Shah, B. C. Rana, S. N. Varma, Copyright © 2011 Dorling Kindersley (India) Pvt. Ltd, Licensees of Pearson Education in South Asia.
3. Engineering Drawing and Graphics by K Venu Gopal /New Age International Pvt. Ltd, Publishers, fifth edition, 2002.
4. Engineering Graphics by Koushik Kumar, Apurba Kumar Roy, Chikesh Ranjan, S Chand and Company limited, first edition 2019.
5. Engineering Drawing with Auto Cad by B. V. R. Gupta, M. Raja Roy, IK International Pub., 2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

DESIGN THINKING

Course Code: GR22A1022 **L/T/P/C: 2/0/0/0**
I Year I Semester

COURSE OUTCOMES

1. Use design thinking and hypothesis-driven innovation processes to develop viable solutions to user challenges
2. Use multiple brainstorming techniques to find innovative solutions
3. Develop and test a business model or business case to support the viability of the solution
4. Prototype a solution to a user challenge
5. Investigate the cultural, emotional, technological, and business factors relevant to developing a new product or service design concept

UNIT I

REVISITING DESIGN THINKING

Creative thinking as basis of innovation; Empathy process for deep understanding of challenge with practical ingenuity; Making sense of observations and insights; Defining a point of view and context Design thinking skills for Problem Discovery, Definition, and Ideation – Identifying problems in daily lives and in the world at large, Understanding user and customer perspectives.

UNIT II

IDEATION PROCESS

Clear Articulation of problem statement with focus on latent needs; Brainstorming potential solutions; Ideation methods with case-study based approach to using Systematic Inventive Thinking (SIT) Methods such as Addition, Subtraction, Multiplication, Division and Task Unification Strategic Innovation for competition in future: Linear Innovation vs. non-linear innovation, Understanding and identifying weak signals, 3-box thinking, 3-Box framework and Box-3 ideation.

UNIT III

DESIGNING CUSTOMER EXPERIENCE

Understanding Innovation through Design Thinking; Enhancing Customer Experience; Service Design and Development Process and Case Studies; Service Experience Cycle and Case Studies .

UNIT IV

SUSTAINABLE DESIGN APPROACHES

Concern for Environment and Sustainability in Design, Case Studies to understand good Design For Environment (DFE) Decisions; Design Considerations in the five stages of the Product Life Cycle.

UNIT V

INTEGRATIVE ENGINEERING DESIGN SOLUTIONS

Identifying and resolving issues with working in diverse teams, Modularising, prototype building by different engineering disciplines within the team, validated learning with accessible metrics, Capstone Project (Interdisciplinary) Applying Design Thinking Principles and Methods for Ideation and Prototyping, Testing Solution, Refining Solution, and Taking the Solution to the Users.

TEXTBOOKS

1. 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, Vijay Kumar, John Wiley & Sons, ISBN: 978-1118083468, 2012

2. Living with Complexity, Donald A Norman, MIT Press, ISBN: 978-0262528948, 2016

3. Design Thinking for Entrepreneurs and Small Businesses: Putting the Power of Design to Work, Beverly Rudkin Ingle, A Press, ISBN: 978-1430261810, 2013

REFERENCES

1. Emotionally Durable Design: Objects, Experiences and Empathy, Jonathan Chapman, 2nd Edition, Routledge, ISBN: 978-0415732161, 2015

2. Innovation Design: How Any Organization Can Leverage Design Thinking to Produce Change, Drive New Ideas, and Deliver Meaningful Solutions, Thomas Lockwood, Edgar Papke, New Page Books, ISBN: 978-1632651167, 2017

3. Design Thinking Business Analysis: Business Concept Mapping Applied, Thomas Frisendal, Springer, ISBN: 978-3642434822, 2012

4. Chapter 1: A Simple Framework for Leading Innovation, The Three Box Solution, HBR Press, 2016

5. Design a Better Business: New Tools, Skills and Mindset for Strategy and Innovation, Patrick Van Der Pijl, Justin Lokitz, Lisa Kay Solomon, Erik van der Pluijm, Maarten van Lieshout, Wiley, ISBN: 978-8126565085, 2016

I YEAR II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(COMMON TO CSE, ECE, EEE, CE, ME, CSE(DS), CSE(AIML))

Course Code: GR24A1002 **L/T/P/C: 3/1/0/4**
I Year II Semester

COURSE OUTCOMES

1. Classify the differential equations of first order and solve them analytically by suggested methods
2. Solve linear differential equations of higher order under various forcing functions
3. Evaluate double and triple integrals and apply them to some problems in geometry and mechanics
4. Apply vector differential operators on scalar and vector fields and apply them to solve some field related problems
5. Apply classical vector integral theorems for fast evaluation of work done around closed curves and flux across closed surfaces

UNIT I
ORDINARY DIFFERENTIAL EQUATIONS OF THE FIRST ORDER

LDE of the first order: Solution of Exact, Linear and Bernoulli equations, modeling Newton's law of cooling, growth and decay models.

UNIT II
ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

LDE with constant coefficients: Complementary function, Particular integrals for *f(x)* of the form e^{ax}, x^n, $cosax$, $sinax$, $e^{ax}V(x)$ and $x\ V(x)$where $V(x)$=$cosax$ and $sinax$, the method of variation of parameters, LDE with variable coefficients: Cauchy's homogeneous equation.

UNIT III
MULTIPLE INTEGRALS

Double integrals: Evaluation of Double Integrals, change of order of integration (only Cartesian form), change of variables (Cartesian and polar coordinates) Triple Integrals: Evaluation of triple integrals, change of variables (Cartesian to Spherical and Cylindrical polar coordinates) Applications: Area using the double integral –Volume of a solid using the double and triple integral-

UNIT IV
VECTOR DIFFERENTIATION AND LINE INTEGRATION

Vector differentiation: Scalar and vector point functions, Concepts of gradient, divergence and curl of functions in cartesian framework, solenoidal field, irrotational field, scalar potential

Vector line integration: Evaluation of the line integral, concept of work done by a force field, Conservative fields

UNIT V
SURFACE INTEGRATION AND VECTOR INTEGRAL THEOREMS

Surface integration: Evaluation of surface and volume integrals, flux across a surface
Vector integral theorems: Green's, Gauss and Stokes theorems (without proof) and their applications

TEXTBOOKS

1. R.K.Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa publishing house, Fourth edition 2014
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006

4.. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

REFERENCES

1. GRIET reference manual
2. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
APPLIED PHYSICS
(Common to all branches)

Course Code: GR24A1003 **L/T/P/C: 3/1/0/4**
I Year II Semester

COURSE OUTCOMES

1. Solve engineering problems involving quantum nature of radiation and matter waves.
2. Understand the characteristics of semiconductor devices and operation of optoelectronic devices.
3. Identify magnetic and superconducting materials based on their properties for various applications.
4. Analyze the properties of Laser and its propagation in different types of optical fibers.
5. Explore the features of nanomaterials.

UNIT I
QUANTUM PHYSICS AND SOLIDS

Quantum Mechanics: Introduction, Black body radiation, Planck's law, Photoelectric effect-Einstein's Photoelectric equation(quantitative), Wave-Particle duality: de Broglie hypothesis, Davisson and Germer experiment, Heisenberg's uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional infinite potential box.

Solids: Classification of solids into metals, semiconductors, and insulators.

UNIT II
SEMICONDUCTORS AND DEVICES

Intrinsic and extrinsic semiconductors(qualitative) - Hall Effect and its applications, direct and indirect band gap semiconductors, Construction and principle of operation of p-n junction diode, I-V characteristics of p-n junction diode and Zener diode.

Radiative transition: Absorption, Spontaneous and Stimulated emissions, Principle, Construction, Working, Characteristics and Applications: LED and Solar cell.

UNIT III
MAGNETIC MATERIALS AND SUPERCONDUCTIVITY

Magnetic Materials: Introduction, permeability, field intensity, magnetic field induction, magnetisation, magnetic susceptibility, origin of magnetic moment: Bohr magneton, classification of magnetic materials: Ferro, Para, Dia, Antiferro and Ferri, Hysteresis curve based on domain theory of ferromagnetism, Soft and hard magnetic materials, Applications of magnetic materials.

Superconductivity: Superconductivity phenomenon, Meissner effect, Type I and Type II superconductors, applications of superconductors.

UNIT IV

LASERS AND FIBER OPTICS

Lasers: Introduction, Characteristics of lasers, Lasing action, Essential components of laser, Construction and working: Ruby laser, He-Ne laser and Semiconductor laser, Applications of lasers.

Fiber Optics: Introduction, Principle and Structure of an optical fiber, Basic components in optical fiber communication system, Advantages of optical fibers over conventional cables, Types of optical fibers, Acceptance angle-Numerical aperture, Losses associated with optical fibers, Applications of optical fibers.

UNIT V

NANOTECHNOLOGY

Introduction, Quantum confinement, Surface to volume ratio, Classification of Nanomaterials, Synthesis methods: Top-Down Technique: Ball milling method, Bottom-Up technique: Sol-Gel method, Characterization techniques: SEM, TEM and EDAX.

TEXTBOOKS

1. Engineering Physics, B.K. Pandey, S. Chaturvedi – Cengage Learing.
2. Applied Physics, T. Bhīma Sankaram, BSP Publishers.
3. Engineering Physics, P.K Palanisamy, Scitech Publishers.
4. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand.

REFERENCES

1. Fundamentals of Semiconductor Devices, Second Edition, Anderson and Anderson, McGraw Hill.
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw- Hill Inc. (1995)
3. Semiconductor Physics and Devices, 4e, Neamen and Biswas, McGraw Hill.
4. Online Course: “Optoelectronic Materials and Devices” by Monica Katiyar and Deepak Guptha on NPTEL.
5. Halliday and Resnick, Physics – Wiley.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
ENGLISH
Common to CSE (SEM-I), and CE, EEE, CSE (AIML), CSE(DS), ECE & ME(SEM-II)

Course Code: GR24A1005 **L/T/P/C: 2/0/0/2**
I Year II Semester

COURSE OUTCOMES

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. Acquire proficiency in English including reading and listening comprehension, writing and speaking skills.
5. Convey complex ideas clearly and accurately in academic and professional settings

UNIT I

Chapter entitled '***Toasted English*' by R.K.Narayan** from ***"English: Language, Context andCulture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of ProperPunctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT II

Chapter entitled **'Appro JRD' by Sudha Murthy** from ***"English: Language, Context and Culture"published*** by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement andSubject-verb Agreement.

Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events

– Classifying- Providing Examples or Evidence.

UNIT III

Chapter entitled **'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises forPractice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter ofRequisition, Email Etiquette, Job Application with CV/Resume.

UNIT IV

Chapter entitled **'Art and Literature' by Abdul Kalam** from ***"English: Language, Context andCulture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion - Précis Writing.

UNIT V

Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from ***"English: Language, Context andCulture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Technical Vocabulary and their Usage

Grammar: Common Errors in English (*Covering all the other aspects of grammar which were notcovered in the previous units*)

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

<u>Note</u>: Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum are coveredin the syllabus of ELCS Lab Course.

- **<u>Note</u>: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* ***Open-ended***, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on theneeds of the students in their respective colleges for effective teaching/learning in the class.

- **<u>Note</u>**: **2**.Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40 percent of each topic from the syllabus in blended mode.

TEXTBOOK

1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCES

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language,Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students.Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

DATA STRUCTURES

Course Code: GR24A1017 **L/T/P/C:2/0/0/2**
I Year II Semester

COURSE OUTCOMES

1. Implement various sorting techniques and analyze the computational complexity of algorithms.
2. Analyze the basics of data structures and its types and translate to programs the operationson stack and queue and their applications.
3. Develop algorithms for various operations on linked lists and convert them to programs.
4. Interpret operations on non-linear data structure binary tree and BST.
5. Summarize the operations on graphs and apply graph traversals techniques and outlinehashing techniques.

UNIT I

Algorithms and Complexities: Analysis of algorithms, Basic concept of order of complexity, Asymptotic Notations: Big Oh notation, Omega notation, Theta notation, little oh notation and little omega notation.
Sorting: Bubble sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Radix Sort, Counting sort.

UNIT II

Stacks: Introduction to Data Structures and types, Stack – Operations: pop, push, display, peek, Representation and implementation of stack operations using arrays, stack applications, recursion, infix to postfix transformation, evaluating postfix expressions.
Queues: Queue – Operations: enqueue, dequeue, display, representation and implementation ofqueue operations using array, applications of queues, circular queues - representation and implementation.

UNIT III

LIST: Introduction, dynamic memory allocation, self-referential structures, single linked list, advantages and disadvantages of single linked list, single linked list vs arrays, representation ofa linked list in memory, operations-insertion, deletion, display, search.
Types and applications: Circular linked list, double linked list, implementation of stack, queueusing linked list.

UNIT IV

Trees: Basic tree concepts, Binary trees**:** properties, types, representation of binary trees using arrays and linked lists, traversals of binary tree.
Binary Search Tree –Representation and implementation of operations, Binary Search Tree Traversals (recursive), creation of binary tree and BST from given traversals.

UNIT V

Graphs: Definition, basic terminology, representation of graphs, graph traversal techniques – Breadth First Traversal, Depth First Traversal.

Hashing - Introduction to hashing, hash function and types, hash table, implementation, collision resolution techniques–separate chaining, linear probing, quadratic probing, double hashing (onlyexamples – no implementation).

Teaching methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

TEXTBOOKS

1. Data Structures, 2/e, Richard F, Gilberg, Forouzan, Cengage
2. Data Structures and Algorithms, 2008, G.A.V.Pai, TMH

REFERENCES

1. Data Structures with C, Seymour Lipschutz, TMH
2. Classic Data Structures, 2/e, Debasis, Samanta, PHI, 2009
3. Fundamentals of Data Structures in C, 2/e, Horowitz, Sahni, Anderson Freed, University Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

ELECTRICAL CIRCUIT ANALYSIS

Course Code: GR24A1014 **L/T/P/C:2/0/0/2**
I Year II Semester

COURSE OUTCOMES

1. Analyze the electric circuits with suitable theorems and coupled circuits.
2. Illustrate the transient response of given DC circuits.
3. Infer electrical circuit responses using Laplace and Inverse Laplace transform.
4. Summarize the concepts of Fourier Series and Fourier transforms.
5. Simplify the network by using two port parameters.

UNIT I
NETWORK THEOREMS AND COUPLED CIRCUITS

Linearity and Superposition, Thevenin's and Norton's theorems, Maximum power transfer theorem and Reciprocity theorem (DC &AC).

Coupled Circuits: Self & Mutual Inductance, Dot convention, Coefficient of Coupling, Analysis of circuits with mutual inductance.

UNIT II
DC TRANSIENTS AND RESONANCE

Solution of first and second order differential equations for Series and Parallel RL, RC, RLC circuits, time constants, steady state and transient response. Current locus diagrams of RL and RC series circuits.

Resonance: Series and parallel circuits, Bandwidth, Q-factor, initial and final conditions in network elements

UNIT III
ELECTRICAL CIRCUIT ANALYSIS USING LAPLACE TRANSFORMS

Introduction to Laplace Transform, Properties of Laplace Transforms, initial and Final value theorems, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, Inverse Laplace Transform, transformed network with initial conditions, Transfer function representation, Poles and Zeros.

UNIT IV
FOURIER SERIES AND FOURIER TRANSFORM

Representation of continuous-time periodic signals by Fourier series; Dirichlet's conditions; Symmetry conditions, Properties of Fourier series, Trigonometric and Exponential Fourier series.

Fourier transform: Fourier transform of periodic signals, Properties of Fourier transforms. Application to simple networks.

UNIT V
TWO PORT NETWORKS

Two Port Networks, terminal pairs, relationship of two port variables, impedance,

admittance, hybrid and transmission parameters, condition for symmetry and reciprocity, interrelation ship between various parameters, interconnections of two port networks (series, parallel and cascade).

TEXTBOOKS

1. "Fundamentals of Electric Circuits" by C.K.Alexander and M.N.O.Sadiku, McGraw Hill Education,2004.
2. "Engineering Circuit Analysis" by W.H.Hayt and J.E.Kemmerly, McGraw Hill Education,2013.

REFERENCES

1. "Basic Electrical Engineering" by A.Sudhakar and Shyam Mohan, McGraw Hill Education.
2. "Circuit Theory" (Analysis and Synthesis) by A.Chakrabarti, Dhanpat Rai & Co
3. "Networks and Systems" by D Roy Choudhury, New Age International Publications, 1998.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

APPLIED PHYSICS LAB

(Common to all branches)

Course Code: GR24A1018 **L/T/P/C:0/0/3/1.5**

I Year II Semester

COURSE OUTCOMES

1. Compare the behavior of Solar cells and LED.
2. Analyze the behavior of magnetic fields and their applications.
3. Infer the work function of a material through photoelectric effect.
4. Discuss the characteristics of Lasers and infer the losses in optical fibers.
5. Estimate the frequency of tuning fork through the phenomena of resonance.

List of Experiments

1. Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.
2. Solar Cell: To study the V-I Characteristics of solar cell.
3. Light emitting diode: To study V-I characteristics of light emitting diode.
4. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect: To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect: To determine work function of a given material and Planck's constant.
7. LASER: To study the V-I characteristics of LASER sources.
8. Optical fiber: To determine the bending losses of Optical fibers.
9. Optical fiber: To determine the Numerical Aperture of Optical fibers.
10. Melde's experiment: To determine the frequency of a tuning fork using Melde's arrangement.

Note: Any 8 experiments are to be performed.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

DATA STRUCTURES LAB

Course Code: GR24A1024 **L/T/P/C: 0/0/2/1**
I Year II Semester

COURSE OUTCOMES

1. Construct executable C programs for sorting techniques.
2. Implement stack and queue data structures and their applications.
3. Interpret various linked list operations to produce executable codes.
4. Develop working procedure for operations on BST using DMA.
5. Demonstrate graph operations and hashing techniques.

TASK 1

a. Implement Bubble sort using a C program.
b. Implement Selection sort using a C program.
c. Implement Insertion sort using a C program.

TASK 2

a. Develop a C program for Quick sort.
b. Demonstrate Merge sort using a C program.
c. Design a C program for Radix Sort.

TASK 3

a. Write a C program to implement Stack operations using arrays.
b. Write a C program to implement Queue operations using arrays.
c. Write a C program to implement Circular Queue operations using arrays

TASK 4

a. Write a C program to convert infix expression to postfix expression.
b. Write a C program to evaluate a postfix expression.

TASK 5

a. Write a C program to check for balanced parenthesis.
b. Write a C program to implement priority queue using arrays.

TASK 6

a. Implement the following operations on Single Linked List using a C program.

i. create
ii. insert
iii. delete
iv. search
v. display

TASK 7

a. Write a C program to implement Circular Linked List operations – create, insert, deleteand display.

TASK 8

a. Write a C program to implement Double Linked List operations – create, insert, deleteand display.

TASK 9

a. Implement a C program for Stack using Linked list.
b. Implement a C program for Queue using Linked list.

TASK 10

a. Implement the following operations on Binary Search Tree

i. create
ii. insert
iii. search
iv. delete

TASK 11

a. Implement the following operations on Binary Search Tree

i. count-nodes
ii. height
iii. minimum node
iv. maximum node

TASK 12

a. Develop a C code for preorder, inorder and postorder traversals of a Binary Search Treeusing recursion.
b. Design a C program for level order traversal of a Binary Search Tree.

TASK 13

a. Write a C program to implement Adjacency Matrix of a given graph.
b. Write a C program to implement Adjacency List of a given graph.

TASK 14

a. Implement a C program for DFS traversal on graph.
b. Implement a C program for BFS traversal on graph.

TASK 15

a. Implement a C program for the following operations on Hashing:

i. insert
ii. delete
iii. search
iv. display

TEXTBOOK

1. Data Structures, 2/e, Richard F, Gilberg, Forouzan, Cengage
2. Data Structures and Algorithms, 2008, G.A.V.Pai, TMH

REFERENCES

1. Data Structures with C, Seymour Lipschutz, TMH
2. Classic Data Structures, 2/e, Debasis, Samanta, PHI, 2009
3. Fundamentals of Data Structures in C, 2/e, Horowitz, Sahni, Anderson Freed, University Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Common to CSE (SEM-I), and CE, EEE, CSE(AIML), CSE(DS), ECE & ME(SEM-II)

Course Code: GR24A1020 **L/T/P/C:0/0/2/1**
I Year II Semester

COURSE OUTCOMES

1. Interpret the role and importance of various forms of communication skills.
2. Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively by listening carefully and respect others point of view.
3. Utilize various media of verbal and non-verbal communication with reference to various professional contexts.
4. Recognize the need to work in teams with appropriate ethical, social and professional responsibilities.
5. Speak and pronounce English intelligibly

English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Exercise I

CALL Lab:

Understand: Introduction to Phonetics – Speech Sounds – Consonant and Vowel Sounds.
Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab:

Understand: Ice Breaking and JAM.
Practice: Ice-Breaking Activity and JAM Session. Introducing oneself and others

Exercise II

CALL Lab:

Understand: Structure of Syllables– Weak Forms and Strong Forms in Context– Word Stress and
Rhythm.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab:

Understand: Features of Good Conversation – Non-verbal Communication.
Practice: Role-Play- Expressions in Various Situations –Making Requests and Seeking

Permissions- Telephone Etiquette, Rapid Round –Memory Games.

Exercise III

CALL Lab:

Understand: Intonation--Errors in Pronunciation-the Influence of Mother Tongue (MTI).
Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks.
Practice: Making a Short Speech – Extempore.

Exercise IV

CALL Lab:
Understand: Presentation Skills – Elements of Presentation – Organizing Content – Use of Power Point
– Slides Preparation
Practice: Presentation Skills

ICS Lab:

Understand: How to make informal and Formal Presentations
Practice: Collages / Poster Presentations-Power point presentations

Exercise V

CALL Lab:

Understand: Listening Skills and its importance-– Purpose- Process- Types- Barriers of Listening - Listening for General/Specific Details.
Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Mind map - Story Telling - Narrating a story using mind maps
Practice: Weaving Stories

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab**
2. **Interactive Communication Skills (ICS) Lab**

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

ELECTRICAL CIRCUIT ANALYSIS LAB

Course Code: GR24A1022 **L/T/P/C:0/0/2/1**
I Year II Semester

COURSE OUTCOMES

1. Solve the circuits using various network theorems.
2. Analyze the performance of R-L, R-C and R-L-C circuits and draw the locus diagrams.
3. Measure the self and mutual inductance and determine the coefficient of coupling.
4. Determine the two-port network parameters.
5. Examine the resonance parameters and verify them practically.

LIST OF EXPERIMENTS

Any ten experiments should be conducted.

1. Verification of Thevenin's Theorem & Norton's Theorem
2. Verification of Superposition Theorem.
3. Verification of Reciprocity Theorem.
4. Verification of Maximum Power Transfer Theorem.
5. Determination of time constant for series RL and RC circuits.
6. Draw the Locus Diagrams of RL (R-Varying) and RC (R-Varying) Series Circuits.
7. Draw the locus Diagrams of RL (L-Varying) and RC (C-Varying) Series Circuits.
8. Analysis of Series Resonant Circuit.
9. Analysis of Parallel Resonant Circuit.
10. Determination of self, mutual inductances and coefficient of coupling.
11. Determination of Z &Y parameters of a two- port network.
12. Determination of Hybrid & Transmission parameters of a two-port network.

TEXTBOOKS

1. "Fundamentals of Electric Circuits" by C.K.Alexander and M.N.O.Sadiku, McGraw Hill Education,2004.
2. "Engineering Circuit Analysis" by W.H.Hayt and J.E.Kemmerly, , McGraw Hill Education,2013.

REFERENCES

1. “Basic Electrical Engineering” by A.Sudhakar and Shyam Mohan, McGraw Hill Education.
2. “Circuit Theory” (Analysis and Synthesis) by A.Chakrabarti ,Dhanpat Rai & Co
3. “Networks and Systems” by D Roy Choudhury, New Age International Publications,1998.

II YEAR – I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

COMPUTATIONAL MATHEMATICS FOR ENGINEERS

(Common to ECE, EEE, ME & CIVIL)

Course Code: GR24A2008 **L/T/P/C:3/0/0/3**

II Year I Semester

COURSE OUTCOMES

1. Apply well known techniques to find real roots of an equation and linear algebraic systems by iterative methods
2. Apply interpolation techniques for univariate and bivariate data using Gaussian and cubic spline methods
3. Apply numerical techniques to find eigen values and corresponding eigenvectors of a matrix
4. Apply numerical techniques in differentiation and integration.
5. Apply finite difference method to solve IVP in ODE and PDE.

UNIT I
ROOT FINDING AND NUMERICAL SOLUTION OF LINEAR ALGEBRAIC SYSTEMS

Finding the real root of algebraic and transcendental equations by Regula-Falsi and Newton Raphson methods - Gauss Jacobi and Gauss Seidel iterative methods to solve a linear algebraic system

UNIT II
INTERPOLATION AND CUBIC SPLINE

Interpolation with non-uniform data: Newton divided differences formula, Hermite interpolation, Interpolation with uniform data- Newton and Gauss formulas-Newton's bivariate interpolation for uniform data, Fitting natural cubic spline to data

UNIT III
EIGENVALUES AND EIGENVECTORS

Jacobi iteration method for finding eigenvalues and eigenvectors of a symmetric matrix-Power method and inverse power method for finding the largest and smallest eigenvalues and eigenvectors of a matrix

UNIT IV
NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION

Numerical differentiation using the Newton's forward, backward and central difference formulas. Numerical integration by Trapezoidal rule, Simpson's 1/3rd and $3/8^{th}$ rules, Gauss-Legendre one point, two point and three point rules.

UNIT V
NUMERICAL SOLUTION OF INITIAL AND BOUNDARY VALUE PROBLEMS IN ODE AND PDE

Euler ,Modified Euler method and R-K fourth order methods to solve initial value problems in ODE- Finite differences method to solve boundary value problems in ODE- Solution of Laplace's equation by Jacobi and Successive over relaxation (SOR) methods

TEXTBOOKS

1. M.K.Jain,S.R.K. Iyengar, R.K.Jain-.Numerical methods for scientific and engineering computation-New Age International publishers-Fourth edition-2—3
2. Robert J.Schilling and Sandra L.Harries- Applied numerical methods for engineers using MATLAB and C-Thomson Brooks/Cole-2002

REFERENCES

1. GRIET reference manual
2. S.S.Sastry- Introductory methods of numerical analysis- Prentice Hall (India)- Fourth edition- 2010

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

SENSORS MEASUREMENTS AND INSTRUMENTATION

Course Code: GR24A2023 **L/T/P/C: 2/1/0/3**
II Year I Semester

COURSE OUTCOMES

1. Illustrate the fundamentals and measurement of different electrical quantities.
2. Outline unknown electrical parameters.
3. Summarize Oscilloscopes and discover the usage of Digital meters.
4. Identify working principles of various Sensors/Transducers.
5. Apply Sensors/Transducers of various types in real time applications.

UNIT I

FUNDAMENTALS OF ELECTRICAL MEASUREMENTS

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, PMMI type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters- electrometer type and attracted disc type – extension of range of E.S. Voltmeters. Instrument Transformers-C.T.s and P.Ts Ratio and Phase angle errors.

UNIT-II

MEASUREMENT OF ENERGY AND OTHER ELECTRICAL QUANTITIES

Single phase & Three phase energy meters, Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate type's standardization – applications
Measurement of resistance, Inductance and Capacitance by bridges: Wheatstone bridge, Kelvin Double Bridge, Maxwell's Bridge, Anderson's bridge, Desauty's Bridge, Schering Bridge Derivations (Theoretical Approach).

UNIT III

OSCILLOSCOPE AND DIGITAL VOLTMETERS

Data Acquisition system, Components of Cathode Ray Oscilloscope: Time base Generator, Horizontal & Vertical Amplifier, Electrostatic Deflection. Measurement of phase and frequency
INTRODUCTION TO SMART AND DIGITAL METERING: Digital Multi-meter, True RMS meters, Clamp- on meters, Digital Energy Meter, Digital Storage Oscilloscope. Digital Voltmeters- Successive Approximation, Ramp, Dual slope Integration.

UNIT IV

SENSOR FUNDAMENTAL PRINCIPLES

Sensors / Transducers, Principle, Types, Basic Requirements, Classification, Selection, Resistive type, Inductive type, and Capacitive type. Linear Variable Differential Transducer (LVDT), Strain Gauge (Elementary).

UNIT V

SENSOR APPLICATIONS

Introduction and Working Principles: Flow - rate sensors: Displacement Flow Sensors, Velocity Flow Sensors, Thermistors and Thermocouples, Ultrasonic sensor, Acceleration Sensors.

TEXTBOOKS

1. "Electrical and Electronic Measurement and Instruments", by A.K.Shawney Dhanpat Rai & Sons Publications.
2. "Sensors and Transducers", by D. Patranabis , PHI Publications

REFERENCES

1. "Sensors and Their Applications XII", by S. J. Prosser, E. Lewis CRC Press
2. "Electrical Measurements and Measuring Instruments", by Er. R K Rajput by S. Chand Publishing.
3. "Measurement Systems", by Ernest O Doebelin by Mc Graw Hill.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

PRINCIPLES OF ANALOG ELECTRONICS

Course Code: GR24A2024 **L/T/P/C: 3/0/0/3**
II Year I Semester

COURSE OUTCOMES

1. Explain the basic principle and operation of Operational amplifier.
2. Summarize different Operational Amplifier's applications.
3. Outline frequency gain for different filters.
4. Illustrate the applications of IC 565.
5. Develop different Multivibrator circuits.

UNIT I
INTEGRATED CIRCUITS

Classification, Introduction to Operational Amplifier, block diagram, 741 OpAmp and its Features, ideal characteristics of op- amp, practical op-amp. Differential mode and common mode operation, Modes of operation-inverting, non-inverting, differential. Inverting amplifier, non-inverting amplifier and Voltage Follower Circuit.
DC Characteristics: Input bias current, Input offset current, input offset voltage and slew rate.

UNIT II
OP-AMP APPLICATIONS

Inverting summing amplifier, Non-Inverting Summing amplifier, Subtractor circuit, differential amplifier, instrumentation amplifier, integrator, differentiator, Voltage to Current and Current to Voltage Converters, Sample & Hold Circuits

UNIT III
FILTERS

Classification of Filters: Active and Passive Filters, Low Pass Filter, High Pass Filter, Narrow Band Pass Filter, Wide Band Pass Filter, Narrow Band Stop Filter, Wide Band Stop Filter, All pass filter.

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
OSCILLATORS

Basic principle of an Oscillator, RC Phase shift and Wein bridge Oscillator, Schmitt Trigger Circuit.
Timers: Principle and operation, block diagram, IC pin description of 555 timer, Astable Multivibrator, Monostable Multivibrator design using 555 timer.

TEXTBOOKS

1. "Linear Integrated Circuits", D.Roy Choudhary & Shail B Jain, New Age International Publishers, 2nd edition 2004.

2. “Op-Amps & Linear ICs”, – Ramakanth A. Gayakwad, PHI, 2003.

REFERENCES

1. “Electronics Analog and Digital”, by I. J. Nagrath, PHI Learning Pvt. Ltd., 2013 Edition.
2. “Electronics Principles”, by Malvino, Mc. Graw Hill, Third edition. 2000.
3. “Analysis and Design of Analog Integrated Circuits”, P. R. Gray, R. G. Meyer and S. Lewis, John Wiley & Sons, 2001.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

DC MACHINES AND TRANSFORMERS

Course code: GR24A2025 **L/T/P/C: 3/0/0/3**
II Year I Semester

COURSE OUTCOMES

1. Interpret the magnetic field in a DC Machine.
2. Summarize concepts of generators and its applications.
3. Select the appropriate DC motors for a given applications.
4. Analyze the performance of single-phase Transformers.
5. Outline the performance of Three-phase Transformers.

UNIT I
INTRODUCTION

Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, Armature windings- lap and wave windings, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Principle Electro-mechanical energy conversion.

UNIT II
DC GENERATORS

Principle-Simple Loop generator, commutator action, construction, EMF equation, and commutation – Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation. Types of field excitations – separately excited, self-excited. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. Characteristics of all generators, Applications.

UNIT III
DC MOTORS

Working principle of motor, construction, types of motors, and its applications Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction. Armature circuit equation for motoring and generation, Significance of back EMF, V-I characteristics, and torque-speed characteristics self-excited. Speed control methods, Losses,load testing and testing of DC machines.

UNIT IV
SINGLE-PHASE TRANSFORMERS

Construction and operation of single-phase transformers, types of transformers, equivalent circuit, phasor diagram of Transformer No-load and ON-load.

Voltage regulation, losses and efficiency –Maximum Efficiency-Testing - open circuit and short circuit tests,polarity test, back-to-back test, separation of hysteresis and eddy current losses- effect of frequency and supply voltage. Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current. All-day efficiency, KVA rating.

UNIT V

THREE-PHASE TRANSFORMERS

Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of and three-phase transformers, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers. Testing of three phase transformers.

TEXTBOOKS

1. "Electrical Machinery", by P. S. Bimbhra, Khanna Publishers, 2011.
2. "Electric Machines", by I.J. Nagrath and D. P. Kothari, McGraw Hill Education, 2012.

REFERENCES

1. "Performance and design of AC machines", by M. G. Say, CBS Publishers, 2002.
2. "Principles of Electric Machines", by PC Sen Second Edition.
3. "Electric Machinery and Transformers", Bhag S. Guru and Huseyin R. Hiziroglu OUP Higher Education Division Publishers, 2000.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
ELECTROMAGNETIC FIELDS

Course Code: GR24A2026 **L/T/P/C: 3/0/0/3**
II Year I Semester

COURSE OUTCOMES
1. Interpret the Electric Field Intensity with respect to free space.
2. Solve the Current Density Equation and Capacitance of different materials.
3. Evaluate Magnetic Field Intensity and Force in Magnetic Fields.
4. Analyze the Maxwell's Equations in Time Varying Fields, Displacement current.
5. Summarize the Electro-Magnetic wave equations & its applications.

UNIT I
STATIC ELECTRIC FIELD
Coulomb's law- Electric Field Intensity-Electrical Field due to Point charge, Line, Surface and Volume Charge distributions. Gauss Law and its Applications-Maxwell's First Law-Work done in moving a point charge in an electrostatic field, Electric potential- Properties of potential function, potential gradient-Electric Dipole-Potential and EFI due to an Electric Dipole-Electrostatic Energy density.

UNIT II
CONDUCTORS & INSULATORS
Behavior of conductors in an electric field-Current density-Conduction and Convection current densities- Ohms Law in Point form- Continuity equation of current-Electric field inside a dielectric material-Polarization and Permittivity-Boundary conditions-Boundary conditions for two perfect dielectric materials. Capacitance-Capacitance of parallel plates, co-axial cable, spherical capacitors-Poisson's equation- Laplace's equation.

UNIT III
STATIC MAGNETIC FIELDS
Biot-Savart's Law-Magnetic Field Intensity-MFI due to a straight current carrying conductor, MFI due to circular conductor- Maxwell's Second Equation-Ampere's Law and its Applications viz MFI due to infinitely long straight conductor only-Maxwell's Third equation-Scalar and Vector Magnetic Potentials.

FORCE IN MAGNETIC FIELDS
Force on a moving point charge-Lorentz force equation- Force on a differential current element- Force between differential current elements-Magnetic Dipole and Magnetic Dipole Moment-- Classification of magnetic materials- Magnetization and Permeability-Magnetic Circuits- Inductance- Self and Mutual Inductances-Neuman's Formula only.

UNIT IV
TIME VARYING FIELDS
Faraday's laws of Electromagnetic induction-it's integral and point forms-Maxwell's Fourth Equation-statically and dynamically induced EMFs-simple problems-Modification of Maxwell's equations for time varying fields-Displacement current.

UNIT V
ELECTROMAGNETIC WAVE PROPAGATION
Waves in general- wave propagation in lossy dielectrics-Plane waves in lossless dielectrics, free space, Good conductors-power and the poynting vector, Reflection of a plane wave at normal incidence, oblique incidence.

TEXTBOOKS

1. "Principles of Electromagnetics", by Matthew N.O.Sadiku, Oxford University Publication, Fourth Edition, 2014.
2. "Engineering Electromagnetics", by W.Hayt, John A.Buck McGraw Hill Education, 2012.

REFERENCES

1. "Electromagnetism-Problems with solution", by Pramanik, Prentice Hall India, 2012.
2. "The electromagnetic field in its engineering aspects", by G. W. Carter, Longmans, 1954.
3. "Electromagnetism - Theory and applications", by Pramanik, PHI Learning Pvt. Ltd, New Delhi, 2009

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

DATABASE FOR ENGINEERS

Course Code: GR24A2027 **L/T/P/C: 2/0/0/2**
II Year I Semester

COURSE OUTCOMES

1. To design ER Diagrams for an application and translate to logical model.
2. To develop database with the creation of tables and populating them with data.
3. To compose queries for retrieving data from the database.
4. To analyze the necessity for normal forms and other database objects in the database.
5. To interpret the need of atomicity, consistency, isolation and durability for a transaction.

UNIT I

Introduction to DBMS, Database System Applications, Database System vs. File System, Instances and Schema, ER Diagrams – Attributes and Entity Sets, Relationships and Relationship sets, Extended ER Features, Conceptual Design with ER Model, Logical Database Design, Construction of Tables using Basic DDL Commands.

To Practice:

1) Practicing ER Diagram for Hostel Management System, Airlines Reservation System.
2) Practicing DDL commands: Creating tables for various relations (in SQL).

UNIT II

Relational Model: Introduction To The Relational Model–Basic Structure, Database Schema, Integrity Constraints over relations, Keys, Construction of tables with integrity constraints using DDL and DML commands, Form of Basic SQL Query (SELECT) , SQL Operators, Use of DISTINCT keyword, Order by Clause.

To Practice:

1) Practicing DDL and DML commands: Creating tables with integrity constraints specified.
2) Practicing DQL command: Queries for above discussed commands.

UNIT III

Exploration of SELECT statement: SQL functions, Aggregate Operators, Group by and Having clauses, Joins, Types of Joins, Nested Queries, Correlated Nested Queries, Set Operators.

To Practice:

1) Practicing DQL/ DRL command: Using Select statement for various purposes as discussed in the chapter

UNIT IV

Other Database Objects: Introduction to Views, Types of Views, Dropping views, Introduction to Sequence, Index and Synonym.

Problems with Redundancy, Decomposition and its properties, Functional Dependencies, Normalization, Types of Normal Forms - 1NF, 2NF, 3NF, BCNF, 4NF.

To Practice:

1) Practicing queries to create view and retrieve data through views.
2) Practicing queries to create an index, sequence and synonym.

UNIT V

Transaction Management - Definition, Properties of Transaction, states of Transaction, Concurrent executions, Serializability, Lock based protocols, and Log based recovery.

Granting privileges to users (DCL) and Transaction Control Language (TCL) Commands

To Practice:

1) Practicing DCL commands - Grant, Revoke, Roles

2) Practicing TCL commands - Commit, Rollback, Savepoint.

TEXTBOOKS

1. "Database Management Systems", Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill, 3rd Edition.

REFERENCES

1. "Database System Concepts", Silberschatz, Korth, McGraw hill, V edition.
2. "Introduction to Database Systems", C.J. Date, Pearson Education.
3. "Database Systems design, Implementation, and Management", Rob &Coronel, 5th Edition.
4. "Database Management Systems", P. Radha Krishna, HI-TECH Publications, 2005.
5. "Database Management System", Elmasri Navate, Pearson Education.
6. "Database Management System", Mathew Leon, Leo.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

PRINCIPLES OF ANALOG ELECTRONICS LAB

Course Code: GR24A2028 **L/T/P/C: 0/0/2/1**
II Year I Semester

COURSE OUTCOMES

1. Demonstrate the working of Operational Amplifiers.
2. Design Operational Amplifiers as inverting and non-inverting amplifier.
3. Perform mathematical operations using Operational Amplifier
4. Analyze the characteristics of Low Pass and High Pass Filters.
5. Examine the application of 555 timer.

LIST OF EXPERIMENTS

Any ten experiments should be conducted.

1. Implement Inverting Amplifier using Operational Amplifier
2. Determine the gain of Non-Inverting Amplifier using Operational Amplifier
3. Design of Operational Amplifier as proportional Amplifier
4. Construct an Operational Amplifier based proportional Amplifier.
5. Implement Subtractor Circuit using Operational Amplifier
6. Develop a differentiator Circuit using Operational Amplifier
7. Implement mathematical Integrator Circuit using Operational Amplifier
8. Develop a mathematical Differentiator Circuit using Operational Amplifier
9. Construct the Low Pass Filter circuit to plot the frequency characteristics.
10. Analyze the High Pass Filter circuit to plot the frequency characteristics.
11. Design an inverter using operational amplifier.
12. Construct 555 timer to generate a square wave.

TEXTBOOKS

1. "Linear Integrated Circuits", D.Roy Choudhary & Shail B Jain, New Age International Publishers, 2nd edition 2004.
2. "Op-Amps & Linear ICs", – Ramakanth A. Gayakwad, PHI, 2003.

REFERENCES

1. "Electronics Analog and Digital", by I. J. Nagrath, PHI Learning Pvt. Ltd., 2013 Edition.
2. "Electronics Principles", by Malvino, Mc. Graw Hill, Third edition. 2000.
3. "Analysis and Design of Analog Integrated Circuits", P. R. Gray, R. G. Meyer and S. Lewis, John Wiley & Sons, 2001.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
DC MACHINES AND TRANSFORMERS LAB

Course Code: GR24A2029 **L/T/P/C: 0/0/2/1**
II Year I Semester

COURSE OUTCOMES

1. Identify various parts of electrical DC machines and Transformers.
2. Develop knowledge helpful for application of DC machines and Transformers.
3. Explain and control of different DC Machines.
4. Distinguish the performance of different machines using different testing methods.
5. Determine the parameters of equivalent circuit of single-phase transformer and 3-phase to 2-phase conversion or vice-versa.

LIST OF EXPERIMENTS
Any ten experiments should be conducted.

1. Swinburne's Test and Speed Control of a D.C Shunt Motor
2. Brake Test on a DC Shunt Motor
3. Brake Test on a DC Compound Motor
4. Open Circuit Characteristics of a D.C. Shunt Generator
5. Load test on a D.C. Shunt Generator
6. Load test on a D.C. Series Generator
7. Load test on a D.C. Compound Generator
8. Hopkinson Test
9. Fields Test
10. Separation of Core Losses of a DC machine
11. OC, SC and Load tests on Single Phase Transformer
12. Scott connection.

TEXTBOOKS

1. "Electrical Machinery", by P. S. Bimbhra, Khanna Publishers, 2011.
2. "Electric Machines", by I.J. Nagrath and D. P. Kothari, McGraw Hill Education, 2012.

REFERENCES

1. "Performance and design of AC machines", by M. G. Say, CBS Publishers, 2002.
2. "Principles of Electric Machines", by PC Sen Second Edition.
3. "Electric Machinery and Transformers", Bhag S. Guru and Huseyin R. Hiziroglu OUP Higher Education Division Publishers, 2000.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

SENSORS MEASUREMENTS AND INSTRUMENTATION LAB

Course Code: GR24A2030 **L/T/P/C:0/0/2/1**
II year I semester

COURSE OUTCOMES

1. Determine the unknown electrical parameters using various types of bridges.
2. Construct basic programs for computer-controlled data acquisition, measurement, and transfer of data across the sensor network for different types of sensors.
3. Analyze and interpret the experimental data by monitoring and capturing.
4. Experiment on various sensor output configurations using measuring instruments.
5. Measure physical and electrical quantities using Sensors/Transducers.

LIST OF EXPERIMENTS

Any ten experiments should be conducted.

1. Measurement of unknown Resistance by Kelvin double Bridge.
2. Measurement of unknown Inductance by Anderson's Bridge.
3. Measurement of unknown Capacitance by Desauty's Bridge.
4. Measurement One-cycle data of a periodic waveform from a DSO.
5. Voltage and Current Detection Circuitry using AT mega microcontroller.
6. Temperature, Pressure and Humidity Detection Circuitry.
7. Measurement of displacement with the help of LVDT.
8. Measurement of distance with the help of Ultrasonic Sensor.
9. Measurement of Flow rate using Flow sensor.
10. Measurement of moist level using soil moisture sensor and rainfall sensor.
11. Calibration and Testing of single-phase Energy meter.
12. Measurement of three-dimensional coordinates using accelerometer sensor.

TEXTBOOKS

1. "Electrical and Electronic Measurement and Instruments", by A.K.Shawney Dhanpat Rai & Sons Publications.
2. "Sensors and Transducers", by D. Patranabis, PHI Publications.

REFERENCES

1. "Sensors and Their Applications XII", by S. J. Prosser, E. Lewis CRC Press.
2. "Electrical Measurements and Measuring Instruments", by Er. R K Rajput by S. Chand Publishing.
3. "Measurement Systems", by Ernest O Doebelin by Mc Graw Hill.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

JAVA PROGRAMMING FOR ENGINEERS

Course Code: GR24A2007 **L/T/P/C: 2/0/0/2**
II Year I Semester

COURSE OUTCOMES

1. Identify the model of Object-Oriented Programming: Abstract data types, Encapsulation, Inheritance and Polymorphism
2. Summarize the fundamental features like Interfaces, Exceptions and Collections
3. List the advantages of Multi-threading.
4. Design interactive programs using Applets, AWT and Swings
5. Develop real time applications using the features of Java

UNIT I
INTRODUCTION TO OOP

Introduction, Need of object-oriented programming, principles of object-oriented languages, Applications of OOP, history of JAVA, Java Virtual Machine, Java features, Program structures, Installation of JDK.

UNIT II
PROGRAMMING CONSTRUCTS

Variables, Primitive data types, Identifiers- Naming Conventions, Keywords, Literals, Operators- Binary, Unary and Ternary, Expressions, Primitive Type conversion and casting, flow of control- branching, conditional, loops.
Classes and Objects- Classes, Objects, Creating objects, methods, constructors- constructor overloading, cleaning up unused objects- Garbage collector, class variable and methods- statickeyword, this keyword, arrays, Command line arguments.

UNIT III

INHERITANCE: Types of Inheritance, Deriving classes using extends keyword, method overloading, super keyword, final keyword, abstract class.
Interfaces: Interface, Extending interface, interface Vs Abstract classes.

UNIT IV
PACKAGES

Creating Packages, using Packages, Access protection, java I/O package. Exploring java.io and String classes.
Exceptions - Introduction, Exception handling techniques - try, catch, throw, throws, finally block, user defined Exception.

UNIT V
MULTITHREADING

Java.lang. Thread, the main Thread, creation of new Threads, Thread priority, multiThreading- using isalive() and join(), Synchronization, suspending and resuming Threads, Communication between Threads.

TEXTBOOKS

1. Java: The Complete Reference, 10th edition, Herbert Schildt, Mc Graw Hill.
2. Java Fundamentals: A Comprehensive Introduction, Herbert Schildt and DaleSkrien, TMH.
3. Java for Programming, P.J.Dietel Pearson Education

REFERENCES

1. Object Oriented Programming through Java, P.Radha Krishna, UniversitiesPress.
2. Thinking in Java, Bruce Eckel, Pearson Education
3. Programming in Java, S.Malhotra and S.Choudhary, Oxford University Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

VALUE ETHICS AND GENDER CULTURE

Course Code: GR24A2002 **L/T/P/C: 2/0/0/0**

II Year I Semester

COURSE OUTCOMES

1. To enable the student to understand the core values that shapes the ethical behaviour. And Student will be able to realize the significance of ethical human conduct and self-development
2. Students will be able to inculcate positive thinking, dignity of labour and religious tolerance.
3. The students will learn the rights and responsibilities as an employee and a team member.
4. Students will attain a finger grasp of how gender discrimination works in our society and how to counter it.
5. Students will develop a better understanding on issues related to gender and Empowering students to understand and respond to gender violence.

UNIT I

VALUES AND SELF-DEVELOPMENT

social values and individual attitudes, Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.

- ❖ A Case study on values and self-development

UNIT II

PERSONALITY AND BEHAVIOUR DEVELOPMENT

Positive thinking, punctuality, avoiding fault finding, Free from anger, Dignity of labour, religious tolerance, Aware of self-destructive habits.

- ❖ A Case study on Personality

UNIT III

INTRODUCTION TO PROFESSIONAL ETHICS

Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional

Accountabilities, Professional Success, Ethics and Profession.

- ❖ A Case study on professional ethics

UNIT IV

INTRODUCTION TO GENDER

Definition of Gender, Basic Gender Concepts and Terminology, Attitudes towards Gender, Social Construction of Gender.

- ❖ A Case study/ video discussion on attitudes towards gender

UNIT V

GENDER-BASED VIOLENCE

The concept of violence, Types of Gender-based violence, the relationship between gender, development and violence, Gender-based violence from a human rights perspective.

- ❖ A Case study/ video discussion on gender-based violence in view of human rights

TEXTBOOKS

1. Professional Ethics Includes Human Values (2nd Edition) By R Subramanian, Oxford University Press, 2017.

2. Ethics in Engineering Practice & Research, Caroline Whit beck, 2e, Cambridge University Press 2015.

3. A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by Telugu Akademi, Hyderabad,Telangana State in the year 2015.

REFERENCES

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012

2. Abdulali Sohaila. "I Fought For My Life…and Won."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

3. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e , Cengage learning, 2015.

4. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008

II YEAR -II SEMESTER

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

POWER GENERATION AND DISTRIBUTION

Course Code: GR24A2031 **L/T/P/C: 3/0/0/3**
II Year II Semester

COURSE OUTCOMES

1. Illustrate the basic concepts of Conventional Power Generation.
2. Explain the environmental benefits of renewable sources of power generation.
3. Examine the impact of government policies, market trends on economics of power generation.
4. Compare the performance and suitability of DC and AC distribution systems for different applications.
5. Analyze the performance of different types of substation layouts and their specific requirements.

UNIT I
CONVENTIONAL POWER GENERATION

The History of Electricity in India, Conventional Sources (Qualitative): Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine Plant.

UNIT II
NON CONVENTIONAL POWER GENERATION

Non-Conventional Sources (Qualitative): Ocean Energy, Tidal Energy, Wave Energy, wind Energy, Fuel Cells, and Solar Energy, Cogeneration and energy conservation and storage.

UNIT III
ECONOMICS OF POWER GENERATION

Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer.

UNIT IV
D.C. DISTRIBUTION & A.C DISTRIBUTION

Classification of DC Distribution Systems. - Comparison of DC vs. AC, Under-Ground vs. Over-Head Distribution Systems. - Requirements and Design features of Distribution Systems. -Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed at one end and both ends (equal/unequal Voltages) and Ring Main Distributor.

Introduction of AC distribution, Single phase, 3-phase, 3 phases 4 wire system, bus bar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

UNIT V

SUBSTATIONS

Classification of Substations, Comparison of Outdoor and Indoor Sub-stations, Transformer Sub-stations, Pole mounted Sub-stations, Underground Sub-stations, Equipment in a transformer sub-station and its symbols, Bus-bar Arrangements in Sub-stations, Terminal and Through Sub-stations, Key diagrams of 66/11 kV & 11 kV/400 V indoor Sub-station.

TEXTBOOKS

1. "A Text Book on Power Systems Engineering", A Chakrabarti, M L Soni, P V Gupta & US Bhatnagar Dhanpat Rai & Co. Pvt..Ltd.
2. "Generation, Distribution and Utilization of Electrical Energy", C.L. Wadhwa Second Edition, New AgeInternational,2009.

REFERENCES

1. "Electrical Power systems", C.L.Wadhwa New age Publishers 7th Edition 2017.
2. "The Transmission and Distribution of Electrical Energy", H.Cotton & H. Barber- Third Edition, ELBS, B.I.Pub.,1985.
3. "Power generation technologies", Paul Breeze Third Edition, Elsevier Publishers 2019.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
AC MACHINES

Course Code: GR24A2032 **L/T/P/C: 2/1/0/3**
II Year II Semester

COURSE OUTCOMES
1. Illustrate the concepts of rotating magnetic fields.
2. Interpret the need for electrical Induction Machines.
3. Identify the working of single and three phase AC machines.
4. Analyze Machine Variables in direct and quadrature axis form for salient pole type.
5. Summarize the concept of harmonic created in supply system, need for reduction and design of synchronous machines for reducing them.

UNIT I
FUNDAMENTALS OF AC MACHINE WINDINGS
Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, Air-gap MMF distribution with fixed current through winding concentrated and distributed, sinusoidal distributed winding, winding distribution factor. Introduction to revolving magnetic field in 3-phase and 1-phase machines.

UNIT II
INDUCTION MACHINES
Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors. Generator Operation. Self-Excitation. Doubly-Fed Induction Machines.

UNIT III
SYNCHRONOUS GENERATORS
Synchronous Generator: Basic principle of operation, construction of salient & non-salient pole synchronous machines, generated EMF, effect of distribution and chording of winding, harmonics causes, reduction and elimination. Armature reaction, synchronous reactance, leakage reactance, Phasor diagram of non-salient type alternator. Voltage regulation-EMF, MMF, ZPF and ASA Methods. Two reaction theory- direct and quadrature axis reactance, Phasor diagram, slip test, synchronizing to infinite bus bars and parallel operation, steady state power-angle characteristics.

UNIT IV
SYNCHRONOUS MOTORS
Synchronous Motor: Principle of operation, Phasor diagrams, torque and torque angle, effect of change in load, effect of change in excitation, V and inverted V curves. Synchronous condenser, hunting and damping. Methods of starting of synchronous motors. Testing of Synchronous motors.

UNIT V
SINGLE-PHASE INDUCTION MOTORS
Constructional features-double revolving field theory, equivalent circuit, determination of

parameters. Types of 1-phase induction motors, Split-phase starting methods and applications.

TEXTBOOKS

1. "Electric Machinery", by A.E.Fitzgerald and C.Kingsley, McGraw Hill Education,2013.
2. "Performance and design of AC machines", by M.G.Say CBSPublishers,2002.

REFERENCES

1. "Electrical Machinery", by P.S.Bimbhra Khanna Publishers,2011.
2. "Electric Machines", by I.J.Nagrath and D.P. Kothari, McGraw Hill Education,2010.
3. "Alternating Current Machines", by A.S.Langsdorf, McGraw Hill Education,1984.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
CONTROL SYSTEMS

Course Code: GR24A2033 **L/T/P/C: 3/0/0/3**
II Year II Semester

COURSE OUTCOMES

1. Summarize the basic elements and structures of feedback control systems.
2. Analyze the concept of time response, steady state response, errors.
3. Formulate Routh-Hurwitz table, root locus for the linear time-invariant systems.
4. Outline the stability of the system using Nyquist and Bode plots.
5. Develop control system models for state space models, to express state transition matrix and calculation of variables.

UNIT I

CONCEPTS OF CONTROL SYSTEMS AND TRANSFER FUNCTION REPRESENTATION

Open loop and closed loop control systems, different examples of control systems, classification of control systems, characteristics and effects of feedback, impulse response and transfer functions, translational and rotational mechanical systems, Transfer function of DC and AC Servomotor, Synchro transmitter and receiver, Block diagram reduction techniques, signal flow graphs, reduction using Mason's gain formula.

UNIT II

TIME RESPONSE ANALYSIS

Standard test signals, time response of first order systems, characteristic equation of feedback control systems, transient response of second order systems-time domain specifications, steady state response-steady state errors and error constants, effects of proportional derivative, proportional integral systems.

UNIT III

STABILITY ANALYSIS &ROOT LOCUS TECHNIQUE

Concept of stability, Routh stability criterion, Routh Hurwitz stability criterion Root locus concept, construction of root loci, effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT IV

STABILITY ANALYSIS IN FREQUENCY DOMAIN

Frequency domain specifications, Bode diagrams, Determination of frequency domain specifications and transfer function from the Bode diagram- Phase and Gain margin, stability analysis from Bode plots. Polar plots, Nyquist plots and applications of Nyquist criterion to find the stability.

UNIT V

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state vector, derivative of state model from transfer function, derivative of transfer function from state model, diagonalization, Solution of State Equation, state transition matrix and its properties, Controllability and Observability.

TEXTBOOKS

1. “Control Systems”, by A. Anand Kumar 2 nd edition, PHI Learning Private Limited

2. “Automatic Control Systems”, by B.C.Kuo 8th edition, 2003, John Wiley and Son’s

REFERENCES

1. “Control Systems Engineering”, I. J. Nagrath and M. Gopal New Age International (P) Limited Publishers, 2nd edition.

2. “Control Systems Engineering”, by John Wiley by NISE 3 rd Edition.

3. “Modern Control Engineering”, by Katsuhiko Ogata Prentice Hall of India Pvt Ltd, 3rd edition,1998.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

PRINCIPLES OF DIGITAL ELECTRONICS

Course Code: GR24A2034 **L/T/P/C: 3/0/0/3**
II Year II Semester

COURSE OUTCOMES

1. Summarize the working of logic gates with applications, design of logic gates with diodes and transistors.
2. Develop the applications using Combinational logic circuits by minimizing the function using K-Map.
3. Make use of different types of counters for applications.
4. Examine types of Memories and application of ROM as PLDs.
5. Model Analog to Digital and Digital to Analog Converter.

UNIT I
NUMBER SYSTEMS AND LOGIC FAMILIES

Logic gates, Boolean algebra, Boolean Postulates, realization of Boolean functions with logic gates, number systems, one's and two's complements arithmetic, Binary codes: BCD, Weighted codes: -2421,8421, Gray code, error detecting and correcting codes, Hamming code.

UNIT II
MINIMIZATION TECHNIQUES

Standard and Canonical form representation for logic functions, minimization of logical functions using Boolean Postulates and Theorems, K-map representation, and simplification of logic functions using K-Map, don't care terms.

Combinational Logic Circuits: Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, carry look ahead adder, digital comparator, parity checker/generator, priority encoders.

UNIT III
SEQUENTIAL CIRCUITS:

SR Latch, the clocked SR flip flop, J- K, T and D types flip-flops, Triggering of Flip Flops, Analysis of Clocked Sequential Circuits, Flip-Flop Excitation Tables, Conversion from one Flip-Flop to other.

REGISTERS: Analysis procedure, design procedure, Registers with parallel load, Shift registers; Serial Transfer, Serial Addition. Ripple Counters; Binary Ripple Counter, BCD Ripple Counter, Synchronous Counters; Binary Counter, Up-Down Counter.

UNIT IV
MEMORIES AND PLDs

Memory organization and operation, expanding memory size, classification and characteristics of memories, ROM, EPROM, E^2PROM and RAM.

PROGRAMMABLE LOGIC DEVICES: ROM as a Programmable Read Only Memory (PROM), Programmable Array Logic (PAL) and Programmable Logic Array (PLA).

UNIT V
DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS

Digital to Analog converters: Weighted resistor D/A converter, R-2R Ladder D/A Converter, Specifications for D/A converters. Analog to Digital converters: Sample and hold circuit, Flash type A/D converter, Successive approximation type A/D converter, Counter Type A/D converter, Specifications of A/D converters.

TEXTBOOKS

1. "Fundamentals of Digital Circuits", Anand. Kumar, Prentice Hall India, 2016.
2. "Digital logic and Computer design", M. M. Mano,Pearson Education India, 2016.

REFERENCES

1. “A Textbook of Digital Electronics”, R.S. Sedha, S.Chand, 2005
2. "Modern Digital Electronics", R. P. Jain, McGraw Hill Education, 2009.
3. “Fundamentals of Logic Design’, Charles H. Roth, Jr., Larry L. Kinney, Raghunandan G. H, Cengage, 1st Edition, 2020

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

MICROPROCESSORS AND MICROCONTROLLERS

Course Code: GR24A2035 **L/T/P/C:3/0/0/3**

II Year II Semester

COURSE OUTCOMES

1. Summarize the internal architecture of 8086 Microprocessor.
2. Analyze assembly level programs of 8086 Microprocessors.
3. Illustrate the internal architecture of 8051.
4. Build skills in writing assembly level programs on the 8051.
5. Develop real-time systems on the 8051 Microcontroller using external interface peripherals.

UNIT I

8086 ARCHITECTURE

8086 Architecture- Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Instruction formats, addressing modes, Instruction Set, Assembler Directives, Macros.

UNIT II

ASSEMBLY LANGUAGE PROGRAMMING OF 8086 AND INTERFACING

Simple Programs involving Logical, Branch and Call Instructions, Sorting, Evaluating Arithmetic Expressions, String manipulations, Signal Descriptions of 8086, Common Function Signals, Minimum and Maximum Mode Signals.

Memory and I/O Interfacing: Memory Interfacing of 8086,8255 PPI, Various Modes of Operation, and Interfacing to 8086, Interfacing keyboard, Display, Stepper Motor Interfacing, D/A and A/D Converter.

UNIT III

THE 8051 ARCHITECTURE

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization.

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers, and Counters

UNIT IV

INSTRUCTION SET AND PROGRAMMING

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, indexed addressing, Bit inherent addressing, bit direct addressing.

8051 Instruction set: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs.

UNIT V

EXTERNAL COMMUNICATION INTERFACE

Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232, USB. **Applications:**

LED, LCD, and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing.

TEXTBOOKS

1. "Advanced Microprocessors and Peripherals", A. K. Ray and K. M. Bhurchandani, 2nd Edition, Tata McGraw-Hill, 2006.
2. "Microprocessors and Interfacing", D.V. Hall, 2nd Edition, Tata McGraw-Hill, 2006.

REFERENCES

1. "The 8051 Microcontroller and Embedded Systems using Assembly and C" – Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 2nd Edition, Pearson Education, 2008.
2. "Microcontrollers: Theory and Applications", Ajay V. Deshmukh, Tata McGraw-Hill Education, 2005.
3. "The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Cengage Learning, 2010.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

PRINCIPLES OF DIGITAL ELECTRONICS LAB

Course Code: GR24A2036 **L/T/P/C: 0/0/2/1**

II Year II Semester

COURSE OUTCOMES

1. Make use of function realization using logic gates.
2. Design Combinational logic circuits.
3. Analyze the types of Flip-Flops used in registers.
4. Develop Sequential logic circuits.
5. Construct a parity checking circuit.

LIST OF EXPERIMENTS

Any ten experiments should be conducted.

1. Design and verification of basic logic gates.
2. Simplify the given Boolean expression realize them using universal gates.
3. Construct half and full adder circuit using basic logic gates.
4. Develop a half subtractor/full subtractor circuit using basic logic gates.
5. Construct a parallel adder circuit using basic logic gates.
6. Design and implementation of subtractor
7. Develop a Multiplexer using basic logic gates.
8. Design and implementation of Decoder
9. Construct a Magnitude comparator using basic logic gates.
10. Design and verify Odd and Even Parity.
11. Implementation and verification of truth table for R-S, J-K, D and T flip-flop.
12. Experiment with J-K flip-flop as D flip-flop.

TEXTBOOKS

1. "Fundamentals of Digital Circuits", A. Kumar, Prentice Hall India, 2016.
2. "Digital logic and Computer design", M. M. Mano, Pearson Education India, 2016.

REFERENCES

1. "A Textbook of Digital Electronics", R.S. Sedha, S.Chand, 2005
2. "Modern Digital Electronics", R. P. Jain, McGraw Hill Education, 2009.
3. "Switching Theory and Logic Design", Godse, Technical Publication, 2010.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

AC MACHINES LAB

Course Code: GR24A2037 **L/T/P/C: 0/0/2/1**

II Year II Semester

COURSE OUTCOMES

1. Assess the performance of different machines using different testing methods.
2. Determine the parameters of equivalent circuit of single-phase induction motor.
3. Make use of various methods to find regulation of an Alternator.
4. Analyze various characteristics of three phase induction motor.
5. Experiment with synchronous machine to find direct and quadrature axis reactance.

LIST OF EXPERIMENTS

Any ten experiments should be conducted.

1. Sumpner's test.
2. Heat run test on transformer.
3. Hysteresis loss determination.
4. Brake Test on Slip Ring Induction Motor.
5. No load and Blocked Rotor Tests on Squirrel Cage Induction Motor.
6. Equivalent Circuit of a Single-Phase Induction Motor.
7. Regulation of an Alternator by Synchronous Impedance Method and MMF Method.
8. Determination of X_d and X_q of a Salient Pole Synchronous Machine from Slip Test.
9. V and inverted V curves of a 3-Phase Synchronous Motor.
10. Induction Generator.
11. Rotor-resistance starter for Slip Ring Induction Motor.
12. Star-delta starter for Squirrel Cage Induction Motor.

TEXTBOOKS

1. "Electric Machinery", A.E.Fitzgerald and C.Kingsley, McGraw Hill Education,2013.
2. "Performance and design of AC machines", M.G. Say CBSPublishers,2002.

REFERENCES

1. "Electrical Machinery", P.S.Bimbhra Khanna Publishers,2011.
2. "Electric Machines", I.J.Nagrath and D.P. Kothari, McGraw Hill Education,2010.
3. "Alternating Current Machines", A.S.Langsdorf, McGraw Hill Education,1984.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

CONTROL SYSTEMS LAB

Course Code: GR24A2038 **L/T/P/C: 0/0/2/1**

II Year II Semester

COURSE OUTCOMES

1. Make use of simulation packages for simple control system programs.
2. Examine the characteristics of synchros.
3. Analyze the root locus and bode plots.
4. Develop the transfer function of DC motor/generator.
5. Interpret the performance of servomotor and PID controller.

LIST OF EXPERIMENTS

Any ten experiments should be conducted.

1. Obtain the Transfer function from zeros and poles and vice versa.
2. Find the Step response, Ramp response and Impulse response for a given transfer function.
3. Draw Root Locus from a Transfer function.
4. Draw Bode Plot and Nyquist Plot from a Transfer function.
5. Derive State Model from a Transfer function.
6. Determine Transfer function of DC motor/Generator.
7. Derive Zeros and poles from state model.
8. Obtain the Time Response of second order system of a given transfer function.
9. Study of Characteristics of DC Servomotor.
10. Design a PID Controller for a given Control System.
11. Characteristics of Synchros.
12. Study of Characteristics of AC Servomotor

TEXTBOOKS

1. "Control Systems", by A. Anand Kumar 2 nd edition, PHI Learning Private Limited
2. "Automatic Control Systems", by B.C.Kuo 8th edition, 2003, John Wiley and Son's

REFERENCES

1. "Control Systems Engineering", I. J. Nagrath and M. Gopal New Age International (P) Limited Publishers, 2nd edition
2. "Control Systems Engineering", by John Wiley by NISE 3 rd Edition.
3. "Modern Control Engineering", by Katsuhiko Ogata Prentice Hall of India Pvt Ltd, 3rd edition,1998.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
ENVIRONMENTAL SCIENCE

Course Code: GR24A2001 **L/T/P/C: 2/0/0/0**

II Year II Semester

Course Pre-Requisites: Basic knowledge of environmental issues

COURSE OUTCOMES

1. Gain a variety of experiences & acquire a basic knowledge about the environment & its allied problems
2. Interpret the key components in safeguarding the environment
3. Evolve an individual vision of harmonious interaction with the natural world.
4. Appraise the quality of the environment to create a healthy atmosphere
5. Familiarize with the individual responsibilities towards the green revolution

UNIT I
INTRODUCTION AND AWARENESS ACTIVITIES

Environmental Science: Introduction, Definition, scope and importance.

AWARENESS ACTIVITIES

- Small group meetings about:
- Water management
- Waste water treatment
- Projects Vs Environment
- Zero waste management
- Impact of Science & Technology on Environment
- E-waste management
- Biodiversity loss
- Renewable Energy

UNIT II
SLOGAN AND POSTER MAKING EVENT

- Food waste management
- Rain water harvesting
- Climate change
- Green Power
- Water conservation
- Green at work
- Role of IT in environment and human health
- Sustainable development

UNIT III

EXPERT LECTURES ON ENVIRONMENTAL SCIENCE

- Environmental Impact Assessment
- Industrial waste treatment
- Regenerative farming/Organic farming/Vertical gardens/Hydroponics
- Circular Economy

UNIT IV
CLEANLINESS DRIVE

- Indoor air pollution
- Vehicular pollution
- Visual pollution
- Waste management at home
- Composting
- Plastic recycling

UNIT V
CASE STUDIES

- HPCL and LG Polymers disasters in Vizag
- Oleum gas leak in Delhi
- Mathura Refinery & Taj Mahal
- Conservation of Hussain Sagar lake
- The Cleanliest city of India-Surat
- Green Buildings in India
- KBR park in Hyderabad (Environmental protection Vs Development)
- Fluorosis and remediation
- Evaluation of STP or ETP operation in Hyderabad
- Ecotourism & its impacts
- Positive Impact on Environment due to Lockdown Forced by Corona Pandemic

TEXTBOOKS

1. Environmental Studies for UG Courses, Erach Bharucha, UGC Publications, Delhi, 2004.
2. Textbook of Environmental Studies, Deeksha Dave, S. S. Katewa, Cengage Delmar Learning India Pvt., 2012.

REFERENCES

1. Introduction to Environmental Science, Y. Anjaneyulu, BS Publications, 2004.
2. Environmental Studies, Anubha Kaushik & C. P. Kaushik, 4th Edition, New Age International Publishers.