Academic Regulations
Programme Structure
and
Detailed Syllabus

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

(Four Year Regular Programme)

(Applicable for Batches admitted from 2022-23)

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 GR22

(Applicable for Batches Admitted from 2022-23)

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	Information Technology	12	B.Tech. Information Technology
7	Computer Science and Business System	32	B.Tech. Computer Science & Business System
8	Computer Science and Engineering (AIML)	66	B.Tech. Computer Science and Engineering (AIML)
9	Computer Science and Engineering (Data Science)	67	B.Tech. Computer Science and Engineering (Data Science)

GR22 Regulations shall govern the above programmes offered by the Departments with effect from the students admitted to the programmes in 2022-23 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) **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. 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.

6. 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	Component of 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 is for 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 is for 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.

g) The evaluation of courses having ONLY internal marks in I-Year I Semester and II Semester is as follows:

- I Year courses: The internal evaluation is for 50 marks and it 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. The student is deemed to have failed, if he/she (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.
- II Year II Semester *Real-Time/Field-based Research Project/Societal Related Project* course: The internal evaluation is for 50 marks and it 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. The student is deemed to have failed, if he/she (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.

7. **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.

8. **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.

9. **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.

10. **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.

11. **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.

12. 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 year 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.

c) Provision of opting 2 OE courses through online mode.

d) Choice of placement-oriented value-added courses in every semester from II year till IV year

e) Students can take a year break after second or third year to work on R&D

f) Under Mandatory Courses

i) Co-Curricular activities -- 0.5 credit for publishing paper, publishing patent, attend seminar, technical competition and taking part in hackathon

ii) Extra-Curricular activities -- 0.5 credit for sports represent University or part or college winning team a medal or cup in outside recognized inter collegiate or above tournaments or NSS activities or donated blood two times or 2 green campus events

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

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

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.

14. Award of Class: After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B.Tech. Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 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 ≥ 6.50 and CGPA < 8.00
4	Second Class	CGPA ≥ 5.50 and CGPA < 6.50
5	Pass Class	CGPA ≥ 5.00 and CGPA < 5.50

Equivalence of grade to marks

Marks % = (CGPA -0.5)*10

15. 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).

16. **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.

17. **Transitory Regulations**

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of GR20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of GR22 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 GR20 regulations for want of attendance, shall be permitted to join the corresponding semester of GR22 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 GR22 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 GR20 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of GR22 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 GR20 & GR22 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 GR22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in GR22 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 GR22 Regulations. **There is NO exemption of credits in any case**.
6. If a student is readmitted to GR22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in GR22 Regulations

will be substituted by another subject to be suggested by the college academic administration.

Note:

If a student readmitted to GR22 Regulations and has not studied any courses/topics in his/her earlier regulations of study which is prerequisite for further subjects in GR22 Regulations, then the college shall conduct remedial classes to cover those courses/topics for the benefit of the students.

18. 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.

19. General Rules

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

b. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

c. In case of any error in the above rules and regulations, the decision of the Academic Council is final.

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

Academic Regulations for B.Tech. (Lateral Entry) under GR22
(Applicable for Batches Admitted from 2023-24)

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 ≥ 6.50 and CGPA < 8.00
4	Second Class	CGPA ≥ 5.50 and CGPA < 6.50
5	Pass Class	CGPA ≥ 5.00 and CGPA < 5.50

Academic Regulations for B.Tech. with Minors Programme under GR22

(Applicable for Batches Admitted from 2022-23)

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. (040)65864440

ELECTRCAL AND ELECTRONICS ENGINEERING
B. Tech (EEE) – GR22 Course Structure

I B. Tech (EEE) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Tota			
1	Maths	BS	GR22A1001	Linear Algebra and Function Approximation	3	1	0	4	3	1	0	4	40	60	100
2	Chemistry	BS	GR22A1005	Engineering Chemistry	3	1	0	4	3	1	0	4	40	60	100
3	EEE	ES	GR22A1009	Basic Electrical Engineering	2	1	0	3	2	1	0	3	40	60	100
4	CSE	ES	GR22A1007	Programming for Problem Solving	2	1	0	3	2	1	0	3	40	60	100
5	EEE	ES	GR22A1018	Basic Electrical Engineering Lab	0	0	1	1	0	0	2	2	40	60	100
6	Chemistry	BS	GR22A1015	Engineering Chemistry Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	CSE	ES	GR22A1017	Programming for Problem Solving Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	ME	ES	GR22A1021	Engineering Workshop	1	0	1.5	2.5	1	0	3	4	40	60	100
		TOTAL			**11**	**4**	**5.5**	**20.5**	**11**	**4**	**11**	**26**	**320**	**480**	**800**
9	Mgmt	MC	GR22A1022	Design Thinking	0	0	0	0	2	0	0	2	40	60	100

I B. Tech (EEE) - II Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Maths	BS	GR22A1002	Differential Equations and Vector Calculus	3	1	0	4	3	1	0	4	40	60	100
2	Physics	BS	GR22A1003	Applied Physics	3	1	0	4	3	1	0	4	40	60	100
3	English	HS	GR22A1006	English	2	0	0	2	2	0	0	2	40	60	100
4	CSE	ES	GR22A1012	Data Structures	2	1	0	3	2	1	0	3	40	60	100
5	Physics	BS	GR22A1013	Applied Physics Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
6	ME	ES	GR22A1011	Graphics for Engineers	1	0	2	3	1	0	4	5	40	60	100
7	CSE	ES	GR22A1020	Data Structures Lab	0	0	1	1	0	0	2	2	40	60	100
8	English	HS	GR22A1016	English Language and Communicati on Skills Lab	0	0	1	1	0	0	2	2	40	60	100
		TOTAL			**11**	**3**	**5.5**	**19.5**	**11**	**3**	**11**	**25**	**320**	**480**	**800**

II B.Tech(EEE) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Maths	BS	GR22A2009	Computational Mathematics for Engineers	3	0	0	3	3	0	0	3	40	60	100
2	EEE	PC	GR22A2024	Electrical Circuit Analysis	2	1	0	3	2	1	0	3	40	60	100
3	EEE	PC	GR22A2025	Principles of Analog Electronics	3	0	0	3	3	0	0	3	40	60	100
4	EEE	PC	GR22A2026	DC Machines and Transformers	3	0	0	3	3	0	0	3	40	60	100
5	EEE	PC	GR22A2027	Electromagnetic Fields	3	0	0	3	3	0	0	3	40	60	100
6	CSE	PC	GR22A2007	Data Base for Engineers	2	0	0	2	2	0	0	2	40	60	100
7	EEE	PC	GR22A2028	Principles of Analog Electronics Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	EEE	PC	GR22A2029	DC Machines and Transformers Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
		TOTAL			**16**	**1**	**3**	**20**	**16**	**1**	**6**	**23**	**320**	**480**	**800**
9	Mgmt	MC	GR22A2003	Constitution of India	0	0	0	0	2	0	0	2	40	60	100
10	Mgmt	MC	GR22A2002	Value Ethics and Gender Culture	0	0	0	0	2	0	0	2	40	60	100

II B.Tech (EEE) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	EEE	PC	GR22A2030	Power Generation and Transmission	3	0	0	3	3	0	0	3	40	60	100
2	EEE	PC	GR22A2031	AC Machines	2	1	0	3	2	1	0	3	40	60	100
3	EEE	PC	GR22A2032	Control Systems	3	0	0	3	3	0	0	3	40	60	100
4	EEE	PC	GR22A2033	Principles of Digital Electronics	3	0	0	3	3	0	0	3	40	60	100
5	EEE	PC	GR22A2034	Microprocessors and Microcontrollers	2	0	0	2	2	0	0	2	40	60	100
6	EEE	PC	GR22A2035	Principles of Digital Electronics Lab	0	0	2	2	0	0	4	4	40	60	100
7	EEE	PC	GR22A2036	AC Machines Lab	0	0	2	2	0	0	4	4	40	60	100
8	EEE	PC	GR22A2037	Control Systems Lab	0	0	2	2	0	0	4	4	40	60	100
		TOTAL			**13**	**1**	**6**	**20**	**13**	**1**	**12**	**26**	**320**	**480**	**800**
9	Chemistry	MC	GR22A2001	Environmental Science	0	0	0	0	2	0	0	2	40	60	100
10	CSE	MC	GR22A2008	Java Programming for Engineers	0	0	0	0	2	0	0	2	40	60	100

III YEAR I SEMESTER

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	EEE	PC		Power System Analysis	2	1	0	3	2	1	0	3	40	60	100
2	EEE	PC		Power Electronics	3	0	0	3	3	0	0	3	40	60	100
3	EEE	PC		Power Distribution and Protection	3	0	0	3	3	0	0	3	40	60	100
4	EEE	PE		Professional Elective I	3	0	0	3	3	0	0	3	40	60	100
5	EEE	OE		Open Elective I	3	0	0	3	3	0	0	3	40	60	100
6	EEE	PC		Power Systems Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	EEE	PC		Power Electronics Lab	0	0	2	2	0	0	4	4	40	60	100
8	EEE	PC		Microprocessors and Microcontrollers Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
		TOTAL			**14**	**1**	**5**	**20**	**14**	**1**	**10**	**25**	**320**	**480**	**800**

Professional Elective –I			
S.No	**BOS**	**Course Code**	**Course Name**
1	EEE		Electrical and Hybrid Vehicles
2	EEE		Solar and Wind Energy Systems
3	EEE		Electrical Machine Design
4	MECH		Optimization Techniques

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				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	EEE	PC		Fundamentals of Digital Signal Processing	3	0	0	3	3	0	0	3	40	60	100
2	EEE	PC		Sensors Measurements and Instrumentation	2	1	0	3	2	1	0	3	40	60	100
3	Mgnt	HS		Economics and Accounting for Engineers	3	0	0	3	3	0	0	3	40	60	100
4	EEE	PE		Professional Elective II	3	0	0	3	3	0	0	3	40	60	100
5	EEE	OE		Open Elective II	3	0	0	3	3	0	0	3	40	60	100
6	EEE	PC		Power System Analysis Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	EEE	PC		Sensors Measurements and Instrumentation Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	EEE	PW		Mini Project with Seminar	0	0	2	2	0	0	4	4	40	60	100
		TOTAL			**14**	**1**	**5**	**20**	**14**	**1**	**10**	**25**	**320**	**480**	**800**

Professional Elective -II			
S.No	**BOS**	**Course Code**	**Course Name**
1	EEE		Modern Power Electronics
2	EEE		HVDC Transmission Systems
3	EEE		Advanced Control Systems
4	CSE		Operating Systems

Open Elective II			
S.No.	**BOS**	**Course Code**	**COURSE**
1	CSE		Machine Learning

IV YEAR I SEMESTER

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	PC	ES		Power Semiconductor Drives	2	1	0	3	2	1	0	3	40	60	100
2	EEE	PE		Professional Elective III	3	0	0	3	3	0	0	3	40	60	100
3	EEE	PE		Professional Elective IV	3	0	0	3	3	0	0	3	40	60	100
4	Mgnt	HS		Fundamentals of Management and Entrepreneurship	3	0	0	3	3	0	0	3	40	60	100
5	EEE	OE		Open Elective III	3	0	0	3	3	0	0	3	40	60	100
6	EEE	PC		DSP Lab	0	0	2	2	0	0	4	4	40	60	100
7	EEE	PC		Power Semiconductor Drives Lab	0	0	2	2	0	0	4	4	40	60	100
8	EEE	PW		Project Work Phase-I	0	0	6	6	0	0	12	12	40	60	100
		TOTAL			**14**	**1**	**10**	**25**	**14**	**1**	**20**	**35**	**320**	**480**	**800**

Professional Elective -III			
S.No	**BOS**	**Course Code**	**Course Name**
1	EEE		Wide Band Gap Power Devices
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		Electrical Energy Audit
3	EEE		Special Electrical Machines
4	ECE		VLSI Design

Open Elective III			
S.No.	**BOS**	**Course Code**	**COURSE**
1	EEE		Artificial Intelligence Techniques (/IoT)

IV YEAR II SEMESTER

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	EEE	PC		Power System Monitoring and Control	2	1	0	3	2	1	0	3	40	60	100
2	EEE	PE		Professional Elective V	3	0	0	3	3	0	0	3	40	60	100
3	EEE	PE		Professional Elective VI	3	0	0	3	3	0	0	3	40	60	100
4	EEE	PW		Project Work Phase-II	0	0	6	6	0	0	12	12	40	60	100
		TOTAL			**8**	**1**	**6**	**15**	**8**	**1**	**12**	**21**	**160**	**240**	**400**

Professional Elective -V			
S.No	**BOS**	**Course Code**	**Course Name**
1	EEE		Advanced Electric Drives
2	EEE		Big Data Applications in Power Systems
3	EEE		Modern Control Theory
4	EEE		Industrial IoT
Professional Elective -VI			
S.No	**BOS**	**Course Code**	**Course Name**
1	EEE		PCB Design
2	EEE		Electric Smart Grid
3	ECE		Embedded Systems
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	Electrical and Hybrid Vehicles	Solar and Wind Energy Systems	Electrical Machine Design	Optimization Techniques
2	Modern Power Electronics	HVDC Transmission Systems	Advanced Control Systems	Operating Systems
3	Wide Band Gap Power Devices	High Voltage Engineering	Digital Control Systems	Industrial Automation
4	Power Quality and FACTS	Electrical Energy Audit	Special Electrical Machines	VLSI Design
5	Advanced Electric Drives	Big Data Applications in Power Systems	Modern Control Theory	Industrial IoT
6	PCB Design	Electric Smart Grid	Embedded Systems	Big Data Analytics

OPENELECTIVESFORGR22 REGULATIONS

THREAD1	THREAD 2	OFFERED BY
1. Soft Skills and Interpersonal Communication 2. Human Resource Development And Organizational Behavior 3. Cyber Law and Ethics 4. Economic Policies in India	1.Principlesof E-Commerce 2.Business Analytics 3.Augmented Reality and Virtual Reality	**CSE**
	1. Internet of Things 2. Augmented Reality and Virtual Reality 3. Human Computer Interaction	**CSE(AIML)**
	1.Augmented Reality and Virtual Reality 2. Internet of Things 3. Human Computer Interaction	**CSE (DS)**
	1. Services Science and Service Operational Management 2. IT Project Management 3. Marketing Research and Marketing Management	**CSBS**
	1.Artificial Intelligence 2. Introduction to Data Science 3.Human Computer Interaction	**IT**
	1. Non-Conventional Energy Sources 2.MachineLearning 3.Artificial Intelligence Techniques	**EEE**
	1.Principles of Communication 2.Sensor Technology 3.Cellularand Mobile Communications	**ECE**
	1.Robotics 2. Composite Materials 3.Operations Research	**ME**
	1.Engineering Materials for Sustainability 2.Geographic Information Systems and Science 3.Environmental Impact Assessment and Life Cycle Analyses	**CE**

I Year
I Semester

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

LINEAR ALGEBRA AND FUNCTION APPROXIMATION

Course Code: GR22A1001 **L/T/P/C: 3/1/0/4**

I Year I Semester

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

Course Objectives

1. Comprehend the concepts of linearity and linear systems, which form the core for many engineering concepts
2. Interpret the matrix eigenvalue problem and relate the theory to pattern recognition problems
3. Distinguish between various techniques of matrix factorization and the significance of unit rank decomposition principle
4. Discuss the differential calculus of multi variable functions which leads to function optimization.
5. Apply tools for function approximation problems that arising in engineering

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. Develop the skill of finding multivariable function optima
5. Illustrate the concepts of function approximation with measurement of error

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

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

UNIT V

FUNCTION APPROXIMATION TOOLS IN ENGINEERING

Function approximation using Taylor's polynomials- Properties of Chebyshev polynomials- Uniform approximation using Chebyshev polynomials

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

Text Books

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 BOOKS

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- 3^{rd} 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

ENGINEERING CHEMISTRY

Course Code: GR22A1005 **L/T/P/C: 3/1/0/4**
I Year I Semesters

Course Objectives

1. To relate how the basic concepts and principles of chemistry can be applied to practical utility in a broader perspective of the society.
2. To distinguish the ranges of electromagnetic spectrum and its interaction with matter and to develop knowledge of various spectroscopic techniques at atomic and molecular levels.
3. To identify and apply various principles of electrochemistry, corrosion and water treatment which are essential for an engineer in industry
4. To acquire knowledge of existence of different organic molecules in different stereo chemical orientations useful for understanding reaction pathways.
5. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.

Course Outcomes

1. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Relate electromagnetic spectra used for exciting different molecular energy levels in various spectroscopic techniques and their application in medicine and other fields.
3. Recognize various problems related to electrochemistry and corrosion in industry and is able to explain different prevention techniques and apply concepts of chemistry in engineering.
4. Know the origin of different types of engineering materials used in modern technology and interpret different problems involved in industrial utilization of water.
5. Understand the processing of fossil fuels for the effective utilization of chemical energy.

UNIT I
ATOMIC AND MOLECULAR STRUCTURE

Atomic and Molecular orbitals - Definition, examples and comparison, Molecular orbital theory- postulates and MO energy diagrams of N_2 and O_2.

Theories of Metallic bonding – Free electron theory, Resonance theory, Molecular orbital theory, Valence Bond Theory – Postulates and Limitations, Bonding in $[Ni(CO)_4]$, $[Ni(Cl)_4]^{2-}$, $[Ni(CN)_4]^{2-}$, $[Co(NH_3)_6]^{3+}$, and $[CoF_6]^{3-}$. Crystal Field Theory, Crystal Field Splitting of transition metal ion d-orbitals in octahedral, tetrahedral and square planar geometries.

UNIT II
SPECTROSCOPIC TECHNIQUES AND APPLICATIONS

Regions of Electromagnetic spectrum. Molecular spectroscopy: Rotational Spectroscopy: Rotation of molecules, Rotational spectra of rigid diatomic molecules, Selection rules.

Vibrational Spectroscopy: The vibrating diatomic molecule, Simple and anharmonic oscillators of a diatomic molecule, Selection rules, Applications of IR spectroscopy.

NMR Spectroscopy: Criteria for NMR activity (Magnetic and non-magnetic nuclei), Basic concepts and Principle of ^1H NMR spectroscopy, Chemical shift- Shielding and Deshielding. Magnetic Resonance Imaging.

UNIT III

BATTERIES AND CORROSION

Batteries: Primary and Secondary types, Lithium ion and Lead acid batteries. Fuel cells: Definition, Hydrogen-Oxygen fuel cell and Microbial Fuel cell – working principle and applications.

Corrosion: Definition, causes and effects of corrosion, Theories of chemical and electro chemical corrosion with mechanism, Differential metal corrosion - Galvanic corrosion, Differential aeration corrosion - pitting corrosion, Factors affecting corrosion – Nature of metal (Position of metal, Relative areas, Purity and Passivity), Nature of Environment (pH, Temperature and Humidity), Corrosion control methods: Cathodic protection (sacrificial anodic and impressed current cathodic protection), Metallic coatings: Hot dipping-galvanization and tinning.

UNIT IV

ENGINEERING MATERIALS AND WATER TECHNOLOGY

Semiconductors: Si and Ge - preparation, purification and crystal growth by zone refining and Czochralski pulling methods, Doping – Epitaxy, Diffusion and Ion implantation.

Plastics: Comparison between thermoplastics and thermosets, Fabrication of plastics - compression moulding and injection moulding. Conducting polymers – Definition, classification and applications.

Water: Hardness - Causes, types and units. Boiler troubles-scales and sludges, caustic embrittlement. Water purification: Demineralization by Ion-exchange process, Desalination by reverse osmosis method.

UNIT V

STEREOCHEMISTRY AND ENERGY RESOURCES

Stereochemistry: Elements of symmetry-plane of symmetry, centre of symmetry, alternating axis of symmetry. Chirality, Enantiomers – tartaric acid, Diastereomers- 2,3-dichloropentane, Conformational analysis of n-butane. Structure, synthesis and pharmaceutical applications of aspirin and ibuprofen.

Energy sources: Fossil Fuels: Coal –types, analysis of coal- proximate and ultimate analysis and their significance, Petroleum-its composition, Cracking – Definition, Fluid bed catalytic cracking, Knocking and its mechanism in Internal Combustion engine, Octane rating, Hydrogen gas generation by Electrolysis process.

Text Books

1. Engineering chemistry by P.C. Jain and M. Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. Textbook of Engineering Chemistry by A. Jayashree, Wiley Publications

Reference Books

1. Organic Chemistry by Morrison, Boyd & Bhattacharjee (Pearson Pubs)
2. Engineering Chemistry by O.G.Palanna, Tata McGraw Hills Private Ltd.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell. McGraw Hill Publication
4. A Textbook of Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BASIC ELECTRICAL ENGINEERING

Course Code: GR22A1009 **L/T/P/C: 2/1/0/3**
I Year I Semesters

Course Objectives

1. Introduce the fundamentals of Electrical Engineering.
2. Solve the problems in the applications of DC circuits.
3. Implement the basic concepts in AC circuits.
4. Provide foundation in theory and applications of Transformers, AC and DC machines.
5. Understand the principals involved in Sensors.

Course Outcomes

1. Illustrate the basic electric circuits.
2. Analyze various parameters of AC circuits.
3. Solve electric circuits with suitable theorems.
4. Interpret Magnetic circuits &electromechanical energy conversion.
5. Choose appropriate LT switchgear used for electrical installations.

UNIT I
BASIC COMPONENTS AND ELECTRIC CIRCUITS
Charge, Current, Voltage, Power, Passive components, Voltage and Current sources, dependent and independent sources, fundamentals of circuit Laws, Source Transformation, Passive components in series and parallel, Mutual coupling, Dot Convention in coupled circuits. Delta – star conversion.

UNIT II
A.C CIRCUITS
Representation of sinusoidal waveforms, average and rms values, phasor representation, real power, reactive power, apparent power, power factor, analysis of RL, RC and RLC circuits. Series circuits, Parallel circuits and Resonance.

UNIT III
NETWORK ANALYSIS
Nodal and Mesh Analysis, Linearity and Superposition, Thevenin's and Norton's theorems, Maximum power transfer theorem and Reciprocity theorem

UNIT IV
INTRODUCTION TO MAGNETIC CIRCUITS AND ELECTROMECHANICAL ENERGY CONVERSION
Force - voltage and Force - Current analogy, Comparison of Electric and Magnetic circuits, Magnetic circuits for Transformer and rotating machines.
Energy Conversion Process – Concept of Energy and Co – energy, mechanical force in the electromagnetic system, singly excited, doubly excited, electromechanical system, and dynamic equation.

UNIT V
ELECTRICAL INSTALLATIONS COMPONENTS
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB (Miniature Circuit Breaker), ELCB (Earth Leakage Circuit Breaker), MCCB (Moulded Case Circuit Breaker), Types of Wires and Cables, Earthing, power factor improvement (using capacitors).

Text Books

1. D.P. Kothari and I.J. Nagrath “Basic Electrical Engineering”, Third edition 2010, Tata McGraw Hill.
2. A. Sudhakar and Shyam Mohan “Basic Electrical Engineering”, McGraw Hill Education.
3. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
4. Vincent Deltoro “Electrical Engineering Fundamentals”, Second Edition, Prentice Hall India, 1989.

Reference Books

1. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education,2004.
2. K. V. V. Murthy and M. S. Kamath, “Basic Circuit Analysis”, Jaico Publishers, 1999.
3. A.Chakrabarti “Circuit Theory (Analysis and Synthesis)”Dhanpat Rai & Co.
4. E. Hughes, “Electrical and Electronics Technology”, 10th Edition, Pearson, 2010
5. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING

Course Code: GR22A1007 **L/T/P/C:2/1/0/3**
I Year I Semester

Course Objectives

1. To interpret the various steps in problem solving and program development.
2. To recall and reuse the fundamentals, syntax and semantics of C programming language.
3. To illustrate problem solving using arrays, strings, structures and pointers.
4. To demonstrate structured and modular programming approach in solving problems.
5. To interpret code and debug the given problems using files.

Course Outcomes

1. To design algorithms and flowcharts for problem solving and illustrate the fundamentals of C language.
2. To identify and apply control structures and arrays to solve problems.
3. To discover the need for strings and functions in problem solving and apply it.
4. To analyze the need for pointers and structures in C and implement for solutions.
5. To interpret working with files, 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 of arrays.

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, void pointer, 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 to files, error handling in files.

Preprocessor: Commonly used preprocessor commands like include, define, undef, if, ifdef, ifndef, elif, Command Line Arguments, Enumeration Data Type.

Text Books

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
    a. Edition)

Reference Books

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

BASIC ELECTRICAL ENGINEERING LAB

Course Code: GR22A1018 **L/T/P/C: 0/0/2/1**
I Year I Semester

Course Objectives

1. Introduce the use of measuring instruments.
2. Analyze a given network by applying various electrical laws
3. Measure and know the relation between basic electrical parameters.
4. Understand the response of electrical circuits for different excitations
5. Summarize the performance characteristics of electrical machines.

Course Outcomes

1. Get an exposure to common electrical components and their ratings.
2. Get an exposure to basic electrical laws.
3. Understand the measurement and relation between the basic electrical parameters
4. Understand the response of different types of electrical circuits to different excitations.
5. Compare the basic characteristics of Electrical machines

LIST OF EXPERIMENTS

TASK-1: Verification of Ohms Law , KVL and KCL

TASK-2: Verification of Thevenin's and Norton's Theorems

TASK-3: Verification of Superposition and Reciprocity Theorems.

TASK-4: Resonance in series RLC circuit

TASK-5: Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)

TASK-6: Three Phase Transformer: Verification of Relationship between Voltages andCurrents (Star-Delta, Delta-Delta, Delta-star, Star-Star)

TASK-7: Measurement of Active and Reactive Power in a balanced Three-phase circuit

TASK-8: Performance Characteristics of a Separately Excited DC Shunt Motor

TASK-9: Torque-Slip Characteristics of a Three-phase Induction Motor

TASK-10: No-Load Characteristics of a Three-phase Alternator

Text Books

1. D.P. Kothari and I.J. Nagrath "Basic Electrical Engineering", Third edition 2010, Tata McGraw Hill.
2. A. Sudhakar and Shyam Mohan "Basic Electrical Engineering", McGraw Hill Education.

Reference Books

1. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education,2004.
2. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.
3. A.Chakrabarti "Circuit Theory (Analysis and Synthesis)"Dhanpat Rai & Co.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY LAB

Course Code : GR22A1015 **L/T/P/C: 0/0/3/1.5**
I Year I Semester

Course Objectives

1. Introduce practical applications of chemistry concepts to solve engineering problems.
2. To determine the rate constant of reactions from concentrations as a function of time.
3. Measure the molecular or ionic properties such as conductance, redox potentials.
4. Synthesize a drug molecule to learn how organic compounds are prepared in industry.
5. Know the laboratory practices implemented in a research and industrial chemistry laboratory setting.

Course Outcomes

1. Ability to perform experiments illustrating the principles of chemistry relevant to the study of science and engineering.
2. Determination of parameters like hardness and chloride content in water, measurement of redox potentials and conductance.
3. Understand the kinetics of a reactions from a change in concentrations of reactants or products as a function of time.
4. Synthesize a drug molecule as an example of organic synthesis methods widely used in industry.
5. Determination of physical properties like adsorption and viscosity.

List of Experiments

1. Determination of Total Hardness of water by 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 constant of acid catalyzed reaction of methyl acetate
7. Adsorption of Acetic acid by charcoal
8. Determination of Surface tension of liquid by using Stalagmometer
9. Determination of Viscosity of liquid by using Ostwald's Viscometer
10. Determination of Partition Coefficient of Acetic acid between n-butanol and water
11. Synthesis of Aspirin
12. Synthesis of Paracetamol

Reference Books

1. Vogel's text book of Practical organic chemistry, 5th Edition.
2. Senior Practical Physical Chemistry, B.D. Khosala, A. Gulati and V. Garg (R. Chand & Co., Delhi)
3. Text book on experiments and Calculations in Engineering Chemistry-S.S.Dara.
4. An introduction to practical chemistry, K.K. Sharma and D.S. Sharma (Vikas Publications, New Delhi)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING LAB

Course Code: GR22A1017 **L/T/P/C: 0/0/3/1.5**

I Year I Semester

Course Objectives

1. To analyse various IDE's to create, edit, compile, run and debug programs.
2. To develop programs to solve basic problems by choosing fundamental concepts in C like operators.
3. Build C programs using suitable control structures.
4. To develop modular, reusable and readable C programs using the concepts like functions, arrays and strings.
5. To design programs using structures, pointers and files.

Course Outcomes

1. Translate algorithms into a working program and analyse and debug the codes using basics 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 365 days).
b. Write a C program to find greatest and smallest among three numbers using conditional operator.
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 bitwise operator and ternary operator.
c. Write a C program to check whether a number is even or odd using bitwise operator and ternary 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.

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TASK 6

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

(i)

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

(ii)

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

(iii)

```
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 are starting and ending values to be supplied by the user.
c. Write a C program to calculate the sum of following series:
   (i) $S1=1+x/1!-x^2/2!+x^3/3!-x^4/4!+\ldots..xn/n!$
   (ii) $S2= x^1/1+x^3/3+x^5/5+\ldots+x^n/n$

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 using functions.
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 are identical 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 program to find the GCD (greatest common divisor) of two given integers using recursive 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 Student and 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 of two 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 case characters 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 greatest of two numbers.

Text Books

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)

Reference Books

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, McGraw Hill, 4th Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING WORKSHOP

Course Code: GR22A1021 **L/T/P/C: 1/0/ 3/2.5**
I Year I Semester

Course Objectives

1. Prepare and practice of scientific principles underlying the art of manufacturing in workshop/manufacturing practices.
2. Demonstrate basic knowledge of various tools and their use in different sections.
3. Make students to execute applications of various tools in carpentry.
4. Make students recognize applications of manufacturing methods casting, forming machining, joining and advanced manufacturing methods.
5. Develop generate safety rules, safe practices and workshop dress code.

Course Outcomes

1. Develop various trades applicable to industries / Manufacturing practices.
2. Create Hands on experience for common trades.
3. Improve to fabricate components with their own hands.
4. Develop practical knowledge on the dimensional accuracies and dimensional tolerances possible with various manufacturing processes.
5. To build the requirement of quality of work life on safety and organizational needs.

TRADES FOR EXERCISES: At least two exercises from each trade:

1. Carpentry
2. Fitting Shop
3. Tin-Smithy
4. Casting
5. Welding Practice
6. House-wiring
7. Black Smithy
8. **VIDEO LECTURES**: Carpentry, Fitting operations, Tin-Smithy, Casting, Welding, Electrical and Electronics, Black Smithy, Plumbing, Power tools in construction and Wood Working, Manufacturing Methods,

Text Books

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal /Anuradha.

Reference Books

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/SciTech
2. Workshop Manual / Venkat Reddy/BSP
3. Workshop Manual/K. Venugopal/Dr.V. Prabhu Raja/G.Sreekanjan

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN THINKING

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

Course Objectives

1) To Define Design Thinking and understand its mindsets
2) To explain Design Thinking Methodology
3) Apply Ideation Tools
4) To Discover the concept of Empathy
5) Explain how to design products

Course Outcomes

1) To find various DT mindsets
2) Students will be able to extend DT methodology towards defining the problem
3) Students will be able to Identify Tools for Innovation
4) Students will be able to develop Empathy Maps
5) Students will be able to build Prototypes

UNIT I

Introduction to Design Thinking: LRI Assessment, Introduction to Design Thinking, Understanding the Mindsets-Empathy, Optimism, Embrace Ambiguity, Make it, Learn from Failure, Iterate, Create Confidence, Creativity Convergent & Divergent Thinking

UNIT-II

Design Thinking Methodology: The 5 Stages of the Design Thinking Process- Empathise, Define (the problem), Ideate, Prototype, and Test

UNIT-III

Ideation tools & exercises. Sample Design Challenge, Design Challenge Themes, Story telling and Tools for Innovation and creativity.

UNIT-IV

Empathize-Understand customers, Empathy Maps, Empathise-Step into customers shoes- Customer Journey Maps, Define- Analysis & Drawing Inferences from Research

UNIT-V

The Design Challenge: Define the Design Challenge, Prototyping & Iteration- Feasibility Study, Testing-Documentation and the Pitching

Textbooks

1. Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School - Idris Mootee.

Reference Books

1. Zero to One: Note on Start-Ups, or How to Build the Future
2. The Lean Startup: How Constant Innovation Creates Radically Successful Businesses
3. Start With Why: How Great Leaders Inspire Everyone To Take Action

I Year
II Semester

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Code: GR22A1002 **L/T/P/C: 3/1/0/4**
I Year II Semester

Course Objectives

1. Solve engineering problems governed by linear differential equations
2. Learn the skill of evaluating multiple integrals needed for applications arising in science and engineering
3. Interpret the principles of vector differential calculus for some field theory concepts
4. Make use of line integrals for evaluating work done by a field
5. Develop the skill of utilizing special vector integral theorems for fast determination of work done and flux

Course Outcomes

1. Classify the differential equations of first order and solve them analytically
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
4. Apply principles of vector differentiation and line integration for 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

Linear Differential Equations of the first order: Solution of Exact, Linear and Bernoulli equations, modelling Newton's law of cooling, growth and decay models, modelling of R-L circuit

UNIT II
ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Solution of homogeneous and non-homogeneous linear differential equations with constant coefficients, complimentary functions, particular integrals and the method of variation of parameters
Solution of Linear Differential Equations with variable coefficients: Cauchy's and Legendre's homogeneous equations

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)
Application of double integral to find the area of a lamina and volume of a solid, application of the triple integral to find the volume of a solid

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

Text Books

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.
4. Calculus Early Transcendental 9E by James Steward, Daniel Clegg, Saleem Watson, CENGAGE Publications

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPLIED PHYSICS

Course Code: GR22A1003 **L/T/P/C: 3/1/0/4**
I Year II Semester

Course Objectives

1. Identify the dualistic nature of matter waves with experimental validation.
2. Outline the properties of semiconductor materials for specific applications.
3. Develop basic understanding of optoelectronic devices.
4. Discuss the use of lasers as light sources in optical fiber applications.
5. Classify the properties of dielectric, magnetic and superconducting materials for various applications.

Course Outcomes

1. Solve engineering problems involving quantum nature of radiation and matter waves.
2. Describe the characteristics of semiconductor devices such as transistors and diodes.
3. Illustrate the operation of optoelectronic devices and its applications.
4. Analyze the properties of Laser and its propagation in different types of optical fibers.
5. Identify dielectric, magnetic and superconducting materials based on their properties for specific applications.

UNIT I

Quantum Mechanics: Introduction, Black body radiation, Planck's law, Photoelectric effect- Einstein's Photoelectric equation, Compton effect, 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.

UNIT II

Semiconductor Physics: Intrinsic and extrinsic semiconductors, Estimation of carrier concentration in intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier concentration and variation with temperature, Carrier transport: diffusion and drift, p-n junction diode: I-V Characteristics, Zener diode: I-V Characteristics, Hall Effect and its applications.

UNIT III

Optoelectronic Devices: Radiative transitions: Absorption, Spontaneous and Stimulated emissions, Non-radiative transitions: Auger recombination, Surface recombination and recombination at defects, Generation and recombination mechanism in semiconductors, Principle, Construction, Working, Characteristics and Applications: LED, PIN photo detector, Avalanche photo detector and Solar cell.

UNIT IV

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, Comparison 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

Dielectric Materials: Introduction, Types of polarizations: Electronic, Ionic and Orientation, Calculation of Electronic and Ionic polarizability, Internal fields in solids, Clausius-Mossotti equation, Applications of dielectric materials.

Magnetic Materials: Introduction, Bohr magneton, classification of magnetic materials: Ferro, Para, Dia, Antiferro and Ferri, Hysteresis curve based on domain theory, Soft and hard magnetic materials, Applications of magnetic materials.

Teaching methodologies:

- White board and marker
- Power Point Presentations
- Video lectures

Text Books

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

ENGLISH

Course Code: GR22A1006 **L/T/P/C : 2/0/0/2**
I Year II Semester

Course Objectives

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
3. Develop study skills and communication skills in formal and informal situations.
4. Understand the importance of defining, classifying and practice the unique qualities of professional writing style.
5. Employ the acquired knowledge in classroom with reference to various social and professional spheres thus leading to a life-long learning process

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. Listen and respond appropriately.

UNIT I

Where the Mind is without Fear poem by Rabindranath Tagore

Vocabulary: The Concept of Word Formation -- The Use of Prefixes and Suffixes.

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 Proper Punctuation - Techniques for writing precisely - Paragraph writing - Do's and Don'ts of Paragraph Writing - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT II

The Last Leaf by O. Henry

Vocabulary: Synonyms and Antonyms.

Grammar: Modal Auxiliaries - Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Précis Writing, Describing Objects, Places and Events – Classifying - Providing Examples or Evidence

UNIT III

'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

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

Reading: Improving Comprehension Skills – Techniques for Good Comprehension

Writing: Format of a Formal Letter-Writing Formal Letters E.g. Letter of Complaint, Letter of Requisition and Letter of permission, Use of phrases for formal and informal letter writing and Email etiquette

UNIT IV

'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Standard Abbreviations in English and Phrasal Verbs
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Comprehension- Intensive Reading and Extensive Reading
Writing: Writing Introduction and Conclusion -Essay Writing- Argumentative and Discursive essay – Picture Composition

UNIT V

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: One Word Substitutes, Technical vocabulary and their usage
Grammar: Common Errors in English
Reading: Reading Comprehension-Exercises for Practice
Writing: What is Report Writing - Technical Reports vs General Reports – Importance of Report Writing – Structure and characteristics of Report Writing - Relevance of Reports to Engineers

Text Books

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

References

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006). Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA STRUCTURES

Course Code: GR22A1012 **L/T/P/C:2/1/0/3**
I Year II Semester

Course Objectives

1. To illustrate various sorting techniques and analyze the order of complexities of algorithms.
2. To demonstrate operations of linear data structures like stacks and queues and their applications.
3. To develop algorithms to implement various linked lists operations and distinguish static and dynamic allocations.
4. To demonstrate operations of non-linear data structures, trees and graphs.
5. To realize the merits and demerits and applications of various data structures.

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 operations on 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 outline hashing 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 of queue 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 of a linked list in memory, operations-insertion, deletion, display, search.
Types and applications: Circular linked list, double linked list, implementation of stack, queue using 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 (only examples – no implementation).

Text Books

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

Reference Books

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

APPLIED PHYSICS LAB

Course Code: GR22A1013 **L/T/P/C: 0/0/3/1.5**
I Year II Semesters

Course Objectives

1. Outline the characteristics of various semiconducting devices.
2. Identify the behavioral aspects of magnetic and electric fields.
3. Demonstrate the quantum nature of radiation through photoelectric effect.
4. Apply the theoretical concepts of Lasers and optical fibers in practical applications.
5. Recall the basic concepts of LCR and RC circuits through hands on experience.

Course Outcomes

1. Compare the behavior of p-n junction diode, Solar cells and LED.
2. Analyze the behavior of magnetic and electric fields with the help of graphs.
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 time constant of RC circuit and resonance phenomenon in LCR circuit.

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. R-C Circuit: To determine the time constant of R-C circuit.
10. LCR Circuit: To determine the resonant frequency and Quality factor of LCR Circuit in series and parallel.

Note: Any 8 experiments are to be performed.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

GRAPHICS FOR ENGINEERS

Course Code: GR22A1011 **L/T/P/C: 1/0/4/3**
I Year II Semester

Course Objectives

1. Provide basic conventions and standards used in Graphics for Engineers.
2. Impart knowledge on different projection methods.
3. Draw multi views of a plane object located in different orientations.
4. Identify and draw 2d views of a solid objects in different positions.
5. Apply solid modelling features and concepts to draw and develop industrial components like springs, gears etc.

Course Outcomes

1. Interpret industrial drawings and read working drawings.
2. Draw engineering objects like springs using AutoCAD.
3. Imagine and create multi-views of 2-d plane figures.
4. Construct and interpret multi-views of 3-d solid objects with proper dimensioning, scaling etc.
5. Draw and create pictorial views and model the industrial objects like gears and bearings with solid modelling commands available in AutoCAD tool.

UNIT I

Engineering Graphics with CAD– Introduction engineering graphics and significance of computer aided design CAD software, advanced commands, dimensioning and tolerancing, fundamentals of 2-D construction.

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 plane figures (triangle, square, pentagon, hexagon, and circle); projections of plane (inclined to one reference plane only).

UNIT IV

Projections of solids - definition and types of solid objects (prism, cylinder, pyramid, and cone); projections of solid (axis inclined to one reference plane only); creation of threads, washers, keys, and springs.

UNIT V

Isometric views – construction of isomeric views of planes (polygons) and solids (prism, cylinder, pyramid, and cone); fundamentals of 3-d drawings, world coordinate system, solid modelling and commands, creation of gears and bearings; conversion of 3-d to 2-d views and construction of 3-d view from 2-d views (simple objects)

Text Books

1. Engineering Graphics and Design by Kaushik Kumar / Apurbakumar Roy / Chikesh
2. Engineering Drawing by N.D.BHATT/CHAROTAR PUBLISHING HOUSE PVT LTD

Reference Books

1. Engineering Graphics Essentials with AutoCAD 2018 Instruction by Kirstie Platenberg/SDC publications.
2. Engineering Drawing by Basanth Agrawal/ C M Agrawal/ McGraw Hill Education
3. Engineering Drawing by K.Venu Gopal/New Age Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA STRUCTURES LAB

Course Code: GR22A1020 **L/T/P/C: 0/0/2/1**
I Year II Semester

Course Objectives:
1. To interpret sorting techniques.
2. To design programs on stack and queue operations and their applications.
3. To construct programs for linked lists operations using dynamic memory allocation.
4. To develop modular, reusable and readable C programs for tree operations.
5. To implement graph representations and graph traversal techniques

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, delete and display.

TASK 8

a. Write a C program to implement Double Linked List operations – create, insert, delete and 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 Tree using 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

Teaching methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

Text Books

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

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Course Code: GR22A1016 **L/T/P/C: 0/0/2/1**
I Year II Semester

Course Objectives

1. Facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. Sensitize students to the nuances of English speech sounds, word accent, intonation rhythm and Neutralization of accent for intelligibility
3. Bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4. Improve the fluency of students in spoken English and neutralize their mother tongue influence
5. Train students to use language appropriately for public speaking and interviews

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 – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.
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: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions- Telephone Etiquette

Exercise III

CALL Lab: Errors in Pronunciation-the Influence of Mother Tongue (MTI).
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: Debates- argumentative vs persuasive - Public Speaking – Exposure to Structured Talks.
Practice: Debates- 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**

II Year
I Semester

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTATIONAL MATHEMATICS FOR ENGINEERS

Code: GR22A2009 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objectives

1. Distinguish between analytical and numerical solutions arising in mathematics
2. Learn methods that provide solutions to problems not possessing an analytical solution
3. Acquire skills to estimate derivatives and integrals numerically
4. Understand the usefulness of the principle of least squares
5. Understand the principles of numerical techniques require to solve ODE and PDE

Course Outcomes

1. Apply well known techniques to find real roots of an equation and linear algebraic systems by iterative methods
2. Apply interpolation and numerical differentiation techniques for univariate data
3. Solve problems related to numerical integration and least squares approximations of a function
4. Choose appropriate numerical techniques to solve IVP and BVP in ODE
5. Distinguish between various numerical methods to solve PDE arising in the context of heat conduction

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 with error analysis

UNIT II

Interpolation - Cubic spline- Differentiation

Interpolation with non-uniform data: Newton divided differences formula, operational calculus, Interpolation with uniform data- Newton and Gauss formulas, Fitting natural cubic spline to data
Numerical differentiation for uniform and non-uniform data

UNIT III

Numerical integration and Curve approximations

Numerical integration by Trapezoidal rule, Simpson's 1/3rd and $3/8^{th}$ rules – The Principle of least squares, Fitting a straight line, parabola, exponential and power curve, Simple and Multiple linear regression with 2 independent variables

UNIT IV

Numerical solution of initial and boundary value problems in ODE

Taylor's series method, Picard's method, Euler method, 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

UNIT V

Numerical solution initial and boundary value problems in PDE

Solution of Laplace's equation by Jacobi, Gauss-Seidel method and Successive over relaxation (SOR)

methods, Solution of Heat equation by the finite difference method.

Text Books

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

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL CIRCUIT ANALYSIS

Course Code: GR22A2024 **L/T/P/C:2/1/0/3**
II Year I Semester

Course Objectives

1. Describe the various properties of Fourier series and Fourier transforms.
2. Evaluate the three phase circuits and dot convention of a coupled circuit.
3. Apply the Laplace Transforms to electrical circuits.
4. Solve the network parameters of two port networks.
5. Simplify theorems & transient state analysis of a circuit.

Course Outcomes

1. Summarize the concept of Fourier Series and Fourier transforms.
2. Analyze three-phase and mutually coupled circuits.
3. Solve electrical circuits using Laplace and Inverse Laplace transform.
4. Simplify network by two port parameters.
5. Apply the network theorems & transient response of given AC circuits.

UNIT I
THREE PHASE CIRCUITS AND COUPLED CIRCUITS
Three-phase circuits: analysis of balanced and unbalanced circuits, measurement of power by three- and two-wattmeters, measurement of reactive power by single wattmeter.

UNIT II
SOLUTION OF FIRST AND SECOND ORDER NETWORKS
Solution of first and second order differential equations for Series and parallel RL, RC, RLC circuits, initial and final conditions in network elements, time constants, steady state and transient response Concept of Duality and Dual Networks.

UNIT III
ELECTRICAL CIRCUIT ANALYSIS USING LAPLACE TRANSFORMS
Introduction to Laplace Transform, 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
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)

UNIT V
FOURIER SERIES AND FOURIER TRANSFORM
Representation of continuous-time periodic signals by Fourier series; Dirichlet's conditions; Properties of Fourier series, Trigonometric and Exponential Fourier series.

Fourier transform: Fourier transform of periodic signals, Properties of Fourier transforms, Fourier transforms involving impulse function.

Textbooks

1. W.H.Hayt and J.E.Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education,2013.
2. C.K.Alexander and M.N.O.Sadiku,"Fundamentals of Electric Circuits",McGraw Hill Education,2004.
3. Sreenivasulu N "Electrical Circuits", Reem Publications, 2009.

Reference Books

1. A.Chakrabarti – Dhanpat Rai & Co "Circuit Theory"(Analysis and Synthesis).
2. N.C.Jagan and C.Lakshmi narayana "Network Theory", BS Publications.
3. K.V.V.Murthy and M.S.Kamath,"Basic Circuit Analysis",JaicoPublishers,1999.
4. D.RoyChoudhury,"Networks and Systems",NewAgeInternationalPublications,1998.
5. M.E.Van Valkenburg, "Network Analysis", Prentice Hall, 2006.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF ANALOG ELECTRONICS

Course Code: GR22A2025 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives
1. Understand the diode principle, to analyze applications.
2. Comprehend the principle and characteristics of BJT, MOSFET circuits.
3. Emphasis the working of Operational Amplifiers.
4. Study the linear & non-linear applications of Op-Amps.
5. Study the functioning of Op-Amp based Digital to analog and Analog to digital converters.

Course Outcomes
1. Analyze the diode principle, rectifier, clipping and clamping circuits.
2. Understand the characteristics of BJT, MOSFET transistors.
3. Illustrate Op-Amp circuits in different applications.
4. Demonstrate the principle and operation of Waveform generators and Multivibrator circuits.
5. Identify Op-Amp based Digital to analog and Analog to digital converters.

UNIT I
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 of Half-wave and full-wave rectifiers, Clipping, types of clipping circuits, series. Clipper, Shunt Clipper, Clamping, types of clamping circuits.

UNIT II
BJT AND JFET CIRCUITS
BJT Structure, Principle and Operation of BJT, Types NPN, PNP, Common Emitter, Common Base and Common Collector Configurations, Input characteristics and Output Characteristics of a BJT; BJT as a switch, and amplifier, Operating point, DC Load line & AC load line.
Bipolar Junction Transistor small signal Hybrid parameter model, Common-emitter, common-base and common collector amplifiers, JFET Structure, principle, Types N-Channel, P-Channel , drain current - characteristics. UJT construction and principle.

UNIT III
OPERATIONAL AMPLIFIERS
Introduction to Operational Amplifier, block diagram of operational amplifier, ideal characteristics of op-amp, practical op-amp, idealized analysis of op-amp circuits. Inverting, non-inverting amplifier and Voltage Follower Circuit.
DC characteristics of op-amp: input bias current, input offset current, Input Offset Voltage, thermal drift, slew rate.

UNIT IV
LINEAR & NONLINEAR APPLICATIONS OF OP-AMP
Inverting summing amplifier, Non-Inverting Summing amplifier, Subtractor circuit, differential amplifier, instrumentation amplifier, integrator, differentiator.

UNIT V

OSCILLATORS

Basic principle of an Oscillator, RC Phase shift and Wein bridge Oscillators, Schmitt Trigger Circuit, Zero Crossing Detector, Square-wave (Astable Multivibrator), Precision rectifier, peak detector, Monostable Multivibrator.

Text/References Books

1. S. Sedra and K. C. Smith, ―Microelectronic Circuits‖, New York, Oxford University Press,1998.
2. D Roy Choudhury, Shail B Jain, ―Linear Integrated Circuits‖, New Age International Pvt. Ltd., Fourth Edition.
3. J. V. Wait, L. P. Huelsman and G. A. Korn, ―Introduction to Operational Amplifier theory and applications‖, McGraw Hill U. S.,1992.
4. P. R. Gray, R. G. Meyer and S. Lewis, ―Analysis and Design of Analog Integrated Circuits, John Wiley& Sons,2001.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DC MACHINES AND TRANSFORMERS

Course code:GR22A2026 **L/T/P/C : 3/0/0/3**
II Year I Semester

Course Objectives

1. Knowledge on the concepts of principals of DC machines.
2. Study the operation of dc machines.
3. Analyze different types of dc machine.
4. Understanding the testing methods of single-phase Transformers.
5. Analyze single phase and three phase transformers circuits.

Course Outcomes

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

UNIT I
DC MACHINES

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.

UNITV

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.

Text Books

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

Reference Books

1. A.E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTROMAGNETIC FIELDS

Course Code: GR22A2027 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives

1. Apply vector Calculus and different coordinates systems for Electro and Magnetic systems.
2. Understand the knowledge of Electro field theory for Point, Line, Surface Charges.
3. Understand the concept of conductors, dielectrics, inductance, capacitance.
4. Ability to do Calculations of MFI for Line, Surface Conductors with different Shapes.
5. Ability of mathematical representation and analysis of EM waves at media interfaces.

Course Outcomes

1. Illustrate the Electric Field Intensity with respect to free space.
2. Summarize the Electric Field Intensity with respect to materials space.
3. Evaluate Magnetic Field Intensity and Force in Magnetic Fields.
4. Analyze the Maxwell's Equations in Time Varying Fields, Displacement current.
5. Apply Electro-Magnetic theory on different 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.

Text Books

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

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATABASE FOR ENGINEERS

Course Code:GR22A2007 **L/T/P/C: 2/0/0/2**
II Year I Semester

Course Objectives:
1. To examine different issues involved in the design and implementation of a database system.
2. To construct Structured Query Language for creating and working on tables.
3. To compose query retrieval for accessing data from databases.
4. To identify the problems of redundancy and perform decomposition.
4. To interpret the concepts of Transaction Management.

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.

Text Books

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

Reference Books

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

PRINCIPLES OF ANALOG ELECTRONICS LAB

Course Code:GR22A2028 **L/T/P/C: 0/0/3/1.5**
II Year I Semester

Course Objectives

1. Classify the types of active components.
2. Describe the operations of Diode and BJT
3. Analyze different Configuration types of Operational Amplifier.
4. Implement the mathematical operation on signals.
5. Make conversant with Oscillator principle.

Course Outcomes

1. Recall types of active components.
2. Illustrate the characteristics of Diode and BJT
3. Design Operational Amplifiers as inverting and non-inverting amplifier
4. Apply mathematical operation on signals using Operational Amplifier
5. Design Oscillator circuit

List of Experiments

TASK 1
Plot the Diode Characteristics experimentally

TASK 2
Obtain the output voltage waveform Half Wave Rectifier Using Diode

TASK 3
Shape the sine waveform through different Clipping Circuits experimentally

TASK 4
Shape the sine waveform through different Clamping Circuits experimentally

TASK 5
Obtain Input and Output characteristics for CB, CE configurations of BJT.

TASK 6
Obtain Input and Output characteristics for CC configurations of BJT.

TASK 7
Obtain drain current characteristics of JFET

TASK 8
Implement Inverting & Non-Inverting Amplifier using Operational Amplifier

TASK 9
Implement Subtractor Circuit/Differential Amplifier using Operational Amplifier

TASK 10

Implement Integrator Circuit using Operational Amplifier

TASK 11

Implement Differentiator Circuit using Operational Amplifier

TASK 12

Design RC Phase Shift Oscillator Circuit

Text/References Books

1. S. Sedra and K. C. Smith, ―Microelectronic Circuits‖, New York, Oxford University Press,1998.
2. D Roy Choudhury, Shail B Jain, ―Linear Integrated Circuits‖, New Age International Pvt. Ltd., Fourth Edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DC MACHINES AND TRANSFORMERS LAB

Course Code: GR22A2029 **L/T/P/C: 0/0/3/1.5**
II Year I Semester

Course Objectives

1. Strong background in different types of DC generators, Motors and Transformers, their construction, operation and applications
2. Understanding the various lab experiments connected with dc generators and there by achieve the design concepts.
3. Knowledge on application of dc motor concepts with respect to the performance characteristics of dc motors.
4. Knowledge on application of dc generator concepts with respect to the performance characteristics of dc generators.
5. Concept of back-to-back connection of a transformer and three phase to two phase conversion by Scott connection.

Course Outcomes

1. Identify various parts of electrical DC machines and Transformers.
2. Develop knowledge helpful for application of DC machines and Transformers.
3. Demonstrate control of different DC Machines.
4. Illustrate the performance of dc machines using different testing methods.
5. Determine the parameters of equivalent circuit of single phase transformer and performance.

TASK-1
Swinburne's test and Load Test of a D.C Shunt Motor

TASK-2:
Brake Test on a DC Shunt Motor

TASK-3
Brake Test on a DC Compound Motor

TASK-4:
Open Circuit Characteristics of a DC Shunt Generator

TASK-5
Load test on a D.C. Shunt Generator.

TASK-6
Load test on a D.C. Series Generator

TASK-7
Load test on D.C. Compound Generator

TASK-8
Hopkinson Test

TASK-9
Fields Test

TASK-10:
Separation of Core Losses of DC machine

TASK-11
OC, SC and Load tests on single phase transformer.

TASK-12
Sumpner's test.

TASK-13
Scott connection.

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

TASK-14
Heat run test on transformer.

TASK-15
Separation of core losses of a single phase transformer

TASK-16
Hysteresis loss determination.

TASK-17
Test on Auto Transformer.

TASK-18
Transient Analysis of DC Machine.

Text Books

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

Reference Books

1. A.E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONSTITUTION OF INDIA

Course Code : GR22A2003 **L/T/P/C: 2/0/0/0**

II Year I Semester

Course Objectives

1. To create an awareness about the Constitution of India, Fundamental Rights and Duties, Directive Principles
2. To Learn the role of Prime Minister, President and the Council of Ministers and the State Legislature
3. To learn the divisions of executive, legislative and judiciary and so on.
4. To know how a municipal office, panchayat office etc. works
5. To understand the importance and role of Election Commission Functions.

Course Outcomes

1. Students will be able to know the importance of Constitution and Government
2. Students will be able to become Good Citizens and know their fundamental rights, duties and principles.
3. Students will learn about the role of PM, President, Council of Ministers etc and it will help students learn about Local Administration.
4. The students understand the importance of Election Commission and the Students will become aware of how a Country and State are run in Democracy.
5. They will know about Secularism, Federalism, Democracy, Liberty, Freedom of Expression, Special Status of States etc.,

UNIT I

Introduction: Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

UNIT II

Union Government and its Administration: Structure of the Indian Union: Federalism, Centre - State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha

UNIT III

State Government and its Administration: Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

UNIT IV

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials.

UNIT V

Composition of Judiciary and Election Commission: Composition of Indian Judiciary, Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC.

Books Recommended:

1. 'Indian Polity' by Laxmikanth 5th Edition, McGraw Hill Edition.
2. Indian Constitution by Subhash C. Kashyap, Vision Books Publisher
3. 'Introduction to Indian Constitution' by D.D. Basu, 21st Edition, LexisNexis Publisher
4. *'Indian Administration by Avasthi* and Avasthi-by lakshminarainagarwal publication

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

VALUE ETHICS AND GENDER CULTURE

Code: GR22A2002 **L/T/P/C: 2/0/0/0**

II Year I Semester

Course Objectives

1. To understand about the importance of ethical values
2. To understand the significance of human conduct and self-development
3. To enable students to imbibe and internalize the value and Ethical behaviour in personal and professional lives.
4. To provide a critical perspective on the socialization of men and women.
5. To create an awareness on gender violence and condemn it.

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.

Reference Books

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

POWER GENERATION AND TRANSMISSION

Course Code: GR22A2030 **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Objectives

1. Illustration on Power Generation resources
2. Elaboration of economics of power generation
3. Analyzation of various power transmission lines, models and their performance
4. Articulate the mechanical design of Power Transmission lines and concept of Corona
5. Describe the overhead line insulators and cables

Course Outcomes

1. Illustrate the basic concepts of Power Generation.
2. Solve the economics of power generation.
3. Demonstrate various power system components, line models and its performance.
4. Analyze the different concepts related to mechanical design of transmission lines and corona
5. Categorize over head line insulators and cables for real time applications

UNIT I
GENERATION OF ELECTRIC POWER

Conventional Sources (Qualitative): Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine Plant. Non-Conventional Sources (Qualitative): Ocean Energy, Tidal Energy, Wave Energy, wind Energy, Fuel Cells, and Solar Energy, Cogeneration and energy conservation and storage.

UNIT II
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 III
TRANSMISSION LINE PARAMETERS AND PERFORMANCE

Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, Composite conductors-transposition, bundled conductors, and effect of earth on capacitance. Representation of lines, short transmission lines, medium length lines, nominal T and PI-representations, long transmission lines. The equivalent circuit representation of a long Line, A, B, C, D constants, Ferranti Effect. Sending end and receiving end power circle diagrams.

UNIT IV
MECHANICAL DESIGN OF OVERHEAD TRANSMISSION LINES AND CORONA

Tension and sag calculations, Factors affecting Sag, Sag template, Stringing charts, vibrations and vibration damper.

Corona: Introduction, disruptive critical voltage, corona loss, Factors affecting corona loss and methods of reducing corona loss, Disadvantages of corona, interference between power and Communication lines.

UNIT V

OVERHEAD LINE INSULATORS & INSULATED CABLES

Introduction, types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators. Introduction, insulation, insulating materials.

Under-Ground Cables: Types of Cables, grading of cables, insulation resistance of a cable. Capacitance of a single core and three core cables. Overhead lines versus underground cables, types of cables**.**

Text Books

1. A Chakrabarti, M L Soni, P V Gupta & U S Bhatnagar, "A Text Book on Power Systems Engineering", Dhanpat Rai &CoPvt.Ltd.
2. C.L. Wadhwa "Generation, Distribution and Utilization of Electrical Energy", Second Edition, New AgeInternational,2009.
3. C.L.Wadhwa "Electrical Power systems" New age Publishers 7th Edition 2017.

Reference Books

1. H.Cotton & H. Barber-The Transmission and Distribution of Electrical Energy, Third Edition, ELBS,B.I.Pub.,1985.
2. Paul Breeze "Power generation technologies", Third Edition, Elsevier Publishers 2019.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

AC MACHINES

Course Code:GR22A2031 **L/T/P/C: 2/1/0/3**
II Year II Semester

Course Objectives

1. Know the applications of single phase induction motor.
2. Provide a foundation in the theory and application of AC machines.
3. Train to have the solid foundation in technical concepts required to control the speed of 3-phase IM.
4. Provide with a strong back ground in 3-phase induction motor, speed control techniques and its Characteristics.
5. Provide sufficient background in synchronous motor, testing of different types of rotors viz salient Pole & cylindrical pole machines

Course Outcomes

1. Understand the concepts of rotating magnetic fields.
2. Interpret the need for electrical Induction Machines.
3. Demonstrate working of single and three phase AC machines.
4. Evaluate 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,reductionandelimination.Armaturereaction,synchronousreactance,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

Text/References Books:

1. A.E.Fitzgerald and C.Kingsley,"Electric Machinery",McGraw Hill Education,2013.
2. M.G.Say,"PerformanceanddesignofACmachines",CBSPublishers,2002.
3. P.S.Bimbhra,"ElectricalMachinery",KhannaPublishers,2011.
4. I.J.Nagrath and D.P. Kothari,"Electric Machines", McGraw Hill Education,2010.
5. A.S.Langsdorf, "Alternating Current Machines", McGraw Hill Education,1984.
6. P.C.Sen,"PrinciplesofElectricMachinesandPowerElectronics",JohnWiley&Sons,2007.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONTROL SYSTEMS

Course Code:GR22A2032 **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Objectives

1. Outline of the fundamental concepts of Control Systems and block diagram algebra.
2. Analyze time response of second order systems.
3. Interpret the stability of a system by Root locus technique.
4. Develop Nyquist and Bode plots for the stability of a system.
5. Apply the concepts of Controllability and Observability.

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.

Text Books

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

References

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF DIGITAL ELECTRONICS

Course Code:GR22A2033 **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Objectives
1. Express the function of logic gates through diodes and transistors and their classifications.
2. Design of arithmetic and logic operations using Boolean postulates and K-Maps
3. Classify the types of Flip-Flops and steps involved in designing registers
4. Design of Synchronous, Asynchronous Counters including State diagram
5. Describe the classification of Finite State Machines and PLDs.

Course Outcomes
1. Summarize the working of logic gates with applications, design of logic gates with diodes and transistors.
2. Design the application using Combinational logic circuits by minimizing the function using K-Map.
3. Analyze the types of Flip Flops and design procedure of synchronous and asynchronous sequential circuits.
4. Make use of different types of counters for applications.
5. Discuss the types of Finite State Machine and uses of PLDs.

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, BCD Counter, Binary Counter with Parallel Load, Counter with Unused States, Ring Counter, Johnson Counter,

UNIT IV

FINITE STATE MACHINE

State diagram, State Assignment, Capabilities and Limitation, Mealy and Moore models.

Programmable Logic Devices: ROM as a Programmable Logic Device, Programmable Array Logic and Programmable Logic Array, example problems based on digital designing.

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.

Text/Reference Books

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
4. Charles H. Roth, Jr and Lizy Kurian John‘s, ―Digital Systems Design Using VHDL‖, Cengage Learning

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MICROPROCESSORS AND MICROCONTROLLERS

Course Code: GR22A2034 **L/T/P/C:2/0/0/2**
II Year II Semester

Course Objectives

1. To familiarize the architecture of 8086 Microprocessors.
2. To describe the 8051 Microcontroller architecture.
3. To familiarize in programming the Microprocessors and Microcontrollers.
4. To understand Memory and I/O interfacing of 8086 and 8051.
5. To interface and program various devices with 8051.

Course Outcomes

1. Understands the internal architecture of 8086 Microprocessor.
2. Understand the internal architecture, organization of 8051.
3. Analyze the assembly language Programming of Microprocessor and Microcontrollers.
4. Do interfacing design of peripherals like Memory, I/O, A/D, D/A, timer etc.
5. Understand the real time applications of timers and serial communication of 8051.

UNIT I

8086 ARCHITECTURE

8086Architecture-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.
3. The 8051 Microcontroller, Kenneth J. Ayala, 3rd Edition, Cengage Learning, 2010.

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.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF DIGITAL ELECTRONICS LAB

Course Code: GR22A2035 **L/T/P/C : 0/0/4/2**
II Year II Semester

Course Objectives

1. Understand the types of logic gates and their families.
2. Design the arithmetic and logic operations using digital IC's.
3. Discuss, how the memory is created using sequential circuits.
4. Classify the types of Flip-Flops and their applications.
5. Discuss the importance of arithmetic circuits.

Course Outcomes

1. Outline the advantages of function realization using logic gates through K-Map.
2. Design Combinational logic circuits.
3. Analyze the types of Flip-Flops used in designing the registers.
4. Discuss the types of Memories and their advantages and application
5. Design Sequential logic circuits

LIST OF EXPERIMENTS

TASK-1
Design and verification of basic logic gates.

TASK-2
Simplify the given Boolean expression realize them using universal gates.

TASK-3
Design and implementation of half/full adder

TASK-4
Design and implementation of half subtractor/full subtractor

TASK-5
Design and implementation of parallel adder

TASK-6
Design and implementation of subtractor

TASK-7
Design and implementation of multiplexer

TASK-8
Design and implementation of Decoder

TASK-9
Design and implementation of one bit magnitude comparator.

TASK-10
Design and implementation of two bit magnitude comparators

TASK-11
Implementation and verification of truth table for R-S, J-K, D and T flip-flops.

TASK-12
Implementation and verification of truth table for J-K flip-flop, Master-slave.

Text/Reference Books
1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

AC MACHINES LAB

Course Code: GR22A2036 **L/T/P/C: 0/0/4/2**
II Year II Semester

Course Objectives

1. Explain the operation of Transformers.
2. Demonstrate various parts of induction motors.
3. Interpret various parts of an alternator.
4. Test for induction generator.
5. Design any electrical machine.

Course Outcomes

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

LIST OF EXPERIMENTS

TASK-1
Sumpner's test.

TASK-2:
Heat run test on transformer

TASK-3
Hysteresis loss determination

TASK-4
Brake Test on Slip Ring Induction Motor.

TASK-5:
No load and Blocked Rotor Tests on Squirrel Cage Induction Motor, Slip Torque Test.

TASK-6
Equivalent Circuit of a Single Phase Induction Motor.

TASK-7
Regulation of Alternator by Synchronous Impedance Method and MMF Method,Portier Triangle Method.

TASK-8
Determination of X_d and $X_q$of a Salient Pole Synchronous Machine from Slip Test.

TASK-9
V and inverted V curves of a 3-Phase Synchronous Motor.

TASK-10
Induction Generator.

TASK-11
Rotor-resistance starter for Slip Ring Induction Motor.

TASK-12
Star-delta starter for Squirrel Cage Induction Motor

Text/References Books:

1. A.E.Fitzgerald and C.Kingsley,"Electric Machinery",McGraw Hill Education,2013.
2. M.G.Say,"PerformanceanddesignofACmachines",CBSPublishers,2002.
3. P.S.Bimbhra,"ElectricalMachinery",KhannaPublishers,2011.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONTROL SYSTEMS LAB

Course Code: GR22A2037 **L/T/P/C: 0/0/4/2**
II Year II Semester

Course Objectives

1. Develop hands-on experience in analyzing, designing and carrying out experiments in control systems.
2. Familiarize the stability analysis techniques and their applications in control systems.
3. Analyze and simulate different transfer functions with variety of inputs.
4. Describe the principle of PID controller.
5. Conduct experiments with dc servomotor and synchros.

Course Outcomes

1. Make use of simulation packages for simple control system programs.
2. Illustrate the characteristics of synchros.
3. Analyze the root locus and bode plots.
4. Determine the transfer function of DC motor/generator.
5. Design the lead and lag compensators and Discuss the performance of servomotor and PID controller.

LIST OF EXPERIMENTS

TASK-1
Transfer function from zeros and poles and vice versa.

TASK-2
Step response, Ramp response and Impulse response of a given transfer function.

TASK-3
Root Locus from a Transfer function.

TASK-4
Bode Plot and Nyquist Plot from a Transfer function.

TASK-5
State Model from a Transfer function.

TASK-6
Zeros and poles from state model.

TASK-7
Transfer function of DC motor/Generator.

TASK-8
Time Response of second order system.

TASK-9
DC Servomotor.

TASK-10
PID Controller.

TASK-11
Characteristics of Synchros.

TASK-12
Lag& Lead Compensator.

Text Books

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

References

1. I. J. Nagrath and M. Gopal "Control Systems Engineering", New Age International (P) Limited Publishers, 2nd edition
2. John Wiley "Control Systems Engineering", by NISE 3rd Edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY

ENVIRONMENTAL SCIENCE

Course Code: GR22A2001 **L/T/P/C:2/0/0/0**
II Year II Semester

Course Pre-Requisites: Basic knowledge of environmental issues

Course Objectives

1. To recognize the impacts of human interventions towards environment
2. To understand how science and scientific method work to address environmental problems
3. To list out the benefits in creating a sustainable environment
4. To sketch out various activities in achieving a cleaner environment
5. To emphasize the role of an individual for a better planet to live

Course Outcomes

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

Text Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

JAVA PROGRAMMING FOR ENGINEERS

Course Code: GR22A2008 **L/T/P/C: 2/0/0/0**
II Year II Semester

Course Objectives:

1. The Java programming language: its syntax, idioms, patterns, and styles.
2. Object oriented concepts in Java and apply for solving the problems.
3. How exception handling and multithreading makes Java robust
4. Explore java Standard API library such as io, util, applet, awt
5. Building of applications using Applets and Swings

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- static keyword, 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, multi Threading- using isalive() and join(), Synchronization, suspending and resuming Threads, Communication between Threads.

Text Books

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

Reference Books

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.