

**Academic Regulations  
Programme Structure  
and  
Detailed Syllabus**

**Bachelor of Technology  
(B.Tech)  
in  
Computer Science and Engineering (Data Science)**  
(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.

<b>S.No</b>	<b>Department</b>	<b>Programme Code</b>	<b>Programme</b>
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)
10	Computer Science and Engineering (Artificial Intelligence)	61	B.Tech Computer Science and Engineering (Artificial Intelligence)
11	Computer Science and Information Technology	33	B.Tech Computer Science and Information Technology

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  $\geq$  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	<p>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</p> <p><b>i) Subjective – 20 marks</b>  <b>ii) Objective – 10 marks</b></p> <p>2) Continuous Evaluation is for each unit using</p> <p><b>i) Assignment – 05 marks</b>  <b>ii) Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks</b></p>
		60	Semester end examination	The semester-end examination is for a duration of 3 hours
2	Practical	40	Internal Examination & Continuous Evaluation	<p>One internal lab examination towards the end of course for a duration of 90 minutes with a viva of 5 minutes.</p> <p><b>i) Internal Exam-10 marks</b>  <b>ii) Viva voce – 10 marks</b>  <b>iii) Continuous Assessment- 10 marks</b>  <b>iv) G-Lab on Board(G-LOB) (Case study inter threading of all experiments of lab)/ Laboratory Project/Prototype Presentation/App Development -10 marks</b></p>
		60	Semester end examination	<p>The semester-end examination is for a duration of 3 hours.</p> <p><b>i) write-up (algorithm/flowchart/procedure) as per the task/experiment/program - 10 marks</b>  <b>ii) task/experiment/program-15 marks</b>  <b>iii) evaluation of results -15 marks</b>  <b>iv) write-up (algorithm/flowchart/procedure) for another task/experiment/program- 10 marks</b>  <b>v) viva-voce on concerned laboratory course - 10 marks</b></p>

3	Graphics for Engineers	40	Internal Examination & Continuous Evaluation	<p>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</p> <p>2) Day-to-Day activity -15 marks</p> <p>3) Continuous Evaluation using</p> <ul style="list-style-type: none"> <li>• <b>Assignment – 05 marks</b></li> <li>• <b>Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks</b></li> </ul>
		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	<p>1) The supervisor continuously assesses the students for 20 marks</p> <p><b>i) Continuous Assessment – 15 marks</b></p> <ul style="list-style-type: none"> <li>• Abstract Presentation - 3 marks</li> <li>• Architectural Design Presentation - 3 marks</li> <li>• Modules Presentation - 3 marks</li> <li>• Execution Cycle 1 Presentation - 3 marks</li> <li>• Execution Cycle 2 Presentation - 3 marks</li> </ul> <p><b>ii) Report – 5 marks</b></p> <p>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 <b>10 marks</b>.</p> <p>3) Technical Event Participation in project area/MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/ Book Publication – <b>10 marks</b></p>
		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 <b>60 marks</b> .



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	<p>1) The supervisor continuously assesses the students for 20 marks</p> <p><b>i) Continuous Assessment – 15 marks</b></p> <ul style="list-style-type: none"> <li>• Abstract Presentation - 3 marks</li> <li>• Architectural Design Presentation - 3 marks</li> <li>• Modules Presentation - 3 marks</li> <li>• Execution Cycle 1 Presentation - 3 marks</li> <li>• Execution Cycle 2 Presentation – 3 marks</li> </ul> <p><b>ii) Report – 5 marks</b></p> <p>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 <b>10 marks</b>.</p> <p>3) Technical Event Participation in project area/ MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/Book Publication – <b>10 marks</b>.</p>
		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 <b>60 marks</b> .

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  $\geq 35\%$  (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 to First year second semester	Regular course of study of First year first semester.
2	First year second semester to Second year first semester	(i) Regular course of study of First year second semester. (ii) Must have secured at least 25% credits up to First year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Second year first semester to Second year second semester	Regular course of study of Second year first semester.
4	Second year second semester to Third year first semester	(i) Regular course of study of Second year second semester (ii) Must have secured at least 25% credits up to Second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to Third year second semester	Regular course of study of Third year first semester.
6	Third year second semester to Fourth year first semester	Regular course of study of Third year second semester.
7	Fourth year first semester to Fourth year second semester	Regular course of study of Fourth year first semester.

- 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 $\geq$ 90
A+ (Excellent)	9	Marks $\geq$ 80 and Marks $<$ 90
A (Very Good)	8	Marks $\geq$ 70 and Marks $<$ 80
B+ (Good)	7	Marks $\geq$ 60 and Marks $<$ 70
B (Average)	6	Marks $\geq$ 50 and Marks $<$ 60
C (Pass)	5	Marks $\geq$ 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) **S<sub>k</sub>** the SGPA of **k<sup>th</sup>** 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.,

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

Where **C<sub>i</sub>** is the number of credits of the **i<sup>th</sup>** course and **G<sub>i</sub>** is the grade point scored by the student in the **i<sup>th</sup>** 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 **S<sub>k</sub>**, where **k  $\geq$  2**.

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

- 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 $\geq$ 8.00 with no F or below grade/detention anytime during the programme
2	First Class	CGPA $\geq$ 8.00 with rest of the clauses of S.No 1 not satisfied
3	First Class	CGPA $\geq$ 6.50 and CGPA $<$ 8.00
4	Second Class	CGPA $\geq$ 5.50 and CGPA $<$ 6.50
5	Pass Class	CGPA $\geq$ 5.00 and CGPA $<$ 5.50

Equivalence of grade to marks

$$\text{Marks \%} = (\text{CGPA} - 0.5) * 10$$

### 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 25% credits up to Second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to Third year second semester.	Regular course of study of Third year first semester.
4	Third year second semester to Fourth year first semester.	(i) Regular course of study of Third year second semester.
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 $\geq$ 8.00 with no F or below grade/ detention anytime during the Programme
2	First Class	CGPA $\geq$ 8.00 with rest of the clauses of S.no 1 not satisfied
3	First Class	CGPA $\geq$ 6.50 and CGPA $<$ 8.00
4	Second Class	CGPA $\geq$ 5.50 and CGPA $<$ 6.50
5	Pass Class	CGPA $\geq$ 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. Ph: (040)65864440

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING  
(Data Science)**

**B.Tech – CSE (DS) - GR22 Course Structure**

**I B. Tech-CSE (DS) - 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	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	CSE	ES	GR22A1007	Programming for Problem Solving	2	1	0	3	2	1	0	3	40	60	100
4	ME	ES	GR22A1008	Fundamentals of Electrical Engineering	2	1	0	3	2	1	0	3	40	60	100
5	Chemistry	BS	GR22A1015	Engineering Chemistry Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
6	CSE	ES	GR22A1017	Programming for Problem Solving Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	ME	ES	GR22A1021	Engineering Workshop	1	0	1.5	2.5	1	0	3	4	40	60	100
8	EEE	ES	GR22A1019	Fundamentals of Electrical Engineering lab	0	0	1	1	0	0	2	2	40	60	100
<b>TOTAL</b>					<b>11</b>	<b>4</b>	<b>5.5</b>	<b>20.5</b>	<b>11</b>	<b>4</b>	<b>11</b>	<b>26</b>	<b>320</b>	<b>480</b>	<b>800</b>
9	Mgmt	MC	GR22A1022	Design Thinking	0	0	0	0	2	0	0	2	40	60	100

**I B. Tech-CSE (DS) – 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	EEE	ES	GR22A1011	Graphics for Engineers	1	0	2	3	1	0	4	5	40	60	100
6	Physics	BS	GR22A1013	Applied Physics Lab	0	0	1.5	1.5	0	0	3	3	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 Communication Skills Lab	0	0	1	1	0	0	2	2	40	60	100
<b>TOTAL</b>					<b>11</b>	<b>3</b>	<b>5.5</b>	<b>19.5</b>	<b>11</b>	<b>3</b>	<b>11</b>	<b>25</b>	<b>320</b>	<b>480</b>	<b>800</b>

## II B.Tech CSE (DS) – 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	IT	PC	GR22A2067	Digital Logic Design	3	0	0	3	3	0	0	3	40	60	100
2	IT	PC	GR22A2068	Java Programming	3	0	0	3	3	0	0	3	40	60	100
3	IT	PC	GR22A2077	Design and Analysis of Algorithms	3	0	0	3	3	0	0	3	40	60	100
4	CSE	PC	GR22A2075	Discrete Mathematics	2	1	0	3	2	1	0	3	40	60	100
5	IT	PC	GR22A2069	Database Management Systems	3	0	0	3	3	0	0	3	40	60	100
6	CSE	PC	GR22A2085	Scripting Languages Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	IT	PC	GR22A2071	Java Programming Lab	0	0	2	2	0	0	4	4	40	60	100
8	IT	PC	GR22A2072	Database Management Systems Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
<b>TOTAL</b>					<b>14</b>	<b>1</b>	<b>5</b>	<b>20</b>	<b>14</b>	<b>1</b>	<b>10</b>	<b>25</b>	<b>320</b>	<b>480</b>	<b>800</b>
9	Mgmt	MC	GR22A2002	Value Ethics and Gender Culture	0	0	0	0	2	0	0	2	40	60	100

## II B. Tech – CSE (DS) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	To Tal	L	T	P	To tal			
1	IT	PC	GR22A2073	Computer Organization	3	0	0	3	3	0	0	3	40	60	100
2	CSE	PC	GR22A2074	Operating Systems	2	1	0	3	2	1	0	3	40	60	100
3	CSE	PC	GR22A2086	Data Science with R Programming	3	0	0	3	3	0	0	3	40	60	100
4	CSE	PC	GR22A2076	Full Stack Web Development	3	0	0	3	3	0	0	3	40	60	100
5	Maths	BS	GR22A2006	Applied Statistics for Engineers	3	0	0	3	3	0	0	3	40	60	100
6	CSE	PC	GR22A2078	Full Stack Web Development Lab	0	0	1.5	1.5	0	0	3	3	40	60	40
7	CSE	PC	GR22A2079	Operating Systems Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	CSE	PC	GR22A2087	Data Science with R Programming Lab	0	0	2	2	0	0	4	4	40	60	100
	<b>TOTAL</b>				<b>14</b>	<b>1</b>	<b>5</b>	<b>20</b>	<b>14</b>	<b>1</b>	<b>10</b>	<b>25</b>	<b>320</b>	<b>480</b>	<b>800</b>
9	HS	MC	GR22A2001	Environmental Science	0	0	0	0	2	0	0	2	40	60	100
10	English	MC	GR22A2108	Effective Technical Communication	0	0	0	0	2	0	0	2	40	60	100
11	CSE	MC	GR22A2109	Real-time Research Project/ Societal Related Project	0	0	2	2	0	0	4	4	50	--	50

### III B. Tech CSE (DS) – 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	IT	PC		Artificial Intelligence	3	0	0	3	3	0	0	3	40	60	100
2	CSE	PC		Data Warehousing and Data mining	2	1	0	3	2	1	0	3	40	60	100
3	CSE	PC		Data Visualization	3	0	0	3	3	0	0	3	40	60	100
4	CSE	PE		Professional Elective-I	3	0	0	3	3	0	0	3	40	60	100
5	CSE	OE		Open Elective-I	3	0	0	3	3	0	0	3	40	60	100
6	CSE	PC		Data Warehousing and Data mining Lab	0	0	2	2	0	0	3	3	40	60	100
7	IT	PC		Artificial Intelligence Lab using python	0	0	1.5	1.5	0	0	3	3	40	60	100
8	CSE	PC		Data Visualization Lab	0	0	1.5	1.5	0	0	4	4	40	60	100
<b>TOTAL</b>					<b>14</b>	<b>1</b>	<b>5</b>	<b>20</b>	<b>14</b>	<b>1</b>	<b>10</b>	<b>25</b>	<b>320</b>	<b>480</b>	<b>800</b>

PROFESSIONAL ELECTIVE – I				
S. No.	BOS	Group	Course Code	COURSE
1	IT	PE		Mobile Application Development
2	IT	PE		Cloud Computing
3	CSE	PE		Computer Networks
4	CSE	PE		Graph Theory

OPEN ELECTIVE – I				
S. No.	BOS	Group	Course Code	Course
1	CSE	OE		Internet of Things

### III B. Tech CSE (DS) – 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	CSE	PC		Machine Learning	3	0	0	3	3	0	0	3	40	60	100
2	IT	PC		Automata and Compiler Design	3	0	0	3	3	0	0	3	40	60	100
3	CSE	PC		Big Data Analytics	2	1	0	3	2	1	0	3	40	60	100
4	CSE	PE		Professional Elective-II	3	0	0	3	3	0	0	3	40	60	100
5	CSE	OE		Open Elective-II	3	0	0	3	3	0	0	3	40	60	100
6	CSE	PC		Machine Learning Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	CSE	PC		Big Data Analytics Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	CSE	PW		Mini Project with Seminar	0	0	2	2	0	0	6	6	40	60	100
<b>TOTAL</b>					<b>14</b>	<b>1</b>	<b>5</b>	<b>20</b>	<b>14</b>	<b>1</b>	<b>12</b>	<b>27</b>	<b>320</b>	<b>480</b>	<b>800</b>
9	Mgmt	MC		Constitution of India	0	0	0	0	2	0	0	2	40	60	100

PROFESSIONAL ELECTIVE – II				
S. No.	BOS	Group	Course Code	COURSE
1	IT	PE		Software Engineering
2	CSE	PE		Mathematical Modeling for Data Analysis
3	CSE	PE		Cryptography and Network Security
4	CSE	PE		Blockchain Technology

OPEN ELECTIVE – II				
S. No.	BOS	Group	Course Code	Course
1	CSE	OE		Augmented Reality and Virtual Reality



#### IV B. Tech CSE (DS) – 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	CSE	PC		Business Intelligence	2	1	0	3	2	1	0	3	40	60	100
2	Maths	BS		Economics and Accounting for Engineers	3	0	0	3	3	0	0	3	40	60	100
3	CSE	PE		Professional Elective-III	3	0	0	3	3	0	0	3	40	60	100
4	CSE	PE		Professional Elective-IV	3	0	0	3	3	0	0	3	40	60	100
5	CSE	OE		Open Elective-III	3	0	0	3	3	0	0	3	40	60	100
6	CSE	PC		Business Intelligence Lab	0	0	2	2	0	0	4	4	40	60	100
7	CSE	PC		Visual Programming using C# and .Net Lab	0	0	2	2	0	0	4	4	40	60	100
8	CSE	PW		Project Work-Phase I	0	0	6	6	0	0	12	12	40	60	100
<b>Total</b>					<b>14</b>	<b>1</b>	<b>10</b>	<b>25</b>	<b>14</b>	<b>1</b>	<b>20</b>	<b>35</b>	<b>320</b>	<b>480</b>	<b>800</b>

#### PROFESSIONAL ELECTIVE – III

S. No.	BOS	Group	Course Code	Course
1	CSE	PE		Introduction to Robotics
2	CSE	PE		Neural Networks and Deep Learning
3	CSE	PE		Natural Language Processing
4	CSE	PE		Semantic Web

#### PROFESSIONAL ELECTIVE – IV

S. No.	BOS	Group	Course Code	Course
1	CSE	PE		Information Storage and Management
2	CSE	PE		Principles of Programming Languages
3	IT	PE		Design Patterns
4	IT	PE		Software Project Management

#### OPEN ELECTIVE – III

S. No.	BOS	Group	Course Code	Course
1	CSE	OE		Human Computer Interaction

#### IV B. Tech CSE (DS) – II Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	To Tal	L	T	P	To tal			
1	Mgmt	HS		Fundamentals of Management and Entrepreneurship	3	0	0	3	3	0	0	3	40	60	100
2	CSE	PE		Professional Elective-V	3	0	0	3	3	0	0	3	40	60	100
3	CSE	PE		Professional Elective-VI	3	0	0	3	3	0	0	3	40	60	100
4	CSE	PW		Project Work-Phase II	0	0	6	6	0	0	12	12	40	60	100
<b>Total</b>					<b>9</b>	<b>0</b>	<b>6</b>	<b>15</b>	<b>9</b>	<b>0</b>	<b>12</b>	<b>21</b>	<b>160</b>	<b>240</b>	<b>400</b>

PROFESSIONAL ELECTIVE – V				
S. No.	BOS	Group	Course Code	Course
1	CSE	PE		Real Time Operating Systems
2	CSE	PE		Cyber Forensics
3	CSE	PE		Green Computing
4	CSE	PE		Robotic Process Automation

PROFESSIONAL ELECTIVE – VI				
S. No.	BOS	Group	Course Code	Course
1	IT	PE		Software Testing Methodologies
2	CSE	PE		Image and Video Processing
3	CSE	PE		Network Routing Algorithms
4	CSE	PE		Software Product Development and Management

## PROFESSIONAL ELECTIVES – 4 THREADS

<b>S. No.</b>	<b>Theory and Algorithms</b>	<b>Applications</b>	<b>Data Science and Machine Intelligence</b>	<b>Software and Technology</b>
1	Computer Networks	Mobile Application Development	Graph Theory	Cloud computing
2	Software Engineering	Cryptography and Network security	Mathematical Modeling for Data Analysis	Blockchain Technology
3	Natural Language Processing	Neural Networks and Deep Learning	Introduction to Robotics	Semantic Web
4	Information Storage And Management	Principles of Programming Languages	Design Patterns	Software Project Management
5	Real Time Operating Systems	Cyber Forensics	Green Computing	Robotic Process Automation
6	Network Routing Algorithms	Software Testing Methodologies	Image and Video Processing	Software Product Development and Management

**OPEN ELECTIVES FOR GR20 REGULATIONS:**

<b>THREAD 1</b>	<b>THREAD 2</b>	<b>OFFERED BY</b>
1. Soft Skills and Interpersonal Communication 2. Human Resource Development and Organizational Behavior 3. Cyber Law and Ethics 4. Economic Policies in India	1. Data Science using R Programming 2. Data Analytics using Open Source Tools 3. Augmented Reality and Virtual Reality	<b>CSE</b>
	1. Internet of Things 2. Augmented Reality and Virtual Reality 3. Human Computer Interaction	<b>CSE (AIML)</b>
	1. Internet of Things 2. Augmented Reality and Virtual Reality 3. Human Computer Interaction	<b>CSE (DS)</b>
	1. Services Science and Service Operational Management 2. IT Project Management 3. Marketing Research and Marketing Management	<b>CSBS</b>
	1. Artificial Intelligence 2. Introduction to Data Science 3. Human Computer Interaction	<b>IT</b>
	1. Non-Conventional Energy Sources 2. Machine Learning 3. Artificial Intelligence Techniques	<b>EEE</b>
	1. Principles of Communication 2. Sensor Technology 3. Cellular and Mobile Communications	<b>ECE</b>
	1. Robotics 2. Composite Materials 3. Operations Research	<b>ME</b>
	1. Engineering Materials for Sustainability 2. Geographic Information Systems and Science 3. Environmental Impact Assessment and Life Cycle Analyses	<b>CE</b>

**I YEAR  
I SEMESTER**

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## LINEAR ALGEBRA AND FUNCTION APPROXIMATION

Course Code: GR22A1001  
I Year I Semester

L/T/P/C: 3/1/0/4

**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<sup>th</sup> edition, R.K.Jain and S.R.K.Iyengar, Narosa publishing house
2. Higher Engineering Mathematics- B.S.Grewal- Khanna publications

##### **Reference Books:**

1. Introduction to Linear Algebra, Gilbert Strang, 5<sup>th</sup> edition, Wellesley,2017.
2. Numerical methods for scientific and engineering computation, M.K.Jain, S.R.K.Iyengar, R.K.Jain- 3<sup>rd</sup> edition- New Age publishers
3. Applied Mathematics, Vol. I & II, P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan,2010

**ENGINEERING CHEMISTRY**

**Course Code: GR22A1005**  
**I Year I Semester**

**L/T/P/C: 3/1/0/4**

**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<sub>2</sub> and O<sub>2</sub>.

Theories of Metallic bonding – Free electron theory, Resonance theory, Molecular orbital theory, Valence Bond Theory – Postulates and Limitations, Bonding in [Ni(CO)<sub>4</sub>], [Ni(CI)<sub>4</sub>]<sup>2-</sup>, [Ni(CN)<sub>4</sub>]<sup>2-</sup>, [Co(NH<sub>3</sub>)<sub>6</sub>]<sup>3+</sup>, and [CoF<sub>6</sub>]<sup>3-</sup>. 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 <sup>1</sup>H 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.

**PROGRAMMING FOR PROBLEM SOLVING**

**Course Code: GR22A1007**  
**I Year I Semester**

**L/T/P/C: 2/1/0/3**

**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 using of 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, 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, (3<sup>rd</sup> Edition)

### **Reference Books:**

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

**FUNDAMENTALS OF ELECTRICAL ENGINEERING**

**Course Code: GR22A1008**  
**I Year I Semester**

**L/T/P/C: 2/1/0/3**

**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 principles involved in Sensors

**Course Outcomes**

1. Summarize Understand basic electric circuits.
2. Analyze electric circuits with suitable theorems.
3. Interpret the working principle of Electrical machines.
4. Solve single phase balanced sinusoidal systems.
5. Apply sensors for real time applications

**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, Delta – star conversion.

**UNIT II**

**NETWORK ANALYSIS**

Nodal and Mesh Analysis, Linearity and Superposition, Thevenin's and Norton's theorems, Maximum power transfer theorem and Reciprocity theorem.

**UNIT III**

**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 and Parallel Circuits, Resonance.

**UNIT IV**

**BASICS OF ELECTRICAL MACHINES**

Transformer: Mutual Induction, construction and working principle, Types of transformers, Ideal transformer, EMF Equation, Phasor diagram on No Load.

Construction and working principles of DC generator, DC motor, Synchronous generator, and Induction Motor – applications.

**UNIT V**

**MEASURING INSTRUMENTS AND SENSORS**

Transducers, Sensors, and Actuators – Physical Principles and their working

Temperature Sensors, Ultrasonic Sensor, Accelerometers Sensor and PIR Motion Detector.

**Text Books:**

1. D.P. Kothari and I.J. Nagrath, Basic Electrical Engineering -, Third edition 2010, Tata McGraw Hill.
2. Sensors and amp, Transducers – D. Patranabis, PHI Publications
3. Electrical Engineering Fundamentals, Vincent Deltoro, 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. Circuit Theory (Analysis and Synthesis) by A.Chakrabarti-Dhanpat Rai & Co.
4. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
5. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
6. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010

**ENGINEERING CHEMISTRY LAB**

**Course Code: GR22A1015**  
**I Year I Semester**

**L/T/P/C: 0/0/3/1.5**

**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 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  $\text{KMnO}_4$  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)

**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

- Write a C program to find the roots of a quadratic equation using if-else.
- 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
- Write a menu driven C program to implement a simple arithmetic calculator.
- Write a C program to display number of days in month using switch case (The input is month number 1 -12).

#### TASK 5

- Write a C Program check whether a given number is Perfect number or not.
- Write a C Program check whether a given number is Palindrome number or not.
- Write a C Program check whether a given number is Armstrong number or not.
- Write a C Program check whether a given number is Strong number or not.

#### TASK 6

- Write a C program to display the following patterns.

(i)	(ii)	(iii)
* * * *	1	1
* *	2 3	2 2
* *	4 5 6	3 3 3
* * * *	7 8 9 10	4 4 4 4

- 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.
- Write a C program to calculate the Sum of following series:
  - $S1=1+x/1!-x^2/2!+x^3/3!-x^4/4!+\dots+x^n/n!$
  - $S2= x^1/1+x^3/3+x^5/5+\dots+x^n/n$

#### TASK 7

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

#### TASK 8

- Write a C program to implement Matrix Addition.
- Write a C program to implement Matrix Multiplication.

**TASK 9**

- 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 10**

- 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 11**

- 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 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, (3<sup>rd</sup> 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 (16<sup>th</sup> 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  
I Year I Semester**

**L/T/P/C: 1/0/ 3/2.5**

**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.

**References:**

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**

**FUNDAMENTALS OF ELECTRICAL ENGINEERING LAB**

**Course Code: GR22A1019**  
**I Year I Semester**

**L/T/P/C: 0/0/2/1**

**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

**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**

Verification of Maximum Power Transfer Theorem

**TASK-5**

Resonance in series RLC circuit

**TASK-6**

Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)

**TASK-7**

Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)

**TASK-8**

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

**TASK-9**

Torque Speed Characteristics of a Separately Excited DC Shunt Motor

**TASK-10**

Torque-Slip Characteristics of a Three-phase Induction Motor

# **GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

## **DESIGN THINKING**

**Course Code: GR22A1022**  
**I Year I Semester**

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

### **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

**Textbook:**

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
- 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**  
**I Year II Semester**

**L/T/P/C: 3/1/0/4**

### 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.

#### **Reference Books:**

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

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 Learning.
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.

### **Reference Books:**

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.

**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.

**DATA STRUCTURES**

**Course Code: GR22A1012**  
**I Year II Semester**

**L/T/P/C:2/1/0/3**

**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**

**Sorting:** Bubble sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Radix Sort, Counting sort.

**Algorithms:** 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.

**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, In -fix- to postfix Transformation, Evaluating Post-fix 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, Implementation of stack, queue using linked list. Circular linked list, Double linked list.

#### **UNIT IV**

**TREES:** Basic tree concepts, **Binary Trees:** Properties, types, Representation of Binary Trees using arrays and linked lists, 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. Introduction to Hashing techniques and 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:**

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**GRAPHICS FOR ENGINEERS**

**Course Code: GR22A1011**  
**I Year II Semester**

**L/T/P/C: 1/0/4/3**

**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 isometric 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

## 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.**

**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 representations and graph traversal 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. Implement a C program for Stack using Linked list.
- c. Implement a C program for Queue using Linked list.

**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 the following operations on Binary Search Tree
- i. Create
  - ii. insert
  - iii. search
  - iv. delete
  - v. count-nodes
  - vi. Height.
  - vii. Minimum node.
  - viii. Maximum node.

**TASK 10**

- 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 11**

- 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 12**

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

**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 Structure with C, Seymour Lipschutz, TMH
2. Classic Data Structures, 2/e, Debasis, Samanta, PHI, 2009
3. Fundamentals of Data Structure 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:**

**2. Computer Assisted Language Learning (CALL) Lab**

**3. Interactive Communication Skills (ICS) Lab**

**II YEAR  
I SEMESTER**



# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## DIGITAL LOGIC DESIGN

**Course Code: GR22A2067**  
**II Year I Semester**

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

### **Course Objectives:**

1. Comprehend different number systems including the binary system and Boolean algebraic principles.
2. Create minimal realizations of single and multiple output Boolean functions;
3. Design and analyze combinational circuits using medium scale integrated (MSI) components, including arithmetic logic units;
4. Apply strategies for state minimization, state assignment, for the implementation of synchronous Finite State Machines
5. Design of Combinational Programmable Logic Devices (CPLDs) like PROM, PAL, and PLA and develop HDL Models for Logic Circuits.

### **Course Outcomes:**

1. Apply knowledge of fundamental Boolean principles and manipulation to design Logic Circuits.
2. Apply various techniques of Boolean function simplification to create minimal expressions.
3. Create combinational circuits for a specified behavior with minimal specification.
4. Synthesize Sequential circuits with minimal states.
5. Realize combinational circuitry using Combinational PLDs and develop & test HDL models of Logic Circuits.

### **UNIT I**

**Binary Systems:** Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.

**Boolean Algebra And Logic Gates:** Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

### **UNIT II**

**Gate-Level Minimization:** The Map method, Four-variable map, Five-variable map, Product of Sum's simplifications, Don't care conditions, NAND and NOR implementation, other two level implementations, Exclusive-OR Function.

### **UNIT III**

**Combinational Logic:** Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers.

### **UNIT IV**

**Synchronous Sequential Logic:** Sequential Circuits, Latches, Flip-Flops, Analysis of clocked sequential circuits, State Reduction and Assignment, Design Procedure.

**Registers and Counters:** Registers, Shift registers, Ripple Counters, Synchronous Counters, other counters.

#### **UNIT V**

**Memory and Programmable Logic:** Introduction, Random Access Memory, Memory decoding, Error detection and correction, Read only Memory, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices.

**Hardware Description Language:** Hardware Description Language, Definition, Structural Definition of HDL, HDL models for Combinational circuits, HDL for models for Sequential circuits.

#### **Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

#### **Text Books:**

1. Digital Design with an Introduction to the Verilog HDL – Fifth Edition, M. Morris Mano, Pearson Education.
2. Fundamentals of Logic Design – Roth, 7<sup>th</sup> Edition, Thomson.

#### **References:**

1. Switching and Finite Automata Theory by ZviKohavi, Tata Mc Graw Hill.
2. Switching and Logic Design – CVS Rao, Pearson Education
3. Digital Principles and Design – Donald D.Givone, Tata Mc Graw Hill.
4. Fundamentals of Digital Logic and Micro Computer Design, 5<sup>th</sup> Edition, M.Rafiquzzaman (John Willey)

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## JAVA PROGRAMMING

**Course Code: GR22A2068**

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

**II Year I 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. Correlate 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**

**Object Oriented Thinking:** 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.

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.

### **UNIT II**

#### **CLASSES, INHERITANCE, POLYMORPHISM:**

**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, Nested Classes

**Strings:** String, StringBuffer, StringTokenizer

**Inheritance and Polymorphism:** Types of Inheritance, deriving classes using extends keyword, super keyword, Polymorphism – Method Overloading, Method Overriding, final keyword, abstract classes.

### **UNIT III**

#### **INTERFACES, PACKAGES, EXCEPTIONS**

**Interfaces:** Interface, Extending interface, interface Vs Abstract classes.

**Packages:** Creating Packages, using Packages, Access protection, java I/O package. Exceptions - Introduction, **Exception handling Techniques:** try...catch, throw, throws, finally block, user defined Exception.

### **UNIT IV**

#### **MULTITHREADING, COLLECTIONS**

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

between Threads.Exploring java.io, Exploring java.util

**Collections:** Overview of Collection Framework : ArrayList, LinkedList, Vector, HastSet, TreeSet, HashMap, HashTable, TreeMap, Iterator, Comparator

## **UNIT V**

### **APPLETS, AWT AND SWINGS**

Applet class, Applet structure, an example Applet program, Applet life cycle.

**Abstract Window Toolkit:** Why AWT?java.awt package, components and containers, Button, Label, Checkbox, Radio buttons, List boxes, choice boxes, Text field and Text area, container classes, Layout Managers.

**Event Handling:**Introduction, Event Delegation Model, Java.awt.event Description, Adapter classes, Innerclasses.

**Swing:** Introduction, JFrame, JApplet, JPanel, Components in swings, JList and JScroll Pane, Split Pane, JTabbed Pane, Dialog Box, Pluggable Look andfeel.

### **Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

### **Text Books/ References:**

1. Java: The Complete Reference, 10thedition, Herbert Schildt, McgrawHill.
2. Java Fundamentals: A Comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.
3. Java for Programming, P.J.DietelPearsonEducation
4. Object Oriented Programming through Java, P.Radha Krishna, UniversitiesPress.
5. Thinking in Java, Bruce Eckel, PearsonEducation
6. Programming in Java, S.Malhotra and S.Choudhary, Oxford University Press

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## DESIGN AND ANALYSIS OF ALGORITHMS

**Course Code: GR22A2077**

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

**II Year I Semester**

### **Course Objectives:**

1. Recall algorithm definition, its properties & performance analysis.
2. Demonstrate a familiarity with major algorithms and data structures.
3. Apply important algorithmic design paradigms and methods of analysis.
4. Evaluate efficient algorithms in common engineering design situations.
5. Understanding performances of various techniques.

### **Course Outcomes:**

1. Distinguish various performances of algorithms.
2. Illustrating Divide and Conquer Design Paradigm algorithms.
3. Examining various algorithms based on Dynamic programming paradigm.
4. Discriminate greedy approach and back tracking algorithms.
5. Demonstrate branch and bound problems and Distinguish problems related to various complexity classes.

### **UNIT I**

**Introduction to Algorithms:** Definition of an algorithm, properties of an Algorithm, performance analysis--space complexity & time complexity, amortized analysis

### **UNIT II**

**Disjoint sets:** Disjoint set Representation, Operations, union and find algorithms.

**Divide and Conquer:** General method, applications, binary search, Quick sort, merge sort, Strassen's matrix multiplication.

### **UNIT III**

**Dynamic Programming:** General method, applications, optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, travelling salesperson problem, optimal rod-cutting-Top down approach and bottom up approach.

### **UNIT IV**

**Greedy Method:** General method, applications-- job sequencing with deadlines, 0/1 knapsack problem, minimum cost spanning trees, single source shortest path problem, activity selection problem.

**Backtracking:** General method, applications, n-queen problem, sum of subsets problem, Hamiltonian cycles.

### **UNIT V**

**Branch and Bound:** General method, applications, travelling sales person problem, 0/1 knapsack problem: LC branch and bound solution, FIFO branch and bound solution

**Complexity Classes:** Non deterministic algorithms, deterministic algorithms, relationship between P and NP, NP-completeness, circuit-satisfiability problem, 3-CNF satisfiability.

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Text Books/ References:**

1. Ellis Horowitz, SatrajSahni and S Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publishers
2. T H Cormen, C E Leiserson, and R L Rivest, Introduction to Algorithms, 3rdEdn, Pearson Education
2. Cormen, Thomash H., Leiserson, Charles E., Rivest, Ronald L., & Stein, Clifford. Introduction to Algorithms. 3rd Edition. 2010.
3. Goodrich, Michael T. & Roberto Tamassia, Algorithm Design, Wiley Singapore Edition, 2002.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**DISCRETE MATHEMATICS**

**Course Code: GR22A2075**

**L/T/P/C: 2/1/0/3**

**II Year I Semester**

**Course Objectives:**

1. Provide logical foundations of computer science: propositional logic and predicate logic.
2. Illustrate applications of discrete structures: set theory, relations, functions.
3. Describe different mathematical counting techniques.
4. Use recurrence relations to solve the real-world problems.
5. Illustrate the importance of graph theory and its applications in computer science

**Course Outcomes:**

1. Use propositional and predicate logic in knowledge representation and truth verification.
2. Demonstrate the application of discrete structures in different fields of computer science.
3. Apply basic and advanced principles of counting to the real-world problems.
4. Able to formulate the problem and solve using recurrence relations and generating functions.
5. Devise the given problem as a graph network and solve with techniques of graph theory.

**UNIT I**

**Mathematical Logic:** Statements and notations, Connectives, Well-formed formulas, Truth tables, Tautology, Equivalence implication, Normal forms.

**Predicates:** Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction.

**UNIT II**

**Set Theory:** Properties of binary relations, Compatibility, Equivalence and Partial ordering relations, Hasse diagram, Lattice and its properties.

**Functions:** Inverse function, Composite of functions, Recursive functions, Pigeon hole principle and its application.

**Algebraic Structures:** Algebraic systems examples and general properties, Semi groups and monads, groups and sub groups' Homomorphism, Isomorphism.

**UNIT III**

**Elementary Combinatorics:** Basics of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial coefficients, Binomial and Multinomial theorems, the principle of Inclusion – Exclusion.

#### **UNIT IV**

**Recurrence Relation:** Generating functions, Function of sequences calculating coefficient of generating function, Recurrence relations, solving recurrence relation by substitution, Generating functions and Characteristics roots, solution of Inhomogeneous recurrence relation.

#### **UNIT V**

**Graph Theory:** Representation of graph, Graph theory and applications, Planar graphs, basic concepts of Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic numbers, Depth First Search, Breadth First Search, Spanning trees.

#### **Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

#### **Text Books/ References:**

1. Discrete and Combinational Mathematics- An Applied Introduction-5th Edition– Ralph.P.Grimadi .Pearson Education
2. Discrete Mathematical Structures with applications to computer science Trembly J.P. & Manohar.P, TMH
3. Mathematical Foundations for Computer Science Engineers, Jayant Ganguly, Pearson Education
4. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition. TMH.
5. Discrete Mathematics with Applications, Thomas Koshy, Elsevier
6. Discrete Mathematical Structures, Bernand Kolman, Roberty C. Busby, Sharn Cutter Ross, Pearson
7. Discrete mathematical structures, Dr. D S Chandrashekar, PRISM Publishers.



# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## DATABASE MANAGEMENT SYSTEMS

Course Code: GR22A2069

L/T/P/C: 3/0/0/3

II Year I Semester

### Course Objectives:

1. Understand the different issues involved in the design and implementation of a database system.
2. Understand Structured Query Language for manipulating the Data.
3. Study the physical, conceptual and logical database designs
4. Provide concepts of Transaction, Concurrency and Recovery Management Strategies of a DBMS
5. Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

### Course Outcomes:

1. Identify the role of Database System Applications and the design issues related.
2. Design the logical model for the applications and apply indexing techniques.
3. Construct a Database Schema, manipulate data using a SQL.
4. Apply the Schema Refinement techniques for a database design for optimized access.
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.

### UNIT I

**Introduction to Database And System Architecture:** Database Systems and their Applications, Database Vs File System, View of Data, Data Models, Database Languages- DDL and DML, Transaction Management, Database users and Administrators, Database System Structure.

**Introduction to Database Design:** ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship set, Extended ER Features, Conceptual Design with the ER Model, Logical database Design.

### UNIT II

**SQL Queries and Constraints:** SQL Data Definition, Types of SQL Commands, Form of Basic SQL Query, SQL Operators, Set Operators, Nested Queries, Aggregate Operators, NULL values, Integrity Constraints Over Relations, Joins, Introduction to Views, Destroying / Altering Tables and Views, Cursors, Triggers and Active Databases.

### UNIT III

**Relational Model:** Introduction to Relational Model, Basic Structure, Database Schema, Keys, Relational Algebra and Relational Calculus.

**Storage and Indexing:** File Organizations and Indexing-Overview of Indexes, Types of Indexes, Index Data Structures, Tree structured Indexing, Hash based Indexing.

### UNIT IV

**Schema Refinement and Normal Forms:** Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD, Normal Forms, Properties of Decomposition.

## **UNIT V**

**Transaction Management:** Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability.

**Concurrency Control:** Lock based Protocols, Timestamp based protocols,

**Recovery System:** Recovery and Atomicity, Log based recovery, Shadow Paging, Recovery with concurrent Transactions, Buffer Management.

### **Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

### **Text Books/ References:**

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

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## SCRIPTING LANGUAGES LAB

**Course Code: GR22A2085**  
**II Year I Semester**

**L/T/P/C: 0/0/3/1.5**

### **Course Objectives:**

1. Classify the client-side and server-side programming works on the web.
2. Apply JavaScript,python and develop real time applications.
3. Analyze the use of PHP-based scripting to experiment on web application.
4. Identify the processing of data in MySQL database.
5. Learn how to use AJAX programming in PHP to make faster web pages.

### **Course Outcomes:**

1. Design JavaScript and python applications for day to day activities.
2. Implement web application using PHP.
3. Design, debug and run complete web applications using PHP and MYSQL.
4. Build web applications using JavaScript and AJAX programming.
5. Develop web application to retrieve data from database using AJAX.

### **TASK 1**

- a. Write a JavaScript code to edit a paragraph text on a button click.
- b. Insert an image in HTML page using image tag. Define a JavaScript code to change image on a button click.

### **TASK 2**

- a. Write a JavaScript Code to check whether given number is positive, negative or zero
- b. Write a JavaScript Code to check whether given number is palindrome or not

### **TASK 3**

Design a simple multiplication table using JavaScript asking the user the number of rows and columns as user wants to print.

### **TASK 4**

Create a sample form program that collects the first name, last name, user id, and password and confirms password from the user. All the inputs are mandatory. Also, the values entered in the password and confirm password textboxes should be the same. After validating using JavaScript, Report error messages in red color just next to the textbox where there is an error.

### **TASK 5**

- a. Write a Python Code to find GCD of given numbers
- b. Write a Python Code to check whether given number is prime or not
- c. Write a Python Code to generate Fibonacci series upto limit 'n'

### **TASK 6**

- a. Write a Python Code to count the number of odd and even numbers in a given list of numbers
- b. Write a Python Code to find the largest number in the given list
- c. Write a Python Code to reverse a given list

### **TASK 7**

- a. Write a Python program that will prompt the user for a file name, read all the lines from the file into a list, sort the list, and then print the lines in sorted order.
- b. Write a Python program that asks the user for a filename, and then prints the number of characters, words, and lines in the file.

### **TASK 8**

Implement PHP script for the following.

- a. Find the factorial of a number (while loop)
- b. To reverse the digit (Use do while)
- c. Find the sum of the digits (Use for loop)
- d. Write a PHP script for the following: Design a form to accept the details of 5 different items, such as item code, item name, units sold, and rate. Display the bill in the tabular format. Use only 4 text boxes. (Hint: Use of explode function.)

### **TASK 9**

- a. Assume an array with different values. Write a PHP script to print only unique values from the array.
- b. Write a PHP script for finding sum of array elements
- c. Write a PHP script for searching an element in an array using linear search

### **TASK 10**

- a. Examine and write a PHP script for creating required student information in the database.
- b. Write a PHP script for deleting and updating a specified student from the database.

### **TASK 11**

Create a simple XMLHttpRequest and retrieve data from a text file.

### **TASK 12**

Develop a AJAX application to retrieve the contents of database.

Example: Consider a webpage with a dropdown list of set of names, as user selects a name the application should be able to display selected user information ( username, Phone number, Email-id, Place) in a table. When user selects other name, other user information should be displayed without reloading the page.

### **Text Books/ References:**

1. Introduction to Programming using Python, Y.Daniel Liang, Pearson.
2. Beginning PHP and MySQL 3<sup>rd</sup> Edition W. Jason Gilmoren - Third Edition, Apress publications
3. Beginning JavaScript with DOM scripting and AJAX: From Novice to Professional by Christian Heilman

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## JAVA PROGRAMMING LAB

**Course Code: GR22A2071**  
**II Year I Semester**

**L/T/P/C: 0/0/4/2**

### **Course Objectives:**

1. Understand Object Oriented Programming concepts and apply them in problem solving.
2. Get knowledge on Abstract classes, Interfaces and Multithreading.
3. Developing java applications and handle the exceptions.
4. Design applications for solving real world problems using Collection framework.
5. Building java GUI based applications using Applets, AWT and Swing.

### **Course Outcomes:**

1. Analyze a problem, identify and define the computing requirements appropriate to its solution using object-oriented programming concepts.
2. Design the applications using Inheritance, Polymorphism and Synchronization concepts.
3. Handle exceptions at Compile time and Run time.
4. Solve the real-world problems using Java Collection framework.
5. Develop GUI applications using Applets, AWT and Swings.

### **TASK 1**

Write java programs that implement the following

- a. Constructor
- b. Parameterized constructor
- c. Method overloading
- d. Constructor overloading.

### **TASK 2**

- a. Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.
- b. Write a Java program for sorting a given list of names in ascending order.
- c. Write a Java Program that reads a line of integers, and then displays each integer and the sum of all the integers (Use String Tokenizer class of java.util)

### **TASK 3**

Write java programs that uses the following keywords

- a) This      b)super      c)static      d)final

### **TASK 4**

- a. Write a java program to implement method overriding
- b. Write a java program to implement dynamic method dispatch.
- c. Write a Java program to implement multiple inheritance.
- d. Write a java program that uses access specifiers.

### **TASK 5**

- a. Write a Java program that reads a file name from the user, then displays information about

whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

- b. Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
- c. Write a Java program that displays the number of characters, lines and words in a text file

#### **TASK 6**

- a. Write a Java program for handling Checked Exceptions.
- b. Write a Java program for handling Unchecked Exceptions.

#### **TASK 7**

- a. Write a Java program that creates three threads. First thread displays “Good Morning” every one second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.
- b. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

#### **TASK 8**

Write a program illustrating following collections framework

- a) ArrayList                      b) Vector                      c) HashTable                      d) Stack

#### **TASK 9**

- a. Develop an applet that displays a simple message.
- b. Develop an applet that receives an integer in one text field and compute its factorial value and return it in another text field, when the button named “Compute” is clicked.
- c. Write a Java program that works as a simple calculator. Use a grid layout to arrange button for the digits and for the +, -, \*, % operations. Add a text field to display the result.

#### **TASK 10**

- a. Write a Java program for handling mouse events.
- b. Write a Java program for handling key events.

#### **TASK 11**

- a. Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields Num1 and Num 2.
- b. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception and display the exception in a message dialog box.

#### **TASK 12**

- a. Write a java program that simulates traffic light. The program lets the user select one of three lights: red, yellow or green. When a radio button is selected, the light is turned on, and only one light can be on at a time. No light is on when the program starts.
- b. Write a Java program that allows the user to draw lines, rectangles and ovals.

**TASK 13**

Create a table in Table.txt file such that the first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using JTable component.

**Text Books/ References:**

1. Java: The Complete Reference, 10th edition, Herbert Schildt, McgrawHill.
2. Java Fundamentals- A Comprehensive introduction, Herbert schildt and Dale skrien, TMH.
3. Java for programming, P.J.Dietel Pearson education (OR) Java: How to Program P.J.Dietel and H.M.Dietel, PHI
4. Object Oriented Programming through java, P.Radha Krishna, Universities Press.
5. Thinking in Java, Bruce Eckel, Pearson Education
6. Programming in Java, S.Malhotra and S.Choudhary, Oxford University Press.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**DATABASE MANAGEMENT SYSTEMS LAB**

**Course Code: GR22A2072**  
**II Year I Semester**

**L/T/P/C: 0/0/3/1.5**

**Course Objectives:**

1. Develop the logical design of the database using data modeling concepts such as Relational model.
2. Infer the data models and use of queries in retrieving the data.
3. Create a relational database using a relational database package.
4. Manipulate a database using SQL.
5. Render the concepts of database system structure.

**Course Outcomes:**

1. Construct the schema of the database and modify it.
2. Compile a query to obtain the aggregated result from the database.
3. Speculate the concepts of various database objects.
4. Compare the use of procedure and function in database.
5. Use triggers and packages to create applications in the database.

**TASK 1**

**DDL commands (Create, Alter, Drop, Truncate)**

1. Create a table EMP with the following structure.

Name Type

-----

EMPNO	NUMBER(6)
ENAME	VARCHAR2(20)
JOB	VARCHAR2(10)
MGR	NUMBER(4)
DEPTNO	NUMBER(3)
SAL	NUMBER(7,2)

2. Add a column commission to the emptable. Commission should be numeric with null values allowed.
3. Modify the column width of the job field of emptable.
4. Create dept table with the following structure.

Name Type

-----

DEPTNO	NUMBER(2)
DNAME	VARCHAR2(10)
LOC	VARCHAR2(10)

DEPTNO as the primary key

5. Add constraints to the emptable that is empno as the primary key and deptno as the foreign key



6. Add constraints to the emp table to check the empno value while entering (i.e) empno > 100.
7. Salary value by default is 5000, otherwise it should accept the values from the user.
8. Add columns DOB to the emp table. Add and drop a column DOJ to the emp table.

## **TASK 2**

### **DML COMMANDS (Insert, Update, Delete)**

1. Insert 5 records into dept. Insert few rows and truncate those from the emp1 table and also drop it.
2. Insert 11 records into emp table.
3. Update the emp table to set the value of commission of all employees to Rs1000/- who are working as managers.
4. Delete only those who are working as supervisors.
5. Delete the rows whose empno is 7599.

## **TASK 3**

### **TCL COMMANDS (Save Point, Rollback Commit)**

## **TASK 4**

### **DQL COMMAND (Select)- SQL Operators and Order by Clause**

1. List the records in the emp table order by salary in descending order.
2. Display only those employees whose deptno is 30.
3. Display deptno from the emp table avoiding the duplicated values.
4. List all employee names, salary and 15% rise in salary. Label the column as pay hike.
5. Display the rows whose salary ranges from 15000 to 30000.
6. Display all the employees in dept 10 and 20 in alphabetical order of names.
7. List the employee names who do not earn commission.
8. Display all the details of the records with 5-character names with 'S' as starting character.
9. Display joining date of all employees in the year of 1998.
10. List out the employee names whose salary is greater than 5000 and less than 6000.

## **TASK 5**

### **SQL Aggregate Functions, Group by clause, Having clause**

1. Count the total records in the emp table.
2. Calculate the total and average salary of the employee.
3. Determine the max and min salary and rename the columns as max\_salary and min\_salary.
4. Find number of departments in emp table.
5. Display job wise sum, average, max, min salaries.
6. Display maximum salaries of all the departments having maximum salary > 2000.
7. Display job wise sum, avg, max, min salaries in department 10 having average salary is greater than 1000 and the result is ordered by sum of salary in descending order.

## **TASK 6**

### **SQL Functions**

1. Display the employee name concatenate with employee number.
2. Display half of employee name in upper case and half in lowercase.
3. Display the month name of date "14-jul-09" in full.
4. Display the Date of joining of all employees in the format "dd-mm-yy".
5. Display the date two months after the Date of joining of employees.
6. Display the last date of that month in "05-Oct-09".
7. Display the rounded date in the year format, month format, day format in the employee

8. Display the commissions earned by employees. If they do not earn commission, display it as "No Commission".

## **TASK 7**

### **Nested Queries**

1. Find the third highest salary of an employee.
2. Display all employee names and salary whose salary is greater than minimum salary of the company and job title starts with 'M'.
3. Write a query to display information about employees who earn more than any employee in dept30.
4. Display the employees who have the same job as Jones and whose salary is greater than or equal to the salary of Ford.
5. List out the employee names who get the salary greater than the maximum salaries of dept with deptno20,30.
6. Display the maximum salaries of the departments whose maximum salary is greater than 9000.
7. Create a table employee with the same structure as the table emp and insert rows into the table using select clause.
8. Create a manager table from the emp table which should hold details only about the managers.

## **TASK 8**

### **Joins, Set Operators**

1. Display all the employees and the departments implementing a left outer join.
2. Display the employee name and department name in which they are working implementing a full outer join.
3. Write a query to display their employee names and their managers' name and salary for every employee.
4. Write a query to output the name, job, empno, deptname and location for each dept, even if there are no employees.
5. Display the details of those who draw the same salary.

## **TASK 9**

### **Views**

1. Create a view that displays the employee id, name and salary of employees who belong to 10<sup>th</sup> department.
2. Create a view with read only option that displays the employee name and their department name.
3. Display all the views generated.
4. Execute the DML commands on views created and drop them
5. Practices on DCL commands.

## **TASK 10**

1. Sequence and Indexes and Table locking
2. Write a PL/SQL code to retrieve the employee name, join date and designation of an employee whose number is given as input by the user.
3. Write a PL/SQL code to calculate tax of employee.
4. Write a PL/SQL program to display top ten employee details based on salary using cursors.
5. Write a PL/SQL program to update the commission values for all the employees' with salary less than 2000, by adding 1000 to the existing values.

### **TASK 11**

1. Write a trigger on employee table that shows the old and new values of employee name after updating on employee name.
2. Write a PL/SQL procedure for inserting, deleting and updating the employee table.
3. Write a PL/SQL function that accepts the department number and returns the total salary of that department.

### **TASK 12**

1. Write PL/SQL program to handle predefined exceptions.
2. Write PL/SQL program to handle user defined exception.
3. Write a PL/SQL code to create
  - i) Package specification
  - ii) Package body to insert, update, delete and retrieve data on emp table.

### **Text Books/ References:**

1. The Complete Reference, 3rd edition by James R. Groff, Paul N. Weinberg, Andrew J. Opper
2. SQL & PL/SQL for Oracle 10g, Black Book, Dr. P. S. Deshpande.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## VALUE ETHICS AND GENDER CULTURE

**Course 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: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 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-abdulali/>
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**

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## COMPUTER ORGANIZATION

**Course Code: GR22A2073**  
**II Year II Semester**

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

### **Course Objectives:**

1. Comprehend operational concepts and understand register organization within a basic computer system
2. Analyze the basic computer organization and understand the concepts of Micro programmed control
3. Understand the design aspects of Central processing unit organization
4. Understand various algorithms for arithmetic operations within a computer system and communication with I/O devices and standard I/O interfaces.
5. Study the hierarchical memory system including cache memory and virtual memory along with the design of Multiprocessor systems using various interconnection structures.

### **Course Outcomes:**

1. Demonstrate knowledge of register organization of a basic computer system
2. Incorporate In-depth understanding of control unit organization and micro programmed control.
3. Understand the performance of central processing unit of a basic computer system.
4. Apply various algorithms to perform arithmetic operations and propose suitable hardware and appraise various methods of communications with I/O devices.
5. Analyze and emphasize various communication media in the basic computer system using design of various memory structures and Multiprocessor systems.

### **UNIT I**

**Basic Structure of Computers:** Computer Types, Functional unit, Data Representation, Fixed Point Representation, Floating – Point Representation, Error Detection codes.

**Register Transfer Language and Micro operations:** Register Transfer language. Register Transfer, Bus and memory transfers, Micro Operations and its types, Arithmetic logic shift unit.

### **UNIT II**

**Basic Computer Organization and Design:** Instruction codes, Computer Registers, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt, Complete Computer Description.

**Micro Programmed Control:** Control memory, Address sequencing, Micro program example, Design of control unit, Micro program Sequencer, Hard wired control Vs Micro programmed control.

### **UNIT III**

**Central Processing Unit Organization:** General Register Organization, STACK organization. Instruction formats, Addressing modes. DATA Transfer and manipulation, Program control. Reduced Instruction set computer.

**Computer Arithmetic:** Addition and subtraction, multiplication Algorithms, Floating – point Arithmetic operations, BCD Adder.

## UNIT IV

**Input-Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input –Output Processor (IOP).

**Pipeline and Vector Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Dependencies, Vector Processing.

## UNIT V

**Memory Organization:** Memory Hierarchy, Main memory- RAM and ROM chips, Memory Address map, Auxiliary memory – Magnetic Disks, Magnetic Tapes, Associative Memory – Hardware Organization, Match Logic, Cache Memory – Associative mapping, Direct mapping, Set associative mapping, Writing into cache and cache initialization, Cache Coherence, Virtual memory – Address Space and Memory Space, Address mapping using pages, Associative Memory page table, Page Replacement.

**Multi Processors:** Characteristics of Multiprocessors, Interconnection Structures, Cache Coherence, Shared Memory Multiprocessors.

### Teaching Methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

### Text Books:

1. Computer Systems Architecture – M.Moris Mano, 3<sup>rd</sup> Edition, Pearson/PHI
2. Computer Organization – Carl Hamacher, ZvonksVranesic, SafeaZaky, 5<sup>th</sup> Edition, McGraw Hill.

### References:

1. Computer Organization and Architecture – William Stallings 7<sup>th</sup> Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 6<sup>th</sup> Edition PHI/Pearson
3. Fundamentals of Computer Organization and Design, - SivaraamaDandamudi Springer Int. Edition.
4. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, 5<sup>th</sup> Edition Elsevier
5. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**OPERATING SYSTEMS**

**Course Code: GR22A2074**

**L/T/P/C: 2/1/0/3**

**II Year II Semester**

**Course Objectives:**

1. Understand main concepts of OS and to analyze the different CPU scheduling policies.
2. Understand process synchronization and deadlock management.
3. Understand memory management and virtual memory techniques.
4. Appreciate the concepts of storage and file management.
5. Study OS protection and security concepts.

**Course Outcomes:**

1. Explain different functions and types of operating system and implement various process management concepts for maximization of CPU throughput.
2. Analyse synchronization problems and design a deadlock management scheme.
3. Optimize memory management for improved system performance.
4. Demonstrate disk management, implement disk scheduling and file system interface
5. Describe protection and security policies for OS.

**UNIT I**

**Operating System Overview:** Objectives and functions, Computer System Architecture, Evolution of Operating Systems, System Services, System Calls, System Programs, OS Structure, Virtual machines.

**Process Management:** Process concepts, CPU scheduling-criteria, Algorithms with evaluation, Preemptive / Non-Preemptive Scheduling, Threads, Multithreading Models.

**UNIT II**

**Concurrency:** Process synchronization, Critical-section problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic problems of synchronization, Monitors.

**Deadlocks:** Principles of deadlock-system model, Deadlock characterization, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

**UNIT III**

**Memory Management:** Swapping, Contiguous memory allocation, Paging, Structure of the page table, Segmentation.

**Virtual Memory:** Demand paging, Page replacement algorithms, Allocation of Frames, Thrashing.

**UNIT IV**

**Mass-storage Structure:** Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management.

**File System Implementation:** Access Methods, File system structure, File system implementation, Directory implementation, Allocation methods, Free-space management.

## **UNIT V**

**Protection:** Goals and Principles of Protection, Implementation of Access Matrix, Access control, Revocation of Access Rights.

**Security:** The Security problem, Program threats, System and network threats, Implementing security defenses.

### **TEXT / REFERENCE BOOKS:**

1. Operating System Principles, 7th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.
3. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
4. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
5. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
6. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.
7. Operating Systems in depth, T. W. Doeppner, Wiley.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## DATA SCIENCE WITH R PROGRAMMING

**Course Code: GR22A2086**  
**II Year II Semester**

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

### Course Objectives

1. Understand the basics concepts and working environment of R
2. Learn basic and descriptive statistical analysis techniques using R
3. Outline the Data Science terminology and describe the Data Science process
4. Discuss Data analysis techniques and model evaluation using R
5. Know R Advance features to solve complex problems

### Course Outcomes:

1. Use R environment, data structures, functions, to solve statistical problems
2. Analyse basic and descriptive statistical analysis methods using R
3. Apply data collection , preparation, visualization and feature engineering with R
4. Summarize data analysis and machine learning techniques with R
5. Implement R advanced features for real time business case studies

### UNIT I

**Introduction to R** - R Windows Environment, R-Data types,R-Data Structures,R Functions and loops, Reading Datasets, Working with different file types, R packages. Introduction to statistical learning and R-Programming,Overview of CRAN.

### UNIT II

**Descriptive Statistics**- Measures of central tendency, Measures of location of dispersions, Practice and analysis with R.

**Basic Statistical Analysis** - Statistical hypothesis generation and testing, Chi-Square test, t-Test, Analysis of variance, Correlation analysis, Maximum likelihood test, Practice and analysis with R.

### UNIT III

**Introduction to Data Science**:Data Science Terminology, Data Science Process, Data Science Project Roles.

**Data Collection and Management**: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources. Data Preparation, Feature Engineering, Data Visualization in R.

### UNIT IV

**Data Analysis techniques** - Exploratory data analysis, Association rules analysis, Regression analysis, Classification techniques, Clustering, Practice and analysis with R  
**Model Evaluation** - Machine Learning concepts, types of machine learning, Machine learning with R.

### UNIT V

**Advanced R Programming** – Data Models, PCA, LDA, Exploratory fact Analysis, NN Modeling with R.

**Business Case studies and projects** -Understanding business scenarios, scalable and

parallel computing with Hadoop and Map-Reduce, Sensitivity Analysis.

**Text Books:**

1. Probability & Statistics for Engineers & Scientists (9th Edn.), Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Prentice Hall Inc.
2. The Elements of Statistical Learning, Data Mining, Inference, and Prediction (2nd Edn.), Trevor Hastie Robert Tibshirani Jerome Friedman, Springer, 2014
3. An Introduction to Statistical Learning: with Applications in R, G James, D. Witten, T Hastie, and R. Tibshirani, Springer, 2013
4. Software for Data Analysis: Programming with R (Statistics and Computing), John M. Chambers, Springer
5. Beginning R: The Statistical Programming Language, Mark Gardener, Wiley, 2013

**Reference Books:**

1. Advances in Complex Data Modeling and Computational Methods in Statistics, Anna Maria Paganoni and Piercesare Secchi, Springer, 2013
2. Data Mining and Analysis, Mohammed J. Zaki, Wagner Meira, Cambridge, 2012
3. Hadoop: The Definitive Guide (2nd Edn.) by Tom White, O'Reilly, 2014
4. MapReduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems, Donald Miner, Adam Shook, O'Reilly, 2014

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## FULL STACK WEB DEVELOPMENT

**Course Code: GR22A2076**  
**II Year II Semester**

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

### **Course Objectives:**

1. Understand the core concepts of both the frontend and backend programming course
2. Get familiar with the latest developments in web technologies
3. Learn new technologies by applying foundation paradigms
4. Knowledge on the client-server architecture using MVC.
5. Connect the web applications to the databases using PHP and MySQL.

### **Course Outcomes:**

1. To develop a complete web application from the scratch that includes Front-end, Back-end and Data-exchange technologies
2. Attain the knowledge of web development basics, HTML, CSS and building interactive web pages using JavaScript & jQuery.
3. Design the applications using XML and AngularJS.
4. Construct the real-world applications using PHP and MySQL
5. Become an industry-ready engineer ready to be deployed in a project

### **UNIT- I**

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets. Introduction to Java Scripts, Objects and Functions in java script, Manipulating DOM, HTML DOM Events, Learning Ajax  
jQuery Programming: Selectors & Mouse Events, Form Events, DOM Manipulation, Effects & Animation, Traversing & Filtering

### **UNIT- II**

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers.  
Angular JS: Introduction, Expressions, Modules, directives, AngularJS HTML DOM, Events, Forms.

### **UNIT -III**

Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

### **UNIT - IV**

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies, and session for session tracking, connecting to database in JSP

## **UNIT – V**

Database Design using MySQL: An Overview of SQL, XAMPP and MySQL Setup, Create Tables, Columns and Insert Data, Selecting Data, Distinct, Aliases & Concat, Update, Delete & Alter, Foreign Keys, Table Joins.

PHP Programming Fundamentals, PHP Data Types & Dates, Cookies, Sessions, Objects and Classes, Intro to PHP & MySQL, creating a MySQL Database, Connect & Fetch data from MySQL, Insert and Delete MySQL data from PHP.

### **Textbooks:**

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech
2. Learning AngularJS: A Guide to AngularJS Development, Ken Williamson, O'Reilly
3. Java Server Pages –Hans Bergsten, SPD O'Reilly
4. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer 1st ed. Edition, Kindle Edition by Chris Northwood

### **References:**

1. Quick Start Full Stack Web Development: Build Secure Asynchronous Single-Page Apps with Flask, React, and PostgreSQL by Erik M. Ferragut (Author)

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## APPLIED STATISTICS FOR ENGINEERS

**Course Code: GR22A2006**  
**II Year II Semester**

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

**Pre-requisites:** Elementary statistics, Calculus and Linear algebra

### Course Objectives

1. Interpret descriptive statistics to concepts in probability theory
2. Understand properties and application of various probability distributions
3. Analyze univariate and bivariate data using correlation and regression
4. Employ tools for the analysis of time series data
5. Apply tests of hypothesis to assess the plausibility of a hypothesis by using sample data

### Course Outcomes

1. Compute and interpret descriptive statistics.
2. Make use of the properties of Binomial, Poisson, Normal and Exponential distributions to estimate the variability of occurrence
3. Analyze univariate and bivariate data using statistical modelling
4. Apply inferential statistics to suggest explanations for a situation arising in the case of large and small samples
5. Apply non parametric tests when the sampled data is distribution-free

### UNIT I

#### Basic Statistics and Random Variables

Measures of central tendency, moments, Skewness and Kurtosis.

Random variables- Discrete&Continuous, Probability mass function and density functions, constants of random variables(Mean, Variance and Moments about mean), Concepts of Bivariate distributions and Covariance.

### UNIT II

#### Discrete and Continuous Probability Distributions

Binomial, Poisson, Normal and Exponential (Properties and applications), evaluation of statistical parameters for Binomial, Poisson and Normal distributions.

### UNIT III

#### Correlation, Regression and Time Series analysis

Correlation(Karl-Pearson's correlation coefficient and Spearman's Rank correlation (Statements of their properties and problems)), Simple and Multiple Linear Regression of three variables (Statements of properties of Regression coefficients and problems).

Components of Time series, Additive and Multiplicative models of Decomposition of Time series, Estimation of trend by method of Moving averages, fitting of various mathematical curves (Straight line and Second degree parabola ).

## **UNIT IV**

### **Testing of Hypothesis-1**

Concept of Sampling distribution and Standard error; tests for single proportion, difference of proportions in large sampling, single mean and difference of means in large and small sampling. Estimation of confidence interval for population mean and population proportions.

## **UNIT V**

### **Testing of Hypothesis-2**

Tests for Population variance, ratio of variances, ANOVA 1-way and 2-way.

Non-parametric Inference: Comparison with parametric inference, Use of order statistics.

Wilcoxon signed rank test, Mann-Whitney U- test and Run test.

Chi-square test for independence of attributes.

### **Texts and References:**

1. S. C.Gupta &V.K.Kapoor, "Fundamentals of Mathematical Statistics", S.Chand.
2. Richard A.Johnson," Probability and Statistics for Engineers", Pearson Education.
3. Jay Devore, "Probability and Statistics for Engineering and the Sciences",Cengage learning.
4. Murat Kulahci,"Time series analysis and forecasting by example",John Wiley & Sons.
5. S. C.Gupta &V.K.Kapoor, "Fundamentals of Applied Statistics", S.Chand.



# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## FULL STACK WEB DEVELOPMENT LAB

Course code: GR22A2078

L/T/P/C:0/0/3/1.5

II Year II Semester

### Prerequisites:

Knowledge of Object Oriented Programming concepts

### Course Objectives:

1. To understand designing of Front-End Applications.
2. To design client-side applications using HTML, JavaScript.
3. To build robust and scalable websites, backend APIs.
4. To understand end-to-end application with exciting features and test it
5. To understand database connectivity with web applications.

### Course Outcomes:

1. To design a website
2. To implement client-side validation.
3. To develop the robust and scalable websites, backend APIs
4. To implement end-to-end applications.
5. To design web applications with database connectivity.

### TASK 1

Develop a website by implementing JavaScript functions for the following problems:

Parameter: A string

Output: The position in the string of the left-most vowel Parameter: A number

Output: The number with its digits in the reverse order

### TASK 2

Write a JavaScript program to calculate the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.

### TASK 3

Write a JavaScript program to display text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXT-SHRINKING” in BLUE color. Then the font size decreases to 5pt.

### TASK 4

Write a JavaScript program to design a simple calculator to perform the following operations: sum, product, difference and quotient

### TASK 5

Write a JQuery AJAX program to request data from the server with an HTTP.

### TASK 6

Create following Student Information form with submit and reset functionality using Angular JS.

**Student Information:**

First Name:

Last Name:

DoB:

Gender:

Training Type:  
 Online  
 OnSite

Subjects  
 Maths  
 Physics  
 Chemistry

Sample AngularJS Form.

### TASK 7

Use AngularJS features to make a shopping list, where you can add or remove items as shown below.

#### My Shopping List

- Milk×
- Bread×

---

- Cheese×

Add

### TASK 8

Write a Servlet Program that accepts the Mobile phone details from user and displays the details on the next page. Create a table and perform insert operation as shown in the Figure 1 below. Connect using JDBC to display each record at a time on the webpage using servlet request and response.

#### Mobile Details

Model Id	Price(Rs.)	Company	Color
J2	12000	Samsung	Silver
6600	20000	Nokia	Black
Note 3	12000	Red Mi	Grey
Zenfone 2	20000	Asus	Grey

Figure 1: Table Details

### **TASK 9**

Develop a JSP Program to validate a particular user login based on the username password stored in the database and display a welcome page.

### **TASK 10**

Write PHP programs to do the following tasks:

- a. Implement simple calculator operations.
- b. Find the transpose of a matrix.
- c. Multiplication of two matrices.
- d. Addition of two matrices.

### **TASK 11**

Write a PHP program named states.py that declares a variable states with value "Mississippi Alabama Texas Massachusetts Kansas". Write a PHP program that does the following:

- a. Search for a word in variable states that ends in xas. Store this word in element 0 of a list named statesList.
- b. Search for a word in states that begins with k and ends in s. Perform a case insensitive comparison. [Note: Passing re.I as a second parameter to method compile performs a case-insensitive comparison.] Store this word in element1 of statesList.
- c. Search for a word in states that begins with M and ends in s. Store this word in element 2 of the list.
- d. Search for a word in states that ends in a. Store this word in element 3 of the list.

### **TASK 12**

Write a PHP program to sort the student records which are stored in the database using selection sort.

#### **Text books:**

1. Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker 1st ed. Edition by Frank Zammetti
2. Web Design with HTML, CSS, JavaScript and jQuery Set 1st Edition by Jon Duckett
3. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer 1st ed. Edition, Kindle Edition by Chris Northwood

#### **References:**

1. Quick Start Full Stack Web Development: Build Secure Asynchronous Single-Page Apps with Flask, React, and PostgreSQL by Erik M. Ferragut (Author)
2. Full Stack Web Development For Beginners: Learn Ecommerce Web Development Using HTML5, CSS3, Bootstrap, JavaScript, MySQL, and PHP by Riaz Ahmed.

**OPERATING SYSTEMS LAB**

**Course Code: GR22A2079**

**L/T/P/C: 0/0/3/1.5**

**II Year II Semester**

**Course Objectives:**

1. Learn different types of CPU scheduling algorithms.
2. Demonstrate the usage of semaphores for solving synchronization problems.
3. Understand Banker's algorithm used for deadlock avoidance.
4. Understand memory management techniques and various page replacement policies.
5. Learn various disk scheduling algorithms and different file allocation methods.

**Course Outcomes:**

1. Evaluate the performance of different types of CPU scheduling algorithms
2. Implement producer-consumer problem, reader-writers problem, and Dining philosophers' problem using semaphores.
3. Simulate Banker's algorithm for deadlock avoidance
4. Implement paging techniques and page replacement policies, memory allocation techniques in memory management.
5. Implement disk scheduling techniques and file allocation strategies .

**TASK 1**

Practice the following commands in UNIX environment

- a) cp          b) rm          c) mv          d) chmod          e) ps          f) kill

**TASK 2**

Write a program that makes a copy of a file using standard I/O and system calls.

**TASK 3**

Simulate the following Scheduling algorithms.

- a) FCFS          b)SJF          c)Priority          d)Round Robin

**TASK 4**

Simulate the Producer Consumer problem using semaphores.

**TASK 5**

Simulate the Readers – Writers problem using semaphores.

**TASK 6**

Simulate the Dining Philosophers problem using semaphores

**TASK 7**

Simulate Bankers Algorithm for Deadlock Avoidance.

**TASK 8**

Simulate First Fit and Best Fit algorithms for Memory Management.

**TASK 9**

Simulate paging technique of memory management.

**TASK 10**

Simulate page replacement Algorithms.

a)FIFO                      b)LRU

**TASK 11**

Simulate following Disk Scheduling algorithms.

a)FCFS                      b)SSTF                      c)SCAN                      d)C-SCAN  
e)LOOK                      f)C-LOOK

**TASK 12**

Simulate file allocation strategies.

a)Sequential              b)Indexed                      c)Linked

**Text Books/ References:**

1. Operating System Concepts- Abraham Silberchatz , Peter B. Galvin, Greg Gagne  
7th Edition, JohnWiley.
2. Operating Systems– Internal and Design Principles Stallings, Fifth Edition–2005,  
Pearson education/PHI.

**DATA SCIENCE WITH R PROGRAMMING LAB**

**Course Code: GR22A2087**

**L/T/P/C: 0/0/4/2**

**II Year II Semester**

**Course Objectives:**

1. To introduce the various programming paradigms.
2. To introduce the principles and techniques involved in design and implementation of modern programming languages
3. To implement mathematical aggregation operators in “R-script” and understand the Statistical operations in “R”.
4. Understanding and being able to use basic programming concepts Automate data analysis
5. Working collaboratively and openly on code, knowing how to generate dynamic documents, being able to use a continuous test-driven development approach.

**Course Outcomes:**

1. Demonstrate to use R in any OS (Windows / Mac / Linux). Able to work with R packages and their installation.
2. Demonstrate exploratory data analysis (EDA) for a given data set.
3. Understand to produce effective visualization for the given data set.
4. Implement and assess relevance and effectiveness of machine learning algorithms for a given dataset.
5. To be able to use and program in the programming language R be able to use R to solve statistical problems, able to implement and describe Monte Carlo the technology, able to minimize and maximize functions using R.

**TASK 1**

- a) Write R script for Vector creation and Data Frames
- b) Implement data analysis and data visualization in R

**TASK 2**

- a) Implement linear and multiple regression model using one variable and multiple variables
- b) Calculate the Error measures SSE, SST, RMSE, and R<sup>2</sup>
- c) Implement Lasso and ridge regression Correlation using R

**TASK 3**

- a) Perform logistic regression using R script
- b) Evaluating model accuracy using confusion matrix using R
- c) Implement ROC curve with threshold selection and Area under the ROC curve.

**TASK 4**

- a) Create the decision tree model using ctree and plot the model
- b) Implement single data imputation and multiple imputation

**TASK 5**

- a) Create Classification and Regression Trees with cross validation
- b) Implement ROC curve for CART

**TASK6**

- a) Implement Random Forest using R
- b) Implement K-fold Cross Validation using R

**TASK 7**

- a) Write R Script for Text Analytics

**TASK 8**

- a) Implement Time Series Analysis in R

**TASK 9**

- a) Implement clustering and Random forest with clustering using R
- b) Implement Heatmaps Using R

**TASK 10**

- a) Implement Support Vector Machines using R
- b) Implement Naive Bayes - Bayesian GLM using R

**Note: min 3 data sets for practice.**

**Text/Reference Books**

1. William N. Venables and David M. Smith, An Introduction to R. 2nd Edition. Network Theory Limited, 2009.
2. Norman Matloff, The Art of R Programming - A Tour of Statistical Software Design, No Starch Press, 2011.
3. Hands-on programming with R, Garrett Golemund, O'Reilley, 1st Edition, 2014.
4. Statistics: An Introduction Using R, Michael J. Crawley, WILEY, Second Edition, 2015.
5. R for everyone, Jared Lander, Pearson, 1st Edition, 2014.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## ENVIRONMENTAL SCIENCE

**Course Code: GR22A2001**  
**II Year II Semester**

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

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 problems
2. Interpret the key components in safe guarding the environment
3. Evolve an individual vision of harmonious interaction with natural world.
4. Appraise the quality of environment in order to create a healthy atmosphere
5. 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

## EFFECTIVE TECHNICAL COMMUNICATION

Course Code: GR22A2108

L/T/P/C:2/0/0/0

### II Year II Semester

#### Course Objectives:

1. Develop proficient written communication skills specific to technical and engineering domains.
2. Familiarize students with various forms of technical discourse, such as technical reports, manuals, and research papers.
3. Empower students with self-assessment tools and strategies for continuous improvement.
4. Enhance communication abilities through effective public speaking and presentation techniques confidently and persuasively.
5. Promote intercultural and ethical awareness in technical communication.

#### Course Outcomes:

1. Demonstrate proficiency in producing well-structured technical documents adhering to standard writing conventions and industry-specific guidelines.
2. Develop critical analysis skills to assess and evaluate technical documents.
3. Develop a habit of lifelong learning in technical communication, recognizing its importance in their personal and professional growth.
4. Exhibit effective oral communication skills by delivering technical presentations with clarity, coherence, and appropriate use of visual aids.
5. Exemplify intercultural competence in technical communication.

#### UNIT- I

**Information Design and Development-** Different kinds of technical documents, Information development life cycle, Organization structures, Factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media, Artificial Intelligence - Voice of the future, Everyday life, Communicating with Machines.

#### UNIT-II

**Technical Writing, Grammar, and Editing-** Abstract Writing, Technical writing process, forms of discourse, Collaborative writing, creating indexes, technical writing style and language, Basics of grammar, and study of advanced grammar, Introduction to Digital Humanities, Managing technical communication projects, Time estimation, Single sourcing, Localization.

#### UNIT-III

**Self-Development and Assessment-** SWOT, Self-assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, Career planning, Self-esteem, Managing Time, Personal memory, Taking notes, Complex problem-solving, Stress Management, Working with Rhythm and Balance, Emotional Intelligence, Six Hats of Thinking.

#### **UNIT-IV**

**Communication and Technical Writing-** Group discussion, Oral presentation, Resume writing, Interview skills, Graphic presentation, Personality Development, Technical articles, Official notes, Memos, and Minutes of meetings.

#### **UNIT-V**

**Ethics-** Business ethics- Corporate Social Responsibility-importance, need, stories, Engineering Ethics, Role and responsibility of engineer, Work culture in jobs.

#### **Textbooks:**

M Ashraf Rizvi, Effective Technical Communication, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.

#### **Reference Books:**

1. Raman Sharma, Technical Communication, Oxford Publication, London, 2013.
2. Meenakshi Raman, Shalini Upadhyay, SOFT SKILLS Key to Success in Workplace and Life, Cengage Learning India Pvt. Ltd., Delhi, 2018.
3. Ron Cowan, The teacher's Grammar of English, CAMBRIDGE UNIVERSITY PRESS, New Delhi, 2008.
4. Shiv Khera, You Can Win, Macmillian Books, New York, 2003.
5. Arthur D. Rosenberg, David Hizer, The Resume Handbook, Adams Media, an F+W Publications Company, 57 Littlefield Street, Avon, MA02322, USA.
6. M. Kay DuPont, Business Etiquette & Professionalism, Viva Books private Limited, Hyd., 2005
7. David F. Beer and David McMurrey, Guide to Writing as an Engineer, John Willey, New York, 2004