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 2024-25)

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD

Academic Regulations for B.Tech (Regular) under GR24

(Applicable for Batches Admitted from 2024-25)

Under Graduate Degree Programme in Engineering and Technology (UG)

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

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

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

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

2. **Admissions:** Admission to the undergraduate (UG) Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the Telangana State Government/JNTUH University from time to time. Admissions shall be made either on the basis of themerit rank obtained by the student in the common entrance examination conducted by the Government/University or on the basis of any other order of merit approved by the Government/University, subject to reservations as prescribed by the Government/University from time to time.

3. **Programme Pattern:**

a) Each Academic Year of study is divided into two semesters.

b) Minimum number of instruction days in each semester is 90.

c) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

d) The total credits for the Programme are 160.

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

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

g) Each semester has 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC, and course structure as suggested by AICTE are followed. The terms 'subject' and 'course' imply the same meaning.

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

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

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

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

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

   a) A student pursues the course of study and completes it successfully in not less than four academic years and not more than eight academic years.
   b) A student has to register for all the 160 credits and secure all credits (with CGPA ≥ 5).
   c) A student must fulfill all the academic requirements for the award of the degree.

5. Courses to be offered

a) **Open Electives:** Students are to register an Open Elective (OE-I) during III year I semester, an Open Elective (OE-II) during III-year II semester, and a Open Elective (OE–III) in IV year I semester from the list of Open Electives given. OE-I and OE-II are to be selected from SWAYAM courses (MOOCs platform).
b) **Professional Electives:** The students have to choose six Professional Electives from the list of Professional Electives given in the course structure.
c) A course may be offered to the students, only if a minimum of 15 students opts for it.
d) More than one faculty member may offer the same subject.
e) A lab/practical may be included with the corresponding theory subject in the same semester) in any semester.
f) If more students opt for a particular course, then the priority shall be given to students firstly on 'first come first serve' basis and secondly based on CGPA (student who has higher CGPA is given more preference).
g) If more students opt for a particular course, then the concerned Head of the Department shall decide whether or not to offer such a course for two or more sections.
h) In case of options coming from students of other departments, priority shall be given to the student of the 'parent department'.

6. Attendance Requirements:

a) A student shall be eligible to appear for the semester-end examinations if he/she puts in a minimum of 75% of attendance in aggregate in all the courses concerned in the semester.
b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in a semester may be granted. A committee headed by Dean (Academic Affairs) shall be the deciding authority for granting the condonation.
c) Students who have been granted condonation shall pay a fee as decided by the Finance Committee.
d) Shortage of Attendance more than 10% (attendance less than 65% in aggregate) shall in no case be condoned.
e) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. **They get detained and their registration for that semester shall stand cancelled**, including all academic credentials (internal marks etc.,) of that semester. **They will not be promoted to the next semester**. They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be reregistered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

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

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

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

b) Distribution and Weightage of marks

S. No	Components	Internal	External	Total
1	Theory	40	60	100
2	Practical	40	60	100
3	Graphics for Engineers	40	60	100
4	Mini Project	40	60	100
5	Project Work	40	60	100

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

Assessment Procedure:

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Theory	40	Internal Examination & Continuous Evaluation	1) Two mid semester examination shall be conducted for 30 marks each for a duration of 120 minutes. Average of the two mid exams shall be considered **i) Subjective – 20 marks** **ii) Objective – 10 marks** 2) Continuous Evaluation is for each unit using **i) Assignment – 05 marks** **ii) Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks**
		60	Semester end examination	The semester-end examination is for a duration of 3 hours
2	Practical	40	Internal Examination & Continuous Evaluation	One internal lab examination towards the end of course for a duration of 90 minutes with a viva of 5 minutes. **i) Internal Exam-10 marks** **ii) Viva voce – 10 marks** **iii) Continuous Assessment- 10 marks** **iv) G-Lab on Board(G-LOB) (Case study inter threading of all experiments of lab)/ Laboratory Project/Prototype Presentation/App Development -10 marks**
		60	Semester end examination	The semester-end examination is for a duration of 3 hours. **i) write-up (algorithm/flowchart/procedure) as per the task/experiment/program - 10 marks** **ii) task/experiment/program-15 marks** **iii) evaluation of results -15 marks** **iv) write-up (algorithm/flowchart/procedure) for another task/experiment/program- 10 marks** **v) viva-voce on concerned laboratory course - 10 marks**

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

d) Mini Project:

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

Note:

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

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

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

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

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

Note:

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

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

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

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

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

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

  CIE is done for 50 marks as follows:
  - There shall be two mid-term examinations during the semester conducted for 40 marks consisting of two parts with a total duration of 2 hours: Part A for 20 marks and Part B for 20 marks.
  - Part A is an objective paper or a quiz and shall consist of multiple-choice questions, fill-in-the blanks, match the following, etc. for a total of 20 marks.
  - Part B is a descriptive paper and shall contain 6 questions out of which, the student needs to answer 4 questions each carrying 5 marks.

- While the first mid-term examination shall be conducted for the first 50% syllabus, the second mid-term examination shall be conducted for the remaining 50% of the syllabus. The average of the two mid-term examinations shall be taken as final marks.
- Two assignments are evaluated for 5 marks each. The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The assignments shall be given by the subject teachers. The average of the two assignments shall be taken as the final marks.
- The remaining 5 marks may be evaluated by conducting viva-voce in the subject or by evaluating the performance of the student in PPT/Poster/Case-Study presentation on a topic in the concerned subject before second mid-term examination**.**

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

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

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

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

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

  A student who is failed in either Real-Time/Field-Based Research Project may reappear once for the evaluation when they are scheduled again; if the student fails again in the evaluation of 'one such reappearance', the student has to reappear for the same in the subsequent semester, as and when it is offered.

- **Mandatory Courses** are evaluated for **50 marks.** The CIE for 50 marks shall be done through first and second mid-term examinations. The average marks of two mid-term examinations are taken as final marks in CIE. Student shall have to earn 40% i.e. 20 marks out of 50 marks in the average of two mid-term examinations. There shall be **NO external evaluation**. The

student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

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

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

8. **Recounting of Marks in the End Examination Answer Books:** A student can request for recounting of his/her answer book on payment of a prescribed fee.

9. **Re-evaluation of the End Examination Answer Books:** A student can request for re- evaluation of his/her answer book on payment of a prescribed fee.

10. **Supplementary Examinations:** A student who has failed to secure the required credits can register for a supplementary examination, as per the schedule announced by the College for a prescribed fee.

11. **Malpractices in Examinations:** Disciplinary action shall be taken in case of malpractices during Mid/ End-examinations as per the rules framed by the Academic Council.

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

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

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

The student is eligible to write Semester End Examination of the concerned subject/course if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

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

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

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

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

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

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

Computation of SGPA and CGPA:

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

i) **Sk** the SGPA of **kth** semester (1 to 8) is the ratio of sum of the product of the number of credits and grade points to the total credits of all courses registered by a student, i.e.,

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

Where **Ci** is the number of credits of the **ith** course and **Gi** is the grade point scored by the student in the **ith** course and **n** is the number of courses registered in that semester.

ii) The CGPA is calculated in the same manner taking into account all the courses **m**, registered by student over all the semesters of a programme, i.e., up to and inclusive of **Sk**, where **k ≥ 2**.

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

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

15. Award of Class: After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B.Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 160 credits.

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA >= 8.00 with no F or below grade/detention anytime during the programme
2	First Class	CGPA >= 8.00 with rest of the clauses of S.No 1 not satisfied
3	First Class	CGPA ≥ 6.50 and CGPA < 8.00

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

Equivalence of grade to marks

Marks % = (CGPA -0.5)*10

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

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

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

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

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

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

18. Transitory Regulations

A. For students detained due to shortage of attendance:

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

B. For students detained due to shortage of credits:

3. A student of GR22 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of GR24 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are

160 including both GR22 & GR24 regulations. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission. The GR24 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in GR24 Regulations:

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

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

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

Note:

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

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

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

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

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

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

20. General Rules

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

Academic Regulations for B.Tech (Lateral Entry) under GR24
(Applicable for Batches Admitted from 2025-26)

1. All regulations as applicable for B.Tech 4-year degree programme (Regular) will hold good for B.Tech (Lateral Entry Scheme) except for the following rules:

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

b) A student should register for all 120 credits and secure all credits. The marks obtained in all 120 credits shall be considered for the calculation of the final CGPA.

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

2. Academic Requirements and Promotion Rules:

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

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

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

	Fourth year second semester.	first semester.

3. Award of Class: After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B.Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 120 credits.

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA >= 8.00 with no F or below grade/ detention anytime during the Programme
2	First Class	CGPA >= 8.00 with rest of the clauses of S.no 1 not satisfied
3	First Class	CGPA ≥ 6.50 and CGPA < 8.00
4	Second Class	CGPA ≥ 5.50 and CGPA < 6.50
5	Pass Class	CGPA ≥ 5.00 and CGPA < 5.50

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

1. Objectives

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4. Registration for the courses in Minor Programme

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

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

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

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

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

5. Minor courses and the offering departments

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

Gokaraju Rangaraju Institute of Engineering and Technology

(Autonomous)

Bachupally, Kukatpally, Hyderabad–500090, India. Ph: (040)65864440

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.Tech – CSE (DS) - GR24 Course Structure

I B. Tech-CSE (DS) - I Semester

S.No	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int.	Ext.	Total Marks
1	Maths	BS	GR24A1001	Linear Algebra and Function Approximation	3	1	0	4	40	60	100
2	Chemistry	BS	GR24A1004	Engineering Chemistry	3	1	0	4	40	60	100
3	ME	ES	GR24A1007	Fundamentals of Electrical Engineering	2	1	0	3	40	60	100
4	CSE	ES	GR24A1006	Programming for Problem Solving	2	0	0	2	40	60	100
5	Chemistry	BS	GR24A1019	Engineering Chemistry Lab	0	0	3	1.5	40	60	100
6	EEE	ES	GR24A1023	Fundamentals of Electrical Engineering Lab	0	0	2	1	40	60	100
7	CSE	ES	GR24A1021	Programming for Problem Solving Lab	0	0	3	1.5	40	60	100
8	ME	ES	GR24A1025	Engineering Workshop	1	0	3	2.5	40	60	100
9	CSE	ES	GR24A1009	Elements of Computer Science and Engineering	1	0	0	1	50	--	50
TOTAL					**12**	**3**	**11**	**20.5**	**370**	**480**	**850**
10	Mgmt	MC	GR24A1028	Design Thinking	**2**	**0**	0	0	50	--	50

I B. Tech-CSE (DS) – II Semester

S.No	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int.	Ext.	Total
1	Maths	BS	GR24A1002	Differential Equations and Vector Calculus	3	1	0	4	40	60	100
2	Physics	BS	GR24A1003	Applied Physics	3	1	0	4	40	60	100
3	English	HS	GR24A1005	English	2	0	0	2	40	60	100
4	CSE	ES	GR24A1017	Data Structures	2	0	0	2	40	60	100
5	ME	ES	GR24A1016	Graphics for Engineers	1	0	4	3	40	60	100
6	Physics	BS	GR24A1018	Applied Physics Lab	0	0	3	1.5	40	60	100
7	CSE	ES	GR24A1024	Data Structures Lab	0	0	2	1	40	60	100
8	English	HS	GR24A1020	English Language and Communication Skills Lab	0	0	2	1	40	60	100
9	CSE	ES	GR24A1027	Python Programming	1	0	0	1	50	--	**50**
		TOTAL			**12**	**2**	**11**	**19.5**	**370**	**480**	**850**

II B.Tech CSE (DS) – I Semester

S.No	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int. Marks	Ext. Marks	Total Marks
1	CSE (DS)	PC	GR24A2084	Data Science	3	0	0	3	40	60	100
2	CSE	PC	GR24A2071	Java Programming	3	0	0	3	40	60	100
3	Mgmt	HS	GR24A2004	Economics and Accounting for Engineers	3	0	0	3	40	60	100
4	CSE	PC	GR24A2077	Discrete Mathematics	2	1	0	3	40	60	100
5	CSE	PC	GR24A2072	Database Management Systems	3	0	0	3	40	60	100
6	CSE (DS)	PC	GR24A2085	Data Science Lab	0	0	3	1.5	40	60	100
7	CSE	PC	GR24A2073	Java Programming Lab	0	0	4	2	40	60	100
8	CSE	PC	GR24A2074	Database Management Systems Lab	0	0	3	1.5	40	60	100
TOTAL					**14**	**1**	**10**	**20**	**320**	**480**	**800**
9	Mgmt	MC	GR24A2002	Value Ethics and Gender Culture	2	0	0	0	50	--	50

II B. Tech – CSE (DS) - II Semester

S.No	BO S	Group	Course Code	Course Name	L	T	P	To tal	Int.	Ext	Total Marks
1	CSE	PC	GR24A2075	Computer Organization	3	0	0	3	40	60	100
2	CSE	PC	GR24A2076	Operating Systems	2	1	0	3	40	60	100
3	CSE	PC	GR24A2079	Design and Analysis of Algorithms	3	0	0	3	40	60	100
4	CSE	PC	GR24A2078	Full Stack Web Development	3	0	0	3	40	60	100
5	Maths	BS	GR24A2006	Applied Statistics for Engineers	3	0	0	3	40	60	100
6	CSE	PC	GR24A2080	Full Stack Web Development Lab	0	0	3	1.5	40	60	**100**
7	CSE	PC	GR24A2081	Operating Systems Lab	0	0	3	1.5	40	60	100
8	CSE (DS)	PC	GR24A2106	Real-time Research Project/ Societal Related Project	0	0	4	2	50	--	50
	TOTAL				**14**	**1**	**10**	**20**	**330**	**420**	**750**
9	HS	MC	GR24A2001	Environmental Science	2	0	0	0	50	--	50

III B. Tech CSE (DS) – I Semester

S.No	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int	Ext	Total Marks
1	CSE	PC		Computer Networks	3	0	0	3	40	60	100
2	CSE(AIML)	PC		Data Warehousing and Data Mining	3	0	0	3	40	60	100
3	CSE(DS)	PC		Data Visualization	3	0	0	3	40	60	100
4.	English	PC		Effective Technical Communication	1	0	0	1	40	60	100
5		PE		Professional Elective-I	3	0	0	3	40	60	100
6		OE		Open Elective-I	3	0	0	3	40	60	100
7	CSE(AIML)	PC		Data Warehousing and Data mining Lab	0	0	2	1	40	60	100
8	CSE(AIML)	PC		Computer Networks Lab	0	0	3	1.5	40	60	100
9	CSE(DS)	PC		Data Visualization Lab	0	0	3	1.5	40	60	100
		TOTAL			**16**	**0**	**8**	**20**	**360**	**540**	**900**
10	Mgmt	MC		Constitution of India	2	0	0	0	50	--	50

PROFESSIONAL ELECTIVE – I				
S. No.	**BOS**	**Group**	**Course Code**	**COURSE**
1	CSE (AIML)	PE		Artificial Intelligence
2	CSE	PE		Cloud Computing
3	CSE	PE		Mobile Application Development
4	CSE	PE		Graph Theory

OPEN ELECTIVE – I				
S. No.	**BOS**	**Group**	**Course Code**	**Course**
1	CSE(DS)	OE		Introduction to Operating Systems

III B. Tech CSE (DS) – II Semester

S.No.	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int.	Ext.	Total Marks
1	CSE(AIML)	PC		Machine Learning	3	0	0	3	40	60	100
2	CSE	PC		Automata and Compiler Design	2	1	0	3	40	60	100
3	CSE(DS)	PC		Big Data Analytics	3	0	0	3	40	60	100
4		PE		Professional Elective-II	3	0	0	3	40	60	100
5		OE		Open Elective-II	3	0	0	3	40	60	100
6	CSE(AIML)	PC		Machine Learning Lab	0	0	3	1.5	40	60	100
7	CSE (DS)	PC		Big Data Analytics Lab	0	0	3	1.5	40	60	100
8	CSE(DS)	PW		Mini Project with Seminar	0	0	4	2	40	60	100
		TOTAL			**14**	**1**	**10**	**20**	**320**	**480**	**800**

PROFESSIONAL ELECTIVE – II

S.No.	BOS	Group	Course Code	COURSE
1	CSE	PE		Software Engineering
2	CSE (DS)	PE		Information Retrieval Systems
3	CSE	PE		DevOps
4	CSE	PE		Blockchain Technology

OPEN ELECTIVE – II

S. No.	BOS	Group	Course Code	Course
1	CSE(DS)	OE		Internet of Things

IV B. Tech CSE (DS) – I Semester

S.No.	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int.	Ext.	Total Marks
1	CSE(DS)	PC		Business Intelligence	3	0	0	3	40	60	100
2	CSE (AIML)	PC		Neural Networks and Deep Learning	3	0	0	3	40	60	100
3		PE		Professional Elective-III	3	0	0	3	40	60	100
4		PE		Professional Elective-IV	3	0	0	3	40	60	100
5		OE		Open Elective- III	3	0	0	3	40	60	100
6	CSE(DS)	PC		Business Intelligence Lab	0	0	4	2	40	60	100
7	CSE (AIML)	PC		Deep Learning Lab	0	0	4	2	40	60	100
8	CSE(DS)	PW		Project Work- Phase I	0	0	12	6	40	60	100
Total					**15**	**0**	**20**	**25**	**320**	**480**	**800**

PROFESSIONAL ELECTIVE – III

S. No.	BOS	Group	Course Code	Course
1	CSE	PE		Cryptography and Network Security
2	CSE (AIML)	PE		Computer Vision and Robotics
3	CSE (AIML)	PE		Natural Language Processing
4	CSE (DS)	PE		Semantic Web

PROFESSIONAL ELECTIVE – IV

S.No.	BOS	Group	Course Code	Course
1	CSE (DS)	PE		Information Storage and Management
2	CSE	PE		Principles of Programing Languages
3	CSE	PE		Design Patterns
4	CSE	PE		Software Testing Methodologies

OPEN ELECTIVE – III

S. No.	BOS	Group	Course Code	Course
1	CSE (DS)	OE		Scripting Languages

IV B. Tech CSE (DS) – II Semester

S.No.	BOS	Group	Course Code	Course Name	L	T	P	Total	Int.	Ext.	Total Marks
1	Mgmt	HS		Fundamentals of Management and Entrepreneurship	3	0	0	3	40	60	100
2		PE		Professional Elective-V	3	0	0	3	40	60	100
3		PE		Professional Elective-VI	3	0	0	3	40	60	100
4	CSE(DS)	PW		Project Work-Phase II	0	0	12	6	40	60	100
Total					**9**	**0**	**12**	**15**	**160**	**240**	**400**

PROFESSIONAL ELECTIVE – V				
S. No.	**BOS**	**Group**	**Course Code**	**Course**
1	CSE	PE		Real Time Operating Systems
2	CSE	PE		Cyber Security
3	CSE(AIML)	PE		Quantum Computing
4	CSE(DS)	PE		Robotic Process Automation

PROFESSIONAL ELECTIVE – VI				
S. No.	**BOS**	**Group**	**Course Code**	**Course**
1	CSE	PE		Distributed Systems
2	CSE	PE		Image and Video Processing
3	CSE(AIML)	PE		Introduction to Drones
4	CSE	PE		Software Process and Project Management

PROFESSIONAL ELECTIVES – 4 THREADS

S. No.	Theory and Algorithms	Applications	Data Science and Machine Intelligence	Software and Technology
1	Artificial Intelligence	Mobile Application Development	Graph Theory	Cloud Computing
2	DevOps	Software Engineering	Information Retrieval Systems	Blockchain Technology
3	Natural Language Processing	Cryptography and Network Security	Computer Vision and Robotics	Semantic Web
4	Information Storage and Management	Principles of Programming Languages	Design Patterns	Software Project Management
5	Real Time Operating Systems	Cyber Security	Quantum Computing	Robotic Process Automation
6	Distributed Systems	Image and Video Processing	Introduction to Drones	Software Process and Project Management

OPEN ELECTIVES FOR GR24 REGULATIONS:

THREAD 1	THREAD 2	OFFERED BY
1. Soft Skills and Interpersonal Communication 2. Human Resource Development and Organizational Behavior 3. Cyber Law and Ethics 4. Economic Policies in India	Data Science for Engineers	**CSE**
	Data Analytics using Open Source Tools	
	Augmented Reality and Virtual Reality	
	Basics of Java Programming	**CSE (AIML)**
	Introduction to DBMS	
	Introduction to Data Mining	
	Introduction to Operating Systems	**CSE (DS)**
	Internet of Things	
	Scripting Languages	
	Services Science and Service Operational Management	**CSBS**
	IT Project Management	
	Marketing Research and Marketing Management	
	Non Conventional Energy Sources	**EEE**
	Concepts of Control Systems	
	Artificial Neural Networks and Fuzzy Logic	
	Principles of Communications	**ECE**
	Sensor Technology	
	Communication Technologies	
	Industrial Automation and Control	**ME**
	Composite Materials	
	Operations Research	
	Engineering Materials for Sustainability	**CE**
	Geographic Information Systems and Science	
	Environmental Impact Assessment	

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

LINEAR ALGEBRA AND FUNCTION APROXIMATION
(COMMON TO CSE, ECE, EEE, CE, ME, CSE(DS), CSE(AIML))

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

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

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

UNIT-1

Fundamentals of Vector and Matrix algebra

Operations on vectors and matrices- Orthogonal projection of vectors- Exact and generalized inverse of a matrix- Rank of a matrix- Linear independence of vectors- Structured square matrices (Symmetric, Hermitian, skew-symmetric, skew-Hermitian, orthogonal and unitary matrices)- Vector and matrix norms
Solution of a linear algebraic system of equations (homogeneous and non-homogeneous) using Gauss elimination

UNIT-II

Matrix eigenvalue problem and Quadratic forms

Determination of eigenvalues and eigenvectors of a matrix, properties of eigenvalues and eigenvectors (without proof)- Similarity of matrices- Diagonalization of a matrix- Orthogonal diagonalization of a symmetric matrix- Definiteness of a symmetric matrix
Quadratic Forms- Definiteness and nature of a quadratic form- Reduction of a quadratic form to the canonical form using an orthogonal transformation

UNIT-III

Matrix decomposition and Least squares solution of algebraic systems

LU decomposition- Cholesky decomposition- Gram-Schmidt orthonormalization process- QR factorization- Eigen decomposition of a symmetric matrix- Singular value decomposition
Least squares solution of an over determined system of equations using QR factorization and the generalized inverse- Estimation of the least squares error

UNIT-IV

Function approximation tools in engineering

Mean value theorems- Lagrange's mean value theorem, Taylor's theorem (without proof), Approximation off a function by Taylor's series
The principle of least squares- Function approximation using polynomial, exponential and power curves using matrix notation- Estimating the Mean squared error

UNIT-V

Multivariable differential calculus and Function optimization

Partial Differentiation- Chain rule- Total differentiation- Jacobian- Functional dependence
Multivariable function Optimization- Taylor's theorem for multivariable functions- Unconstrained optimization of functions using the Hessian matrix- Constrained optimization using the Lagrange multiplier method

TEXT BOOKS:

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

REFERENCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

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

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

Course Outcomes

After completion of the course, the student should be able to

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

Unit I: Water and its Treatment:

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

Unit II: Battery Chemistry and Corrosion

Introduction - Classification of **Batteries**- primary, and secondary batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of Zn-air and Lithium-ion battery, Applications of Li-ion battery to electric vehicles.

Fuel Cells - Definition, Construction, working principle and applications of Hydrogen-Oxygen fuel cell and Solid oxide fuel cell, Differences between battery and a fuel cell.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods.

Unit III: Polymers

Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples – Nylon 6:6

Plastics: Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Compounding and fabrication of plastics - compression moulding and injection moulding. Fiber-reinforced plastics (FRP).

Conducting Polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable Polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

Unit V: Energy Resources

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

UNIT - V: Engineering Materials

Smart materials and their engineering applications: Shape memory materials- Poly L-Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinyl amides.

Biosensors: Definition, characteristics, classification-, construction & working, applications and advantages of biosensors. Biochips -Definition, advantages, and applications.

Semiconductors: Si and Ge - Preparation, Ultra-purification and Crystal Growth by Zone Refining and Czochralski Crystal Pulling methods, Doping – Epitaxy, Diffusion and Ion-implantation.

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FUNDAMENTALS OF ELECTRICAL ENGINEERING
(CSE, CSE(AIML), CSE(DS) and ECE)

Course Code: GR24A1007 **L/T/P/C:2/1/0/3**
I Year I Semester

COURSE OUTCOMES

1. Summarize the basic fundamental laws of electric circuits.
2. Analyze electric circuits with suitable theorems.
3. Distinguish the single phase and three phase systems.
4. Interpret the working principle of Electrical machines.
5. Outline the protection principles using Switch gear components.

UNIT I
NETWORK ELEMENTS & LAWS

Charge, Current, Voltage, Power, Active elements, Independent and dependent sources. Passive elements - R, L and C, Energy stored in inductance and capacitance, Kirchhoff's laws, Source transformations, Star-delta transformations, Node voltage method, mesh current method.

UNIT II
NETWORK THEOREMS

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

UNIT III
AC CIRCUITS

Representation of sinusoidal waveforms, RMS and average values of periodic sinusoidal and non- sinusoidal waveforms, Phasor representation, Types of power, active power, Reactive power and Apparent power, Power factor. Impedance and Admittance, Analysis of series, parallel and series-parallel circuits, Introduction to three-phase circuits, types of connection. voltage and current relations in star and delta connections. Resonance: Series circuits, Bandwidth and Q-factor.

UNIT IV
BASICS OF ELECTRICAL MACHINES

Transformer: Mutual Induction, construction and working principle, Types of transformers, Ideal transformer, EMF Equation-simple Problems.

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

UNIT V

ELECTRICAL INSTALLATIONS

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, MCCB, Earthing – Plate and Pipe Earthing. Types of Batteries – Primary and Secondary, UPS (Uninterrupted power supply)-components, calculation of ratings for UPS-Components to a specific load, power factor improvement methods.

TEXTBOOKS

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

REFERENCES

1. "A Textbook of Electrical Technology",- BL Theraja volume-I, S.Chand Publications.
2. "Electrical Machinery", P. S. Bimbhra, Khanna Publishers, 2011.
3. "Electrical and Electronics Technology", E. Hughes, 10th Edition, Pearson, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING

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

Course Outcomes

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

UNIT I
Introduction to Programming:
Introduction to Algorithms: Representation of Algorithm, Flowchart, Pseudo code with examples, compiling and executing programs, syntax and logical errors.
Introduction to C Programming Language: Structure of C program, keywords, variables, constants, datatypes, operators, precedence and associativity, expression evaluation, implicit and explicit type conversion, formatted and unformatted I/O.

UNIT II
Decision Making and Arrays:
Branching and Loops: Conditional branching with simple if, if-else, nested if else, else if ladder,switch-case, loops: for, while, do-while, jumping statements: goto, break, continue, exit.
Arrays: One and two dimensional arrays, creating, accessing and manipulating elements ofarrays. **Searching:** Introduction to searching, Linear search and Binary search.

UNIT III
Strings and Functions:
Functions: Introduction to structured programming, function declaration, signature of a function, parameters and return type of a function, categories of functions, parameter passing techniques, passing arrays and strings to functions, recursion, merits and demerits of recursive functions, storage classes.
Strings: Introduction to strings, operations on characters, basic string functions available in C -strlen, strcat, strcpy, strrev, strcmp, String operations without string handling functions, arrays of strings.

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

pointer.

Structures and Unions: Defining structures, declaring and initializing structures, arrays withinstructures, array of structures, nested structures, passing structures to functions, unions, typedef.

UNIT V

File handling and Preprocessor in C:

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

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

Teaching methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

TEXT BOOKS

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

REFERENCE BOOKS

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY LAB

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

I year I Semester

Course Outcomes

The experiments will make the student gain skills on:

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

List of Experiments

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

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FUNDAMENTALS OF ELECTRICAL ENGINEERING LAB

(CSE, CSE (AIML), CSE (DS) and ECE)

Course Code: GR24A1023 **L/T/P/C:0/0/2/1**
I Year I Semester

COURSE OUTCOMES

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

LIST OF EXPERIMENTS

Any ten experiments should be conducted.

1. Verification of Ohms Law, KVL and KCL.
2. Verification of Thevenin's & Norton's Theorems.
3. Verification of Superposition and Reciprocity Theorems.
4. Resonance in series RLC circuit.
5. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
6. Verification of Voltage and Current relations in Three Phase Circuits (Star-Delta)
7. Measurement of Active and Reactive Power in a balanced Three-phase circuit.
8. Torque – speed characteristics of a Separately Excited DC Shunt Motor.
9. Torque-Slip Characteristics of a Three-phase Induction Motor.
10. No-Load Characteristics of a Three-phase Alternator.
11. Verification of Maximum Power Transfer Theorem.
12. Power factor improvement by using capacitor bank in parallel with inductive load.

TEXTBOOKS

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

REFERENCES

1. "A Textbook of Electrical Technology",- BL Theraja volume-I, S.Chand Publications.
2. "Electrical Machinery", P. S. Bimbhra, Khanna Publishers, 2011.
3. "Electrical and Electronics Technology", E. Hughes, 10th Edition, Pearson, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING LAB

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

I Year I Semester

Course Outcomes

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

TASK 1

a. Write a C program to convert days into years, weeks and days.(Assume a year has 365days).

b. Write a C program to find greatest and smallest among three numbers using conditionaloperator.

c. Write a C program to enter P, T, R and calculate Compound Interest.

TASK 2

a. Write a C program to swap two numbers using the following:

b. Using third variable

c. Without using third variable

d. Using bitwise operators

e. Write a C program to do the following using implicit and explicit type conversion

f. Convert Celsius temperature to Fahrenheit

g. Convert Fahrenheit temperature to Celsius

h. Find area of a triangle given sides a,b,c

TASK 3

a. Write a C program to add two numbers without using arithmetic operators in C.

b. Write a C program to determine whether a number is a power of 2 or not using bitwise operator and ternary operator.

c. Write a C program to check whether a number is even or odd using bitwise operator and ternary operator.

TASK 4

a. Write a C program to find the roots of a quadratic equation using if-else.

b. Write a C program to input electricity unit charges and calculate total electricity bill according to the given condition:

For first 50 units Rs. 0.50/unit

For next 100 units Rs. 0.75/unit For next 100 units Rs.

1.20/unit For unit
above 250 Rs.
1.50/unit
An additional surcharge of 20% is added to the bill

c. Write a menu driven C program to implement a simple arithmetic calculator.
d. Write a C program to display number of days in month using switch case (The input is month number 1 -12).

TASK 5

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

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TASK 6

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

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

b. Write a C program to generate the prime numbers between x and y where x and y arestarting and ending values to be supplied by the user.

c. Write a C program to calculate the sum of following series:(i) S1=1+x/1!-x^2/2!+x^3/3!-x^4/4!+…..xn/n!

(ii) S2= x^1/1+x^3/3+x^5/5+….+x^n/n

TASK 7

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

TASK 8

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

TASK 9

a. Write a C program to display binary equivalent of a given decimal number usingfunctions.
b. Write a C program to implement transpose of a matrix using functions
c. Write a C program using functions that compares two strings to see

whether they areidentical or not. The function returns 1 if they are identical, 0 otherwise.

TASK 10

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

b. Write a C programto find the GCD (greatest common divisor) of two given integers usingrecursive and non-recursive functions.

c. Write a C program to print first 'n' terms of Fibonacci series using recursive and non- recursive functions.

TASK 11

a. Write a C program to implement the following with and without string functions:

(i) Reverse a string (ii) Concatenate 2 strings.

b. Write a C program to read a string and determine whether it is palindrome or not.

c. Write a C program to sort the 'n' strings in the alphabetical order.

TASK 12

a. Write a C program to implement function pointer to find sum and product of two numbers.

b. Write a C program to sort list of numbers using pointers.

TASK 13

a. Define a structure Student, to store the following data about a student: rollno(int), name(string)and marks. Suppose that the class has 'n' students. Use array of type 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 oftwo complex numbers? (use structures and functions)

TASK 14

a. Write a C program to merge two files into a third file.

b. Write a C program to count number of characters in a file and also convert all lower casecharacters to upper case and display it

c. Write a C program to append a file and display it

TASK 15

a. Write a C program to find sum of 'n' numbers using command line arguments.

b. Write a C program to implement following pre-processor directives:

i. define ii. undef iii. ifdef iv. ifndef.

c. Write a C program to create a user defined header file to find sum, product and greatestof two numbers.

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, CengageLearning, (3rd Edition)

REFERENCE BOOKS

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING WORKSHOP

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

I B.Tech I Semester

Course Outcomes

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

TRADES FOR EXERCISES: At least two tasks from each trade

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

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

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

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

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

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

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

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

Text Books

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

Reference Books

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELEMENTS OF COMPUTER SCIENCE AND ENGINEERING

Course Code: GR24A1009 **L/T/P/C:1/0/0/1**

I Year I Semester

Course Outcomes

1. Interpret the working principles of functional units of a basic Computer.
2. Analyze steps in program development and types of operating systems.
3. Identify the significance of database systems and computer networks.
4. Develop applications using MS-Word and MS-Excel .
5. Design presentations using MS-PowerPoint and develop web pages using web designing tools.

UNIT – I

Basics of a Computer – Characteristics of computer, Generations, classification, Hardware - Components of CPU, Memory – hierarchy, types of memory, Input and output devices. Software – systems software, application software, packages, frameworks, IDEs.

UNIT – II

Software development – Waterfall model, Agile, Types of computer languages – Programming, markup, scripting, Program Development – steps in program development, flowcharts, algorithms.

Operating systems: Functions of operating systems, types of operating systems, Examples of OS- MS-DOS, Windows, Linux, Installation and formatting of Windows OS.

UNIT – III

Database Management Systems: Database Vs File System, Database applications, types of DBMS, Database users, SQL – Types of SQL commands.

Computer Networks: Advantages of computer networks, LAN, WAN, MAN, internet, WiFi, 5G communications – evolution, key technologies.

UNIT – IV

MS-Word: Introduction, MS-Word screen and its components- Office button—New, open, save, save as, print, close, Ribbon—Home, Insert, Page layout, References, Review, View. Example Applications - Resume preparation, Magazine Cover, Mail merge.

MS-Excel: Basics of Spreadsheet, MS-Excel screen and its components, Office button, Ribbon-Home, Insert, Page Layout, Formulas, Data, Review, View. Example Application- Employee Salary calculation.

UNIT – V

MS-PowerPoint: MS-PowerPoint screen and its components, Office button, Ribbon-Home, Insert, Design, Animations, Slideshow, Review, View. Example - Design a "Happy Birthday" card.

World Wide Web: Basics, role of HTML, CSS, XML, Tools for web designing, Social media.

Teaching methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

TEXT BOOKS

1. Computer Fundamentals, Anita Goel, Pearson Education India, 2010.
2. Invitation to Computer Science, G. Michael Schneider, Macalester College, Judith L. Gersting University of Hawaii, Hilo, Contributing author: Keith Miller University of Illinois, Springfield.

REFERENCE BOOKS

1. Introduction to computers, Peter Norton, 8th Edition, Tata McGraw Hill.
2. Elements of computer science, Cengage.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN THINKING

Course Code: GR241028 **L/T/P/C: 2/0/0/0**
I Year I Semester

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

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

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

UNIT - III Designing Customer Experience: Understanding Innovation through Design Thinking; Enhancing Customer Experience; Service Design and Development Process and Case Studies; Service Experience Cycle and Case Studies .

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

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

TEXTBOOKS

1. 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, Vijay Kumar, John Wiley & Sons, ISBN: 978-1118083468, 2012
2. Living with Complexity, Donald A Norman, MIT Press, ISBN: 978-0262528948, 2016
3. Design Thinking for Entrepreneurs and Small Businesses: Putting the Power of Design to Work, Beverly Rudkin Ingle, A Press, ISBN: 978-1430261810, 2013

REFERENCE BOOKS

1. Emotionally Durable Design: Objects, Experiences and Empathy, Jonathan Chapman, 2nd Edition, Routledge, ISBN: 978-0415732161, 2015
2. Innovation Design: How Any Organization Can Leverage Design Thinking to Produce Change, Drive New Ideas, and Deliver Meaningful Solutions, Thomas Lockwood, Edgar Papke, New Page Books, ISBN: 978-1632651167, 2017
3. Design Thinking Business Analysis: Business Concept Mapping Applied, Thomas Frisendal, Springer, ISBN: 978-3642434822, 2012
4. Chapter 1: A Simple Framework for Leading Innovation, The Three Box Solution, HBR Press, 2016
5. Design a Better Business: New Tools, Skills and Mindset for Strategy and Innovation, Patrick Van Der Pijl, Justin Lokitz, Lisa Kay Solomon, Erik van der Pluijm, Maarten van Lieshout, Wiley, ISBN: 978-8126565085, 2016

I YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(COMMON TO CSE, ECE, EEE, CE, ME, CSE(DS), CSE(AIML))

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

Course Outcomes: After learning the contents of this paper, the student must be able to

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

UNIT-I
ORDINARY DIFFERENTIAL EQUATIONS OF THE FIRST ORDER

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

UNIT-II
ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

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

UNIT-III

MULTIPLE INTEGRALS

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

UNIT-IV
VECTOR DIFFERENTIATION AND LINE INTEGRATION

Vector differentiation: Scalar and vector point functions, Concepts of gradient, divergence and curl of functions in cartesian framework, solenoidal field, irrotational field, scalar potential Vector line integration: Evaluation of the line integral, concept of work done by a force

field, Conservative fields

UNIT-V
SURFACE INTEGRATION AND VECTOR INTEGRAL THEOREMS

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

TEXT BOOKS

1. R.K.Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa publishing house, Fourth edition 2014
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
4. . G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

REFERENCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

APPLIED PHYSICS
(Common to all branches)

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

Course Outcomes:

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

UNIT I: Quantum Physics and Solids

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

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

UNIT II: Semiconductors and devices

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

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

UNIT III: Magnetic materials and Superconductivity

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

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

UNIT IV: Lasers and Fiber Optics

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

Fiber Optics: Introduction, Principle and Structure of an optical fiber, Basic components in optical fiber communication system, Advantages of optical fibers over conventional cables,

Types of optical fibers, Acceptance angle-Numerical aperture, Losses associated with optical fibers, Applications of optical fibers.

UNIT V: Nanotechnology

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

Text books:

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

References:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH

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

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

Course Outcomes:
Students will be able to

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

UNIT – I

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

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

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

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

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

UNIT – II

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

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

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

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

Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events– Classifying- Providing Examples or Evidence.

UNIT – III

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

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

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

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

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

UNIT – IV

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

Vocabulary: Standard Abbreviations in English
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice
Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion - Précis Writing.

UNIT - V

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

Vocabulary: Technical Vocabulary and their Usage
Grammar: Common Errors in English (*Covering all the other aspects of grammar which were notcovered in the previous units*)
Reading: Reading Comprehension-Exercises for Practice
Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

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

- **<u>Note</u>: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* ***Open-ended***, besides following the prescribed

textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on theneeds of the students in their respective colleges for effective teaching/learning in the class.

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

TEXTBOOK:

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

REFERENCE BOOKS:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA STRUCTURES

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

Course Outcomes:

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

UNIT I

Algorithms and Complexities: Analysis of algorithms, Basic concept of order of complexity, Asymptotic Notations: Big Oh notation, Omega notation, Theta notation, little oh notation and little omega notation.

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

UNIT II

Stacks: Introduction to Data Structures and types, Stack – Operations: pop, push, display, peek,Representation and implementation of stack operations using arrays, stack applications, recursion, infix to postfix transformation, evaluating postfix expressions.

Queues: Queue – Operations: enqueue, dequeue, display, representation and implementation ofqueue operations using array, applications of queues, circular queues - representation and implementation.

UNIT III

LIST: Introduction, dynamic memory allocation, self-referential structures, single linked list, advantages and disadvantages of single linked list, single linked list vs arrays, representation of a linked list in memory, operations-insertion, deletion, display, search.

Types and applications: Circular linked list, double linked list, implementation of stack, queue using linked list.

UNIT IV

Trees: Basic tree concepts, Binary trees**:** properties, types, representation of binary trees using arrays and linked lists, traversals of binary tree.

Binary Search Tree –Representation and implementation of operations, Binary Search Tree Traversals (recursive), creation of binary tree and BST from given traversals.

UNIT V

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

Hashing - Introduction to hashing, hash function and types, hash table, implementation,

collisionresolution techniques–separate chaining, linear probing, quadratic probing, double hashing (onlyexamples – no implementation).

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

REFERENCE BOOKS

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

GRAPHICS FOR ENGINEERS

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

I Year II Semester

Course Outcomes

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

UNIT I

Introduction to AutoCAD software: user interface, tool bar -draw, modify, dimension, layers, setting drawing area, status bar, print setup, generation of two-dimensional drawings.

Construction of Engineering Curves- Ellipse, Parabola and Hyperbola -general method only.

UNIT II

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

UNIT III

Projections of planes - definition and types of regular plane figures like triangle, square, pentagon, hexagon, and circle; projections of planes -inclined to one reference plane only.

Projections of solids - definition and types of right regular solids objects like prism, cylinder, pyramid, and cone; projections of solids -axis inclined to one reference plane only.

UNIT IV

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

Development of surfaces- Development of surfaces of Right Regular Solids like Prism, Pyramid, Cylinder and Cone.

UNIT V

Isometric views– isomeric views of lines, planes (polygons) and solids (prism, cylinder, pyramid, and cone); generation of Isometric line diagrams. World Coordinate System, User Coordinate System.

Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.

Text Books:

1. Engineering Drawing by N. D. Bhatt, Fiftieth Revised and Enlarged Edition:2011, Charotar Publishing House Pvt. Ltd.

2. Engineering Graphics by Basant Agrawal and C M Agrawal, fifth re-print 2011, Tata McGraw Hill Education Private Limited, New Delhi.

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPLIED PHYSICS LAB
(Common to all branches)

Course Code: GR24A1018 **L/ T/ P/ C:0/0/3/ 1.5**
I Year II Semester

Course Outcomes:

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

List of Experiments

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

Note: Any 8 experiments are to be performed.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA STRUCTURES LAB

Course Code: GR24A1024 **L/T/P/C: 0/0/2/1**

I Year II Semester

Course Outcomes:

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

TASK 1

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

TASK 2

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

TASK 3

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

TASK 4

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

TASK 5

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

TASK 6

a. Implement the following operations on Single Linked List using a C program.
i. create
ii. insert
iii. delete
iv. search
v. display

TASK 7

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

insert, deleteand display.

TASK 8

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

TASK 9

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

TASK 10

a. Implement the following operations on Binary Search Tree
   i. create
   ii. insert
   iii. search
   iv. delete

TASK 11

a. Implement the following operations on Binary Search Tree
   i. count-nodes
   ii. height
   iii. minimum node
   iv. maximum node

TASK 12

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

TASK 13

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

TASK 14

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

TASK 15

a. Implement a C program for the following operations on Hashing:
   i. insert
   ii. delete
   iii. search
   iv. display

TEXT BOOKS

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

REFERENCE BOOKS

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

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

Subject Code: GR24A1020 **L/T/P/C: 0/0/2/1**
I year II Semester

Course Outcomes:
Students will be able to

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

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

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

Exercise I

CALL Lab:

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

ICS Lab:

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

Exercise II

CALL Lab:

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

ICS Lab:

Understand: Features of Good Conversation – Non-verbal Communication.
Practice: Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions-
Telephone Etiquette, Rapid Round –Memory Games.

Exercise III

CALL Lab:

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

ICS Lab:

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

Exercise IV

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

ICS Lab:

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

Exercise V

CALL Lab:

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

ICS Lab:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PYTHON PROGRAMMING

Course Code: GR24A1027 **L/T/P/C: 1/0/0/1**

I Year II Semester

Course Outcomes:

1. Demonstrate the fundamental concepts and flow control in Python
2. Implement different sequence types and file handling operations.
3. Design python programs using functions and exception handling mechanisms.
4. Develop programs with object oriented programming features and modules.
5. Design GUI based applications using Tkinter.

UNIT I

Introduction: features of Python-Interactive execution, comments, types, variables, operators, expressions, Statements-assignment, input, print.

Control flow: if, if-else, if-elif-else Statements, Nested Decision Structures, Loops-while loop, for loop, Nested Loops, break, continue, pass statement.

UNIT II

Sequences: Strings, Lists and Tuples-basic operations and functions, iterating over sequences, Sets and Dictionaries- operations and functions, Python program examples.

Files-operations-opening, reading, writing, closing, file positions.

UNIT III

Exceptions: raising and handling exceptions, try/except statements, finally clause, standard exceptions, custom exceptions.

Functions: definition, call, scope and lifetime of variables, keyword arguments, default parameter
values, variable length arguments, recursive functions, Lambda function.

UNIT IV

Modules: Modules, Standard Modules, Importing Modules, Namespaces and Packages.

Object Oriented Programming: Classes, constructors, objects, class variables, class methods, static methods, operator overloading. Inheritance-is-a relationship, composition, polymorphism, overriding, multiple inheritance, abstract classes, multithreaded programming, Python program examples.

UNIT V

GUI Programming: Introduction, Tkinter, Widgets (Buttons, Canvas, Frame, Label, Menu, Entry, Text, Scrollbar, Combobox, Listbox), event driven programming-events, callbacks, binding, layout management- geometry managers: pack and grid, creating GUI based applications in Python.

Teaching methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

TEXT BOOKS

1) Exploring Python, Timothy A. Budd, McGraw Hill Publications.
2) Introduction to Programming using Python, Y.Daniel Liang, Pearson.
3) Python Programming, Sheetal Taneja and Naveen Kumar, Pearson.

REFERENCE BOOKS

1) Introduction to Computer Science using Python, Charles Dierbach, Wiley India Edition.
2) Internet of Things - A hands on approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015.
3) Fundamentals of Python, K. A. Lambert, B.L. Juneja, Cengage Learning.
   Think Python, how to think like a computer scientist, Allen B. Downey,SPD, O'Reilly.
4) Core Python Programming, Wesley J.Chun, second edition, pearson.

II YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

DATA SCIENCE

Course Code: GR24A2084 **L/T/P/C: 3/0/0/3**
II Year II Semester

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

I**ntroduction 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 forHadoop and Other Systems, Donald Miner, Adam Shook, O'Reilly, 2014

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

JAVA PROGRAMMING

Course Code: GR24A2071 **L/T/P/C : 3/0/0/3**

II Year I Semester

Course Outcomes:

1. Identify the model of Object-Oriented Programming: Abstract data types, Encapsulation,Inheritance and Polymorphism.
2. Summarize the fundamental features like Interfaces, Exceptions and Collections.
3. 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 linearguments, Nested Classes

Strings: String, String Buffer, String Tokenizer

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, userdefined Exception.

UNIT IV
MULTITHREADING, COLLECTIONS

java.lang.Thread, the main Thread, creation of new Threads, Thread priority, multithreading- usingisalive() and join(), Synchronization, suspending and resuming Threads, Communication between Threads. Exploring java.io, Exploring java.util

Collections: Overview of Collection Framework: ArrayList, Vector, TreeSet, HashMap,

HashTable,Iterator, Comparator.

UNIT V
APPLETS, AWT AND SWINGS
Applet class, Applet structure, an example Applet program, Applet life cycle.
Event Handling- Introduction, Event Delegation Model, Java.awt.event Description, Adapter classes,Innerclasses.
Abstract Window Toolkit: Introduction to AWT, components and containers, Button, Label, Checkbox,Radio buttons, List boxes, choice boxes, Text field and Text area, container classes, Layout Managers. **Swing:** Introduction, JFrame, JApplet, JPanel, Components in swings, JList and JScroll Pane, Split Pane, JTabbed Pane, Dialog Box, Pluggable Look and feel.

Teaching methodologies:
- Power Point Presentations
- Tutorial Sheets
- Assignments

TEXT BOOKS
1. Java: The Complete Reference, 10th edition, Herbert Schildt, Mcgraw Hill.
2. Java Fundamentals: A Comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.

REFERENCE BOOKS
1. Java for Programming, P.J. Dietel Pearson Education.
2. Object Oriented Programming through Java, P. Radha Krishna, Universities Press.
3. Thinking in Java, Bruce Eckel, Pearson Education.
4. Programming in Java, S.Malhotra and S.Choudhary, Oxford University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

ECONOMICS AND ACCOUNTING FOR ENGINEERS

Code: GR24A2004 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Outcomes:

After studying this course, students will be in a position to:

1. The students will be able to understand the managerial economics, analyze demand behavior and interpret the concepts of national income indicators.
2. The student will be able to plan the production levels in tune with maximum utilization of organizational resources to determine optimal input combinations for production processes.
3. To recognize the type of markets based on competition levels, the characteristics and determine pricing strategies for products and services.
4. Understand the importance of capital budgeting in the context of strategic financial management and identify, evaluate investment opportunities using appropriate capital budgeting techniques.
5. Learners understand the fundamental principles, concepts & conventions of accounting, including the recording of business transactions using journals, ledgers, preparation of trail balance and more emphasis on preparation of final accounts.

Unit-1: Introduction & Demand Analysis: ***Definition and Scope:*** Introduction to micro, macroeconomics, Nature, and Scope of Managerial Economics. National Income and its Components - GNP, NNP, GDP, NDP, ***Introduction to demand:*** Demand Determinants, Law of Demand, and its exceptions. ***Elasticity of Demand***: Definition, Types, Measurement and Significance of Elasticity of Demand. ***Demand Forecasting***, Factors governing demand forecasting, methods of demand forecasting, Law of supply.

Unit-2: Production & Cost Analysis: ***Production Function*** – Law of variable proportions, Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Laws of Returns, Internal and External Economies of Scale. ***Cost Analysis*****:** Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

Unit-3: Markets and Forms of Business organizations: ***Types of competition and Markets***, Features of Perfect competition, Monopoly and Monopolistic Competition. ***Pricing*****:** Objectives of Pricing, Methods of Pricing. *Business:* Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises.

Unit-4: Introduction to Financial Accounting: ***Accounting Concepts and Conventions*** - Double-Entry Bookkeeping. ***Accounting Cycle:*** Journal, Ledger, Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

Unit-5: Capital Budgeting: Capital and its significance, Types of Capital, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value (NPV) Method and Internal Rate of Return (IRR) (simple problems) and Profitability Index (PI)

Textbooks:

1. Managerial Economics – International Edition, 2019, by Christopher Thomas (Author), S. Charles Maurice (Author), McGraw-Hill Education
2. Managerial Economics & Business Strategy, Michael R. Baye, Jeffrey T. Princ, McGraw-Hill Education, 2021 (10th Edition)
3. Managerial Economics, Mark Hirschey, Cengage Learning, 2016 (13th Edition)
4. Managerial Economics: Analysis, Problems and Cases - P. L. Mehta, Edition, 13. Publisher, Sultan Chand, 2016.
5. Managerial Accounting, Carl S. Warren, James M. Reeve, Jonathan Ducha, Cengage Learning, 2021
6. Managerial Accounting: Tools for Business Decision Making (9th Edition), Jerry J. Weygandt, Paul D. Kimmel, Donald E. Kieso, Wiley, 2021
7. Managerial Economics Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.

Reference Books:

1. Managerial Economics 4th Edition, W. Cris Lewis, Sudhir K. Jain, H. Craig Petersen, Pearson, 2009
2. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2009
3. Financial Accounting, 6/e, Dr S N Maheshwari, CA Sharad K Maheshwari & Dr Suneel K Maheshwari, Vikas Publishing, 2018

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DISCRETE MATHEMATICS

Course Code: GR24A2077 **L/T/P/C: 2/1/0/3**

II Year I Semester

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. 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 ofcontradiction.

UNIT II

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

Functions: Inverse function, Composite of functions, Recursive functions, Pigeon hole principle and itsapplication.

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 ofIsomorphism 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

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. Discrete Mathematics for Computer Scientists and Mathematicians 2nd Edition by Joe L. Mott, Abhraham Kandel and Theodore P. Baker

REFERENCE BOOKS

1. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition.TMH.
2. Discrete Mathematics with Applications, Thomas Koshy, Elsevier
3. Discrete Mathematical Structures, Bernand Kolman, Roberty C. Busby, Sharn Cutter Ross,Pearson
4. Discrete mathematical structures, Dr. D S Chandrashekar, PRISM Publishers.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATABASE MANAGEMENT SYSTEMS

Course Code: GR24A2072 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Outcomes:

1. Interpret the concepts of Database systems and design issues in modeling applications.
2. Develop the database using constraints and queries in SQL and PL/SQL.
3. Outline the concepts of relational model and indexing techniques.
4. Apply the Schema Refinement techniques for database design.
5. Summarize the components of transaction management in database systems.

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

UNIT II

SQL Queries and Constraints: Types of SQL Commands, Form of Basic SQL Query, SQL Operators, Set Operators, Nested Queries, Aggregate Operators, NULL values, Keys, Integrity Constraints Over Relations, Joins, Introduction to Views, DCL Commands, Introduction to PL/SQL, Cursors, Triggers and Active Databases.

UNIT III

Relational Model:
Introduction to Relational Model, Basic Structure, Database Schema, Relational Algebra, Relational Calculus.
File Organization and Indexing:
Introduction, Types of File Organizations, Overview of Indexes, Types of Indexes, Index DataStructures, Tree structured Indexing, Hash based Indexing.

UNIT IV

Schema Refinement And Normal Forms:
Introduction to Schema Refinement, Properties of Decomposition, Functional Dependencies, Reasoning about FD, Normal Forms – 1NF, 2NF, 3NF, BCNF, Multivalued Dependencies and 4NF.

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, Time stamp 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

1. "Database Management Systems",Raghurama Krishnan, Johannes Gehrke, TATA Mc GrawHill 3rd Edition.
2. "Database System Concepts", Silberschatz, Korth, Mc Grawhill, V edition.
3. "Introduction to Database Systems", C.J. Date Pearson Education.

REFERENCE BOOKS

1. "Database Systems design, Implementation and Management", Rob &Coronel 5th Edition.
2. "Database Management Systems", P.RadhaKrishna HI-TECH Publications 2005.
3. "Database Management System", Elmasri Navate, Pearson Education.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA SCIENCE LAB

Course Code: GR24A2085 **L/T/P/C: 0/0/4/2**
II Year II Semester

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 multiplevariables
b) Calculate the Error measures SSE, SST, RMSE, and R2
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 Tress 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 Grolemund, 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

JAVA PROGRAMMING LAB

Course Code: GR24A2073 **L/T/P/C : 0/0/4/2**
II Year I Semester

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. Illustrate exception handling 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) Class and object
b) Constructor
c) Parameterized constructor
d) Method overloading
e) Constructor overloading.

TASK 2

a) Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is apalindrome.
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 allthe integers (Use StringTokenizer 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 thefile exists, whether the file is readable, whether the file is writable, the type of file and the length of thefile in bytes.
b) Write a Java program that reads a file and displays the file on the screen, with a line number before eachline.
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 interthread 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 itin another text field, when the button named "Compute" is clicked.
c) Write a Java programthat works as a simple calculator. Use a grid layout to arrange button for the digitsand 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 numbersin 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 Num1or 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 dialogbox.

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.
c) 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 displaythe table using JTable component.

TEXT BOOKS

1. Java: The Complete Reference, 10th edition, Herbert Schildt, Mcgraw Hill.
2. Java Fundamentals - A Comprehensive introduction, Herbert schildt and Dale skrien, TMH.

REFERENCE BOOKS

1. Java for programming, P.J.Dietel Pearson education (OR) Java: How to Program P.J.Dietel andH.M.Dietel,PHI
2. Object Oriented Programming through java, P.Radha Krishna, Universities Press.
3. Thinking in Java, Bruce Eckel, Pearson Education
4. Programming in Java, S.Malhotra and S.Choudhary, Oxford University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATABASE MANAGEMENT SYSTEMS LAB

Course Code: GR24A2074 **L/T/P/C: 0/0/3/1.5**
II Year I Semester

Course Outcomes:

1. Demonstrate the use of DDL and DML commands in SQL.
2. Apply the basic SELECT operations for data retrieval.
3. Illustrate the SQL concepts to retrieve data from multiple tables.
4. Construct PL/SQL code to work with database objects.
5. Experiment with procedural constructs and exception handling to develop applications in the database systems.

TASK 1 : DDL commands (Create, Alter, Drop, Truncate)

1. Create a table EMP with the following structure:Name Data Type

---

EMPNO NU MBER(6)
ENAME VARCHAR2(20)
JOB VARCHAR2(10)
MGRID NUMBER(6)
DEPTNO NUMBER(3)
SAL NUMBER(7,2)

2. Add a column **commission** to the emp table. Commission should be numeric with null valuesallowed.
3. Alter the **job** field of EMP table by modifying its size.
4. Create a table DEPT with the following structure:
   Name DataType

DEPTNO NUMBER(3)
DNAME VARCHAR2(10)
LOC VARCHAR2(10)
DEPTNO as the primary key

5. Add constraints to the EMP table with **empno** as the primary key and **deptno** as the foreign key referencing the DEPT table.
6. Add check constraint to the EMP table to check the **empno** value with **empno**>100.
7. Add NOT NULL constraint on **sal** field with default value 5000, otherwise it should accept the values from the user.
8. Add columns **dob, doj** with date data type to the EMP table. Drop the column **doj** from the EMP table.
9. Create EMP1, EMP2 tables as copy of EMP table. Drop EMP1 table and truncate EMP2 table.

TASK 2: DML COMMANDS (Insert, Update, Delete)

1. Insert 5 records into DEPT table.
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 "clerk".
4. Delete the records from EMP table whose **job** is "Admin".
5. Delete the rows from DEPT table whose **deptno** is 10.

TASK 3: DQL COMMAND (SELECT) - SQL Operators and Order by Clause

Note: Use EMPLOYEES and DEPARTMENTS tables of HR Schema

1. List the records in the EMPLOYEES table by sorting the salary in descending order.
2. Display only those employees whose department number is 30.
3. Display the unique department numbers from EMPLOYEES table.
4. List the employee name, salary and 15% rise in salary. Label the column as "pay_hike".
5. Display the rows whose salary ranges from 5000 to 7500.
6. Display all the employees in department 10 or 20 in alphabetical order of employee names.
7. List the employee names who do not earn commission.
8. Display all the details of the employees 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 4: SQL Aggregate Functions, Group By clause, Having clause

1. Count the total records in the EMPLOYEES table.
2. Calculate the total and average salary of the employees.
3. Determine the max and min salary and rename the column as "max_salary" and "min_salary".
4. Find number of unique departments from the EMPLOYEES table.
5. Display job wise sum, average, maximum, and minimum salary from EMPLOYEES table.
6. Display maximum salaries of all the departments having maximum salary >2000.
7. Display job wise sum, average, maximum, minimum salaries in department 10 having average salary greater than1000. Sort the result with the sum of salary in descending order.

TASK 5: SQL Functions

1. Display the employee name concatenated with employee number.
2. Display the employee name with half of employee name in upper case and half in lowercase.
3. Display the month name of "14-OCT-09" in full.
4. Display the date of joining of all employees in the format "dd-mm-yy".
5. Display the date after two months of hire date of employees.
6. Display the last date of the month in "05-OCT-09".
7. Display the hire date by rounding the date with respect to month and year.
8. Display the commission earned by employees. If they do not earn commission, display it as "NoCommission".

TASK 6: Nested Queries

1. Display the salary of the third highest paid employee in EMPLOYEES table.
2. Display the employee name and salary of employees whose salary is greater than the minimum salary of the company and job title starts with 'I'.
3. Write a query to display information about employees who earn more than any employee in department number 30.
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 salary of departments with department number 20, 30.
6. Display the maximum salary of the departments where maximum salary is greater than 9000.
7. Create a table employee with the same structure as EMPLOYEES table and insert rows into the table using select clause.
8. Create MANAGER table from the EMPLOYEES table which should hold details only about the managers.

TASK 7: Joins, Set Operators.

1. Display all the EMPLOYEES and the DEPARTMENTS information implementing a left outer join.
2. Display the employee name and department name in which they are working implementing a fullouter join.
3. Write a query to display the employee name, salary and their manager's name for everyemployee.
4. Write a query to display the employee name, job, employee number, department name and location for each department, even if there are no employees.
5. Display the details of employees those who draw the same salary.
6. Display the names of employees who did not change their job at least once. (Use Set Operators)
7. Display the names of employees whose current job_id is same as their previous one. (Use Set Operators)
8. Display the names of employees with their current and previous job details. (Use Set Operators)

TASK 8: Views

1. Create a view that displays the employee id, name and salary of employees who belong to 10^{th} department using with check option.
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 the views created.

TASK 9: Sequence and Index

1. Write a PL/SQL code to retrieve the employee name, hire date and designation of an employee whosenumber is given as input by the user.
2. Write a PL/SQL code to calculate tax of employee.
3. Write a PL/SQL program to display top ten employee details based on salary using cursors.
4. Write a PL/SQL program to update the commission values for all the employees with salary lessthan 2000, by adding 1000 to the existing values.

TASK 10: TCL COMMANDS (Save Point, Rollback, Commit)

TASK 11: Triggers, Procedures, and Functions

1. Write a trigger on employee table that shows the old and new values of employee name after updatingon employee name.
2. Write a PL/SQL procedure to insert, delete, and update the records in the EMPLOYEES table.
3. Write a PL/SQL function that accepts the department number and returns the total salary of thatdepartment.

TASK 12: Exceptions and Packages

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
   a) Package specification
   b) Package body to insert, update, delete and retrieve data on EMPLOYEES table.

TEXT BOOKS

1. The Complete Reference, 3rd edition by James R.Groff, Paul N.Weinberg, Andrew J. Oppel
2. SQL & PL/SQL for Oracle10g, Black Book, Dr. P.S.Deshpande.

REFERENCE BOOKS

3.Database Systems design, Implementation and Management", Rob &Coronel 5th Edition.

4."Database Management Systems", P.RadhaKrishna HI-TECH Publications 2005.

5."Database Management System", Elmasri Navate, Pearson Education.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

VALUE ETHICS AND GENDER CULTURE

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

II year II Semester

Course Outcomes

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

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

- A Case study on values and self-development

Unit-II Personality and Behaviour Development-positive thinking, punctuality, avoiding fault finding, Free from anger, Dignity of labour, religious tolerance, Aware of self-destructive habits.

- A Case study on Personality

Unit- III: **Introduction to Professional Ethics**: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

- A Case study on professional ethics

Unit–IV: Introduction to Gender - Definition of Gender, Basic Gender Concepts and Terminology, Attitudes towards Gender, Social Construction of Gender.

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

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

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

Textbooks

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

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

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

Reference Books

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

2. Abdulali Sohaila. "I Fought For My Life…and Won."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
3. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e , Cengage learning, 2015.

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

II YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTER ORGANIZATION

Course Code: GR24A2075 **L/T/P/C: 3/0/0/3**
II Year II Semester

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. Analyze the performance of central processing unit of a basic computer system.
4. Apply various algorithms to perform arithmetic operations and propose suitable hardware and appraisevarious methods of communications with I/O devices.
5. Analyze and emphasize various communication media in the basic computer system using design ofvarious memory structures and Multiprocessor systems.

UNIT I

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

Register Transfer Language and Micro operations: Register Transfer language. Register
Transfer, Bus and memory transfers, Arithmetic Micro operations, Logic micro operations, Shift microoperations, 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 Arithmeticoperations, 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 associativemapping, writing into cache and cache initialization, Cache Coherence, Virtual memory – Address Spaceand Memory Space, Address mapping using pages, Associative Memory page table, Page Replacement.**Multi Processors**: Characteristics or 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, 3rd Edition, Pearson/PHI
2. Computer Organization – Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill.

REFERENCE BOOKS

1. Computer Organization and Architecture – William Stallings 7^{th} Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 6^{th} Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.
4. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, 5^{th} Edition Elsevier
5. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BSPublication.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATING SYSTEMS

Course Code: GR24A2076 **L/T/P/C: 2/1/0/3**
II Year II Semester

Course Outcomes:
1. Interpret 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 ofOperating 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, Diskscheduling, 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.

Teaching methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

TEXT BOOKS

1. Operating System Principles, 7th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne, Wiley AsiaStudent Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall ofIndia.

REFERENCE BOOKS

1. Operating System: A Design-oriented Approach, 1st Edition b y Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
4. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN AND ANALYSIS OF ALGORITHMS

Course Code: GR24A2079 **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Outcomes:

1. Distinguish various performances of algorithms.
2. Illustrate Divide and Conquer Design Paradigm algorithms.
3. Examine various algorithms based on Dynamic programming paradigm.
4. Demonstrate greedy approach and back tracking algorithms.
5. Demonstrate branch and bound problems and Distinguish problems related to variouscomplexity 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

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, knapsack problem,minimum cost spanning trees, single source shortest path problem, activity selection problem.
Backtracking: General method, applications, n-queen problem, sum of subsetsproblem, Hamiltoniancycles.

UNIT V

Branch and Bound:
General method, applications, travelling sales person problem, 0/1 knapsack problem: LC branch and boundsolution, FIFO branch and bound solution
Complexity Classes: non deterministic algorithms, deterministicalgorithms, relationshipbetween P, NP,NP-completeness, circuit-satisfiability problem, 3-CNF satisfiability.

Teaching methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

TEXT BOOKS

1. Ellis Horowitz, Satraj Sahni and S Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publishers.
2. Design and Analysis of Computer Algorithms by Aho, Hopcroft and Ullman, Pearson

REFERENCE BOOKS

1. T H Cormen, C E Leiserson, and R L Rivest, Introduction to Algorithms, 3rd Edition,Pearson Education.
2. Michael T. Goodrich & Roberto Tamassia, Algorithm Design, Wiley Singapore Edition,2002.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FULL STACK WEB DEVELOPMENT

Course code: GR24A2078 **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Outcomes:

1. Build the knowledge of web development basics, HTML, CSS and building interactive web pages
   using JavaScript.
2. Develop a complete web application from the scratch that includes Front-end, Back-end and Data-exchange technologies.
3. Design server side applications using servlets and JSP for interactive web applications.
4. Demonstrate simple NodeJs Applications and connectivity to MongoDB.
5. Apply concepts of Express over full stack application development using MERN Stack.

UNIT I
HTML Common tags- List, Tables, images, forms, Frames; Introduction to JavaScript- Objects and Functions in javascript, Manipulating HTML DOM; Cascading Style sheets;
XML: Introduction to XML, Document Type Definition, XML Schemas, XHTML Parsing XML Data – DOM and SAX Parsers.

UNIT II
Bootstrap Programming - Setup, Templates & Navbar, Typography, Forms & Tables, CSS Components, Grid System, Modal, Dropdown, Tabs & Tooltip, Collapse, Accordion and Carousel.
jQuery Programming: Selectors & Events, Effects & Animation, DOM Traversing & Filtering
Angular JS: Introduction, Expressions, Modules, directives, AngularJS HTML DOM, Events, Forms.

Unit-III
Introduction to Servlets: Life cycle of a Servlet, deploying a servlet, The Servlet API, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.
Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, implicit objects, Using Beans in JSP Pages.

Unit-IV
Introduction to Node.js- NPM - Events, Timers, and Callbacks in Node.js – file upload – email – Express framework – request –response –routing - templates- view engines.
Introduction to MongoDB- creating DB, collection – CRUD operations - Accessing MongoDB from Node.js. – Accessing online MongoDB from Node JS.

Unit-V
Express: Getting Started with Express, Configuring Routes, Using Requests Objects, Using Response Objects.
React: Need of React, Simple React Structure, The Virtual DOM, React Components, Introducing React Components, Creating Components in React, Data and Data Flow in React, Rendering and Life Cycle Methods in React, Working with forms in React, integrating third party libraries, Routing in React.

Teaching Methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

TEXT BOOKS

1. Beginning JavaScript with DOM scripting and AJAX: From Novice to Professional by Christian Heilmann
2. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech
3. Jakarta Struts Cookbook, Bill Siggelkow, SPDO'Reilly.

REFERENCE BOOKS

1. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018.
2. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo,Express, React, and Node', Second Edition, Apress, 2019.
3. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018.
4. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications
5. Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
APPLIED STATISTICS FOR ENGINEERS
(Common to CSE(DS) & CSE(AIML))

Course Code: GR24A2006 **L/T/P/C: 3/0/0/3**
II year II Semester

Pre-requisites: Elementary statistics,Calculus and Linear algebra

Course Outcomes

After completion of the course, the student will be able to

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 or phenomenon arising in the case of large samples
5. Apply parametric and non parametric tests of inferential statistics to suggest explanations for a situation or phenomenon arising in the case of small samples

Unit-1
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 (Statements of Properties and applications), evaluation of statistical parameters for Binomial, Poisson and Normal distributions through numerical examples.

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.

Unit-V

Testing of Hypothesis-2

Tests for ratio of variances, ANOVA 1-way and 2-way.
Non-parametric Inference: Wilcoxon signed rank test and Run test for randomness
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: GR24A2080 **L/T/P/C: 0/0/3/1.5**
II Year II Semester

Course Outcomes:

1. Design a website using the basic core concepts of Front-End technologies.
2. Develop robust and scalable websites using client and server side validations.
3. Apply the concepts of Servlets and JSP to develop the web applications.
4. Demonstrate the creation of full stack applications using Angular JS, React JS and Mongo DB.
5. Implement simple full stack application development using Express and optimize server side rendering.

Task - 1: Design an HTML webpage to design Curriculum Vitae.

Task - 2: Write a JavaScript program to design a shopping list, where user can add or remove items as shown below.

My Shopping List

- Milk X
- Bread X
- Cheese X

[ ] Add

Task - 3: Develop a web page using jQuery to display five star rating application.

Task - 4: Write a Program on Bootstrap templates and Navbar.

Task - 5: Develop AngularJS application that displays details of students and their CGPA. Allow users to input the student details.

Task - 6: 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 - 7: Create a JSP application for performing basic arithmetic operations using Java Beans.

Ex: Use jsp:use Bean action tag

Task - 8: Create a food delivery website where users can order food from a particular restaurant listed in the website for handling http re quests and responses using NodeJS.

Task - 9: Implement CRUD operations on the given dataset using MongoDB.

Task - 10: Develop a web application to manage student information using Express and Angular JS.

Task - 11: Write a program to create a voting application using React JS.

Task - 12: Develop a leave management system for an organization where users can apply different types of leaves such as casual leave and medical leave. They also can view the available number of days using react application.

TEXT BOOKS

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech
2. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018.

REFERENCE BOOKS

1. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018.
2. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo,Express, React, and Node', Second Edition, Apress, 2019.
3. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATING SYSTEMS LAB

Course Code: GR24A2081 **L/T/P/C: 0/0/3/1.5**

II Year II Semester

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 techniquesin 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)FIFOb)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

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 ofIndia.

REFERENCE BOOKS

1. Operating System: A Design-oriented Approach, 1st Edition b y Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.

Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hi

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

REAL-TIME RESEARCH PROJECT/ SOCIETAL RELATED PROJECT

Course Code: GR24A2106 **L/T/P/C:0/0/4/2**

II Year II Semester

Course Outcome:

At the end of this course, students will be able to:

1. Predict the Field domain in the specialized area under Engineering discipline.
2. Evaluate and Obtained the category of the solution with help of Real time studies
3. Analyse and Discuss the field problems using software tools /Modes/simulations and experimental investigations.
4. Implementing the solution of problem statement.
5. Prioritize the reports and deliver the final work with presentation.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL SCIENCE

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

II Year I Semester

Course Pre-Requisites: Basic knowledge of environmental issues

Course Outcomes:

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

UNIT I
INTRODUCTION AND AWARENESS ACTIVITIES
Environmental Science: Introduction, Definition, scope and importance.
AWARENESS ACTIVITIES

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

UNIT II
SLOGAN AND POSTER MAKING EVENT

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

UNIT III
EXPERT LECTURES ON ENVIRONMENTAL SCIENCE

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

UNIT IV
CLEANLINESS DRIVE

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

UNIT V
CASE STUDIES

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

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.