

# **ACADEMIC REGULATIONS PROGRAMME STRUCTURE AND DETAILED SYLLABUS**

## **GR22**

### **Bachelor of Technology (Computer Science and Information Technology)**

(Effective for the students admitted from the Academic Year 2023-24)



**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY  
(Autonomous)**



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**ACADEMIC REGULATIONS  
PROGRAMME STRUCTURE  
&  
DETAILED SYLLABUS**

**Bachelor of Technology  
Computer Science and Information  
Technology**

(Four Year Regular Programme)

(Applicable for Batches Admitted from 2023-24)



**GOKARAJU RANGARAJU  
INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
Bachupally, Kukatpally, Hyderabad, Telangana, India- 500090





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

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

**Under Graduate Degree Programme in Engineering and Technology (UG)**

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

S.No	Department	Programme Code	Programme
1	Civil Engineering	01	B.Tech Civil Engineering
2	Electrical and Electronics Engineering	02	B.Tech Electrical and Electronics Engineering
3	Mechanical Engineering	03	B.Tech Mechanical Engineering
4	Electronics and Communication Engineering	04	B.Tech Electronics and Communication Engineering
5	Computer Science and Engineering	05	B.Tech Computer Science and Engineering
6	Information Technology	12	B.Tech Information Technology
7	Computer Science and Business System	32	B.Tech Computer Science & Business System
8	Computer Science and Engineering (AIML)	66	B.Tech Computer Science and Engineering (AIML)
9	Computer Science and Engineering (Data Science)	67	B.Tech Computer Science and Engineering (Data Science)
10	Computer Science and Engineering (Artificial Intelligence)	61	B.Tech Computer Science and Engineering (Artificial Intelligence)
11	Computer Science and Information Technology	33	B.Tech Computer Science and Information Technology



GR22 Regulations shall govern the above programmes offered by the Departments with effect from the students admitted to the programmes in 2023-24 academic year is given below.

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

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

**3. Programme Pattern:**

- a) Each Academic Year of study is divided into two semesters.
- b) Minimum number of instruction days in each semester is 90.
- c) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
- d) The total credits for the Programme are 160.
- e) A student has a choice to register for all courses in a semester / one less or one additional course from other semesters provided the student satisfies prerequisites.
- f) All the registered credits except Mandatory and Value Added Courses will be considered for the calculation of final CGPA.
- g) Each semester has 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC, and course structure as suggested by AICTE are followed. The terms 'subject' and 'course' imply the same meaning.
- h) **Course Classification:** All courses offered for all undergraduate programmes in B.Tech degree programmes are broadly classified as follows.



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

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

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



### 5. Attendance Requirements:

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

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

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

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

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

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



## Assessment Procedure:

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



3	Graphics for Engineers	40	Internal Examination & Continuous Evaluation	<p>1) Two mid semester examination shall be conducted for 15 marks each for a duration of 90 minutes. Average of the two mid exams shall be considered</p> <p>2) Day-to-Day activity -15 marks</p> <p>3) Continuous Evaluation using</p> <ul style="list-style-type: none"> <li>• <b>Assignment – 05 marks</b></li> <li>• <b>Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks</b></li> </ul>
		60	Semester end examination	The semester-end examination is for a duration of 3 hours

**d) Mini Project:**

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Mini Project	40	Continuous Evaluation & Internal Evaluation	<p>1) The supervisor continuously assesses the students for 20 marks</p> <p><b>i) Continuous Assessment – 15 marks</b></p> <ul style="list-style-type: none"> <li>• Abstract Presentation - 3 marks</li> <li>• Architectural Design Presentation - 3marks</li> <li>• Modules Presentation - 3 marks</li> <li>• Execution Cycle 1 Presentation - 3 marks</li> <li>• Execution Cycle 2 Presentation - 3 marks</li> </ul> <p><b>ii) Report – 5 marks</b></p> <p>2) At the end of the semester, Mini Project shall be displayed in the road show at the department level. Mini Project is evaluated by Mini Project Review Committee for <b>10 marks</b>.</p> <p>3) Technical Event Participation in project area/MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/ Book Publication – <b>10 marks</b></p>
		60	External Evaluation	The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for <b>60 marks</b> .

**Note:**

- i) Mini Project Review Committee consists of HoD, Mini Project Coordinator and Supervisor.
- ii) Plagiarism check is compulsory for mini project report as per the plagiarism policy of GRIET.



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

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

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Project Work (Phase- I and Phase -II)	40	Continuous Evaluation & Internal Evaluation	1) The supervisor continuously assesses the students for 20 marks <b>i) Continuous Assessment – 15 marks</b> <ul style="list-style-type: none"> <li>• Abstract Presentation - 3 marks</li> <li>• Architectural Design Presentation - 3 marks</li> <li>• Modules Presentation - 3 marks</li> <li>• Execution Cycle 1 Presentation - 3 marks</li> <li>• Execution Cycle 2 Presentation - 3 marks</li> </ul> <b>ii) Report – 5 marks</b> 2) At the end of the semester, Mini Project shall be displayed in the road show at the department level. Mini Project is evaluated by Mini Project Review Committee for <b>10 marks</b> . 3) Technical Event Participation in project area/MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/ Book Publication – <b>10 marks</b> .
		60	External Evaluation	The Project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for <b>60 marks</b> .

**Note:**

- i) Project Review Committee consists of HoD, Project Coordinator and Supervisor.
  - ii) Plagiarism check is compulsory for project work report (Phase I and Phase II) as per the plagiarism policy of GRIET.
  - iii) The above rules are applicable for both Phase I and Phase II.
- g) The evaluation of courses having ONLY internal marks in I-Year I Semester and II Semester is as follows:
- I Year courses: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the



two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he/she (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

- **II Year II Semester Real-Time/Field-based Research Project/Societal Related Project course:** The internalevaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he/she (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or secures less than 40% marks in this course.

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

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

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

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

**11. Re-registration for mid examination:** A student shall be given one time chance to re-register for a maximum of two subjects in a semester:

- If the internal marks secured by a student in Continuous Internal Evaluation marks for 40 (sum of average of 2 mid-term examinations, average of all assignments and Subject Viva-voce/ PPT/Poster Presentation/Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects

A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork when the course is offered next, it could be semester for first years and a year for others.

In the event of the student taking this chance, his/her Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

## 12. Academic Requirements and Promotion Rules:

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

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

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

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



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

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

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

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

f) Under Mandatory Courses

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

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



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

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

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

#### Computation of SGPA and CGPA:

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

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

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

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

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

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



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

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

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

Equivalence of grade to marks

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

#### 15. Award of 2-Year B.Tech Diploma Certificate

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) upto B. Tech. – II Year – II Semester if the student want to exit the 4-Year B. Tech. program and requests for the 2-Year B.Tech (UG) Diploma Certificate..
  2. The student once **opted and awarded for 2-Year UG Diploma Certificate, the student will be permitted to join** in B. Tech. III Year – I Semester and continue for completion of remaining years of study for 4- Year B. Tech. Degree. ONLY in the next academic year along with next batch students. However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of classwork for that semester.
  3. The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join the B.Tech program, must submit the 2 -Year B. Tech. (UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.
  4. A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).
- 16. Withholding of Results:** If the student has not paid dues to the Institute/ University, or if any case of indiscipline is pending against the student, the result of the student (for that Semester) may be withheld and the student will not be allowed to go into the next semester. The award or issue of the Degree may also be withheld in such cases.

#### 17. Transitory Regulations

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of GR20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of GR22 Regulations and he is required to complete the study



of B.Tech programme within the stipulated period of eight academic years from the date of first admission in I Year.

2. A student who has been detained in any semester of II, III and IV years of GR20 regulations for want of attendance, shall be permitted to join the corresponding semester of GR22 Regulations and is required to complete the study of B.Tech within the stipulated period of eight academic years from the date of first admission in I Year. The GR22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

**B.** For students detained due to shortage of credits:

3. A student of GR20 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of GR22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both GR20 & GR22 regulations. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission. The GR22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

**C.** For readmitted students in GR22 Regulations:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including GR22 Regulations. **There is NO exemption of credits in any case.**
6. If a student is readmitted to GR22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in GR22 Regulations will be substituted by another subject to be suggested by the college academic administration.

**Note:**

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

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

- a) Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities shall be considered only on case-to-case basis.
- b) There shall be no branch transfers after the completion of admission process.
- c) The students seeking transfer to GRIET from various other Universities/institutions have to pass the failed courses which are equivalent to the courses of GRIET, and also pass the courses of GRIET which the students have not studied at the earlier institution. Further, though the students have passed some of the courses at the earlier institutions, if the same courses are prescribed in different semesters of GRIET, the students have to study those courses in GRIET in spite of the fact that those courses are repeated.
- d) The transferred students from other Universities/institutions to GRIET who are on rolls are to be provided one chance to write the CBT (internal marks) in the **equivalent course(s)** as per the clearance (equivalence) letter issued by the University.

**19. General Rules**

- a. The academic regulations should be read as a whole for the purpose of any interpretation.
- b. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.
- c. In case of any error in the above rules and regulations, the decision of the Academic Council is final.



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



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

1. All regulations as applicable for B.Tech 4-year degree programme (Regular) will hold good for B.Tech (Lateral Entry Scheme) except for the following rules:
  - a) Pursued programme of study for not less than three academic years and not more than six academic years.
  - b) A student should register for all 120 credits and secure all credits. The marks obtained in all 120 credits shall be considered for the calculation of the final CGPA.
  - c) Students who fail to fulfil all the academic requirements for the award of the degree within six academic years from the year of their admission, shall forfeit their seat in B.Tech programme.

### 2. Academic Requirements and Promotion Rules:

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

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



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

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



## Academic Regulations for B.Tech with Minors Programme under GR22 (Applicable for Batches Admitted from 2023-24)

### 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 interdisciplinary 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.

## B. Tech (CSIT)-GR22 Course Structure

## I B. Tech (CSIT) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Maths	BS	GR22A1001	Linear Algebra and Function Approximation	3	1	0	4	3	1	0	4	40	60	100
2	Chemistry	BS	GR22A1005	Engineering Chemistry	3	1	0	4	3	1	0	4	40	60	100
3	EEE	ES	GR22A1008	Fundamentals of Electrical Engineering	2	1	0	3	2	1	0	3	40	60	100
4	CSE	ES	GR22A1007	Programming for Problem Solving	2	1	0	3	2	1	0	3	40	60	100
5	EEE	ES	GR22A1019	Fundamentals of Electrical Engineering Lab	0	0	1	1	0	0	2	2	40	60	100
6	Chemistry	BS	GR22A1015	Engineering Chemistry Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	CSE	ES	GR22A1017	Programming for Problem Solving Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	ME	ES	GR22A1021	Engineering Workshop	1	0	1.5	2.5	1	0	3	4	40	60	100
<b>TOTAL</b>					<b>11</b>	<b>4</b>	<b>5.5</b>	<b>20.5</b>	<b>11</b>	<b>4</b>	<b>11</b>	<b>26</b>	<b>320</b>	<b>480</b>	<b>800</b>
9	Mgmt	MC	GR22A1022	Design Thinking	0	0	0	0	2	0	0	2	40	60	100

## I B. Tech (CSIT) - II Semester

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



## II B. Tech (CSIT) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	IT	PC	GR22A2067	Digital LogicDesign	3	0	0	3	3	0	0	3	40	60	100
2	IT	PC	GR22A2068	Java Programming	3	0	0	3	3	0	0	3	40	60	100
3	Maths	BS	GR22A2005	Probability andStatistics	3	0	0	3	3	0	0	3	40	60	100
4	IT	PC	GR22A2069	Database Management Systems	3	0	0	3	3	0	0	3	40	60	100
5	CSE	PC	GR22A2075	Discrete Mathematics	2	1	0	3	2	1	0	3	40	60	100
6	IT	PC	GR22A2058	Digital ElectronicsLab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	IT	PC	GR22A2071	Java ProgrammingLab	0	0	2	2	0	0	4	4	40	60	100
8	IT	PC	GR22A2072	Database Management Systems Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
<b>TOTAL</b>					<b>14</b>	<b>1</b>	<b>5</b>	<b>20</b>	<b>14</b>	<b>1</b>	<b>10</b>	<b>25</b>	<b>320</b>	<b>480</b>	<b>800</b>
9	Mgmt	MC	GR22A2002	Value Ethics and Gender Culture	0	0	0	0	2	0	0	2	40	60	100

## II B. Tech (CSIT) – II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	IT	PC	GR22A2077	Design and Analysis of Algorithms	3	0	0	3	3	0	0	3	40	60	100
2	IT	PC	GR22A2073	Computer Organization	3	0	0	3	3	0	0	3	40	60	100
3	Mgmt	HS	GR22A2004	Economics & Accounting for Engineers	3	0	0	3	3	0	0	3	40	60	100
4	IT	PC	GR22A2081	Data Communicationand Computer Networks	3	0	0	3	3	0	0	3	40	60	100
5	CSE	PC	GR22A2074	OperatingSystems	2	1	0	3	2	1	0	3	40	60	100
6	IT	PC	GR22A2082	Design and Analysis of Algorithms using Java Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	IT	PC	GR22A2083	Operating Systems and Sci Lab	0	0	2	2	0	0	4	4	40	60	100
8	IT	PC	GR22A2084	Data Communicationand Computer Networks Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
<b>TOTAL</b>					<b>14</b>	<b>1</b>	<b>5</b>	<b>20</b>	<b>14</b>	<b>1</b>	<b>10</b>	<b>25</b>	<b>320</b>	<b>480</b>	<b>800</b>
9	Chemistry	MC	GR22A2001	Environmental Science	0	0	0	0	2	0	0	2	40	60	100
10	English	MC	GR22A2108	Effective Technical Communication	0	0	0	0	2	0	0	2	40	60	100
11	IT	MC	GR22A2109	Real-time Research Project/ Societal Related Project	0	0	2	2	0	0	4	4	50	--	50



## III B. Tech (CSIT) – I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	IT	PC	GR22A3052	Software Engineering	3	0	0	3	3	0	0	3	40	60	100
2	CSE (AIML)	PC	GR22A3070	Artificial Intelligence	3	0	0	3	3	0	0	3	40	60	100
3	IT	PC	GR22A3053	Web Programming	3	0	0	3	3	0	0	3	40	60	100
4		PE		Professional Elective-I	3	0	0	3	3	0	0	3	40	60	100
5		OE		Open Elective-I	3	0	0	3	3	0	0	3	40	60	100
6	CSIT	PC	GR22A3150	Software Engineering and UML Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	IT	PC	GR22A3057	Internet of Things and Applications Lab	0	1	1	2	0	1	2	3	40	60	100
8	IT	PC	GR22A3058	Web Programming Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
<b>TOTAL</b>					<b>15</b>	<b>1</b>	<b>4</b>	<b>20</b>	<b>15</b>	<b>1</b>	<b>8</b>	<b>24</b>	<b>320</b>	<b>480</b>	<b>800</b>
9	Mgmt	MC	GR22A2003	Constitution of India	0	0	0	0	2	0	0	2	40	60	100

PROFESSIONAL ELECTIVE-I			
S. No.	BOS	Course Code	Course
1	ECE	GR22A4038	Digital Image Processing
2	CSE	GR22A3047	Principles of Programming Languages
3	IT	GR22A4059	Edge Computing
4	IT	GR22A3055	Cyber Security

OPEN ELECTIVE-I			
S. No.	BOS	Course Code	Course
1	IT	GR22A3056	Introduction to Data Science



## III B. Tech (CSIT) – II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	CSE	PC	GR22A3115	Automata and Compiler Design	2	1	0	3	2	1	0	3	40	60	100
2	CSE (AIML)	PC	GR22A3140	Machine Learning	3	0	0	3	3	0	0	3	40	60	100
3	IT	PC	GR22A3123	Full Stack Development	3	0	0	3	3	0	0	3	40	60	100
4		PE		Professional Elective-II	3	0	0	3	3	0	0	3	40	60	100
5		OE		Open Elective-II	3	0	0	3	3	0	0	3	40	60	100
6	CSE (AIML)	PC	GR22A3142	Machine Learning Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	IT	PC	GR22A3128	Full Stack Development Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8		PW	GR22A3089	Mini Project with Seminar	0	0	2	2	0	0	4	4	40	60	100
<b>TOTAL</b>					<b>14</b>	<b>1</b>	<b>5</b>	<b>20</b>	<b>14</b>	<b>1</b>	<b>10</b>	<b>25</b>	<b>320</b>	<b>480</b>	<b>800</b>

PROFESSIONAL ELECTIVE-II			
S. No.	BOS	Course Code	Course
1	CSE	GR22A3146	Blockchain Technology
2	IT	GR22A3124	Unix Programming
3	CSE	GR22A4121	Green Computing
4	IT	GR22A3126	Cloud Computing

OPEN ELECTIVE-II			
S. No.	BOS	Course Code	Course
1	IT	GR22A3127	User Centric Human Computer Interaction



## IV B. Tech (CSIT) – I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Mgmt	HS	GR22A3116	Fundamentals of Management and Entrepreneurship	3	0	0	3	3	0	0	3	40	60	100
2	IT	PC	GR22A4057	Middleware Technologies	3	0	0	3	3	0	0	3	40	60	100
3		PE		Professional Elective-III	3	0	0	3	3	0	0	3	40	60	100
4		PE		Professional Elective-IV	3	0	0	3	3	0	0	3	40	60	100
5		OE		Open Elective-III	3	0	0	3	3	0	0	3	40	60	100
6		PC		Professional Elective-III Lab	0	0	2	2	0	1	3	4	40	60	100
7	IT	PC	GR22A4065	Middleware Technologies Lab	0	0	2	2	0	1	3	4	40	60	100
8	CSIT	PW	GR22A4082	Project Work-Phase I	0	0	6	6	0	0	12	12	40	60	100
<b>TOTAL</b>					<b>15</b>	<b>0</b>	<b>10</b>	<b>25</b>	<b>15</b>	<b>2</b>	<b>18</b>	<b>35</b>	<b>320</b>	<b>480</b>	<b>800</b>

PROFESSIONAL ELECTIVE-III With Professional Core Lab			
S. No.	BOS	Course Code	Course
1	IT	GR22A3125	Mobile Application Development
2	CSIT	GR22A4148	Mobile Application Development Lab
3	IT	GR22A4061	DevOps
4	CSIT	GR22A4149	DevOps Lab
5	CSIT	GR22A4156	Fundamentals of Big Data Analytics
6	CSIT	GR22A4157	Fundamentals of Big Data Analytics Lab
7	CSIT	GR22A4155	Server side Scripting Languages
8	CSIT	GR22A4158	Server side Scripting Languages Lab

PROFESSIONAL ELECTIVE-IV			
S. No.	BOS	Course Code	Course
1	IT	GR22A4060	Embedded Systems
2	IT	GR22A3037	Soft Computing
3	CSE (AIML)	GR22A4143	Introduction to Robotics
4	CSIT	GR22A4150	Intrusion Detection Systems

OPEN ELECTIVE-III			
S. No.	BOS	Course Code	Course
1	IT	GR22A4063	Design Patterns



## IV B. Tech (CSIT) – II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	IT	PC	GR22A4126	Software Project Management	2	1	0	3	2	1	0	3	40	60	100
2		PE		Professional Elective-V	3	0	0	3	3	0	0	3	40	60	100
3		PE		Professional Elective-VI	3	0	0	3	3	0	0	3	40	60	100
4		PW	GR22A4145	Project Work-Phase II	0	0	6	6	0	0	12	12	40	60	100
<b>TOTAL</b>					<b>8</b>	<b>1</b>	<b>6</b>	<b>15</b>	<b>8</b>	<b>1</b>	<b>12</b>	<b>21</b>	<b>160</b>	<b>240</b>	<b>400</b>

PROFESSIONAL ELECTIVE-V			
S. No.	BOS	Course Code	Course
1	IT	GR22A4127	Agile Methodologies
2	IT	GR22A4131	Distributed Databases and Systems
3	IT	GR22A4129	Information Retrieval Systems
4	IT	GR22A4130	Cyber Forensics

PROFESSIONAL ELECTIVE-VI			
S. No.	BOS	Course Code	Course
1	IT	GR22A4058	Software Testing Methodologies
2	CSE	GR22A4054	Augmented Reality and Virtual Reality
3	IT	GR22A4132	Speech and Natural Language Processing
4	CSIT	GR22A4151	Cyber Laws and IPR



### PROFESSIONAL ELECTIVES - 4THREADS

System Software and Architectures	Concept Development	AI & ML	Networking and Applications
Digital Image Processing	Principles of Programming Languages	Edge Computing	Cyber Security
Blockchain Technology	Unix Programming	Green Computing	Cloud Computing
Mobile Application Development	Devops	Fundamentals of Big Data Analytics	Server side Scripting Languages
Embedded Systems	Soft Computing	Introduction to Robotics	Intrusion Detection Systems
Agile Methodologies	Distributed Databases and Systems	Information Retrieval Systems	Cyber Forensics
Software Testing Methodologies	Augmented Reality and Virtual Reality	Speech and Natural Language Processing	Cyber Laws & IPR



### OPEN ELECTIVES FOR GR22 REGULATIONS

THREAD 1	THREAD 2	OFFERED BY
Soft Skills and Interpersonal Skills (GR22A3145)  Human Resource Development and Organizational Behavior (GR22A4049)  Cyber Law and Ethics (GR22A4077)  Economic Policies in India (GR22A4147)	Data Science for Engineers (GR22A3049)	<b>CSE</b>
	Data Analytics using Open-Source Tools (GR22A3120)	
	Augmented Reality and Virtual Reality (GR22A4054)	
	Basics of Java Programming (GR22A3072)	<b>CSE (AIML)</b>
	Introduction to DBMS (GR22A3141)	
	Introduction to Data Mining (GR22A4080)	
	Programming in Python (GR22A3077)	<b>CSE (DS)</b>
	Internet of Things (GR22A3147)	
	Scripting Languages (GR22A4085)	
	Services Science and Service Operational Management (GR22A4134)	<b>CSBS</b>
	IT Project Management (GR22A4135)	
	Marketing Research and Marketing Management (GR22A4136)	
	Introduction to Data Science (GR22A3056)	<b>IT</b>
	User Centric Human Computer Interaction (GR22A3127)	
	Design Patterns (GR22A4063)	
	Non-Conventional Energy Sources (GR22A3019)	<b>EEE</b>
	Concepts of Control Systems (GR22A3095)	
	Artificial Neural Networks and Fuzzy Logic (GR22A4022)	
	Principles of Communications (GR22A3040)	<b>ECE</b>
	Sensor Technology (GR22A3113)	
	Communication Technologies (GR22A4045)	
	Industrial Automation and Control (GR22A3030)	<b>ME</b>
	Composite Materials (GR22A3105)	
	Operations Research (GR22A3018)	
	Engineering Materials for Sustainability (GR22A3009)	<b>CE</b>
	Construction Project Planning and Systems (GR22A4090)	
	Environmental Impact Assessment (GR22A4011)	
	Basics of Java Programming (GR22A3072)	<b>CSE (AI)</b>
	Introduction to DBMS (GR22A3141)	
	Introduction to Data Mining (GR22A4080)	
	Introduction to Data Science (GR22A3056)	<b>CSIT</b>
	User Centric Human Computer Interaction (GR22A3127)	
	Design Patterns (GR22A4063)	



# I YEAR I SEMESTER



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**LINEAR ALGEBRA AND FUNCTION APPROXIMATION**

Course Code:GR22A1001

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

**I Year I Semester**

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

**Course Outcomes:**

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

**UNIT I**

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

**UNIT II**

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

**UNIT III**

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

**UNIT IV**

**Multivariable differential calculus and Function Optimization:** Partial Differentiation- Chainrule- Total differentiation- Jacobian- Functional dependence  
Multivariable function Optimization- Taylor's theorem for multivariable functions- Unconstrained optimization of functions using the Hessian matrix- Constrained optimization using the Lagrange multiplier method.



## UNIT V

**Function approximation tools in Engineering:** Function approximation using Taylor's polynomials- Properties of Chebyshev polynomials- Uniform approximation using Chebyshev polynomials.

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

### Text Books

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

### Reference Books

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



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

**Course Code: GR22A1005**

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

**I Year I Semester**

**Course Outcomes:**

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

**UNIT I**

**Atomic and Molecular Structure (8 Lectures)**

Atomic and Molecular orbitals - Definition, examples and comparison, Molecular orbital theory- postulates and MO energy diagrams of N<sub>2</sub> and O<sub>2</sub>.

Theories of Metallic bonding – Free electron theory, Resonance theory, Molecular orbital theory, Valence Bond Theory – Postulates and Limitations, Bonding in [Ni(CO)<sub>4</sub>], [Ni(Cl)<sub>4</sub>]<sup>2-</sup>, [Ni(CN)<sub>4</sub>]<sup>2-</sup>, [Co(NH<sub>3</sub>)<sub>6</sub>]<sup>3+</sup>, and [CoF<sub>6</sub>]<sup>3-</sup>. Crystal Field Theory, Crystal Field Splitting of transition metal ion d-orbitals in octahedral, tetrahedral and square planar geometries.

**UNIT II**

**Spectroscopic Techniques and Applications (10 Lectures)**

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

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

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

**UNIT III**

**Batteries and Corrosion (12 Lectures)**

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

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

**UNIT IV**

**Engineering Materials and Water Technology (8 Lectures)**

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

Plastics: Comparison between thermoplastics and thermosets, Fabrication of plastics - compression



moulding and injection moulding. Conducting polymers – Definition, classification, and applications.  
Water: Hardness - Causes, types, and units. Boiler troubles-scales and sludges, caustic embrittlement.  
Water purification: Demineralization by Ion-exchange process, Desalination by reverse osmosis method.

## UNIT V

### Stereochemistry and Energy Resources (8 Lectures)

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

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

### Text Books

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

### Reference Books

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
FUNDAMENTALS OF ELECTRICAL ENGINEERING**

**Course Code: GR22A1008**

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

**I Year I Semester**

**Course Outcomes:**

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

**UNIT I**

**Basic Components And Electric Circuits**

Charge, Current, Voltage, Power, Passive components, Voltage and Current sources, dependent and independent sources, fundamentals of circuit Laws, Source Transformation, Passive components in series and parallel, Delta – star conversion.

**UNIT II**

**Network Analysis**

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

**UNIT III**

**A.C Circuits**

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

**UNIT IV**

**Basics Of Electrical Machines**

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

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

**UNIT V**

**Measuring Instruments And Sensors**

Transducers, Sensors, and Actuators – Physical Principles and their working Temperature Sensors, Ultrasonic Sensor, Accelerometers Sensor and PIR Motion Detector.

**Text Books**

1. D.P. Kothari and I.J. Nagrath, Basic Electrical Engineering -, Third edition 2010, Tata McGraw Hill.
2. Sensors and amp, Transducers – D. Patranabis, PHI Publications
3. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989



**Reference Books**

1. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education, 2004.
2. K. V. V. Murthy and M. S. Kamath, “Basic Circuit Analysis”, Jaico Publishers, 1999.
3. Circuit Theory (Analysis and Synthesis) by A.Chakrabarti-Dhanpat Rai & Co.
4. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
5. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
6. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
PROGRAMMING FOR PROBLEM SOLVING**

**CourseCode:GR22A1007**

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

**I Year I Semester**

**Course Outcomes:**

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

**UNIT I**

**Introduction to Programming:**

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

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

**UNIT II**

**Decision Making and Arrays:**

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

**Arrays:** one- and two-dimensional arrays, creating, accessing and manipulating elements of arrays.

**Searching:** Introduction to searching, Linear search and Binary search.

**UNIT III**

**Strings and Functions:**

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

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

**UNIT IV**

**Pointers and Structures:**

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

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

**UNIT V**

**File handling and Preprocessor in C:**

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

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



**Text Books**

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

**Reference Books**

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
FUNDAMENTALS OF ELECTRICAL ENGINEERING LAB**

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

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

**Course Outcomes:**

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

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

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

**TASK-3:** Verification of Superposition and Reciprocity Theorems.

**TASK-4:** Verification of Maximum Power Transfer Theorem

**TASK-5:** Resonance in series RLC circuit

**TASK-6:** Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)

**TASK-7:** Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)

**TASK-8:** Measurement of Active and Reactive Power in a balanced Three-phase circuit

**TASK-9:** Torque Speed Characteristics of a Separately Excited DC Shunt Motor

**TASK-10:** Torque-Slip Characteristics of a Three-phase Induction Motor



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ENGINEERING CHEMISTRY LAB**

**Course Code: GR22A1015**

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

**I Year I Semester**

**Course Outcomes:**

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

**List of Experiments:**

1. Determination of Total Hardness of water by complexometric method using EDTA
2. Determination of Chloride content of water by Argentometry
3. Redox titration: Estimation of Ferrous ion using standard  $\text{KMnO}_4$  by Permanganometry
4. Estimation of HCl by Conductometric titrations
5. Estimation of Ferrous ion by Potentiometry using dichromate
6. Determination of Rate constant of acid catalyzed reaction of methyl acetate
7. Adsorption of Acetic acid by charcoal
8. Determination of Surface tension of liquid by using Stalagmometer
9. Determination of Viscosity of liquid by using Ostwald's Viscometer
10. Determination of Partition Coefficient of Acetic acid between n-butanol and water
11. Synthesis of Aspirin
12. Synthesis of Paracetamol

**Reference Books**

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
PROGRAMMING FOR PROBLEM SOLVING LAB**

**CourseCode:GR22A1017**

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

**I Year I Semester**

**Course Outcomes:**

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

**TASK 1**

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

**TASK 2**

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

**TASK 3**

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

**TASK 4**

- a. Write a C program to find the roots of a quadratic equation using if-else.
- b. Write a C program to input electricity unit charges and calculate total electricity bill according to the given condition:  
For first 50 units Rs. .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**

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

**TASK 6**

- Write a C program to display the following patterns:

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

- Write a C program to generate the prime numbers between x and y where x and y are starting and ending values to be supplied by the user.
- Write a C program to calculate the sum of following series:
  - $S1 = 1 + x/1! - x^2/2! + x^3/3! - x^4/4! + \dots + x^n/n!$
  - $S2 = x^1/1 + x^3/3 + x^5/5 + \dots + x^n/n$

**TASK 7**

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

**TASK 8**

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

**TASK 9**

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

**TASK 10**

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

**TASK 11**

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

**TASK 12**

- Write a C program to implement function pointer to find sum and product of two numbers.
- 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 roll no
  - iii. Print the names of the students having the highest test score.
- b. Write a C program that uses structures and functions to perform addition and product of two complexnumbers? (use structures and functions)

**TASK 14**

- a. Write a C program to merge two files into a third file.
- b. Write a C program to count number of characters in a file and also convert all lower-case characters toupper 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:
  - a. Define
  - b. Undef
  - c. ifdef
  - d. ifndef.
- c. Write a C program to create a user defined header file to find sum, product and greatest of two numbers.

**Text Books**

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

**Reference Books**

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



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

**Course Code: GR22A1021**

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

**I Year I Semester**

**Course Outcomes:**

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

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

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

**Text/ Reference Books:**

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

**Reference Books:**

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
DESIGN THINKING**

**CourseCode:GR22A1022**

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

**I Year I Semester**

**Course Outcomes:**

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

**UNIT I**

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

**UNIT II**

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

**UNIT III**

**Ideation tools & exercises:** Sample Design Challenge, Design Challenge Themes, Storytelling and Tools for Innovation and creativity.

**UNIT IV**

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

**UNIT V**

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

**Text Books**

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

**Reference Books**

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



# **I YEAR II SEMESTER**



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**

**Course Code: GR22A1002**  
**I Year II Semester**

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

**Course Outcomes:**

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

**UNIT I**

**Ordinary Differential Equations of the First Order**

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

**UNIT II**

**Ordinary Differential Equations of Higher Order**

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

**UNIT III**

**Multiple Integrals**

Double integrals: Evaluation of Double Integrals, change of order of integration (only Cartesian form), change of variables (Cartesian and polar coordinates)

Triple Integrals: Evaluation of triple integrals, Change of variables (Cartesian to Spherical and Cylindrical polar coordinates)

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

**UNIT IV**

**Vector Differentiation and Line Integration**

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

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

**UNIT V**

**Surface Integration and Vector Integral Theorems**

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

**Text Books**

1. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa publishing house, Fourth edition 2014
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010



3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

#### **Reference Books**

1. GRIET reference manual
2. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. Calculus Early Transcendental 9E by James Steward, Daniel Clegg, Saleem Watson, CENGAGE Publications



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**APPLIED PHYSICS**

**Course Code: GR22A1003**  
**I Year II Semester**

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

**Course Outcomes:**

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

**UNIT I**

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

**UNIT II**

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

**UNIT III**

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

**UNIT IV**

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

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

**UNIT V**

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

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

**Teaching Methodologies:**

- White board and marker
- Power Point Presentations



- Video lectures

### **Text Books**

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

### **Reference Books**

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



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

**Course Code: GR22A1006**  
**I Year II Semester**

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

**Course Outcomes:**

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

**UNIT I**

**Where the Mind is without Fear poem by Rabindranath Tagore**

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

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

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

**Writing:** Sentence Structures -Use of Phrases and Clauses in Sentences-Importance of Proper Punctuation - Techniques for writing precisely - Paragraph writing - Do's and Don'ts of Paragraph Writing - Creating Coherence-Organizing Principles of Paragraphs in Documents.

**UNIT II**

**The Last Leaf by O. Henry Vocabulary:** Synonyms and Antonyms.

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

**Reading:** Sub-skills of Reading- Skimming and Scanning

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

**UNIT III**

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

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

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

**Reading:** Improving Comprehension Skills – Techniques for Good Comprehension

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

**UNIT IV**

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

**Vocabulary:** Standard Abbreviations in English and Phrasal Verbs **Grammar:** Redundancies and Clichés in Oral and Written Communication. **Reading:** Comprehension- Intensive Reading and Extensive Reading

**Writing:** Writing Introduction and Conclusion -Essay Writing- Argumentative and Discursive essay – Picture Composition



## UNIT V

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

**Vocabulary:** One Word Substitutes, Technical vocabulary and their usage

**Grammar:** Common Errors in English

**Reading:** Reading Comprehension-Exercises for Practice

**Writing:** What is Report Writing - Technical Reports vs General Reports – Importance of Report Writing – Structure and characteristics of Report Writing - Relevance of Reports to Engineers

### **Text Books**

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

### **Reference Books**

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**DATA STRUCTURES**

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

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

**Course Outcomes:**

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

**UNIT I**

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

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

**UNIT II**

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

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

**UNIT III**

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

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

**UNIT IV**

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

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

**UNIT V**

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

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



**Text Books**

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

**Reference Books**

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
APPLIED PHYSICS LAB**

**Course Code: GR22A1013**

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

**I Year II Semester**

**Course Outcomes:**

1. Compare the behavior of p-n junction diode, Solar cells and LED.
2. Analyze the behavior of magnetic and electric fields with the help of graphs.
3. Infer the work function of a material through photoelectric effect.
4. Discuss the characteristics of Lasers and infer the losses in optical fibers.
5. Estimate the time constant of RC circuit and resonance phenomenon in LCR circuit.

**List of Experiments:**

1. Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.
2. Solar Cell: To study the V-I Characteristics of solar cell.
3. Light emitting diode: To study V-I characteristics of light emitting diode.
4. Stewart – Gee’s experiment: Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect: To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect: To determine work function of a given material and Planck's constant.
7. LASER: To study the V-I characteristics of LASER sources.
8. Optical fiber: To determine the bending losses of Optical fibers.
9. R-C Circuit: To determine the time constant of R-C circuit.
10. LCR Circuit: To determine the resonant frequency and Quality factor of LCR Circuit in series and parallel.

**Note: Any 8 experiments are to be performed.**



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

**Course Code: GR22A1011**

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

**I Year II Semester**

**Course Outcomes:**

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

**UNIT I**

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

**UNIT II**

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

**UNIT III**

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

**UNIT IV**

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

**UNIT V**

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

**Text Books:**

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

**Reference Books:**

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
DATA STRUCTURES LAB**

**Course Code: GR22A1020  
I Year II Semester**

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

**Course Outcomes:**

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

**TASK 1**

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

**TASK 2**

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

**TASK 3**

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

**TASK 4**

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

**TASK 5**

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

**TASK 6**

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

**TASK 7**

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

**TASK 8**

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

**TASK 9**

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

**TASK 10**

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

**TASK 11**

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

**TASK 12**

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

**TASK 13**

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

**TASK 14**

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

**TASK 15**

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

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Text Books**

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

**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**

**Course Code: GR22A1016**

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

**I Year II Semester**

**Course Outcomes:**

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

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

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

**Exercise I CALL Lab:**

**Understand:** Introduction to Phonetics – Speech Sounds – Consonant and Vowel Sounds.

**Practice:** Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

**ICS Lab:**

**Understand:** Ice Breaking and JAM.

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

**Exercise II CALL Lab:**

**Understand:** Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

**Practice:** Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

**ICS Lab:**

**Understand: Features of Good Conversation – Non-verbal Communication.**

**Practice:** Situational Dialogues – Role-Play- Expressions in Various Situations – Making Requests and Seeking Permissions- Telephone Etiquette

**Exercise III**

**CALL Lab:** Errors in Pronunciation-the Influence of Mother Tongue (MTI).

**Understand:** Intonation--Errors in Pronunciation-the Influence of Mother Tongue (MTI).

**Practice:** Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

**ICS Lab:**

**Understand:** Debates- argumentative vs persuasive - Public Speaking – Exposure to Structured Talks.

**Practice:** Debates- Making a Short Speech – Extempore.



#### **Exercise IV**

##### **CALL Lab:**

**Understand:** Presentation Skills – Elements of Presentation – Organizing Content – Use of Power Point – SlidesPreparation

**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 ofListening - Listening for General/Specific Details.

**Practice:** Listening Comprehension Tests.

##### **ICS Lab:**

**Understand:** Mind map - Story Telling - Narrating a story using mind maps

**Practice:** Weaving Stories

#### **Minimum Requirement of infrastructural facilities for ELCS Lab:**

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



# **II YEAR I SEMESTER**



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**DIGITAL LOGIC DESIGN**

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

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

**Course Outcomes:**

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

**UNIT I**

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

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

**UNIT II**

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

**UNIT III**

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

**UNIT IV**

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

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

**UNIT V**

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

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

**Teaching methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments



**Text Books**

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

**Reference Books**

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

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY****JAVA PROGRAMMING****Course Code: GR22A2068****L/T/P/C: 3/0/0/3****II Year I Semester****Course Outcomes:**

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

**UNIT I****Object Oriented Thinking**

Introduction, Need of object-oriented programming, principles of object-oriented languages, Applications of OOP, history of JAVA, Java Virtual Machine, Java features, Program structures, Installation of JDK. Variables, Primitive data types, Identifiers- Naming Conventions, Keywords, Literals, Operators- Binary, Unary and Ternary, Expressions, Primitive Type conversion and casting, flow of control- branching, conditional, loops.

**UNIT II****Classes, Inheritance, Polymorphism**

**Classes and Objects-** Classes, Objects, creating objects, methods, constructors- constructor overloading, cleaning up unused objects- Garbage collector, class variable and methods- static keyword, this keyword, arrays, Command line arguments, Nested Classes

**Strings:** String, 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, user defined Exception.

**UNIT IV****Multithreading, Collections**

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

**Collections:** Overview of Collection Framework: ArrayList, 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.

### **Text Books**

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
PROBABILITY AND STATISTICS**

**Course Code: GR22A2005**  
**II Year I Semester**

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

**Prerequisite:** Elementary Statistics, Calculus and Linear algebra

**Course Outcomes:**

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

**UNIT I**

**Basic Statistics and Random Variables**

Measures of Central tendency, moments, Skewness and Kurtosis.

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

**UNIT II**

**Discrete and Continuous Probability Distributions**

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

**UNIT III**

**Correlation, Regression and Time Series analysis**

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

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

**UNIT IV**

**Testing of Hypothesis-1(Large sampling)**

Concept of Sampling distribution and Standard error, tests for single proportion, difference of proportions, single mean, difference of means and Chi-square test for independence of attributes, Estimation of confidence interval for population mean and population proportions.

**UNIT V**

**Testing of Hypothesis-2(Small Sampling)**

Test for single mean, difference of means, Population variance, ratio of variances, ANOVA 1-way and 2-way, Estimation of confidence interval for Population mean.



**Text Books 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**  
**DATABASE MANAGEMENT SYSTEMS**

**Course code: GR22A2069**

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

**II Year I Semester**

**Course Outcomes:**

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

**UNIT I**

**Introduction to database and system architecture**

Database Systems and their Applications, Database Vs File System, View of Data, Data Models, Database Languages-DDL and DML, Transaction Management, Database users and Administrators, Database System Structure.

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

**UNIT II**

**SQL Queries and Constraints**

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

**UNIT III**

**Relational Model**

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

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

**UNIT IV**

**Schema Refinement And Normal Forms**

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

**UNIT-V**

**Transaction Management Transactions**

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.



**Text /Reference Books**

1. “Database Management Systems”,Raghurama Krishnan, Johannes Gehrke, TATA Mc GrawHill 3rdEdition
2. “Database System Concepts”,Silberschatz, Korth, Mc Grawhill, Vedition.
3. “Introduction to Database Systems”, C.J. Date Pearson Education.
4. “DatabaseSystemsdesign,Implementation,andManagement”,Rob&Coronel5thEdition.
5. “Database Management Systems”,P.RadhaKrishnaHI-TECHPublications2005.
6. “Database Management System”,Elmasri Navate Pearson Education.
7. “Database Management System”,Mathew Leon,Leo



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

**Course Code: GR22A2075**  
**II Year I Semester**

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

**Course Outcomes:**

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

**UNIT I**

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

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

**UNIT II**

**Set Theory:** Properties of binary relations, compatibility, equivalence and partial ordering relations, Hasse diagram, Lattice and its properties.

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

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

**UNIT III**

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

**UNIT IV**

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

**UNIT V**

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

**Teaching Methodologies:**

1. Power Point Presentations
2. Tutorial Sheets
3. 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. Mathematical Foundations for Computer Science Engineers, Jayant Ganguly, Pearson Education

**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, Bernard Kolman, Robert C. Busby, Sharn Cutter Ross, Pearson
4. Discrete mathematical structures, Dr. D S Chandrashekar, PRISM Publishers.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
DIGITAL ELECTRONICS LAB**

**Course Code: GR22A2058  
II Year I Semester**

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

**Course Outcomes:**

1. Comprehend the fundamentals digital theory to enable the process of logical design
2. Analyze the concept of design of digital combinational circuits using VHDL programming
3. Know the origin of sequential circuits design using VHDL
4. Acquaint with binary to grey and parity checker
5. Discriminate in digital counters and registers

**DESIGN AND SIMULATION OF COMBINATIONAL CIRCUITS USING VHDL**

**Task 1:** Realization of Gates

**Task 2:** Half adder, Full adder

**Task 3:** Magnitude comparator

**Task 4:** Decoder and Encoder

**Task 5:** Multiplexer

**Task 6:** Demultiplexer

**Task 7:** a. Binary to Gray code converter

b. Excess-3 code Converter

**Task 8:** a. Parity Generator

b. Parity Checker

**DESIGN AND SIMULATION OF SEQUENTIAL CIRCUITS USING VHDL**

**Task 9:**

a. D-T Flip-Flops

b. S-R Flip-Flops

**Task 10:** Left Shift Register

**Task 11:** Serial to Parallel Shift Register

**Task 12:** Frequency Divider

**Text Books**

1. Digital Design –Fourth Edition, M. Morris Mano, Pearson Education.
2. Fundamentals of Logic Design –Roth, 5th Edition, Thomson.

**References Books**

1. Switching and Finite Automata Theory by ZviKohavi, Tata McGraw Hill.
2. Fundamentals of Digital Logic with VHDL Design, Stephen Brown, Zvonko Vranesic, TataMcGraw Hill, Indian edition.
3. Switching and Logic Design –CVS Rao, Pearson Education



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**JAVA PROGRAMMING LAB**

**Course Code: GR22A2071**

**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. Handle exceptions at Compile time and Run time
4. Solve the real-world problems using Java Collection framework.
5. Develop GUI applications using Applets, AWT and Swings

**Task-1:**

Write java programs that implement the following

- a) 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 isa palindrome.
- b) Write a Java program for sorting a given list of names in ascending order.
- c) Write a Java Program that reads a line of integers, and then displays each integer and the sum of all the integers (Use String Tokenizer class of java.util)

**Task-3:** Write java programs that uses the following keywords

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

**Task-4:**

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

**Task-5:**

- a) Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
- b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
- c) Write a Java program that displays the number of characters, lines and words in a text file

**Task-6:**

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

**Task- 7:**

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

**Task-8:**

Write a program illustrating following collections framework

- a) Array List
- b) Vector
- c) Hash Table
- d) Stack

**Task-9:**

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

**Task-10:**

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

**Task-11:**

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

**Task -12:**

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

**Text/Reference Books:**

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
DATABASE MANAGEMENT SYSTEMS LAB**

**Course Code: GR22A2072**

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

**II Year I Semester**

**Course Outcomes:**

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

**Task-1:**

DDL commands (Create, Alter, Drop, Truncate)

1. Create a table EMP with the following structure.

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

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

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

DEPTNO as the primary key

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

**Task-2: DML COMMANDS (Insert, Update, Delete)**

1. Insert 5 records into dept Insert few rows and truncate those from the emp1 table and also drop it.
2. Insert 11 records into emp table.
3. Update the emp table to set the value of commission of all employees to Rs1000/- who are workingas managers.



4. Delete only those who are working as supervisors.
5. Delete the rows whose empno is 7599.

**Task-3: TCL COMMANDS (Save Point, Rollback Commit)**

**Task-4: DQL COMMAND (Select)- SQL Operators and Order by Clause**

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

**Task-5: SQL Aggregate Functions, Group By clause, Having clause**

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

**Task-6: SQL Functions**

1. Display the employee name concatenate with employee number.
2. Display half of employee name in upper case and half in lowercase.
3. Display the month name of date "14-jul-09" in full.
4. Display the Date of joining of all employees in the format "dd-mm-yy".
5. Display the date two months after the Date of joining of employees.
6. Display the last date of that month in "05-Oct-09".
7. Display the rounded date in the year format, month format, day format in the employee
8. Display the commissions earned by employees. If they do not earn commission, display it as "NoCommission".

**Task-7: Nested Queries**

1. Find the third highest salary of an employee.
2. Display all employee names and salary whose salary is greater than minimum salary of the company and job title starts with 'M'.
3. Write a query to display information about employees who earn more than any employee in dept 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 salaries of dept with deptno 20, 30.
6. Display the maximum salaries of the departments whose maximum salary is greater than 9000.
7. Create a table employee with the same structure as the table emp and insert rows into the table using select clauses.



8. Create a manager table from the emp table which should hold details only about the managers.

**Task-8 Joins, Set Operators.**

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

**Task-9: Views**

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

**Task-10:**

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

**Task-11:**

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

**Task-12:**

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

**Text/Reference Books**

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
VALUE ETHICS AND GENDER CULTURE**

**Course Code: GR22A2002**

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

**II Year I Semester**

**Course 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 labor, 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

**Text Books**

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



2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.
3. A Bilingual Textbook on Gender” written by A. Suneetha, Uma Bhugubanda, 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-abdul/>
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  
DESIGN AND ANALYSIS OF ALGORITHMS**

**Course Code: GR22A2077**

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

**II Year II Semester**

**Course Outcomes:**

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

**UNIT I**

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

**UNIT II**

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

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

**UNIT III**

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

**UNIT IV**

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

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

**UNIT V**

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

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

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Text Books/ References**

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



## GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY COMPUTER ORGANIZATION

Course Code: GR22A2073  
II Year II Semester

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

### Course Outcomes:

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

### UNIT I

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

**Register Transfer Language and Micro operations:** Register Transfer language. Register Transfer, Bus and memory transfers, Arithmetic Micro operations, Logic micro operations, Shift micro operations, and Arithmetic logic shift unit.

### UNIT II

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

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

### UNIT III

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

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

### UNIT IV

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

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

### UNIT V

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

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



**Text Books**

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

**Reference Books**

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ECONOMICS AND ACCOUNTING FOR ENGINEERS**

**Course Code: GR22A2004**  
**II Year II Semester**

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

**Course Outcomes:**

1. The student will be able to understand the concepts of economics and Demand concepts, elasticity, and techniques for forecast demand of products.
2. The student will be able to plan the production levels in tune with maximum utilization of organizational resources and with maximum profitability.
3. To understand the types of markets, types of competition and to estimate the cost of products and decide the price of the products and services produced.
4. The student will be able to analyze the profitability of various projects using capital budgeting techniques and
5. The student is able will be able prepare the financial statements and more emphasis on preparation of final accounts.

**UNIT I**

**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 **Demand Analysis:** 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.

**UNIT II**

**Production & Cost Analysis: Production Function** – 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 III**

**Markets and Forms of Business organizations: Types of competition and Markets,** Features of Perfect competition, Monopoly and Monopolistic Competition. **Pricing:** Objectives and Policies of Pricing. Methods of Pricing. Business: Features and evaluation of different forms of Business Organization: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises, and their types.

**UNIT IV**

**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)

**UNIT V**

**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).

**Text Books**

1. Managerial Economics – International Edition, 2019, by Christopher Thomas (Author), S.Charles Maurice (Author), McGraw-Hill Education
2. Managerial Economics Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.
3. Managerial Economics: Analysis, Problems and Cases - P. L. Mehta, Edition, 13. Publisher, Sultan



Chand, 2007.

4. Financial Accounting Paperback – 2016 by K.L.Narang S.P.Jain, Kalyani Publishers,2005.

**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  
DATA COMMUNICATIONS AND COMPUTER NETWORKS****Course Code: GR22A2081  
II Year II Semester****L/T/P/C: 3/0/0/3****Course Outcomes:**

1. Appraise various network topologies, models and transmission media.
2. Apply framing methods and design error correction technique for specified problems
3. Compare various routing methods and apply them to solve transmission problems
4. Apply various transmission methods and techniques to improve the quality of service.
5. Design and implement different protocols in network design and implementation.

**UNIT I****Data Communications:** Components – Direction of Data flow, Networks: Types of Connections – Topologies – Categories of Networks – The Internet , Protocols and Standards – OSI model – TCP/IP protocol suite.

Physical layer: Transmission modes, Multiplexing, Transmission Media: Guided and Unguided, Switching: Circuit Switched Networks - Datagram Networks - Virtual Circuit Networks.

**UNIT II****Data Link Layer:** Introduction, Framing, Error Detection and Correction: Parity – Hamming codes – CRCs – Checksum, Flow and Error Control: Noiseless Channels – Noisy Channels.

Medium Access sub layer: Random Access – ALOHA – CSMA – CSMA /CD – CSMA /CA, Controlled Access: Reservation – Polling – Token Passing, Channelization . IEEE Standards, Standard Ethernet 802.3, Wireless LAN 802.11 – Bluetooth 802.15

**UNIT III****Network Layer:** Logical Addressing - IPv4 - IPv6, Internetworking, Transition from IPv4 to IPv6 , Address mapping: ARP – RARP–BOOTP–DHCP, ICMP, IGMP, Uni-Cast Routing Protocols, Multicast Routing Protocols**UNIT IV****Transport Layer:** Process to Process Delivery, UDP and TCP protocols, Data Traffic, Congestion, Congestion Control, Congestion Control in TCP, QoS, Techniques to Improve QoS, Integrated Services, Differentiated Services.**UNIT V****Application Layer:** DNS - Domain name space -DNS in internet, Electronic mail, SMTP, FTP, WWW: Architecture – Web documents, HTTP, SNMP.**Text Books**

1. Data Communications and Networking, Behrouz A. Forouzan , Fourth Edition TMH, 2006.
2. Computer Networks, Andrew S Tanenbaum, 4th Edition. Pearson Education, PHI.

**Reference Books**

1. Data communications and Computer Networks, P.C .Gupta, PHI.
2. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education.
3. Data and Computer Communication, William Stallings, Sixth Edition, Pearson Education, 2000

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
OPERATING SYSTEMS****Course Code: GR22A2074****L/T/P/C: 2/1/0/3****II Year II Semester****Course Outcomes:**

1. Explain functions and structures of operating system and differentiate among different OS types; Implement and analyze various process management concepts and maximization of CPU throughput
2. Analyze synchronization problems and solutions; Design a deadlock management policy.
3. Optimize memory management for improved system performance.
4. Demonstrate disk management, implement disk scheduling and file system interface
5. Describe and frame protection and security policy for OS.

**UNIT I**

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

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

**UNIT II**

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

**Deadlocks:** Principles of deadlock-system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from deadlock.

**UNIT III**

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

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

**UNIT IV**

**Mass-storage structure:** Overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

**File System implementation:** Access Methods, File system structure, file system implementation, directory implementation, allocation methods, free-space management.

**UNIT V**

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

**Security:** The Security problem, program threats, system and network threats, implementing security defenses.

**TEXT / REFERENCE BOOKS:**

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice



Hallof India.

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
DESIGN AND ANALYSIS ALGORITHMS USING JAVA LAB**

**Course Code: GR22A2082**

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

**II Year II Semester**

**Prerequisite:** JAVA and Eclipse

**Course Outcomes:**

1. Analyze the asymptotic behaviors of functions obtained by elementary composition of polynomials, exponentials and logarithmic functions
2. Apply different sorting algorithms using divide and conquer strategy.
3. Design and implement greedy and dynamic approach.
4. Build various graph algorithms to solve different problems.
5. Develop branch and bound technique algorithms and backtracking algorithms.

**Task 1:**

Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.

**Task 2:**

Demonstrate using Java how the divide -and- conquer method works to sort a given set of n integer elements using Quick Sort method and compute its time complexity. Read the numbers using randomnumber generator.

**Task 3:**

Write a java program to implement greedy algorithm for job sequencing with deadlines.

**Task 4:**

Implement in Java, the Knapsack problem using greedy approach.

**Task 5:**

Write a java program to implement Dijkstra's algorithm for the Single source shortest path problem.

**Task 6 :**

Write a java program that implements Prim's algorithm to generate minimum cost spanning tree.

**Task 7:**

Write a java program that implements Kruskal's algorithm to generate minimum cost spanning tree

**Task 8:**

Implement All-Pairs Shortest Paths problem using Floyd's algorithm

**Task 9:**

Write a java program to implement Dynamic Programming algorithm for the 0/1 Knapsack problem.

**Task 10:**

Implement Travelling Sales Person problem using Dynamic programming.

**Task 11:**

Write a java program to implement the backtracking algorithm for the sum of subsets problem of a given set  $S = \{S_1, S_2, \dots, S_n\}$  of  $n$  positive integers whose SUM is equal to a given positive integer  $d$ . For example, if  $S = \{1, 2, 5, 6, 8\}$  and  $d = 9$ , there are two solutions  $\{1, 2, 6\}$  and  $\{1, 8\}$ . Display a suitable message, if the given problem instance doesn't have a solution.

**Task 12:**

Write a java program to implement the backtracking algorithm for the Hamiltonian cycles problem.

**Textbooks:**

1. Ellis Horowitz, Satraj Sahni and S Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publishers.
2. T H Cormen, C E Leiserson, and R L Rivest, Introduction to Algorithms, 3<sup>rd</sup> Edition, Pearson Education.

**Reference Books:**

1. Michael T. Goodrich & Roberto Tamassia, Algorithm Design, Wiley Singapore Edition, 2002.
2. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson Education.
3. Design and Analysis of Algorithms, S. Sridhar, Oxford Univ. Press





**Task-12:** Reading Microsoft Excel Files

**Text/Reference Books:**

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, GregGagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, PrenticeHall of India.
3. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing.
4. Scilab, from theory to practice Fundamentals Perrine Mathieu, Philippe Roux2016 ISBN:978-2-8227-0293-5.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
DATA COMMUNICATIONS AND COMPUTER NETWORKS LAB**

**Course Code: GR22A2084**

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

**II Year II Semester**

**Course Outcomes:**

1. Independently understand basic computer network technology, Data Communications System and its components.
2. Identify the different types of network topologies and protocols.
3. Understanding the working of wired and wireless networks.
4. Understand the implementation of different framing techniques, Error detecting and correcting techniques.
5. Implementation of various routing algorithms.

**PART I**

**Task-1:** Introduction to Cisco Packet tracer Simulator.

**Task-2:** Initial Configuration of switch and router.

**Task-3:** Working with static and dynamic IP addressing.

**Task-4:** Design star, bus, ring topology using packet tracer.

**Task-5:** Design a network using Static NAT and Dynamic NAT.

**Task-6:** Design a wireless LAN.

**PART II**

**Task-7:** Implement the data link layer framing methods such as character, character stuffing and bit stuffing.

**Task-8:** Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.

**Task-9:** Implement Hamming code

**Task-10:** Implement Dijkstra's algorithm to compute the Shortest path through a graph.

**Task-11:** Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table at each node using distance vector routing algorithm.

**Task-12:** Take an example subnet of hosts. Obtain broad cast tree for it.

**Text/Reference Books:**

1. Data Communications and Networking, Behrouz A. Forouzan , Fourth Edition TMH, 2006.
2. Computer Networks, Andrew S Tanenbaum, 4th Edition. Pearson Education, PHI.
3. Data communications and Computer Networks, P.C.Gupta, PHI.
4. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
ENVIRONMENTAL SCIENCE****Course Code:GR22A2001  
II Year II Semester****L/T/P/C:2/0/0/0****Prerequisites:** 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 safe guarding 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 green revolution.

**UNIT I****Introduction and Awareness Activities**

Environmental Science: Introduction, Definition, scope, and importance.

**AWARENESS ACTIVITIES**

Small group meetings about:

- Water management
- Waste water treatment.
- Projects Vs Environment
- Zero waste management
- Circular economy
- Impact of Science & Technology on Environment
- E-waste management
- Biodiversity loss
- Renewable Energy

**UNIT II****Slogan and Poster Making Event**

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

**UNIT III****Expert Lectures on Environmental Science**

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



#### UNIT IV

##### Cleanliness Drive

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

#### UNIT V

##### Case Studies

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

##### Text Books

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

##### Reference Books

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**EFFECTIVE TECHNICAL COMMUNICATION**

**Course Code: GR22A2108**

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

**II Year II Semester**

**Course Outcomes:**

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

**UNIT I**

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

**UNIT II**

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

**UNIT III**

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

**UNIT IV**

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

**UNIT V**

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

**Text Books**

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

**Reference Books**

1. Raman Sharma, Technical Communication, Oxford Publication, London, 2013.
2. Meenakshi Raman, Shalini Upadhyay, SOFT SKILLS Key to Success in Workplace and Life, Cengage Learning India Pvt. Ltd., Delhi, 2018.



3. Ron Cowan, The teacher's Grammar of English, CAMBRIDGE UNIVERSITY PRESS, New Delhi,2008.
4. Shiv Khera, You Can Win, Macmillian Books, New York, 2003.
5. Arthur D. Rosenberg, David Hizer, The Resume Handbook, Adams Media, an F+W Publications Company, 57 Little field Street, Avon, MA02322, USA.
6. M. Kay DuPont, Business Etiquette & Professionalism, Viva Books private Limited, Hyd.,2005
7. David F. Beer and David McMurrey, Guide to Writing as an Engineer, John Willey, New York, 2004.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
REAL-TIME RESEARCH PROJECT/ SOCIETAL RELATED PROJECT**

**Course Code: GR22A2109**

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

**II Year II Semester**

**Course Outcomes:**

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. Analyze 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.



# **III YEAR I SEMESTER**



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

**Course Code: GR22A3052**  
**III Year I Semester**

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

**Course Outcomes:**

1. Understand business requirements and choose a relevant Process model for a given software proposal
2. Analyze the requirements to prepare SRS.
3. Model various Architectural Designs for a software project.
4. Develop various functional and structural test cases for a software module
5. Estimate the Cost and Schedules of a Software Project.

**UNIT I**

**Introduction to Software Engineering:** The evolving role of software, Changing Nature of Software, Software myths.

**A Generic view of process:** Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.

**Process models:** The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

**UNIT II**

**Software Requirements:** Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

**Requirements engineering process:** Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

**UNIT III**

**Design Engineering:** Design process and Design quality, Design concepts, the Design model. **Creating an architectural design:** Software architecture, Data design, Architectural Styles and Patterns, Architectural Design.

**Performing User interface design:** Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

**UNIT IV**

**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.

**Product metrics:** Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.

**Metrics for Process and Products:** Software Measurement, Metrics for software quality.

**UNIT V**

**Risk management:** Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk



projection, Risk refinement, RMMM, RMMM Plan.

**Quality Management :** Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

**Text Books**

1. Software Engineering, A practitioner's Approach- Roger S.Pressman, 6th edition. McGrawHill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson education.

**Reference Books**

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
3. Systems Analysis and Design- Shely Cashman Rosenblatt,Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
ARTIFICIAL INTELLIGENCE**

**Course Code: GR22A3070**

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

**III Year I Semester**

**Course Outcomes:**

1. Select an appropriate searching strategy for developing intelligent agents to find solution in optimized way using building blocks of AI.
2. Apply Propositional and First Order Logic methods to resolve decisions for Knowledge-based agents.
3. Practice uncertain knowledge and reasoning handling using Bayesian Networks.
4. Analyze the working of temporal model, Hidden Markov Model, and Decision trees.
5. Breakdown the steps to construct small robot capable of performing perception and movement based on techniques learnt in the course.

**UNIT – I**

**Introduction to AI:** Introduction, Foundation of AI, History of Intelligent Agents, Agents and environments, Concept of Rationality, Nature of environments & Structure of Agents, Problem solving agents and formulation, Searching For Solutions and Strategies, Uninformed search strategies BFS, DFS, Heuristic approach, Greedy best search, A\* Search, Game Playing: Adversal search, Games, Min-Max algorithm, Optimal decisions in multiplayer games, Alpha Beta pruning.

**UNIT – II**

**Knowledge Representation & Reasons:** Logical agents, Knowledge based agents, The Wumpus world, Logic: Proportional logic, Resolution patterns in proportional logics, Resolution: Forward and Backward chaining, First order logic: Inference in First order logic, Proportional vs first order inference, Unification & Lifting, forward chaining, Resolution, Practice problems.

**UNIT - III**

**Uncertain Knowledge and Reasoning:** Uncertainty-Acting under uncertainty, Basic probability notion, the axioms of probability, inference using full joint distribution, Independence, Bayes' rule.

**Probabilistic Reasoning:** Representing Knowledge in uncertain domain, the semantics of Bayesian networks, efficient representations of conditional distributions, exact inference in Bayesian networks, approximate inference in Bayesian networks.

**UNIT - IV**

**Probabilistic reasoning over time:** Time and uncertainty, inference in temporal model, Hidden Markov models.

**Planning:** Overview, Components of Planning, Conditional Planning, Goal Stack Planning.

**Learning:** Learning from observations: Forms of learning, inductive learning, learning decision trees, ensemble learning, why learning works.

**UNIT - V**

**Perception:** Image formation, Early Image Processing operations- Edge detection, image segmentation. Object recognition, using vision for manipulation and navigation.

**Robotics:** Introduction, Robot hardware, robotic perception, planning to move, robotic software architectures, application domains. Introduction to Expert Systems, Conversational AI, Generative AI.



**Text Books:**

1. Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, 4th Edition, Pearson

**Reference Books:**

1. Artificial Intelligence, Elaine Riche & Kevin Night, 2nd Edition, Tata McGraw Hill Education Pvt Ltd.
2. Artificial Intelligence, Kevin Knight, Elaine Rich, Shivashankar B. Nair, 3rd Edition, McGraw Hill Education Pvt Ltd.
3. Paradigms of Artificial Intelligence Programming, Case Studies in Common Lisp, Peter Norvig, Morgan Kaufmann Publisher.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
WEB PROGRAMMING**

**Course Code: GR22A3053**

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

**III Year I Semester**

**Course Outcomes:**

1. Develop web page using JavaScript for event handling which uses HTML tags and intrinsic event attributes.
2. Understand the concept and learn to use the building blocks of XML and Java Bean Components.
3. Build server side applications using servlets for web applications.
4. Design dynamic and interactive websites using JSP.
5. Design databases and Develop the supporting code for Client and Server-Side applications using JSP and Servlets

**UNIT I**

**HTML:** Common tags- List, Tables, images, forms, Frames, Cascading Style sheets.

**Java Script:** Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script

**UNIT II**

**XML:** Introduction to XML, Building Blocks in XML, Document type definition, XML Schemas, Presenting XML.

**Java Beans:** Introduction to Java Beans, Advantages of Java Beans, Java Beans API and Features of Java Beans: Introspection, Bound properties, Constrained properties, Persistence, Customization.

**UNIT III**

**Servlets:** Introduction, Lifecycle, Generic Servlet Package, reading parameters, Reading Initialization parameters, HTTP Servlet Package, Handling Http Request & Responses, Cookies, Session Tracking.

**UNIT IV**

**JSP Application Development:** The Problem with Servlet, The Anatomy of a JSP Page, JSP Processing, JSP Components: Directives, Action Elements, Scripting Elements, Tag Libraries, Expression Language, Java Bean Components, Deploying JAVA Beans in a JSP Page, Model View Controller, JSP Application Design with MVC Setting Up, Error Handling, Scope of Implicit Objects.

**UNIT V**

**Database Access:** Database Programming using JDBC, Studying javax.sql.\* package, Steps to access database, Working with Prepared Statements, Accessing a Database from a Java/Servlet/JSP, Application – Specific Database Actions, Introduction to struts framework.

**Text Books**

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY, Dreamtech
2. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH
3. Java Server Pages –Hans Bergsten, SPD O'Reilly



### Reference Books

1. Programming world wide web-Sebesta, Pearson
2. Core SERVLETS ANDJAVASERVER PAGES VOLUME 1: CORE TECHNOLOGIES By Marty Hall and Larry Brown Pearson
3. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia.
4. Jakarta Struts Cookbook , Bill Siggelkow, S P D O'Reilly for chap 8.
5. Murach's beginning JAVA JDK 5, Murach, SPD



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**DIGITAL IMAGE PROCESSING**  
**(PROFESSIONAL ELECTIVE – I)**

**Course Code: GR22A4038**  
**III Year I Semester**

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

**Course Outcomes:**

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

1. Interpret the effect of sampling and quantizing the 2-D continuous-Image signals and analyze, implement fundamental algorithms and different types of image transforms.
2. Analyze and apply enhancement and restoration techniques suitable for specific application.
3. Design simple systems for realizing some multimedia applications with image segmentation techniques.
4. Use color image processing techniques to classify objects.
5. Apply the acquired knowledge to solve practical multimedia related problems and projects on work.

**UNIT I**

**Digital image fundamentals and Image Transforms**

Digital Image through scanner, Concept of gray levels, Gray level to binary image conversion. Sampling and quantization. Relationship between pixels. 2D FFT and its Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, Slant transform, SVD and Hotelling transform.

**UNIT II**

**Image enhancement in spatial domain and Frequency domain**

Point processing, Histogram processing, Spatial filtering, Enhancement in frequency domain, Image smoothing, Image sharpening, Image enhancement using Fuzzy logic.

**UNIT III**

**Color image processing and Restoration**

Pseudo color image processing, full color image processing. Image Restoration Degradation model, Algebraic approach to restoration, Inverse filtering, least mean square filters, Constrained Least Squares Restoration, Interactive Restoration.

**UNIT IV**

**Segmentation and Thresholding**

Image segmentation, Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation, edge detection using Fuzzy logic.

**UNIT V**

**Image Compression Techniques**

Image compression Redundancies and their removal methods, Fidelity criteria, Image compression models, Source encoder and decoder, Error free compression, Lossy compression, Case study in Image watermarking.

**Text Books**

1. Digital Image processing – R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education, 2nd



Education, 2002

2. Fundamentals of Digital Image processing – A.K.Jain , PHI.

Reference Books

1. Digital Image processing using MAT LAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Edition, PEA, 2004.
2. Digital Image Processing – William K. Pratt, John Wiley, 3rd Edition, 2004.
3. Fundamentals of Electronic Image Processing – Weeks Jr., SPIC/IEEE Series, PHI



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**PRINCIPLES OF PROGRAMMING LANGUAGES**  
**(PROFESSIONAL ELECTIVE - I)**

**Course Code: GR22A3047**  
**III Year I Semester**

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

**Course Outcomes:**

1. Evaluate language constructs and programming paradigms.
2. Apply formal methods of syntax, semantics and data types.
3. Illustrate sub programs, blocks and control structures in different programming languages.
4. Construct abstract data types, concurrency and exceptions.
5. Compare functional and imperative languages.

**UNIT I**

**Preliminary Concepts:** Reasons for studying, concepts of programming languages, Programming domains, Language Evaluation Criteria, Influences on Language design, Language categories, Programming Paradigms – Imperative, Object Oriented, Functional Programming , Logic Programming.

**Programming Language Implementation:** Compilation and Virtual Machines, Programming environments.

**UNIT II**

**Syntax and Semantics:** General Problem of describing Syntax and Semantics, formal methods of describing syntax - BNF, EBNF for common programming language features, parse trees, ambiguous grammars, attribute grammars, denotation semantics and axiomatic semantics for common programming language features.

**Data types:** Introduction, primitive, character, user defined, array, associative, record, union, pointer and reference types, design and implementation uses related to these types, Names, Variable, concept of binding, type checking, strong typing, type compatibility, named constants and variable initialization.

**UNIT III**

**Expressions and Statements:** Arithmetic relational and Boolean expressions, Short circuit evaluation, mixed mode assignment, Assignment Statements, Control Structures– Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, guarded commands.

**Subprograms and Blocks:** Fundamentals of sub-programs, Scope and lifetime of variable, static and dynamic scope, Design issues of subprograms and operations, local referencing environments, parameter passing methods, overloaded sub-programs, generic sub-programs, parameters that are sub- program names, design issues for functions, user defined overloaded operators, co routines.

**UNIT IV**

**Abstract Data types:** Abstractions and encapsulation, Introduction to data abstraction, design issues, language examples, C++ parameterized ADT, object oriented programming in C++, Java, C#,Python

**Concurrency:** Subprogram level concurrency, semaphores, monitors, message passing, Java threads, Examples: Java RMI, Parallel Java, Parallel C

**Exception handling:** Exceptions, Exception propagation, Exception handler in C++ and Java and PHP. Handling Large Database.



## UNIT V

**Functional Programming Languages:** Introduction, fundamentals of FPL, LISP, ML, Haskell, application of Functional Programming Languages and comparison of functional and imperative languages.

**Logic Programming Language:** Introduction and overview of logic programming, basic elements of prolog, application of logic programming.

### Text Books

1. Concepts of Programming Languages Robert .W. Sebesta 6/e, Pearson Education.
2. Programming Languages –Louden, Second Edition, Thomson.

### Reference Books

1. Programming languages –Ghezzi, 3/e, JohnWiley
2. Programming Languages Design and Implementation – Pratt and Zelkowitz, Fourth Edition  
PHI/Pearson Education



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**EDGE COMPUTING**  
**(PROFESSIONAL ELECTIVE - I)**

**Course Code: GR22A4059**

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

**III Year I Semester**

**Course Outcomes:**

1. Analyze the Edge platforms.
2. Understand Implementations of IoT with examples.
3. Understand the RaspberryPi Programming.
4. Apply the Edge to Cloud protocols.
5. Understand Edge computing and solutions

**UNIT-I**

IoT and Edge Computing Definition and Use Cases, Introduction to Edge Computing Scenario's and Use cases - Edge computing purpose and definition, Edge computing use cases, Edge computing hardware architectures, Edge platforms, Edge vs Fog Computing, Communication Models - Edge, Fog and M2M.

**UNIT- II**

IoT Architecture and Core IoT Modules-A connected ecosystem, IoT versus machine-to-machine versus, SCADA, the value of a network and Metcalfe's and Backstrom's laws, IoT and edge architecture, Role of an architect, Understanding Implementations with examples-Example use case and deployment, Case study – Telemedicine palliative care, Requirements, Implementation, Use case retrospective.

**UNIT -III**

RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout and Pinouts, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming Raspberry Pi, Connecting Raspberry Pi via SSH, Remote access tools, Interfacing DHT Sensor with Pi, Pi as Webserver, Pi Camera, Image & Video Processing using Pi.

**UNIT IV**

Implementation of Microcomputer RaspberryPi and device Interfacing, Edge to Cloud Protocols, MQTT, MQTT publish-subscribe, MQTT architecture details, MQTT state transitions, MQTT packet structure, MQTT data types, MQTT communication formats, MQTT 3.1.1 working example.

**UNIT V**

Edge computing with RaspberryPi, Industrial and Commercial IoT and Edge, Edge computing and solutions.

**Text Books**

1. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packt Publishing, 2020, ISBN: 9781839214806
2. Raspberry Pi Cookbook, 3rd Edition, by Simon Monk, Publisher: O'Reilly Media, Inc., 2019, ISBN: 978149204322.



**Reference Books**

1. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, Satish Narayana Srirama, wiley publication, 2019, ISBN: 9781119524984.
2. David Jensen, “Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge, MICROSOFT AZURE



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**CYBER SECURITY**  
**(PROFESSIONAL ELECTIVE - I)**

**Course Code: GR22A3055**

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

**III Year I Semester**

**Course Outcomes:**

1. Obtain firm understanding on basic terminology and concepts of cybercrimes and security.
2. Analyze the plans of attacks.
3. Deal with the security challenges posed by mobile devices.
4. Implement the tools to handle security challenges.
5. Evaluate the associated challenges and the cost of cybercrimes in Organizations.

**UNIT I**

**Introduction to Cybercrime:** Introduction, Cybercrime and Information Security, Cyber Criminals, Classifications of Cybercrimes and Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

**UNIT II**

**Cyber Offenses:** Introduction, How Criminals plan the Attacks, Types of Attackers, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

**UNIT III**

**Cybercrime:** Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

**UNIT IV**

**Tools and Methods Used in Cybercrime:** Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and Types of DDoS attacks, SQL Injection, Buffer Overflow.

**UNIT V**

**Cyber Security:** Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing, and the associated challenges for Organizations.

**Text Books**

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, WileyINDIA.

**Reference Books**

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu, J. David Irwin. CRC Pr



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**SOFTWARE ENGINEERING AND UML LAB**

**Course Code: GR22A3150**  
**III Year I Semester**

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

**Course Outcomes:**

1. To understand the software engineering methodologies in the phases of project development
2. To gain knowledge about open source tools used for implementing software engineering methods
3. An ability to distinguish the different uml diagrams.
4. An ability to design how to apply the UML to a number of common modeling techniques.
5. Show the role and function of each UML model in developing object oriented software.

**I. UML diagrams to be developed are:**

1. Use Case diagram.
2. Class diagram.
3. Sequence diagram.
4. Collaboration diagram.
5. State diagram.
6. Activity diagram
7. Component Diagram
8. Deployment Diagram

**II. Case Studies:**

1. Online Movie ticket system
2. E commerce Website.
3. Easy Leave Application
4. Hospital Management system

Prepare the following documents and develop the software project startup, prototype model, using software engineering methodology for at least two real time scenarios or for the sample experiments.

Problem Analysis and Project Planning -Thorough study of the problem – Identify Project scope, Objectives and Infrastructure.

Software Requirement Analysis – Describe the individual Phases/modules of the project and Identify deliverables. Identify functional and non-functional requirements.

Data Modeling – Use work products – data dictionary.

Software Designing – Develop use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams.

Prototype model – Develop the prototype of the product.

The SRS and prototype model should be submitted for end semester examination.

**TEXT BOOKS**

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Edition, 6th edition, 2001.
2. Ian Sommerville, Software engineering, Pearson education Asia, 6th edition, 2000
3. Unified modeling language- Grady booch



## REFERENCES

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
3. Systems Analysis and Design- Shely Cashman Rosenblatt, Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**INTERNET OF THINGS AND APPLICATIONS LAB**

**Course Code: GR22A3057**

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

**III Year I Semester**

**Course Outcomes:**

1. Apply the skills to code and build simple real time applications using 8-bit and 32-bit microcontroller.
2. Develop the skills to write and to upload the programs.
3. Understand interfacing techniques to connect different sensors to a microcontroller.
4. Design mobile applications to work with data through cloud.
5. Apply the skills to develop an IoT project.

**TASK 1**

Write an ARDUINO Program for

- a) Blinking LEDs
- b) Serial Lights
- c) LED Interface through Switch

**TASK 2**

Write an ARDUINO Program for

- a) Display string1 on first line and string2 on second line on LCD
- b) Implement different LCD commands

**TASK 3**

Write an ARDUINO Program for

- a) Take command from PC and glow corresponding LED
- b) Echo Program- read a string from serial monitor and display it back on PC
- c) Press Switch and display switch number on PC

**TASK 4**

Write an ARDUINO Program

- a) Read LM35 sensor data, and display the temperature value on the serial monitor
- b) Read LDR sensor data, and display it on the PC
- c) Read LDR sensor data and make the LED ON or OFF

**TASK 5**

Write an ARDUINO Program

- a) Transfer/ Receive data to/ from PC using Bluelink and display data on PC
- b) Read data from mobile phone and make the LED ON or OFF using Bluelink

**TASK 6**

Interfacing different Sensors to ESP32

- a) Programming a Generic Sensor Board to interface the Temperature & Humidity sensor
- b) Write a program for interfacing the Ultrasonic Sensor with Generic Sensor Board



### **TASK 7**

- a) Using Generic Sensor Board write a program to interface the Soil Moisture Sensor
- b) Programming a Generic Sensor Board to interface the Real Time Clock module

### **TASK 8**

- a) Design and interface the Magnetic Sensor with Generic Sensor Board
- b) With the help of Generic Sensor Board, build an interface for switching applications using relay

### **TASK 9**

- a) Develop a Mobile app for simple User Interface
- b) Design a Mobile app to work with data of a cloud

### **TASK 10**

Design an application to create a Remote Motor Control System

### **TASK 11**

Develop a Smart Garden using Generic Sensor Board

### **TASK 12**

Integrating different blocks to do the IOT project on Real Time-based Appliance Control.

### **TEXT BOOKS**

1. Embedded Controllers using C and Arduino/2E by James M.Fiore

### **REFERENCES**

#### **Web References:**

1. <https://www.arduino.cc/en/Tutorial/HomePage>,
2. <https://www.espressif.com/en/products/socs/esp32>



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
WEB PROGRAMMING LAB**

**Course Code: GR22A3058**

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

**III Year I Semester**

**Course Outcomes:**

1. Create web pages using HTML, DHTML and Cascading Styles sheets.
2. Design dynamic web pages using JavaScript (client side programming).
3. Apply the concepts of XML, Servlets, JSP and protocol usage in the workings of the web applications
4. Analyze a web page and identify its elements and attributes.
5. Create interactive web applications using JSP.

**TASK -1**

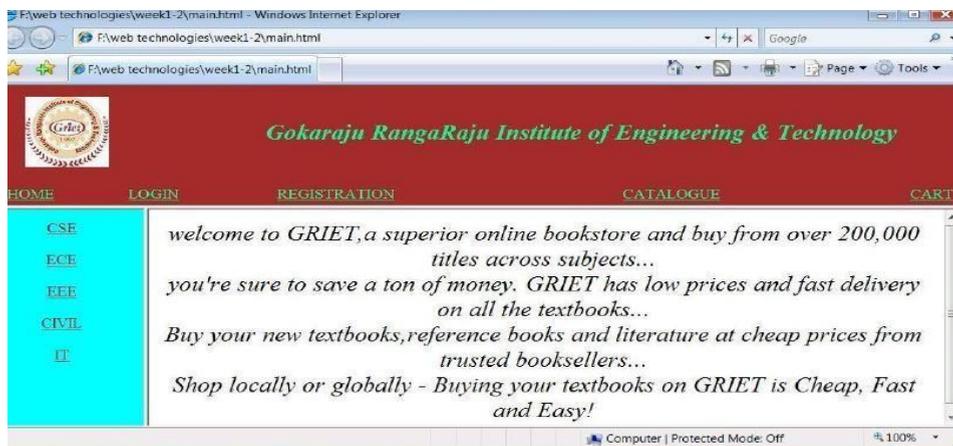
Design the following static web pages required for an online book store web site.

**Home Page:** The static home page must contain three frames.

**Top frame:** Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

**Left frame:** At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link “CSE” the catalogue for CSE Books should be displayed in the Right frame.

**Right frame:** The pages to the links in the left frame must be loaded here. Initially this page contains description of the web site





Login Page



CATOLOGUE PAGE

The catalogue page should contain the details of all the books available in the web site in atable.

The details should contain the following:

1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button

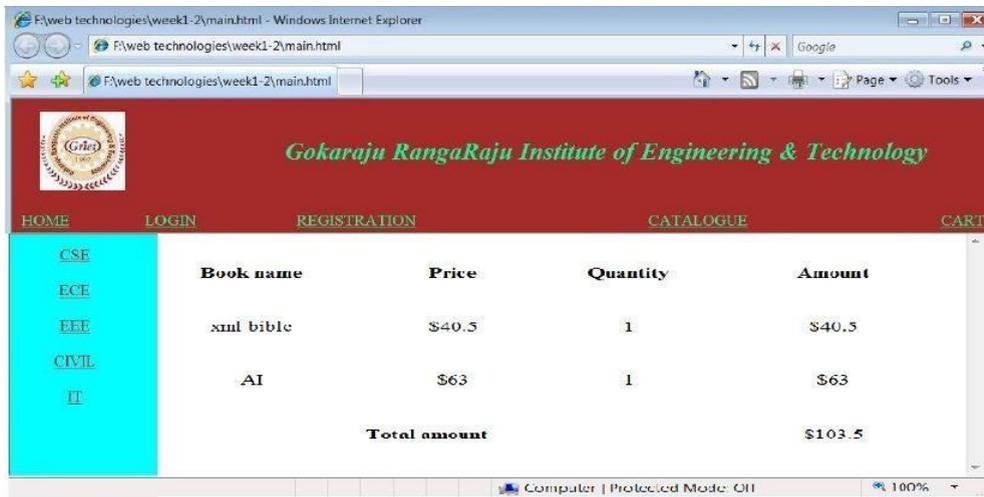


**Note:** Task 2 contains the remaining pages and their description.

**TASK-2**

## Cart Page

The cart page contains the details about the books which are added to the cart. The cart page should look like this:



## Registration Page

Create a “registration form “with the following fields

1. Name (Text field)
2. Password (password field)
3. E-mail id (text field)
4. Phone number (text field)
5. Gender (radio button)
6. Date of birth (3 select boxes)
7. Languages known (check boxes English, Telugu, Hindi, Tamil)
8. Address (text area)



**TASK-3**

## Validation

Write *JavaScript* to validate the following fields of the above registration page.

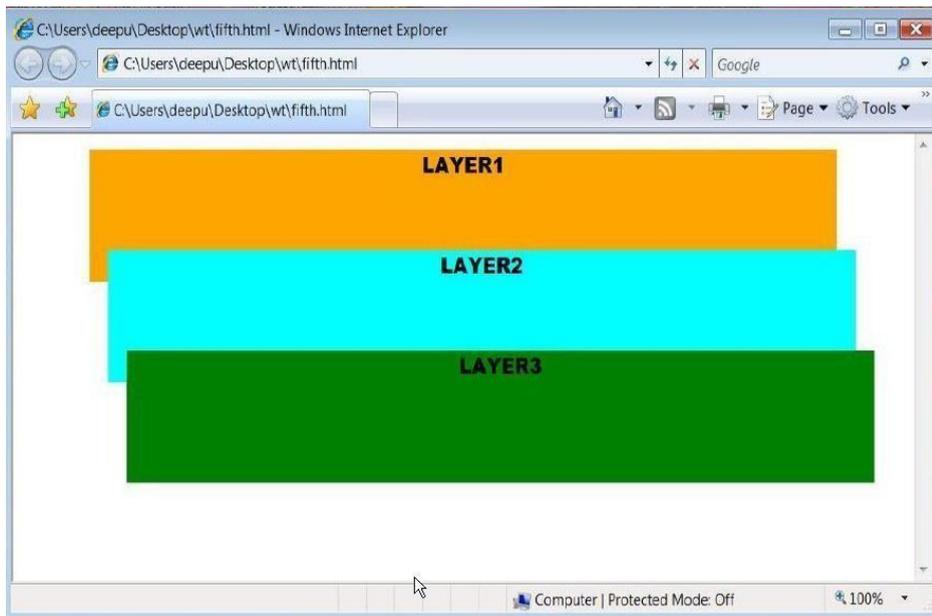
1. Name (Name should contains alphabets and the length should not be less than 6characters).
2. Password (Password should not be less than 6 characters length).
3. E-mail id (should not contain any invalid and must follow the standard patternname@domain.com)
4. Phone number (Phone number should contain 10 digits only).

**Note:** You can also validate the login page with these parameters.

**TASK-4**

Design a web page using CSS (Cascading Style Sheets) which includes the following:

1. Use different font, styles: In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.
2. Set a background image for both the page and single elements on the page.
3. Control the repetition of the image with the background-repeat property. As background- repeat: repeat Tiles the image until the entire page is filled, just like an ordinary background image in plain HTML.
4. Design a web page which must include hyperlinks by using A:link, A:visited, A:active, A:hover  
Work with layers
5. Add a customized cursor like crosshair, help, wait, move, e-resize



### TASK-5

Write an XML file which will display the Book information which includes the following:

1. Title of the book
2. Author Name
3. ISBN number
4. Publisher name
5. Edition
6. Price

Write a Document Type Definition (DTD) to validate the above XML file. Display the XMLfile as follows. The contents should be displayed in a table. The header of the table should be in color GREY. And the Author names column should be displayed in one color and should be capitalized and in bold. Use your own colors for remaining columns. Use XML schemas XSL and CSS for the above purpose.

### TASK- 6

Create a simple visual bean with an area filled with a color.

The shape of the area depends on the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false.

The color of the area should be changed dynamically for every mouse click. The color should also be changed if we change the color in the “property window “.

### TASK-7

1. Install TOMCAT web server and APACHE. While installation assign port number 4040to TOMCAT and 8080 to APACHE. Make sure that these ports are available i.e., no other process is using this port.
2. Access the above developed static web pages for books web site, using these serversby putting the web pages developed in week-1 and week-2 in the document root.

Access the pages by using the urls <http://localhost:4040/rama/books.html> (for tomcat)  
<http://localhost:8080/books.html> (for Apache).



## TASK-8

### User Authentication:

1. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following.
  - Create a Cookie and add these four-user id's and passwords to this Cookie.
  - Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.  
If he/she is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display “You are not an authenticated user “.
2. Repeat the same using by storing the 4 user ids and passwords in web.xml file using init-parameters

## TASK-9

Install a database (Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form). Practice 'JDBC' connectivity.

Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.

Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page (week2).

## TASK-10

Write a JSP which does the following job:

Insert the details of the 3 or 4 users who registered with the web site using week9 by using registration form. Authenticate the user when he submits the login form using the user name and password from the database.

## TASK-11

Create tables in the database which contain the details of books having Book name, Price, Quantity, Amount of each category. Modify the catalogue page (week 2) in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using JDBC.

## TASK-12

HTTP is a stateless protocol. Session is required to maintain the state. The user may add some items to cart from the catalog page. He can check the cart page for the selected items. He may visit the catalogue again and select some more items. Here our interest is the selected items should be added to the old cart rather than a new cart. Multiple users can do the same thing at a time. This can be achieved through the use of sessions. Every user will have his own session which will be created after his successful login to the website. When the user logs out his session should get invalidated (by using the method session.invalidate()). Modify the catalogue and cart JSP pages to achieve the above mentioned functionality using sessions.

## TEXT BOOKS

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY, Dream tech
2. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH  
Java Server Pages –Hans Bergsten, SPD O'Reilly



## GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY CONSTITUTION OF INDIA

Course Code: GR22A2003

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

III Year I Semester

### Course Outcomes

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

### UNIT I

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

### UNIT II

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

### UNIT III

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

### UNIT IV

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

### UNIT V

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

### TEXT BOOKS

1. 'Indian Polity' by Laxmikanth 5<sup>th</sup> Edition, McGraw Hill Edition.
2. Indian Constitution by Subhash C. Kashyap, Vision Books Publisher

### REFERENCES

1. 'Introduction to Indian Constitution' by D.D. Basu, 21<sup>st</sup> Edition, LexisNexis Publisher
2. Indian Administration by Avasthi and Avasthi-by lakshminarainagarwal publication.



# **III YEAR II SEMESTER**



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**AUTOMATA AND COMPILER DESIGN**

**Course Code: GR22A3115**

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

**III Year II Semester**

**Course Outcomes:**

1. Articulate the models for regular sets grammar for program constructs.
2. Develop the phases of the compiler for a language definition through regular expressions and grammars.
3. Build the Bottom up parsers and intermediate code generation algorithms.
4. Experiment memory management techniques in the phases of compiler.
5. Interpret the Code optimization and code generation techniques.

**UNIT I**

**Introduction:** Alphabets, Strings and Languages; Automata and Grammars, Deterministic Finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic Finite Automata (NFA), introduction to CFG, Ambiguous grammar, Regular Expressions, Arden's theorem.

**UNIT II**

**Compiler Structure:** Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler. **Lexical Analysis:** The role of Lexical Analyzer, The Lexical-Analyzer Generator Lex , **Syntax Analysis** : CFG, Lexical Versus Syntactic Analysis , Eliminating Ambiguity , Elimination of Left Recursion , Left Factoring, **Top-Down parsers:** Recursive-Descent Parsing, FIRST and FOLLOW, LL(1) Grammars, Non recursive Predictive Parsing, Error Recovery in Predictive Parsing.

**UNIT III**

**Bottom-up Parsers:** Reductions, Handle Pruning, Shift-Reduce Parsing, Conflicts During Shift-Reduce Parsing, LR parsers : SLR, Canonical LR, LALR, Parser Generators : YACC. Syntax Directed translation mechanism and attributed definition.

**Intermediate Code Generation:** Variants of Syntax Trees, Three-Address Code, Quadruples & Triples, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Switch- Statements, Intermediate Code for Procedures.

**UNIT IV**

**Run Time Memory Management:** Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management, Error Detection and Recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.

**UNIT V**

**Code Optimization and Code Generation:** Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection.



**Text Books**

1. Introduction to Theory of Computation. Sipser, 2<sup>nd</sup> Edition, Thomson.
2. Hopcroft, Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education
3. Compilers Principles, Techniques and Tools Aho, Ullman, Sethi, Pearson Education

**Reference Books**

1. Modern Compiler Construction in C , Andrew W.Appel Cambridge University Press.
2. Compiler Construction, LOUDEN, Thomson.
3. Elements of Compiler Design, A. Meduna, Auerbach Publications, Taylor and Francis Group.
4. Principles of Compiler Design, V.Raghavan, TMH.
5. Engineering a Compiler, K. D. Cooper, L.Torczon, ELSEVIER.
6. Introduction to Formal Languages and Automata Theory and Computation -Kamala Krithivasan and Rama R, Pearson.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**MACHINE LEARNING**

**Course Code: GR22A3140**  
**III Year II Semester**

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

**Course Outcomes:**

1. Explain the concepts machine learning models and able to perform feature engineering techniques.
2. Identify and apply appropriate supervised learning models.
3. Design neural network models for the given data.
4. Perform evaluation on machine learning algorithms and model selection techniques.
5. Devise un-supervised and reinforcement learning models.

**UNIT I**

**Introduction:** Introduction to machine learning, Supervised learning, Unsupervised learning, Semi-supervised learning, Reinforcement learning, Deep learning, Concept learning using find-S algorithm.

**Feature Engineering:** Feature Selection using Filter, Wrapper, Embedded methods, and Feature normalization using min-max normalization, z-score normalization, and constant factor normalization,

**Introduction to Dimensionality Reduction:** Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) techniques.

**UNIT II**

**Supervised Learning – I (Regression and Classification)**

**Regression models:** Simple linear regression, Multiple linear regression. Cost Function, Gradient Descent, Performance Metrics: Mean Absolute Error (MAE), Mean Squared Error (MSE), R-Squared error, Adjusted R Square.

**Classification models:** Decision Trees-ID3, CART, Naive Bayes, K-Nearest-Neighbors (KNN), Logistic regression, Multinomial logistic regression, Support Vector Machines (SVM).

**UNIT III**

**Supervised Learning – II (Classification with Neural Networks)**

**Neural Network Representation:** Introduction to Artificial Neural Networks (ANN), Activation Functions, Perceptron and Back Propagation algorithms.

**Convolutional Neural Networks** - Convolution and Pooling layers, Recurrent Neural Networks(RNN).

**Classification Metrics:** Confusion matrix, Precision, Recall, Accuracy, F-Score, ROC curves

**UNIT IV**

**Model Validation in Classification:** Cross Validation - Holdout Method, K-Fold, StratifiedK-Fold, Leave-One-Out Cross Validation (LOOC-V).

Bias-Variance tradeoff, Regularization, Overfitting, Underfitting.

**Ensemble Methods:** Boosting, Bagging, Random Forest classifier.

**UNIT V**

**Unsupervised Learning:** K-means, K-Modes, K-Prototypes, Gaussian Mixture Model clustering algorithms, Expectation-Maximization, BIRCH clustering algorithms.

**Reinforcement Learning:** Exploration and exploitation trade-offs, non-associative learning, Markov decision processes, Q-learning.



**Text Books**

1. Data Mining–Concepts and Techniques -Jiawei Han and Micheline Kamber, Morgan Kaufmann (2nd Edition).
2. Machine Learning – Tom M. Mitchell, TMGH.
3. Introduction to Data Mining - Michael Steinbach, Pang-Ning Tan, and Vipin Kumar (Second Edition).

**Reference Books**

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. R. S. Sutton and A. G. Barto. Reinforcement Learning - An Introduction. MIT Press,1998.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009.
4. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
5. Machine Learning Yearning, Andrew Ng.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
FULL STACK DEVELOPMENT**

**Course Code: GR22A3123**  
**III Year II Semester**

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

**Course Outcomes:**

At the end of this course, students will able to

1. Analyse the Structure and implement HTML/CSS and apply intermediate and advanced web development practices.
2. Implement the basic JavaScript and Develop a fully functioning website and deploy on a web server.
3. Design the applications using bootstrap, jQuery and Angular JS
4. Construct the real-world applications using PHP and MySQL
5. Become an industry-ready engineer who can be readily deployed in a project

**UNIT I**

**Introduction to Full Stack Development & HTML5**

Introduction, Modern Application Architecture, Front-End Technologies, Front End Libraries and Frameworks, Back-end Technologies.

**HTML 5** - New Elements, Video & Audio, Canvas, Vector Graphics, Web Storage, Drag & Drop, Geolocation.

**UNIT II**

**CSS3 & Java Script**

**CSS3:** Basic Styling, Positioning & Background Images, Pseudo Classes, Colors, Backgrounds & Gradients, Text & Box Shadows, Transitions & Animation, Columns & Flexbox.

**Java Script:** Variables, Arrays & Objects, Loops, Conditionals & Switches, Functions & Events, JavaScript Form Validation

**UNIT III**

**Bootstrap and React JS**

**Bootstrap Programming** - Setup, Templates & Navbar, Typography, Forms & Tables, CSS Components, Grid System, Modal, Dropdown, Tabs & Tooltip, Collapse, Accordion and Carousel.

**React JS** - Introduction, Features, Components - Lifecycle, Constructor, Forms, Events.

**UNIT IV**

**jQuery and Angular JS**

**jQuery** - Overview of jQuery, Configuration of jQuery, syntax, selectors, events, effects, working with HTML, jQuery with CSS, Traversing.

**Angular JS** – Introduction to AngularJS, Features of AngularJS-MVC Architecture and Expressions - Numbers, Strings, Objects, Arrays, Directives, Filters.

**UNIT V**

**PHP and MySQL**

**Backend Programming with PHP** - XAMPP Environment Setup, PHP Programming Fundamentals, PHP Data Types & Dates, Objects and Classes, Cookies, Sessions.

**Introduction MySQL** - Creating a MySQL Database, Connect & Fetch data from MySQL, Insert and



Delete MySQL data from PHP.

**Text Books**

1. Full Stack Web Development For Beginners: Learn Ecommerce Web Development Using HTML5, CSS3, Bootstrap, JavaScript, MySQL, and PHP by Riaz Ahmed – 2021
2. Complete Course Full Stack Web Development – Matthew J. Leonard

**Reference Books**

1. Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker Paperback – 30 March 2020, by Frank Zammetti (Author)
2. Mastering Html, Css & Javascript Web Publishing Paperback – 15 July 2016 by Laura Lemay (Author), Rafe Colburn (Author), Jennifer Kyrnin (Author)
3. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer Paperback – Import, 20 November 2018 by Chris Northwood (Author)



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**BLOCKCHAIN TECHNOLOGY**  
**(PROFESSIONAL ELECTIVE-II)**

**Course Code: GR22A3146**  
**III Year II Semester**

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

**Course Outcomes:**

1. Summarize the fundamental concepts of Blockchain, Consensus mechanism and Cryptocurrency.
2. Illustrate the application of public blockchain system and smart contract in industry.
3. Comprehend the characteristics of private blockchain, consortium blockchain and Initial Coin Offering Platforms.
4. Demonstrate the security, privacy challenges and applications of blockchain
5. Develop blockchain programs using Python and Hyperledger Fabric for real time applications.

**UNIT I**

**Fundamentals of Blockchain:** Introduction, Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.

**Blockchain Types and Consensus Mechanism:** Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol.

**Cryptocurrency – Bitcoin, Altcoin and Token:** Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

**UNIT II**

**Public Blockchain System:** Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.

**Smart Contracts:** Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

**UNIT III**

**Private Blockchain System:** Introduction, Key Characteristics of Private Blockchain, Why We Need Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E-commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

**Consortium Blockchain:** Introduction, Key Characteristics of Consortium Blockchain, Why We Need Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda.

**Initial Coin Offering:** Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

**UNIT IV**

**Security in Blockchain:** Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric.



**Applications of Blockchain:** Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain.

#### **UNIT V**

**Blockchain Case Studies:** Case Study 1 – Retail, Case Study 2 – Banking and Financial Services, Case Study 3 – Healthcare, Case Study 4 – Energy and Utilities.

**Blockchain Platform using Python:** Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain.

**Blockchain platform using Hyperledger Fabric:** Introduction, Components of Hyperledger Fabric Network, Chain codes from Developer.ibm.com, Blockchain Application Using Fabric Java SDK.

#### **Text Books**

1. “Blockchain Technology”, Chandramouli Subramanian, Asha A.George, Abhilash K A and Meena Karthikeyan, Universities Press.

#### **Reference Books**

1. Blockchain Blueprint for Economy, Melanie Swan, SPD O'reilly.
2. Blockchain for Business, Jai Singh Arun, Jerry Cuomo, Nitin Gaur, Pearson Addition Wesley.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY****UNIX PROGRAMMING  
(PROFESSIONAL ELECTIVE-II)****Course Code: GR22A3124****L/T/P/C: 3/0/0/3****III Year II Semester****Course Outcomes:**

1. Experiment and work with various shell scripts. Demonstrate the usage of various system calls for file and directory management
2. Develop the ability to implement various process and signal handling mechanisms of UNIX
3. Select the appropriate mechanism for working with IPC using pipes, named pipes along with concurrency management
4. Interpret the usage of system calls for SYSTEM-V IPC using programs
5. Develop the ability to implement various client server applications using sockets

**UNIT-I**

**Working with the Bourne shell:** shell responsibilities, shell meta characters, shell variables, shell commands, control structures, shell script examples.

**Unix Files:** Unix file structure, low level file access system calls, usage of open, creat, read, write, close, lseek, stat, fstat, umask, dup, dup2. Formatted I/O, streams and file descriptors, file and directory maintenance system calls chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd, Directory handling system calls opendir, readdir, closedir, rewinddir, seekdir, telldir.

**UNIT-II**

**Unix Process and Signals:** process structure, starting new process, waiting for a process, zombie process, process control, system call interface for process management-fork, vfork, exit, wait, waitpid, exec, system, **Signals-** Signal functions, unreliable signals, kill, raise, alarm, pause, abort, sleep functions.

**UNIT-III**

**Interprocess Communication Overview:** Introduction to IPC, IPC between processes on a single computer system, file and record locking, other unix locking techniques, pipes, FIFOs, streams and messages, namespaces.

**UNIT-IV**

**Message Queues-**Unix system-V messages, unix kernel support for messages, unix APIs for messages, client/server example. **Semaphores-**Unix system-V semaphores, unix kernel support for semaphores, unix APIs for semaphores, file locking with semaphores. **Shared Memory-**Unix system-V shared memory, unix kernel support for shared memory, unix APIs for shared memory, semaphore and shared memory example.

**UNIT-V**

**Sockets:** Introduction to Sockets, Socket system calls for connection-oriented protocol and connectionless protocol, example-client/server programs.

**Text Books**

1. Unix the ultimate guide, Sumitabha Das, TMH



2. Unix Network Programming, W.R.Stevens, Pearson/PHI
3. UNIX Network Programming, Vol. I, Sockets API, 2nd Edition. - W.Richard Stevens, Pearson Edn. Asia.

**Reference Books**

- 1.M.G. Venkatesh Murthy: UNIX & Shell Programming, Pearson Education.
2. Richard Blum , Christine Bresnahan : Linux Command Line and Shell Scripting Bible, 2nd Edition, Wiley,2014.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**GREEN COMPUTING**  
**(PROFESSIONAL ELECTIVE-II)**

**Course Code: GR22A4121**  
**III Year II Semester**

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

**Pre-requisites:** Hydraulics and Water Resource Engineering

**Course outcomes:**

1. Summarize the fundamentals of green computing practices.
2. Apply the modeling to reduce negative impact on the environment.
3. Analyze the energy saving practices for use in hardware.
4. Demonstrate the tools for reducing paper waste and carbon foot print.
5. Articulate green computing strategies for Case Study Scenarios.

**UNIT I**

**Fundamentals:** Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon footprint, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

**UNIT II**

**Green Assets and Modeling:** Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture –Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

**UNIT III**

**Grid Framework:** Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center- Green Grid framework.

**UNIT IV**

**Green Compliance:** Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap - Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

**UNIT V**

**Case Studies:** The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

**Text Books**

1. Bhuvan Unhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2011
2. Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, August 2009.



### Reference Books

1. Alin Gales, Michael Schaefer, Mike Ebbers, “Green Data Center: steps for the Journey”, Shoff/IBM rebook, 2011.
2. John Lamb, “The Greening of IT”, Pearson Education, 2009.
3. Jason Harris, “Green Computing and Green IT- Best Practices on regulations & industry”,Lulu.com, 2008.
4. Carl speshocky, “Empowering Green Initiatives with IT”, John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), “Green computing: Large Scale energy efficiency”, CRC Press, 2012.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**CLOUD COMPUTING**  
**(PROFESSIONAL ELECTIVE -II)**

**Course Code: GR22A3126**

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

**III Year II Semester**

**Course Outcomes:**

1. Identify various features, advantages and challenges of cloud computing, compare their operation, implementation and performance
2. Applying knowledge of Virtualization, Analyze and compare different types of clouds and cloud services.
3. Validating the financial and technological implications in selecting cloud computing paradigm for an organization.
4. Compare operation and economic models of various trending cloud platforms in IT Industry.
5. To know how to overcome the security challenges and risks involved in the cloud.

**UNIT I**

Understanding Cloud Computing: Cloud Computing, Introduction to Cloud Computing, Cloud Architecture and Cloud Services (IaaS, PaaS, SaaS) , Cloud models– Public vs Private, Cloud Technologies for Network-Based System , System Models for Distributed and Cloud Computing , NIST Cloud Computing Reference Architecture

**UNIT II**

Virtualization: Basics of Virtualization, Types of Virtualizations, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data-centre Automation

**UNIT III**

Cloud Infrastructure: Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources

**UNIT IV**

Programming Model: Parallel and Distributed Programming Paradigms, Map Reduce, Twister and Iterative Map Reduce, Hadoop Library from Apache, Mapping Applications, Programming Support, Google App Engine, Amazon AWS, Cloud Software Environments, Eucalyptus, Working with EC2 API, Open Nebula, Open Stack, Aneka, CloudSim

**UNIT V**

Security in the Cloud: Security Overview, Cloud Security Challenges and Risks, Software- as-a Service Security, Security Governance, Risk Management, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security



**Text Books**

1. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud” O'Reilly
2. Kumar Saurabh, “Cloud Computing, insights into New-Era Infrastructure”, Wiley India.
3. Rajkumar Buyya, Christian Vecchiola, S.TamaraiSelvi, ‘Mastering Cloud Computing’, TMGH.

**Reference Books**

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers.
2. John W. Rittinghouse and James F. Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH.
4. Ronald L. Krutz, Russell Dean Vines, “Cloud Security, A comprehensive Guide to Secure Cloud Computing”, Wiley, India.
5. Nick Antonopoulos, Cloud computing, Springer Publications.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**MACHINE LEARNING LAB**

**Course Code: GR22A3142**  
**III Year II Semester**

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

**Course Outcomes:**

1. Describe the knowledge of physical, chemical, and biological parameters of water and their importance.
2. Develop the social responsibility to eradicate water borne diseases.
3. Recognize the methods to control environmental pollution.
4. Express water quality parameters in written reports
5. Generalize the various quality control aspects of industrial effluents by performing the different lab tests.

**TASK 1**

Write a python program to import and export data using Panda's library functions.

**TASK 2**

Demonstrate various data preprocessing techniques for a given dataset.

**TASK 3**

Implement dimensionality reduction using Principal Component Analysis (PCA) method.

**TASK 4**

Write a python program to demonstrate various Data Visualization Techniques.

**TASK 5**

Implement Simple and Multiple Linear Regression models.

**TASK 6**

Develop Logistic Regression model for a given dataset.

**TASK 7**

Develop Decision Tree classification model for a given dataset and use it to classify a new sample.

**TASK 8**

Implement Naïve Bayes Classification in Python for a given dataset.

**TASK 9**

Build KNN Classification model in python for a given dataset.

**TASK 10**

Implement Back propagation model in python for a given dataset.

**TASK 11**

- a) Implement Random Forest classification method in python for a given dataset.
- b) Implement Boosting ensemble method on a given dataset.



**TASK 12**

- a) Write a python program to implement K-Means clustering algorithm.
- b) Write a python program to implement BIRCH algorithm.

**TEXT BOOKS**

- 1. Python Machine Learning by Sebastian Raschka, Oreilly Publishers
- 2. Machine Learning – Tom M. Mitchell, -MGH
- 3. Data Mining–Concepts and Techniques -Jiawei Han and Micheline Kamber, MorganKaufmann
- 4. Introduction to Data Mining - Michael Steinbach, Pang-Ning Tan, and Vipin Kumar (Second Edition).
- 5. Christopher Bishop, Pattern Recognition and Machine Learning, Springer.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**FULL STACK DEVELOPMENT LAB**

**Course Code:GR22A3128**

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

**III Year II Semester**

**Course Outcomes:**

1. To create visually appealing website interfaces and utilize modern design principles.
2. To integrate client-side validation techniques to enhance user input accuracy and improve the overall user experience.
3. To design and develop backend APIs that are secure, efficient, and scalable to support various frontend applications.
4. To ensure seamless communication between the client and server, managing data flow and user interactions effectively.
5. Implement efficient database designs and queries to optimize application performance and ensure data integrity.

**WEEK 1:** Write a Program on HTML5 Video and Audio.

**WEEK 2:** Write a Program on CSS3 Colors, Fonts and Text Align

**WEEK 3:** Write a Program on Text and Box Shadows.

**WEEK 4:** Write a Program on Transitions and Animations in CSS.

**WEEK 5:** Write a Program on Bootstrap templates and Navbar.

**WEEK 6:** Write a Program on Tabs and Tooltip.

**WEEK 7:** Write a Program on React JS forms and events.

**WEEK 8:** Write a Program on Java Script Functions and Events.

**WEEK 9:** Write a Program on jQuery form events.

**WEEK 10:** Write a Program on filters using jQuery and AngularJS.

**WEEK 11:** Write a Program on connecting, inserting, fetching data with MySQL using PHP.

**WEEK 12:** Write a PHP program to keep track of the number of visitors visiting the web page.

and to display this count of visitors, with proper headings.

**TEXT BOOKS**

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



## REFERENCES

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
MINI PROJECT WITH SEMINAR**

**Course Code:GR22A3089  
III Year II Semester**

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

**Course Outcomes:**

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

1. Make use of fundamental knowledge and practical knowledge to implement towards industries.
2. Utilizing software and design, analyze the engineering Knowledge in accordance with applicable standards.
3. Analyze project management skills and scheduling of work in stipulated time.
4. Evaluate and demonstrate the problem finding ability in Engineering Technologies.
5. Develop technical information by means of written and oral reports.



# **IV YEAR I SEMESTER**



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
FUNDAMENTALS OF MANAGEMENT AND ENTREPRENEURSHIP**

**Course Code: GR22A3116**

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

**IV Year I Semester**

**Course Outcomes:**

1. The students understand the significance of Management in their Profession.
2. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course.
3. The students can explore the Management Practices in their domain area and understand, adopt motivational theories and leadership styles and apply controlling techniques at right time for better decision making.
4. The student will be exposed to the basic concepts of entrepreneurship and its development process.
5. The student will be able to evaluate business ideas and attain hands on experience in designing value proposition and he will acquire the ability of developing a business plan / model.

**UNIT I**

**Introduction to Management:** Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills; **Evolution of Management Thought-** Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Systems Approach; Contingency Approach.

**UNIT II**

**Planning and Organizing:** Planning – Planning Process, Types of Plans, Decision making and Steps in Decision Making; Principles of Organization: Span of control, organizational Design & Organizational Structures; Departmentalization, Delegation; Centralization, Decentralization.

**UNIT III**

**Leading, Motivation and Controlling:** Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills. Motivation – Types; Motivational Theories – Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y. - **controlling**– basic control process– control techniques.

**UNIT IV**

**Nature of Entrepreneurship:** Characteristics and skills of an entrepreneur, Entrepreneur scenario in India and abroad. Types of entrepreneurs, types of ownership, small business in Indian economy. Risk Reduction strategies. Strategies for growth. Financial aspects: sources of rising capital, schemes of Department of Industries (DIC), KVIC, SIDBI, NABARD, NSIC, IFCI and IDBI.

**UNIT V**

**Creating and Starting the venture:** Creativity and the business idea (Self-discovery, Opportunity discovery); Developing the business plan (Business model –Lean canvas by Alexander Osterwalder); Marketing plan (Customer & Solution- Value proposition, Marketing & Sales); Financial plan (Validation, money), Human Resource Plan (Team).



**Text Books**

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
3. Principles and Practice of Management, L. M. Prasad, Sultan Chand & Sons, 2012
4. Entrepreneurship- Robert D Hisrich, Michael P Peters, Dean A Shepherd, TMH.2009

**Reference Books**

1. Essentials of Management, Koontz Kleihrich, Tata Mc – Graw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
3. Entrepreneurship- Rajeev Roy, Oxford, 2011
4. Intellectual Property- Deborah E.Bouchoux,Cengage, 2012



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
MIDDLEWARE TECHNOLOGIES**

**Course Code: GR22A4057**  
**IV Year I Semester**

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

**Course Outcomes:**

1. Choose appropriate client server computing model for given problem.
2. Develop java bean component model with EJB'S.
3. Design distributed applications using Enterprise Java Beans.
4. Develop real time projects by Using CORBA.
5. Implement distributed applications using .Net

**UNIT I**

**CLIENT/SERVER CONCEPTS:** Client – Server – File Server, Database server, Group server, Object server, Web server. Middleware – General Middleware – Service specific middleware. Client/Server Building blocks-RPC – Messaging – Peer – to – Peer.

**UNIT II**

**EJB ARCHITECTURE:** EJB –EJB Architecture – Overview of EJB software architecture – View of EJB – Conversation – Building and Deploying EJBs – Roles in EJB.

**UNIT III**

**EJB APPLICATIONS:** EJB Session Beans – EJB entity beans – EJB clients – EJB Deployment – Building an application with EJB.

**UNIT IV**

**CORBA:** CORBA – Distributed Systems – Purpose – Exploring CORBA alternatives – Architecture overview – CORBA and networking model – CORBA object model – IDL – ORB – Building an application with CORBA.

**UNIT V**

**COM:** COM – Data types – Interfaces – Proxy and stub – Marshalling – Implementing server/Client – Interface pointers – Object Creation, Invocation, Destruction – Comparison COM and CORBA – Introduction to .NET – Overview of .NET architecture–Marshalling – Remoting.

**Text Books**

1. Robert Orfali, Dan Harkey and Jeri Edwards, “The Essential Client/server Survival Guide”, Galgotia publications Pvt. Ltd.(UNIT 1)
2. Tom Valesky, “Enterprise Java Beans”, Pearson Education.(UNIT 2 & 3)
3. Jason Pritchard. “COM and CORBA side by side”, Addison Wesley. (UNIT 4 & 5)

**Reference Books**

1. Mowbray, “Inside CORBA”, Pearson Education.
2. Visual Studio .NET Walkthroughs – Microsoft Manual.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**MOBILE APPLICATION DEVELOPMENT**  
**(PROFESSIONAL ELECTIVE -III)**

**Course Code:GR22A3125**  
**IV Year I Semester**

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

**Course Outcomes:** At the end of the course the student will be able to

1. Design simple GUI applications.
2. Apply key technological principles and methods for delivering and maintaining mobile Applications on Android devices.
3. Make use of built-in widgets and components.
4. Design apps which uses the database to store data locally.
5. Develop the apps that make use of interfaces with built-in views.

#### **UNIT I**

**Java Concepts:** OOPs Concepts, Inheritance in detail, Exception handling, Packages & interfaces, Multi-threading, JVM & .jar file extension, SQL-DML and DDL Queries.

#### **UNIT II**

**Introduction to Android:** What is Android? Setting up development environment, Dalvik Virtual Machine & .apk file extension, Fundamentals: Basic Building blocks - Activities, Services, and Broadcast Receivers & Content providers. UI Components - Views & notifications. Components for communication -Intents & Intent Filters, Android API levels (versions & version names).

#### **UNIT III**

**Application Structure (in detail):** Android Manifest.xml, uses-permission & uses-sdk, Resources & R.java, Assets, Layouts & Drawable Resources, Activities and Activity lifecycle, first sample Application.  
**Emulator-Android Virtual Device:** Launching emulator, editing emulator settings, Introduction to DDMS, Basic UI design, Preferences, Menu, Intents- Implicit Intents, Explicit Intents.

#### **UNIT IV**

**Content Providers:** SQLite Programming, SQLiteOpenHelper, SQLite Database, Cursor, Reading and updating Contacts, Reading bookmarks, Examples.

#### **UNIT V**

**Threads:** Threads running on UI thread (runOnUiThread), Worker thread, Handlers & Runnable, AsyncTask, and Examples.  
UI design, Tabs and Tab Activity, Styles & Themes, Examples.

#### **Text Books**

1. Android Programming for Beginners - Second Edition: Build in-depth, full-featured Android 9 Pie apps starting from zero programming experience, 2nd Edition by John Horton.
2. Head First Android Development: A Brain-Friendly Guide by Dawn Griffiths.



3. Android Cookbook: Problems and Solutions for Android Developers, Second Edition (Grayscale Indian Edition) by Ian Darwin.

**Reference Books**

1. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd.
2. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd.
3. Android Application Development All in one for Dummies by Barry Burd, Edition.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**DEVOPS**  
**(PROFESSIONAL ELECTIVE -III)**

Course Code:GR22A4061

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

IV Year I Semester

**Course Outcomes:**

1. Increase **speed** of development and release processes
2. Make builds more **reliable** and **Shorter turnaround** for new features and bug fixes
3. Greater **Scalability** of applications and infrastructure
4. Increased **security** by automating compliance practices
5. Improved **collaboration** throughout the development lifecycle

**UNIT I**

**DevOps and Infrastructure as Code**

DevOps Culture and Practices: Getting started with DevOps, Implementing CI/CD, and continuous deployment, Understanding IaC.

**UNIT II**

**Ansible**

Using Ansible for Configuring, IaaS Infrastructure: Installing Ansible, Creating an Ansible inventory, Executing the first playbook, protecting data with Ansible Vault, Using a dynamic inventory for an Azure infrastructure.

**UNIT III**

**DevOps CI/CD Pipeline**

**Managing Your Source Code with Git:** A Git overview and principal Git command lines The Git process and GitFlow pattern.

**Continuous Integration and Continuous Deployment:** The CI/CD principles, using a package manager in the CI/CD process, Jenkins CI/CD implementation, Azure Pipelines for CI/CD, Using GitLab CI.

**UNIT IV**

**Docker**

Containerizing Your Application with Docker: Installing Docker, creating a Docker file, Building, and running a container on a local machine, Pushing an image to Docker Hub, Deploying a container in ACI with a CI/CD pipeline.

**UNIT V**

**kubernetes**

Managing Containers Effectively with Kubernetes: Installing Kubernetes, First example of Kubernetes application deployment, Using HELM as a package manager, Using AKS, Creating a CI/CD pipeline for Kubernetes with Azure Pipelines.

**Text Books**

1. Mikael Krief “Learning DevOps” Published by Packt Publishing Ltd. Livery Place,35 Livery Street Birmingham,B3 2PB, UK.,ISBN 978-1-83864-273-0., published: October 2019
2. Scott chacon and Ben Straup,”ProGit”,second edition, published by Apress,2014



### Reference Books

1. Effective DevOps with AWS: Implement continuous delivery and integration in the AWS environment, 2nd Edition Paperback – Import, 28 September 2018, by Yogesh Raheja (Author), Giuseppe Borgese (Author), Nathaniel Felsen (Author).
2. The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations Paperback – 30 November 2021, by Gene Kim (Author), Jez Humble (Author), Patrick Debois (Author), John Willis (Author), Nicole Forsgren (Author)
3. <https://git-scm.com/book/en/v2/Getting-Started-About-Version-Control>



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**FUNDAMENTALS OF BIG DATA ANALYTICS**  
**(PROFESSIONAL ELECTIVE-III)**

**Course Code: GR22A4156**

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

**IV Year I Semester**

**Course outcomes:**

The students will be able to:

1. Distinguishes applications and Analytic Challenges between Traditional and Big Data.
2. Manage Large Data Storage requirement on Hadoop Distributed File System.
3. Develop Map Reduce Jobs for Large data Processing in Hadoop Environment
4. Analyze Big Data Solutions using Hadoop Eco System
5. Classifies and applies different tools to process Big Data.

**UNIT I**

**INTRODUCTION TO BIG DATA AND HADOOP**

Types of Digital Data : Structured, Semi-Structured and Unstructured data. Characteristics of Data, Data Analysis, Data Analytics, Types of Analytics, Evolution of Big Data, Big Data definition, Big Data Characteristics, Big Data Analytics, Big Data Challenges. Hadoop Features, Hadoop Eco-System overview, Hadoop Distributions.

**UNIT II**

**Big Data Storage and Data Ingestion**

File Systems and Distributed Systems storage and computing. Need for HDFS, Design of HDFS, HDFS Concepts, Line Interface, Data flow.

Data Ingestion : Data Ingest with Sqoop and Flume. Benefits of Apache Sqoop, Importing and Exporting to and from Hadoop using Sqoop, Limitations of Sqoop, Apache Flume Model, Data Sources for FLUME, Components of FLUME Architecture

**UNIT III**

**Map Reduce and Pig**

Hadoop Map Reduce Programming Model : Map, Reduce, Combine, Sort and Shuffle. Anatomy of Map Reduce Job Run, Failures handling in Map Reduce.

**Pig :** Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Pig Latin, Data Processing operators.

**UNIT IV**

**Hive and NoSQL**

**Structured Data Queries with Hive :** What is Hive?, Hive Data Types, Hive Command Line Interface(CLI), Hive Query Language(HQL), Data Analysis with Hive.

**NoSQL Database :** Introduction, Features, NoSQL Database types, Sharding, CAP theorem. MongoDB: Why Mongo DB, and Mongo DB - Data Types - MongoDB Query Language.



## UNIT V

### Spark

Functional Programming, Components of Apache Spark, Applications of in - memory processing, Hadoop Ecosystem Vs. Spark, Spark Architecture, RDDs in Spark.

Scalable Machine Learning with Spark : Classification, Clustering.

### Text Books

1. Tom White “ Hadoop: The Definitive Guide” Third Editon, O’reilly Media, 2012.
2. Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015.
3. Benjamin Bengfort & Jenny Kim, “Data Analytics with Hadoop” FirstEditon, O’reilly Media, 2016.

### Reference Books

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis”, Springer, 2007.
2. Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013)



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**SERVER SIDE SCRIPTING LANGUAGES**  
**(PROFESSIONAL ELECTIVE - III)**

**Course Code: GR22A4155**  
**IV Year I Semester**

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

**Course outcomes:**

1. Analyze a problem, identify and define the computing requirements appropriate to its solution.
2. Understand and apply advanced Ruby programming concepts.
3. Comprehend the differences between typical scripting languages and typical system and application programming languages.
4. Develop and secure internet applications using PERL.
5. Design event-driven and internet-aware applications using TCL.

**UNIT I**

**Introduction:** Ruby, Rails, The structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and web services

RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

**UNIT II**

**Extending Ruby:** Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter

**UNIT III**

**Introduction to PERL and Scripting:** Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

**UNIT IV**

**Advanced Perl :**Finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

**UNIT V**

**TCL:** TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C-Interface.

**Tk:**Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

**Text Books**

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Progammmers guide by Dabve Thomas Second edition

**Reference Books**

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.



3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**EMBEDDED SYSTEMS**  
**(PROFESSIONAL ELECTIVE - IV)**

**Course Code:GR22A4060**  
**IV Year I Semester**

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

**Course Outcomes:**

1. Identify various I/O devices and their communication.
2. Define the unique design problems and challenges of real-time systems Program an embedded system
3. Recognize unique characteristics of real-time operating systems and evaluate the need for real-time operating system
4. Relate structure of real-time systems to build an embedded real-time system.
5. Develop embedded systems based on different applications and real-time operating systems.

**UNIT I**

**Introduction to Embedded Systems:** Embedded Systems, Processor Embedded to a system, Embedded hardware units and devices in a system, Embedded software in a system, Examples of Embedded systems, Soc(System on chip) and use of VLSI circuit design technology, complex system design and processors, Design process in Embedded system, formalization of system design, design process and design examples, classification of embedded systems, skills required for embed system design.

**UNIT II**

**Devices and Buses for Devices Network:** I/O Devices:-Types and Examples of I/O devices, Synchronous, Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices:- SPI, UART, Parallel Port Devices - Timer and Counting Devices – Serial Communication using: ‘I2C’, ‘USB’, ‘CAN’- Advanced I/O Serial high speed buses: ISA, PCI, PCI- X, cPCIand advanced buses.

**UNIT III**

**Real Time Operating Systems:** Definitions of process, tasks and threads–Inter Process Communication, Shared data problem, Use of Semaphore(s), Priority Inversion Problem and Deadlock Situations, Message Queues, Mail boxes, Pipes, Virtual (Logical) Sockets, Remote Procedure Calls (RPCs).

**UNIT IV**

**Operating System Services:** Goals, Structures, Kernel, Process Management, Memory Management, Device Management- Real Time Operating System-RTOS Task scheduling models- Co-operative Round Robin Scheduling, Cyclic Scheduling with Time Slicing.

**UNIT V**

**System Design Techniques:** Design Methodologies, Requirement Analysis, Specification, System Analysis and Architecture Design. Design Examples: Telephone PBX-System Architecture, Inkjet printer-Hardware Design and Software Design, Personal Digital Assistants, Set-top Boxes.

**Text Books**

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill.



### Reference Books

1. Steve Heath, Embedded Systems Design.
2. David E. Simon, An Embedded Software Primer, Pearson Education Asia. Frank Vahid and Tony Givargis, Embedded Systems Design–Aunified Hardware/Software Introduction, JohnWiley.
3. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design – Harcourt India, Morgan Kaufman Publishers.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**SOFT COMPUTING**  
**(PROFESSIONAL ELECTIVE - IV)**

**Course Code: GR22A3037**  
**IV Year I Semester**

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

**Course Outcome:**

1. Distinguish various soft computing techniques to solve real world problems.
2. Differentiate between Fuzzy Model with respect to Probabilistic Model.
3. Apply fuzzy inference techniques to solve problems in different domain.
4. Identify the problems, where Supervised and (Neural Networks) Unsupervised Learning Techniques can be applied.
5. Evaluate the fitness function in Genetic Algorithm.

**UNIT I**

**Introduction to Soft Computing:** Computing System, “Soft” Computing Versus “Hard” Computing, Soft Computing Methods, Recent trends in Soft Computing, Characteristics of Soft Computing, Applications of Soft Computing Techniques.

**UNIT II**

**Fuzzy Logic: I(Introduction):** Fuzzy Logic Basic Concepts, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversation.

**UNIT III**

**Fuzzy Logic: II (Fuzzy Membership, Rules):** Membership Functions, Interference in Fuzzy Logic, Fuzzy if then else Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzifications and Defuzzification’s, Fuzzy Controller, Industrial Applications.

**UNIT IV**

**Neural Network:** Structure and Function of a single neuron: Biological Neuron, Artificial Neuron, Definition of ANN, Taxonomy of Neural Network, Difference between ANN and human brain, Characteristics and Applications of ANN, Single Layer Network.

**UNIT V**

**Genetic Algorithms:** Basic Operators and Terminology, Traditional Algorithms Versus Genetic Algorithm, Simple Genetic Algorithm, General Genetic Algorithm, Classification of genetic Algorithm, Genetic Programming, Applications of Genetic Algorithm. Applications of Soft Computing: Internet Search Techniques, Hybrid Fuzzy Controllers.

**Text Books**

1. B.K. Tripathy, J. Anuradha,” Soft Computing Advances and Applications”, Cengage Learning.
2. S.Rajsekaran and G.A. VijaylakshmiPai , “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications” Prentice Hall of India.
3. Introduction to Artificial Neural Systems- Jacek M. Zurada, Web Publishing Company.



### Reference Books

1. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall.
2. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley.
3. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India
4. S. N. Sivanandam , S. Sumathi and S. N. Deepa, “Introduction to Fuzzy Logic using MATLAB”, Springer.
5. N. P. Padhy, “Artificial Intelligence and Intelligent Systems” Oxford University Press.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**INTRODUCTION TO ROBOTICS**  
**(PROFESSIONAL ELECTIVE - IV)**

**Course Code:GR22A4143**

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

**IV Year I Semester**

**Course Outcomes:**

On completion of the course the student will be able to:

1. List and explain the basic elements of industrial robots
2. Analyse robot kinematics and its control methods.
3. Classify the various sensors used in robots for better performance.
4. Summarize various industrial and non-industrial applications of robots.
5. Design a Robot using advanced machine learning algorithm

**UNIT I**

**Robot Basics Robot-**Basic Concepts, Need, Law, History, Anatomy, Specifications. Robot Configurations- Cartesian, Cylinder, Polar And Articulate. Robot Wrist Mechanism, Precision And Accuracy Of Robot. Robot Elements End Effectors-Classification, Types Of Mechanical Actuation, Gripper Design, Robot Drive System Types, Position And Velocity Feedback Devices-Robot Joints And Links-Types, Motion Interpolation.

**UNIT II**

**Robot Kinematics And Control Robot** Kinematics – Basics Of Direct And Inverse Kinematics, Robot Trajectories, 2D And 3D Transformation-Scaling, Rotation, Translation Homogeneous Transformation. Control Of Robot Manipulators – Point To Point, Continuous Path Control, Robot Programming, Control – Pwm, Joint Motion Control, Feedback Control, Computed Torque Control

**UNIT III**

**Robot Sensors Sensors In Robot** – Touch Sensors-Tactile Sensor – Proximity And Range Sensors. Force Sensor-Light Sensors, Pressure Sensors, Introduction To Machine Vision And Artificial Intelligence. Actuators (Electrical)-Dc Motors, Blde Servo Motors, Sensors , Sensor Integration

**UNIT IV**

**Robot Applications** - Industrial Applications of Robots, Medical, Household, Entertainment, Space, Underwater, Defense, Disaster Management. Applications, Micro And Nanorobots, Future Applications.

**UNIT V**

Probabilistic Robotics, Path Planning, Bfs; Dfs; Dijkstra; A-Star; D-Star; Voronoi; Potential Field; Hybrid Approaches Simultaneous Localization And Mapping, Introduction To Reinforcement Learning

**Text Books**

1. Robert J Schilling, Fundamentals of Robotics, Prentice Hall India, 2000
2. John J Craig, Introduction to Robotics, Prentice Hall International, 2005

**Reference Books**

1. Groover, Mitchell Weiss, Roger N Nagel, Industrial Robotics Technology, Programming and Applications, Tata –McGraw Hill Pub, 2008.
2. Deb.S.R and Sankha Deb, Robotics Technology and Flexible Automation, Tata McGraw Hill Pub, 2010.



3. Klafter.R.D, Chmielewski.T.A, and Noggin's, Robot Engineering: An Integrated Approach, Prentice Hall, 1994.
4. Fu.K.S, Gonzalez, Robotics control, sensing, vision and intelligence, Tata- McGraw Hill Pub, 2008.
5. Yu. Industrial Robotics, MIR Publishers Moscow, 1985.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY****INTRUSION DETECTION SYSTEMS  
(PROFESSIONAL ELECTIVE - IV)****Course Code:GR22A4150  
IV Year I Semester****L/T/P/C: 3/0/0/3****Course Outcomes:**

After completing the course, students will be familiar with

1. Analyzing several security threats and the significance of security needs.
2. Fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets
3. Detect, identify, resolve and document network intrusions.
4. Several types of IDS and IPS, their use and implementation, and also how to evaluate their performance.
5. Various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems.

**Unit I**

History of Intrusion detection, Audit, Concept and definition, Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based information sources.

**UNIT II**

Intrusion Prevention Systems, Network IDs protocol-based IDs, Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis, techniques Responses requirement of responses, types of responses mapping responses to policy Vulnerability analysis, Credential analysis non credential analysis.

**UNIT III**

Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes.

**UNIT IV**

Working with Snort Rules, Rule Headers, Rule Options, The Snort Configuration File etc. Plugins, Preprocessors and Output Modules, Using Snort with MySQL

**UNIT V**

Using ACID and Snort Snarf with Snort, Agent development for intrusion detection, Architecture models of IDs and Ips.

**Text Books**

1. Rafeeq Rehman: "Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall, 2003.
2. Christopher Kruegel, Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer, 2005



### Reference Books

1. Carl Endorf, Eugene Schultz and Jim Mellander “Intrusion Detection & Prevention”, 1st Edition, Tata McGraw-Hill, 2004.
2. Stephen Northcutt, Judy Novak: “Network Intrusion Detection”, 3rd Edition, New Riders Publishing, 2002.
3. T. Fahringer, R. Prodan, “A Text book on Grid Application Development and Computing Environment”. 6th Edition, Khanna Publishers, 2012.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**MOBILE APPLICATION DEVELOPMENT LAB**  
**(PROFESSIONAL ELECTIVE-III LAB)**

**Course Code: GR22A4148**  
**IV Year I Semester**

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

**Course Outcomes:**

1. Design simple GUI applications.
2. Apply key technological principles and methods for delivering and maintaining mobile applications on Android devices.
3. Make use of built-in widgets and components.
4. Design apps which uses user interfaces with built-in views and layouts.
5. Develop the apps that make use of Android Debug Bridge tool.

**Task 1: Installation of Android SDK.**

1. Installing jdk1.6 above version.
2. Installing the Android Studio IDE.
3. Installing Android SDK.
4. Installing Android Development Tools
5. Choosing which Android version to use
6. Creating and starting an android emulator.

**Task 2:** Create an Android app to demonstrate the application Lifecycle.

**Task 3:** Create an Android application to create a simple Registration form using the following UI elements.

1. TextView
2. EditText
3. Radio Button
4. CheckBoxes
5. Button

**Task 4:** Create an Android application which implements different Layouts and widget controls such as Text controls, Button controls , Toggle buttons, and to display Images.

**Task 5:** Create an Android application to display a slideshow of images which scroll automatically after a certain period of time.

**Task 6:** Create an Android application using Intents for the Registration form in Task -3. The application must send form data from first activity to another and display the details in the second activity.



**Task 7:** Create an Android application to implement a custom ListView which displays a list of students names along with their roll number and picture.

**Task 8:** Create an Android application to implement custom GridView which displays all the B.Tech branch logos along with their branch name.

**Task 9:** Create an Android application for working with Dialogs and Toast messages.

**Task 10:** Create an Android application for working with Tabs and Fragments.

**Task 11:** Create an Android application for displaying and controlling music playback.

**Task 12:** Create an Android application for implementing a basic Android Service Class and its lifecycle.

### TEXT BOOKS

1. Android How to Program with an Introduction to Java, Deitel, Deitel and Deitel, Prentice Hall, ISBN 978-0-13-299054-7.
2. Android for Programmers: An App-Driven Approach, Deitel, Deitel, Deitel, and Morgano, Prentice Hall, ISBN 978-0-13-2121361.

### REFERENCES

1. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
2. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd
3. Android Application Development All in one for Dummies by Barry Burd.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**DEVOPS LAB**  
**(PROFESSIONAL ELECTIVE-III LAB)**

**Course Code: GR22A4149**

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

**IV Year I Semester**

**Course Outcomes**

1. Enhance the efficiency of development and release cycles.
2. Enhance build reliability and expedite the introduction of new features and bug fixes.
3. Enhance the scalability of both applications and infrastructure.
4. Boost security through automated compliance procedures.
5. Foster better collaboration across the entire development lifecycle.

**Task 1:** Simple flask application, which will return “Hello, World”

**Task 2:** Write code for a simple user registration form for an event using Flask and Docker in DevOps.

**Task 3:** Install and set up Jenkins, and explore the environment.

**Task 4:** Demonstrate continuous integration and development using Jenkins

**Task 5:** Explore Docker commands for content management.

**Task 6:** Create a Docker Application to display Hello World!

**Task 7:** Create a Docker Application to display Student Details.

**Task 8:** Develop a simple containerized application using Docker.

**Task 9:** Demonstrate Kubernetes application deployment.

**Task 10:** Demonstrate the integration of Kubernetes with Docker.

**Task 11:** Automate the process of running containerized application developed in exercise 10 using Kubernetes.

**Task 12:** Build CI/CD Pipeline For Azure Kubernetes.

**TEXT BOOKS**

1. Mikael Krief “Learning DevOps” Published by Packt Publishing Ltd. Livery Place,35 Livery Street Birmingham,B3 2PB, UK.,ISBN 978-1-83864-273-0.
2. Scott chacon and Ben Straup,”ProGit”.

**REFERENCES**

1. Effective DevOps with AWS: Implement continuous delivery and integration in the AWS environment, 2nd Edition Paperback – Import, 28 September 2018,by Yogesh Raheja (Author), Giuseppe Borgese (Author), Nathaniel Felsen (Author).
2. The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations Paperback – 30 November 2021, by Gene Kim (Author), Jez Humble (Author), Patrick Debois (Author), John Willis (Author), Nicole Forsgren (Author)
3. <https://git-scm.com/book/en/v2/Getting-Started-About-Version-Control>Top of Form



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**FUNDAMENTALS OF BIG DATA ANALYTICS LAB**  
**(PROFESSIONAL ELECTIVE-III LAB)**

**Course Code: GR22A4157**

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

**IV Year I Semester**

**Course Outcomes:**

1. Demonstrates ability of working with Hadoop framework.
2. Articulates the Data Ingestions using Sqoop and Flume tools
3. Apply Map Reduce concepts for big data processing on real world problems.
4. Develop queries to analyze SQL, NoSQL datasets.
5. Understand spark working environment and integration with pyspark.

**TASK 1**

Practice basic HDFS commands in Hadoop environment.

**TASK 2**

Ingest structured data using Apache Sqoop.

**TASK 3**

Ingest structured and unstructured data using Flume.

**TASK 4**

Write a Map Reduce Program to process Text files. Count number of occurrences of each word in a directory of documents provided as text files.

**TASK 4**

Analyze the highest recorded global temperature for each year using NCDC Weather dataset. Implement a Map Reduce program to mine weather data.

**TASK 5**

Write a Map Reduce Program to Find Designation wise Average Salary of Employees in an organization.

**TASK 6**

Run Pig, use Pig to perform sort, group, join, project, and filter data.

**TASK 7**

Develop a pig Latin script to count the number of words in a text file.

**TASK 8**

Run Hive, use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

**TASK 9**

Use Hive to create, alter, and drop databases, tables and views.

**TASK 10**

Develop MongoDB CRUD Operations.



### **TASK 11**

Develop a program in Spark framework for processing of large datasets.

### **TASK 12**

Develop a Spark program for Classification

### **TEXT BOOKS**

1. Tom White, “Hadoop: The Definitive Guide”, 4th Edition, O’Reilly Inc,2015.
2. Tanmay Deshpande, “Hadoop Real-World Solutions Cookbook”, 2ndEdition, Packt Publishing, 2016.

### **REFERENCES**

1. Edward Capriolo, Dean Wampler, and Jason Rutherglen, “Programming Hive”, O’Reilly Inc, 2012.
2. Vignesh Prajapati, “Big data Analytics with R and Hadoop”, Packt Publishing, 2013.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**SERVER SIDE SCRIPTING LANGUAGES LAB**  
**(PROFESSIONAL ELECTIVE-III LAB)**

**Course Code: GR22A4158**

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

**IV Year I Semester**

**Course Outcomes:**

1. Ability to understand the differences between Scripting languages and programming languages
2. Build desktop applications and static websites using Ruby
3. Interpret the data processing services and even automation tools in Ruby
4. Develop proficiency in regular expressions for pattern matching, substitutions, and text processing with Perl's powerful built-in functions.
5. Design application using TCL/TK scripts

**Task 1:** Write a Ruby script to create a new string which is n copies of a given string where n is a non-negative integer

**Task 2:** Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.

**Task 3:** Write a Ruby script which accept the users first and last name and print them in reverse order with a space between them

**Task 4:** Write a Ruby script to accept a filename from the user print the extension of that

**Task 5:** a) Write a Perl script to find the largest number among three numbers.

b) Write a Perl script to print the multiplication tables from 1-10 using subroutines.

**Task 6:** Write a Perl program to implement the following list of manipulating functions

- a) Shift
- b) Unshift
- c) Push

**Task 7:** a) Write a Perl script to substitute a word, with another word in a string.

b) Write a Perl script to validate IP address and email address.

**Task 8:** Write a Perl script to print the file in reverse order using command line arguments

**Task 9:** Write a TCL script to find the factorial of a number

**Task10:** Write a TCL script that multiplies the numbers from 1 to 10

**Task 11:** Write a TCL script for sorting a list using a comparison function

**Task 12:** Write a TCL script to (i) create a list (ii) append elements to the list (iii) Traverse the list (iv) Concatenate the list

**TEXT BOOKS**

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pragmatic Programmers guide by Dabve Thomas Second edition



## REFERENCES

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
MIDDLEWARE TECHNOLOGIES LAB**

**Course code: GR22A4065**

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

**IV Year I Semester**

**Course Outcomes:**

1. To demonstrate middleware basics through the RMI.
2. To demonstrate their ability to apply theoretical knowledge to practical scenarios in the design and implementation of enterprise-level Java applications.
3. To design and construct reusable components or applications by effectively employing JavaBean technology
4. To learn the object-oriented middleware basics through the example of the CORBA objects.
5. To develop applications utilizing .NET technology.

**TASKS**

1. Create a distributed application to download various files from various servers using RMI.
2. Create a Java Bean to draw various graphical shapes and display it using or without using BDK.
3. Develop an Enterprise Java Bean for student Information System.
4. Develop an Enterprise Java Bean for Library operations.
5. Create an Active-X control for Timetable.
6. Develop a component for converting the currency values using COM/.NET.
7. Develop a component for encryption and decryption using COM/.NET.
8. Develop a component for retrieving information from message box using DCOM/.NET
9. Develop a middleware component for retrieving Stock Market Exchange information Using CORBA.
10. Develop a middleware component for retrieving Bank Balance using CORBA.
11. Develop a middleware component for retrieving Weather Forecast information using CORBA.

**TEXT BOOKS**

1. Tom Valesky, "Enterprise Java Beans", Pearson Education.
2. Jason Pritchard. "COM and CORBA side by side", Addison Wesley.
3. Visual Studio .NET Walkthroughs – Microsoft Manual.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
PROJECT WORK – PHASE I**

**Course Code:GR22A4082  
IV Year I Semester**

**L/T/P/C: 0/0/12/6**

**Course Outcomes:**

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

1. Practice and acquire the knowledge within the chosen area of technology for Project Development.
2. Identify, discuss, and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
3. Design and develop Engineering Projects by implementing technical aspects.
4. Work as an individual or in a team in development of Technical Projects.
5. Compile and report effectively the project related activities and findings.



# **IV YEAR II SEMESTER**



## GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY SOFTWARE PROJECT MANAGEMENT

Course Code:GR22A4126  
IV Year II Semester

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

**Course Outcomes:** After going through this course, the student will be able to

1. Develop the model from the conventional software product to the modern
2. Analyze and design the software architecture.
3. Design various estimation levels of cost and effort
4. Acquire the knowledge of managing, economics for conventional, modern and future software projects
5. Sketch various artifacts sets for better understanding of software development

### UNIT I

**Conventional Software Management:** The waterfall model, conventional software Management performance.

**Evolution of Software Economics:** Software Economics, pragmatic software cost estimation.

**Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

### UNIT II

**Life cycle phases:** Engineering and production stages, inception, Elaboration, Construction, transition phases.

**Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

**Model based software architectures:** A Management perspective and technical perspective.

**Work Flows of the process:** Software process workflows, Iteration workflows.

### UNIT III

**Checkpoints of the process:** Major mile stones, Minor Milestones, Periodic status assessments.

**Iterative Process Planning:** Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

### UNIT IV

**Project Organizations and Responsibilities:** Line-of-Business Organizations, Project Organizations, evolution of Organizations.

**Process Automation:** Automation Building blocks, The Project Environment.

### UNIT V

**Project Control and Process instrumentation:** The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

### Text Books

1. Software Project Management, Walker Royce: Pearson Education.



**Reference Books**

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw- Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education.
3. Software Project Management in practice, Pankaj Jalote, Pearson Education.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
AGILE METHODOLOGIES**

**(PROFESSIONAL ELECTIVE -V)**

**Course Code: GR22A4127**

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

**IV Year II Semester**

**Course Outcomes:** At the end of the course the student will be able to

1. explain fundamentals of Agile methodology.
2. Perform iterative software development processes: how to plan them, how to execute them.
3. Develop techniques and tools for improving team collaboration and software quality.
4. Perform Software process improvement as an ongoing task for development teams.
5. Show how agile approaches can be scaled up to the enterprise level.

**UNIT I**

Introduction: Agile Definition, Why Agile, how to be Agile, Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods, Understanding XP, Values and Principles, Improve the Process, Eliminate Waste, Deliver Value.

Scrum and Self-Organizing Teams: Scrum, Scrum process flow, Scrum Roles, The Rules of Scrum, everyone on a Scrum Team Owns the Project.

**UNIT II**

Practicing XP: Thinking, Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, Collaborating, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting.

**UNIT III**

Releasing: Done, Production-Ready Software, No Bugs, Version Control, Concurrent Editing, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation.

**UNIT IV**

Planning: Vision, Release Planning, Risk Management, Iteration Planning, Slack, Reducing the need for slack, Stories, Estimating, Velocity and the Iteration Timebox.

**UNIT V**

Developing: Incremental Requirements, Customer Tests, Test- Driven Development, How to use TDD, Refactoring, Simple Design, Incremental Design and Architecture, Spike Solutions, Performance Optimization.

**Text Books**

1. James Shore and Shane Warden, “The Art of Agile Development”, O’REILLY, 2007.
2. Robert C. Martin, “Agile Software Development, Principles, Patterns, and Practices”, PHI, 2002

**Reference Books**

1. Craig Larman, —Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2004.
2. Kevin C. Desouza, —Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.
3. Andrew Stellman and Jennifer Greene -Learning Agile, Revision History for the First Edition,2013, Published by O’Reilly Media, Inc.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
DISTRIBUTED DATABASES AND SYSTEM**

**(PROFESSIONAL ELECIIVE - V)**

**Course Code:GR22A4131**

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

**IV Year II Semester**

**Course Outcomes:**

1. Demonstrate system architecture based on distributed databases.
2. Illustrate the introductory distributed system concepts and its structures.
3. Develop the query processing techniques in DDBMS.
4. Understand transaction management and concurrency control of distributed systems
5. Discover the parallel database systems and its architecture.

**UNIT I**

**Introduction:** Distributed data processing, what is a Distributed Database System, Advantages and Disadvantages of DDBS, Design Issues, Overview of Database and Computer Network Concepts.

**Distributed DBMS Architecture:** Transparencies in a distributed DBMS, Distributed DBMS architecture.

**UNIT II**

**Distributed Database Design:** Alternative design strategies, Distributed design issues, Fragmentation, Allocation.

**Semantic Data Control:** View management, Data security, Semantic Integrity Control.

**UNIT III**

**Overview of Query Processing:** Query processing problem, Objectives of Query Processing, Complexity of Relational Algebra operations, characterization of Query processors, Layers of Query Processing, Query decomposition, Localization of distributed data.

**Optimization of Distributed Queries:** Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms.

**UNIT IV**

**Introduction to Transaction Management:** Definition of Transaction, Properties of transaction, Types of transaction.

**Distributed Concurrency Control:** Serializability theory, Taxonomy of concurrency control mechanisms, locking-based concurrency control algorithms, Timestamp-based concurrency control algorithms, Optimistic Concurrency Control Algorithms, Deadlock Management.

**UNIT V**

**Reliability:** Reliability concepts and measures, Failures in Distributed DBMS, Local Reliability protocols, Distributed Reliability protocols, dealing with site failures, Network Partitioning, Parallel Database Systems, Database Servers, Parallel Architectures.

**Text Books**

1. Principles of Distributed Database Systems, Second Edition, M. Tamer Ozsu Patrick Valduriez.
2. Distributed Databases principles and systems, Stefano Ceri, Giuseppe Pelagatti, TataMcGrawHill.



**Reference Books**

1. Fundamental of Database Systems, Elmasri&Navathe, Pearson Education, Asia.
2. Database System Concepts, Korth&Sudarshan, TMH



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**INFORMATION RETRIEVAL SYSTEMS**  
**(PROFESSIONAL ELECTIVE - V)**

**Course Code: GR22A4129**  
**IV Year II Semester**

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

**Course Outcomes:**

1. To understand the different models of information storage and retrieval
2. Possess the ability to use the various retrieval utilities for improving search
3. Possess an understanding of indexing and compressing documents to improve space and time efficiency
4. Possess the skill to formulate parallel and distributed text search algorithms
5. Understand issues in webs search.

**UNIT I**

**Introduction, Retrieval Strategies:** Vector space model, Probabilistic retrieval strategies: Simple term weights, Non binary independence model, Language Models.

**UNIT II**

**Retrieval Utilities:** Relevance feedback, Clustering, N-grams, PAT data structure, Regression analysis, Thesauri.

**UNIT III**

**Retrieval Utilities:** Semantic networks, Parsing Cross-Language Information Retrieval: Introduction, Crossing the language barrier.

**UNIT IV**

**Efficiency:** Inverted index, Query processing, Signature files, Duplicate document detection.

**UNIT V**

**Text Search Algorithms:** Introduction, Software text search algorithms, Hardware text search systems.

**Text Books**

1. David A. Grossman, Ophir Frieder, information Retrieval —Algorithms and Heuristics, Springer, 2 Edition (Distributed by Universities Press),2004.
2. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press,1997.

**Reference Books**

1. Gerald J Kowaiski, Mark T Maybury. Information Storage and Retrieval Systems, Springer,2000
2. SoumenChakrabarti, Mining the Web : Discovering Knowledge from Hypertext Data, Morgan-Kaufmann Publishers, 2002
3. Christopher D. Manning, PrabhakarRaghavan, HinñchSchütze, An Introduction to Information Retrieval, Cambridge University Press, Cambridge, England,2009



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**CYBER FORENSICS**  
**(PROFESSIONAL ELECTIVE -V)**

**Course Code:GR22A4130**  
**IV Year II Semester**

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

**Course Outcomes**

1. Discuss the security issues network layer and transport layer.
2. Apply security principles in the application layer.
3. Explain computer forensics.
4. Use forensics tools.
5. Analyze and validate forensics data.

**UNIT I**

**Network Layer Security & Transport Layer Security** IPSec Protocol - IP Authentication Header - IP ESP - Key Management Protocol for IPSec. Transport layer Security: SSL protocol, Cryptographic Computations – TLS Protocol.

**UNIT II**

**E-Mail Security & Firewalls** PGP - S/MIME - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs- SET for E- Commerce Transactions.

**UNIT III**

**Introduction to Computer Forensics** Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

**UNIT IV**

**Evidence Collection and Forensics Tools** Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/Hardware Tools.

**UNIT V**

**Analysis and Validation** Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.

**Text Books**

1. Cybersecurity & Digital Forensics by ANAS ZAKIR – 17 March 2022
2. Cyber Security and Digital Forensics by Mangesh M. Ghonge, Sabyasachi Pramanik, Ramchandra Mangrulkar, Dac-Nhuong Le Released March 2022 Publisher(s): Wiley-Scrivener
3. Man Young Rhee, “Internet Security: Cryptographic Principles”, “Algorithms and Protocols”, Wiley Publications, 2003.
4. Nelson, Phillips, Enfinger, Steuart, “Computer Forensics and Investigations”, Cengage Learning, India Edition, 2008.



### Reference Books

1. John R.Vacca, "Computer Forensics", Cengage Learning, 2005.
2. Richard E.Smith, "Internet Cryptography", 3rd Edition Pearson Education, 2008.
3. Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall, 2013.
4. Cyber Forensics A Complete Guide - 2020 Edition Kindle Edition by [Gerardus Blokdyk](#) (Author)
5. Cyber Forensics Examining Emerging and Hybrid Technologies Edited by [Albert J. Marcella](#)
  6. Majid Yar, "Cybercrime and Society", SAGE Publications Ltd, Hardcover, 2nd Edition, 2013



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**SOFTWARE TESTING METHODOLOGIES**  
**(PROFESSIONAL ELECTIVE -VI)**

**Course Code:GR22A4058**  
**IV Year II Semester**

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

**Course Outcomes:**

1. Identify the various bugs and correcting them after knowing the consequences of the bug.
2. Apply Path testing Strategies to conduct as part of White Box Testing.
3. Apply various Data flow testing techniques for exploring Data Bugs and Domain Bugs.
4. Design test cases based on decision tables for a given logical construct.
5. Understand graph matrices and apply matrices techniques for the simplification of graphs and simplify testing process.

**UNIT I**

**Introduction:** Purpose of testing, Dichotomies, Model for testing, Consequences of bugs, Taxonomy of Bugs.

**UNIT II**

**Flow Graphs and Path Testing:** Basics concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

**Transaction Flow Testing:** Transaction flows, transaction flow testing techniques.

**UNIT III**

**Dataflow testing:** Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

**Domain Testing:** Domains and paths, Nice & ugly domains, Domain Testing, domains and interfaces testing, domain and interface testing, domains and testability.

**UNIT IV**

**Paths, Path products and Regular expressions:** Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

**Logic Based Testing: Overview, decision tables, path expressions, kv charts, specifications**

**UNIT V**

**State, State Graphs and Transition testing:** State graphs, good & bad state graphs, state testing, Testability tips.

**Graph Matrices and Application:** Motivational overview, matrix of graph, relations, power of a matrix, Node Reduction algorithm.

**Text Books**

1. Software Testing techniques – Boris Beizer, Dreamtech, 2<sup>nd</sup> Edition.
2. Software Testing Tools – Dr.K.V.K.K. Prasad, Dreamtech.

**Reference Books**

1. The craft of software testing - Brian Marick, Pearson Education.



2. Software Testing Techniques –SPD(Oreille).
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**AUGMENTED REALITY AND VIRTUAL REALITY**  
**(PROFESSIONAL ELECTIVE-VI)**

**Course Code: GR22A4054**  
**IV Year II Semester**

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

**Course Outcomes:**

1. Analyze about augmented reality.
2. Identify AR devices for various applications.
3. Analyze about virtual reality.
4. Interpret about usage of VR devices and human factors involved.
5. Apply AR & VR technology in various domains.

**UNIT I**

Introduction to Augmented Reality, The Relationship Between Augmented Reality and Other Technologies, Augmented Reality Concepts, How Does Augmented Reality Work?, Ingredients of an Augmented Reality Experience.

**UNIT II**

Augmented Reality Hardware, Major Hardware Components for Augmented Reality Systems, Augmented Reality Software, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.

**UNIT III**

Virtual Reality: The Three I's of Virtual Reality, A Short History of Early Virtual Reality, Early Commercial VR Technology, VR Becomes an Industry, The Five Classic Components of a VR System.  
Input Devices: Trackers, Navigation, and Gesture Interfaces: Three-Dimensional Position Trackers, Navigation and Manipulation Interfaces

**UNIT IV**

Output Devices: Graphics, Three-Dimensional Sound, and Haptic Displays : Graphics Displays, Sound Displays, Haptic Feedback.  
Human Factors in VR: Methodology and Terminology, User Performance Studies, VR Health and Safety Issues, VR and Society

**UNIT V**

Augmented Reality Applications, What Makes a Good Augmented Reality Application? Application Areas: Education, Gaming, Robotics, Health care, Manufacturing, Evaluating Augmented Reality Applications.

**Text Books**

1. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.
2. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley IEEE Press,



2003/2006.

**Reference Books**

1. LaValle, “Virtual Reality”, Cambridge University Press, 2016.
2. Alan B Craig, William R Sherman and Jeffrey D Will, “Developing Virtual Reality Applications: Foundations of Effective Design”, Morgan Kaufmann, 2009.
3. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007.
4. Anand R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
SPEECH AND NATURAL LANGUAGE PROCESSING**

**(PROFESSIONAL ELECTIVE- VI)**

**Course Code: GR22A4132**

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

**IV Year II Semester**

**Course Outcomes:**

1. To understand regular expressions, text normalization, n gram and vector representation of text
2. To understand word classes, Maximum Entropy Markov Models and Context-Free Grammars
3. To understand CKY parsing, PCFG parsing and CCG parsing, and dependency relations
4. To understand relation extraction using events and template filling, frame net and semantic role labeling
5. To understand discourse analysis and machine translation for question answering and speech recognition methods.

**UNIT I**

Introduction, Regular Expressions, Text Normalization, Edit Distance, N-gram Language Models Naïve Bayes and Sentiment Classification, Vector Semantics

**UNIT II**

Introduction, Regular Expressions, Text Normalization, Edit Distance, N-gram Language Models Naïve Bayes and Sentiment Classification, Vector Semantics

**UNIT III**

Dependency Parsing, Neural shift-reduce dependency parsing, Efficient parsing for context-free grammars (CFGs). Statistical parsing, probabilistic CFGs (PCFGs). Lexicalized PCFGs.

**UNIT IV**

Discourse Analysis. Information Extraction: Relation extraction, Event extraction Semantic Role Labeling, IE using sequence labeling, Lexicons for Sentiment analysis

**UNIT – V**

**Machine Translation (MT):** Basic issues in MT. Statistical translation, word alignment, phrase-based translation, and synchronous grammars.

**Text Books**

1. Daniel Jurafsky and James H. Martin. 2018. Speech and Language Processing: An Introduction to Natural Language Processing, Speech Recognition, and Computational Linguistics. 3rd edition. Prentice-Hall.
2. Christopher D. Manning and Hinrich Schütze. 1999. Foundations of Statistical Natural Language Processing. MIT Press.
3. Thushan Ganegedara, Andrei Lopatenko, Natural Language Processing with TensorFlow, Packt publications 2022.



### Reference Books

1. Elsa Harrington, Computational Linguistics and Natural Language Processing, 2022.
2. Mona M, Premkumar Rangarajan, Julien Simon, Natural Language Processing with AWS AI Services, 2021



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
CYBER LAWS AND IPR**

**(PROFESSIONAL ELECTIVE- VI)**

**Course Code: GR22A4151**

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

**IV Year II Semester**

**Course Outcomes:**

After completing the course, students will be familiar with

1. Understanding concepts related to cyber world and cyber law in general
2. Students locate and apply case law and common law to current legal dilemmas in the technology field.
3. Students will be able to understand Cyber-crime and Ethical practices.
4. Students will interface with various issues pertaining to Intellectual Property, copy rights, patents rights etc.
5. Intellectual property issues in the cyber space and the growth and development of the law.

**UNIT 1**

**CYBER SOCIETY**

Definitions, Specificities of the Cyberspace, Dimensions of Cyber Ethics in Cyber Society, Fourth Industrial Revolution, Users' Motivations in Cyber-Space, Core Values and Virtues, Old Values or Eschatological Vision, Cyber Ethics by Norms, Laws and Relations Artificial Intelligence Ethics: "AI for Good", Cyber-Capitalism: Cyber-Ethics as Business Ethics.

**UNIT II**

**CYBER LAW AND CYBER ETHICS**

The importance of cyber law, the significance of cyber ethics, cyber-crime is unethical and illegal, ethics education has positive impact, the need for cyber regulation based on cyber ethics, very dangerous times.

**UNIT III**

**ETHICS IN THE INFORMATION SOCIETY, THE NINE P'S**

Principles: ethical values, participation: access to knowledge for all, people: community, identity, gender, generation, education, profession: ethics of information professions, privacy: dignity, data mining, security.

Piracy: intellectual property, cybercrime, protection: children and young people, power: Economic power of technology, media and consumers, policy: ethics of regulation and freedom.

**UNIT IV**

**INTRODUCTION TO IPR**

General agreement on tariffs and trade (GATT) eight rounds: Uruguay round, world trade organization: structure, technology transfer, dispute resolution mechanism, Doha declaration world trade organization agreements including trade related intellectual properties rights and trade related investment measures.

**UNIT V**

**WORLD INTELLECTUAL PROPERTY ORGANIZATION AND PATENTS**

Paris convention, Bern convention, Budapest treaty, Madrid agreement, huge agreement, Historical background of intellectual property rights, introduction, definition and classification of intellectual property, patents, patentable and non-patentable inventions. Legal requirements for patents, types of patent



applications, Patent document, specifications and claims.

### **TEXT BOOKS**

1. P.KrishnaRao, WTO, Text and cases, Excel Books, 2015.
2. P. K. Vasudeva, World Trade Organization: Implications on Indian Economy, Pearson Education, 2015.
3. Christoph Stuckelberger, Pavan Duggal, “Cyber Ethics 4.0 Serving Humanity with Values”, Globethics.net, Global Series, 2018.

### **REFERENCES**

1. J.P. Sharma, SunainaKanojia, Cyber Laws
2. Dr. Farooq Ahmad, Cyber Law in India, Allahbad Law Agency- Faridabad
3. Caves, Frankel, Jones, World Trade and Payments-An Introduction, Pearson Education, 2015.
4. Carlos M.Correa- Intellectual property rights, The WTO and Developing countries-Zed books.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
PROJECT WORK – PHASE II**

**Course Code: GR22A4145**

**L/T/P/C: 0/0/12/6**

**IV Year II Semester**

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

**Course Outcomes:**

1. Practice and acquire the knowledge within the chosen area of technology for Project Development.
2. Identify, discuss, and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
3. Design and develop Engineering Projects by implementing technical aspects.
4. Work as an individual or in a team in development of Technical Projects.
5. Compile and report effectively the project related activities and findings.



# OPEN ELECTIVES



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**SOFT SKILLS AND INTERPERSONAL SKILLS**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3145**

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

**Course Outcomes**

- Develop soft skills communication skills, leadership skills etc.
- Implement goal setting techniques to build a promising career and evaluate the power of confidence building and self-esteem with examples.
- Design formal reports and proposals with appropriate formal expressions.
- Create a healthy workplace environment by treating others with respect and dignity.
- Describe team dynamics and exchange ideas about the elements of positive teamwork.

**Unit 1: Soft Skills**

- Introduction to soft skills, Definition of Soft skills, Importance of soft skills
- Communication skills, Usage of English in Business/Corporate scenario
- Nonverbal communication - Proxemics
- Presentation skills

**Unit 2: Team Building & Leadership Qualities**

- Qualities of a good leader
- Problem solving and Decision Making
- Strategic management
- Crisis management

**Unit 3: Personality Development**

- Motivation
- Goal setting
- Self-esteem
- Team skills

**Unit 4: Developing Reports and Proposals**

- Understanding reports and proposals
- Planning reports and proposals
- Writing beginning, body and ending
- Formats of reports and proposals

**Unit 5: Interpersonal Skills**

- Understanding professional relationships
- Networking professionally
- Showing basic office courtesies
- Interview skills.

**Text Books**

1. Soft Skills-Key to success in workplace and life Meenakshi Raman, Raman Upadhyay, CENAGE

**Reference Books**

1. Soft skills for Everyone - Jeff Butterfield, CENAGE Learning
2. Soft skills for Interpersonal Communication - S.Balasubramaniam (ORIENT BLACKSWAN)



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOUR  
(OPEN ELECTIVE)**

**Course Code: GR22A4049**

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

**Course Outcomes**

1. To acquaint the student with the determinants of intra -individual, inter-personnel, and inter-group behaviour in an organizational setting.
2. To Understand individual behavior in organizations, including diversity, attitudes, job satisfaction, emotions, moods, personality, values, perception, decision making, and motivational theories and apply in the organizational context.
3. To assess the group behavior in organizations, including communication, leadership, power and politics, conflict, and negotiations in the framework of organization and to familiarize the concepts, techniques, and practices of human resource development in the current organizational view.
4. To impart and apprise the capable of applying the principles and techniques as professionals for developing human resources in an organization.
5. To report the current trends and applications in HRD and Balanced Scorecard to measures the performance and to develop, implement, and evaluate organizational human resource development strategies aimed at promoting organizational effectiveness in different organizational environments.

**Unit I - Introduction to OB:** Organizational Behaviour- Concept and Emergence of OB Concept; Nature and Theoretical frameworks; Models of Organizational Behaviour, Challenges and Opportunities for Organizational Behavior;

**Unit II- Individual Behaviour:** Individual Behaviour: Personality, Learning, Values and Attitudes, Perception, Stress at work. Management's assumptions about people- McGregor's Theory X and Theory Y. Motivation - Maslow's Need Hierarchy, Herzberg's Two Factors Theory, Vroom's Expectancy Theory.

**Unit III-Inter-personal and Group Behaviour:** Interpersonal communication and Feedback; Transactional Analysis (TA); Johari Window. Group Behaviour: Group Dynamics, Cohesiveness and Productivity; Management of Dysfunctional groups; Group Decision Making. Leadership- Concept and Styles.

**Unit IV -Introduction to Human Resource Development:** Concept; Relationship between human resource management and human resource development; HRD mechanisms, processes, and outcomes; HRD matrix; Roles and competencies of HRD professionals; Challenges in HRD, steps in HRD Process.

**Unit V-HRD Applications and Trends:** Coaching and mentoring; Career management and development; Competency mapping; Balanced Score Card. HRD in Organizations: Selected cases covering HRD practices in government Organizations, manufacturing, and service industries and MNCs.

**Text Books**

1. Robbins, Stephen P. and Timothy A. Judge, Organizational Behaviour, Prentice -Hall, New Delhi.
2. Werner J. M., DeSimone, R.L., Human resource development, South Western.

**Reference Books**

1. Luthans, Fred, Organizational Behaviour, McGraw-Hill, New York.
2. Gregory, Moorhead and Ricky W. Griffin, Managing Organizational Behaviour, Thomson South Western Publication.



3. Pareek, Udai and V. Sisodia, "HRD in the New Millennium, Tata McGraw - Hill Publishing Co. Ltd., New Delhi, 1999.
4. Haldar, U. K., Human resource development, Oxford University Press India.
5. Rao, T.V., Future of HRD, Macmillan Publishers India.
6. Rao, T.V., HRD Score Card 2500: Based on HRD audit, Response Books, SAGE Publications.
7. Mankin, D., Human resource development, Oxford University Press India.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**CYBER LAW AND ETHICS**  
**(OPEN ELECTIVE)**

**Course Code: GR22A4077**

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

**Course Outcomes**

1. Students identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
2. Students locate and apply case law and common law to current legal dilemmas in the technology field.
3. Students apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.
4. Students will be able understand cybercrime and ethical practices and the student will be able to know and learn web technologies and related issues.
5. The student will be in a position to interface with various issues pertaining to Intellectual Property, copy rights, patents rights etc. and provide an overview of cybercrime and framework.

**Unit I - The Legal System: Sources of Law and The Court Structure:** Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers. (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court), Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration.

**Unit II - Introduction cyber law:** Computers and its Impact in Society, Overview of Computer and Web Technology, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level. , NITI Aayog and some current aspects.

**Unit –III - Constitutional & Human Rights Issues in Cyber space:** Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace, Access to Internet, Right to Privacy, Right to Data Protection.

**Unit –IV Cyber Crimes & Legal Framework:** Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act

**Unit –V Intellectual Property Issues in Cyber Space:** Interface with Copyright Law, Interface with Patent Law, Trademarks & Domain Names Related issues.

**Text Books**

1. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
2. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012)
3. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)
4. Jonthan Rosenoer, Cyber Law, Springer, New York, (1997).
5. Sudhir Naib, The Information Technology Act, 2005: A Handbook.
6. S. R. Bhansali, Information Technology Act, 2000
7. University Book House Pvt. Ltd. Jaipur (2003).
8. Vasu Deva, Cyber Crimes and Law Enforcement, Commonwealth Publishers, New Delhi



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ECONOMIC POLICIES IN INDIA**  
**(OPEN ELECTIVE)**

**Course Code: GR22A4147**

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

**Course Outcomes**

1. Familiarize with the nature of business environment and its components.
2. The students will be able to demonstrate and develop conceptual framework of business environment.
3. Understand the definition of ethics and the importance and role of ethical behaviour in the business world today.
4. Explain the effects of government policy on the economic environment.
5. Outline how an entity operates in a business environment.

**Unit 1: Business environment**-factors effecting Business Environment-need for industrial policies, Overview of Indian Economy, Trends towards market economy, problems of underdevelopment – meaning, Main problems, reasons, of underdevelopment.

**Unit :2 Factors and measure**, Meaning of Economic development, National income, Per capital income, Quality of life, Capital Formation – Savings, Investment.

**Unit 3: NITI Aayog and Planning in India**, Niti Aayog and its function, how is Niti Aayog different from planning commission, Meaning, Importance, Main reasons of adopting, planning in India, Objectives of planning, Economic development, moderation, stability, self-sufficiency, employment etc, foreign aid, Employment. Allocation of Resources,

**Unit 4: Private and Public Sector, Public Sector** – role and growth, Achievements of the public sector, Private Sector – Importance Problems, New foreign Trade Policy.

**Unit 5: Present Economic Policy**, Main feature, Globalization, Expansion of Private sector, more market orient approach. Public distribution system, Industrial policies before and after 1991, Industrial Licensing, Monetary and Fiscal Policy, elements of Indian current GDP and review of current budget.

**Text Books**

1. Francis Cherunilam: Business Environment: Text and Cases. 18/e. Himalaya. 2009.
2. Misra and Puri: Indian Economy, Himalaya, 2009.

**Reference Books**

1. Indian Economy- A. N. Agarwal
2. Indian Economy – Mishra &Puri
3. Indian Development and planning – M. L. Jhingan
4. Indian Economy – R. S. Rastogi Yozna and Kurukshetra Magazines



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**DATA SCIENCE FOR ENGINEERS**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3049**

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

**Course Outcomes**

1. Illustrate a flow process for data science problems.
2. Demonstrate the mathematical foundations for data science.
3. Analyze the data science process and predictive modelling.
4. Develop R codes for data science solutions.
5. Correlate results to the solution approach followed.

**UNIT I**

Introduction to R, Variables and datatypes in R, Data frames, Recasting and joining of data frames, Recasting and joining of data frames, Arithmetic, Logical and Matrix operations in R, Advanced programming in R : Functions, Control structures, Data visualization in R Basic graphics.

**UNIT II**

**Linear Algebra and Statistics for Data Science:** Solving Linear Equations, Linear Algebra Distance, Hyperplanes and Half spaces, Eigenvalues, Eigenvectors, Statistical Modelling, Random Variables and Probability Mass/Density Functions, Sample Statistics.

**UNIT III**

Introduction to Data Science, Solving Data Analysis Problems - A Guided Thought Process, Predictive Modelling, Linear Regression, Model Assessment, Diagnostics to Improve Linear Model Fit.

**UNIT IV**

Simple Linear Regression Model Building, Cross Validation, Multiple Linear Regression Modelling Building and Selection.

**UNIT V**

Classification, K - Nearest Neighbors (KNN), K - Nearest Neighbors implementation in R, K - means Clustering, K - means implementation in R.

**Text Books**

1. Data Science for Engineers, 1<sup>st</sup> Edition, Raghunathan Rengaswamy, Resmi Suresh, CRC Press, Taylor & Francis Group.
2. Introduction to Linear Algebra, Fifth Edition, Gilbert Strang, ISBN: 978-09802327-7-6.
3. Applied Statistics and Probability for Engineers, Douglas Montgomery, George C Runger, Fifth Edition, John Wiley & Sons, Inc.

**Reference Books**

1. Hands On Introduction to Data Science Hardcover – 2 April 2020 by Chirag Shah (Author)
2. Essential Math for Data Science: Take Control of Your Data with Fundamental Linear Algebra, Probability, and Statistics by Thomas Nield (Author)



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**DATA ANALYTICS USING OPEN-SOURCE TOOLS**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3120**

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

**Course Outcomes:**

1. Interpret about graphics techniques in data analysis.
2. Implement data modeling techniques for a dataset.
3. Develop the simulation for mining and clustering the data.
4. Infer the data using business intelligence and predictive analytics.
5. Implement the data analytics using Programming Environments

**UNIT I**

**Graphics:** A Single Variable – Dot and Jitter Plots, Histograms and Kernel Density Estimates, The Cumulative Distribution Function, Rank-Order Plots and Lift Charts, Summary Statistics and Box Plots, Practice using Numpy, Two Variables- Scatter Plots, Smoothing, Logarithmic Plots, Banking, Practice using Matplotlib, Time as A Variable- Time-Series Analysis, More Than Two Variables- False-color plots, Multi plots.

**UNIT II**

**Modeling Data:** Guesstimation and the back of the envelope- Principles, Perturbation Theory and Error Propagation, Models from scaling arguments- Models, Arguments from Scale, Mean-Field Approximations, Common Time-Evolution Scenarios, Arguments from probability models- The Binomial Distribution and Bernoulli Trials, The Gaussian Distribution and the Central Limit Theorem, Power-Law Distributions and Non-Normal Statistics, Bayesian Statistics.

**UNIT III**

**Mining Data:** Simulations- Monte Carlo Simulations, Resampling Methods, Discrete Event Simulations with SimPy, Finding Clusters- Distance and Similarity Measures, Clustering Methods, Pre and Postprocessing, Pycluster, Seeing the Forest for the trees- PCA, Kohonen Maps, PCA with R.

**UNIT IV**

**Applications:** Reporting, Business intelligence and Dashboards- Corporate Metrics and Dashboards, Data Quality Issues, Financial calculations and modeling- The Time Value of Money, Uncertainty in Planning and Opportunity Costs, Cost Concepts and Depreciation, Predictive analytics- algorithms for classification.

**UNIT V**

**Programming Environments and Data analytics**

**Programming Environments:** Software Tools, A Catalog of Scientific Software - Matlab, R, Python

**Results from Calculus:** Common Functions, Calculus, Useful Tricks -Binomial theorem, Linear transformation.

**Working with data:** Sources for Data, Cleaning and Conditioning, Sampling, Data File Formats, The Care and Feeding of Your Data Zoo.



### **Text Books**

1. Philipp K. Janert, Data Analysis with Open Source Tools, O'Reilly Media, Inc, November 2010: 1<sup>st</sup> Edition.

### **Reference Books**

1. G James, D. Witten, T Hastie, and R. Tibshirani, An Introduction to Statistical Learning: with Applications in R, Springer, 2013
2. Chambers, John, Software for Data Analysis Programming with R, Springer, 2008
3. Trevor Hastie Robert Tibshirani Jerome Friedman, The Elements of Statistical Learning, Data Mining, Inference, and Prediction (2<sup>nd</sup> Edn.), Springer, 2014
4. Mark Gardener, Beginning R: The Statistical Programming Language, Wiley, 2013
5. Upadhyaya and A. Upadhyaya, Material Science and Engineering, Anshan Publications, 2007



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
AUGMENTED REALITY AND VIRTUAL REALITY  
(OPEN ELECTIVE)**

**Course Code: GR22A4054**

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

**Course Outcomes:**

1. Analyze about augmented reality.
2. Identify AR devices for various applications.
3. Analyze about virtual reality.
4. Interpret about usage of VR devices and human factors involved.
5. Apply AR & VR technology in various domains.

**UNIT I**

Introduction to Augmented Reality, The Relationship Between Augmented Reality and Other Technologies, Augmented Reality Concepts, How Does Augmented Reality Work? Ingredients of an Augmented Reality Experience.

**UNIT II**

Augmented Reality Hardware, Major Hardware Components for Augmented Reality Systems, Augmented Reality Software, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.

**UNIT III**

Virtual Reality: The Three I's of Virtual Reality, A Short History of Early Virtual Reality, Early Commercial VR Technology, VR Becomes an Industry, The Five Classic Components of a VR System. Input Devices: Trackers, Navigation, and Gesture Interfaces: Three-Dimensional Position Trackers, Navigation and Manipulation Interfaces

**UNIT IV**

Output Devices: Graphics, Three-Dimensional Sound, and Haptic Displays : Graphics Displays, Sound Displays, Haptic Feedback.  
Human Factors in VR: Methodology and Terminology, User Performance Studies, VR Health and Safety Issues, VR and Society

**UNIT V:**

Augmented Reality Applications, What Makes a Good Augmented Reality Application? Application Areas: Education, Gaming, Robotics, Health care, Manufacturing, Evaluating Augmented Reality Applications.

**Text Books**

1. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.
2. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley IEEE Press, 2003/2006.



### Reference Books

1. LaValle, “Virtual Reality”, Cambridge University Press, 2016.
2. Alan B Craig, William R Sherman and Jeffrey D Will, “Developing Virtual Reality Applications: Foundations of Effective Design”, Morgan Kaufmann, 2009.
3. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007.
4. Anand R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**BASICS OF JAVA PROGRAMMING**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3072**

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

**Course Outcomes**

1. Apply knowledge on key attributes of Object-Oriented Programming (OOP) and control structures.
2. create and manipulate classes and objects, employ various methods and method utilization.
3. Demonstrate expertise in both array-based and string-based structures.
4. understanding of Java's inheritance and interface concepts
5. proficient at organizing Java code using packages and exception handling.

**UNIT I**

**Java Programming Fundamentals:** Java Language, Key Attributes of Object-Oriented Programming, Java Development Kit, Simple Program, Create Blocks of Code, Keywords, Identifiers, The Java Class Libraries.

**Data Types and Operators:** Java's Primitive Types, Literals, Variables, Scope and Lifetime of Variables, Operators- Arithmetic, Relational, Logical, Bitwise, Assignment. Type conversion in Assignments, Using a Cast, Operator Precedence.

**Program Control Structures:** if, switch, for, enhanced for, while, do-while, break, continue.

**UNIT II**

**Introduction to Classes, Objects and Methods:** Class Fundamentals, Objects creation, Reference Variables and Assignment, Methods, returning a Value, Using Parameters, passing objects to methods, passing arguments, Method Overloading, Constructors, Parameterized Constructors, Overloading Constructors. new Operator, this Keyword, Command-Line Arguments.

**UNIT III**

**Arrays:** Introduction to Arrays, 1D Arrays, Multidimensional Arrays, Irregular Arrays, Using the Length Member. Arrays class of util package.

**Strings:** String class, constructors, length(), string literals, concatenation, Character extraction, string comparison, searching strings, modifying, data conversion, changing the case, joining, split(). String Buffer class: constructors, length(), capacity(), ensure Capacity(), set Length(), charAt(), setCharAt(), get Chars(), append(), insert(), reverse(), delete(), deleteCharAt(), replace().

**UNIT IV**

**Inheritance:** Basics, Inheritance Types, Using Super, Multilevel Hierarchy, Super class Reference Books and Subclass Objects, Method Overriding, Abstract Classes, Using final. **Interfaces:** Fundamentals, Creating and Implementing an Interface, Using Interface Reference Books, Implementing Multiple Interfaces, Extending Interfaces, Nested Interface.

**UNIT V**

**Packages:** Package Fundamentals, Member Access, Importing Packages, Static import.

**Exception Handling:** Exception Hierarchy, Fundamentals, Handling errors, Multiple Catch, Throwing and Rethrowing an Exception, Throwable, using finally, using throws, Creating Exception Sub classes.

**Text Books**

1. Herbert Schildt, Dale Skrien, Java Fundamentals A Comprehensive Introduction, 1/e, Tata McGraw



Hill, 2017.

2. Herbert Schildt, The Java complete Reference Books, 9/e, Tata McGraw Hill, 2014.

**Reference Books**

1. Y. Daniel Liang, An Introduction to JAVA Programming, 10/e, Tata McGraw Hill.

2. Kathy Sierra, Head First Java, 2/e, Shroff Publishers, 2012.

3. Balagurusamy, Programming with JAVA, 2/e, Tata McGraw Hill, 2014.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**INTRODUCTION TO DBMS**  
**(OPEN ELECTIVE)**

Course Code: GR22A3141

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

**Course Outcomes**

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

**UNIT I**

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

**UNIT II**

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

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

**UNIT III**

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

**UNIT IV**

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

**UNIT V**

**Transaction Management:** Transaction Concept, Transaction State, Concurrent Executions, Serializability, Testing for Serializability.

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

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

**Text Books**

1. "Data base Management Systems", Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3<sup>rd</sup> Edition.
2. "Data base System Concepts", Silberschatz, Korth, McGraw hill, V Edition.
3. "Introduction to Database Systems", C.J.Date Pearson Education.



**Reference Books**

- 1.“Database Systems design, Implementation, and Management”, Rob & Coronel 5<sup>th</sup> Edition.
- 2.“Database Management Systems”, P. Radha Krishna HI-TECH Publications 2005.
- 3.“Database Management System”, Elmasri Navate, Pearson Education.
- 4.“Database Management System”, Mathew Leon, Leo



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**INTRODUCTION TO DATA MINING**  
**(OPEN ELECTIVE)**

**Course Code: GR22A4080**

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

**Course Outcomes**

1. Learn the concepts of database technology evolutionary path which has led to the need for data mining and its applications.
2. Apply pre-processing statistical methods for any given raw data.
3. Apply Apriori and FP growth algorithms for forming strong association rules.
4. Extract knowledge and implementation of data mining techniques.
5. Apply the data mining algorithm for solving practical problems.

**UNIT I**

**Introduction:** Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.

**UNIT II**

**Data Preprocessing:** Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction.

**Introduction to Data Warehouse:** Data Warehouse, Multi-dimensional Data Model, Data Warehouse Architecture, Data Marts.

**UNIT III**

**Mining Frequent Patterns, Associations:** Basic Concepts, Market Basket Analysis, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules.

**UNIT IV**

**Classification:** Issues Regarding Classification, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification.

**Prediction:** Issues Regarding Prediction, Regression techniques.

**Accuracy and Error measures:** Evaluating the accuracy of a Classifier or a Predictor.

**UNIT V**

**Cluster Analysis Introduction:** Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods - k-Means and k-Medoids, Hierarchical Methods – Agglomerative, BIRCH.

**Text Books**

1. Data Mining– Concepts and Techniques - Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition, 2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education.



**Reference Books**

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



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**PROGRAMMING IN PYTHON**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3077**

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

**Course Outcomes**

1. Demonstrate the concepts of control flow, data structures and Functions in Python
2. Design python programs using functional programming
3. Implement the file handling operations, exception handling mechanism.
4. Design python programs using object-oriented programming and multithreaded programming concepts.
5. Develop GUI based applications using Tkinter.

**UNIT I**

Basic features of Python-Interactive execution, comments, types, variables, operators, expressions, Statements-assignment, input, print, Control flow-Conditionals, Loops, break statement, continue statement, pass statement, Functions, definition, call, scope and lifetime of variables, keyword arguments, default parameter values, variable length arguments, recursive functions.

**UNIT II**

Sequences-Strings, Lists and Tuples-basic operations and functions, iterating over sequences, Sets and Dictionaries- operations and functions, Functional programming-mapping, filtering and reduction, Lambda functions, List comprehensions. Scope, namespaces, and modules, import statement, creating own modules, avoiding namespace collisions when importing modules.

**UNIT III**

Files-operations-opening, reading, writing, closing, file positions. Exceptions – raising and handling exceptions, try/except statements, finally clause, standard exceptions, custom exceptions., iterators and generators, Python program examples.

**UNIT IV**

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

**Text Books**

1. Exploring Python, Timothy A. Budd, McGraw Hill Publications.
2. Introduction to Programming using Python, Ys.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. Fundamentals of Python, K. A. Lambert, B.L. Juneja, Cengage Learning.
3. 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.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**INTERNET OF THINGS**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3147**

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

**Prerequisites**

Students are expected to have knowledge on Operating systems, Virtualization and Networking

**Course Outcomes**

1. Learn characteristics, applications, components and challenges of Internet of Things (IOT)
2. Create understanding of IOT networking concepts – terminologies, stack components, infrastructure and data protocols
3. Create understanding of the concept of Cloud based IOT technologies, cloud service providers and security aspects
4. Develop skills in understanding and programming the Arduino and Raspberry Pi hardware platforms
5. Make the student understand the requirements, components, challenges and develop various application areas - smart homes, smart grids, smart health care, smart cities and industrial IOT

**UNIT I**

**Introduction to IOT:** Characteristics of IOT, Applications of IOT, IOT Categories, IOT Enablers and Connectivity Layers, Sensors, Actuators, IOT Components & Implementation, Challenges for IOT

**UNIT II**

**IOT Networking & Connectivity Technologies:** Connectivity terminologies-IOT Node, LAN, WAN, Gateway, IOT protocol Stack vs. Web Stack, IOT Identification and Data Protocols-IPV4, IPV6,HTTP,MQTT,COAP,AMQP,DDS Connectivity Technologies – Zigbee, Bluetooth, LoRa

**UNIT III**

**Cloud for IOT:** IOT with Cloud-Challenges, Cloud service providers for IOT-Overview, Cloud service model, Cloud Computing – Security aspects, Case Study, Fog computing, Edge computing

**UNIT IV**

**Hardware Platforms:** Programming with Arduino-Features of Arduino, Components of Arduino Board, Arduino IDE, Program Elements, Raspberry Pi – Introduction, Architecture, PIN Configuration, Implementation of IOT with Raspberry Pi

**UNIT V**

**IOT Applications:** Smart Homes-Smart Home Origin, Technologies, Implementation, Smart Grids-Characteristics, Benefits, Architecture, Components, Smart Cities-Characteristics, Frameworks, Challenges, Industrial IOT-Requirements, Design Considerations, Applications

**Text Books**

1. Internet of Things, Jeeva Jose, Khanna Publishing, 2018
2. Internet of Things, Abhishek S Nagarajan, RMD Sundaram, Shriram K Vasudevan, Wiley, 2019



3. IOT Fundamentals: Networking Technologies, Protocols and Use Cases for IOT, Rowan Trollope, David Hanes, Patrick Gassetete, Jerome Henry, Pearson Education Limited, 2017

### **Reference Books**

1. The Internet of Things, Michael Miller, Pearson Education Limited, 2015  
IoT Applications, Security Threats, and Countermeasures, Padmalaya Nayak, Niranjana Ray, P. Ravichandran, Taylor & Francis, 2021
2. Internet of Things: Architecture, Implementation and Security, Mayur Ramgir, Pearson Education Limited, 2019
3. IOT Fundamentals: Networking Technologies, Protocols and Use Cases for IOT, Rowan Trollope, David Hanes, Patrick Gassetete, Jerome Henry, Pearson Education Limited, 2017



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**SCRIPTING LANGUAGES**  
**(OPEN ELECTIVE)**

**Course code: GR22A4085**

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

**Course Outcomes**

1. Analyze a problem, identify, and define the computing requirements appropriate to its solution.
2. Design Web pages with DB.
3. Implement the PHP Authentication Methodologies.
4. Implement PHP Encryption functions and Mcrypt Package
5. Understand the syntax and functions in Perl and Python.

**UNIT- I**

**PHP Basics**

PHP Basics- Features, Embedding PHP Code in your Web pages, outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures. Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

**UNIT -II**

**MySQL Basics**

Introduction to MYSQL: Database Concepts, General Overview of MySQL database, Installation. Connecting and disconnecting from MySQL Server, Querying the database, Data Definition Language, Functions and Logical operators, Access privilege system.

**UNIT -III**

**Advanced PHP Programming**

Advanced PHP Programming: PHP and Web Forms, Files, PHP Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, and Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package.

**UNIT- IV**

**PERL:** Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

**Advanced PERL:** Finer points of looping, pack and unpack, file system, data structures, packages, modules, objects, interfacing to the operating system.

**UNIT -V**

**Python:** Introduction to Python language, Python-syntax, statements, functions, Built-in-functions and Methods, Modules in Python, Exception Handling.



### **Text Books**

1. The World of Scripting Languages, David Barron, Wiley India. Beginning PHP andMySQL, 3<sup>rd</sup> Edition, Jason Gilmore, A press Publications (Dream tech.).
2. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.

### **Reference Books**

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl andPHP, Lee and B.Ware (Addison Wesley) Pearson Education.
2. Programming Python,M.Lutz,SPD.
3. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage
4. Learning Publications.
5. PHP 5.1,I.Bayross and S.Shah,The X Team,SPD.
6. Core Python Programming,Chun,Pearson Education.
7. Guide to Programming with Python,M.Dawson,Cengage Learning.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
SERVICES SCIENCE AND SERVICE OPERATIONAL MANAGEMENT  
(OPEN ELECTIVE)**

**Course Code: GR22A4134**

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

**Pre-Requisite(s):** Fundamentals of Management, Operations Research

**Course Outcomes:**

1. Understand concepts of services and their significance in the economy and society and distinguish it from goods.
2. Understand the service strategy, design, and development.
3. Comprehend ways to design services and able to understand service guarantee, recovery, and failures.
4. Forecast the service demand, supply and facilitate various methods to operate and manage services.
5. Understand the service productivity and how innovation can be approached from service point of view

**UNIT I**

**Introduction:** Service operations, Role of service in economy and society, Indian service sector

**Nature of Services and Service Encounters:** Differences between services and operations, Service package, characteristics, various frameworks to design service operation system, Kind of service encounter, importance of encounters

**Service-Dominant Logic:** From Goods-Dominant logic to Service-Dominant logic, Value Co-creation

**UNIT II**

**Service Strategy and Competitiveness:** Development of Strategic Service Vision (SSV), Data Envelopment Analysis

**New Service Development:** NSD cycle, Service Blueprinting, Elements of service delivery system  
**Service Design:** Customer Journey and Service Design, Design Thinking methods to aid Service Design

**Locating facilities and designing their layout:** models of facility locations (Huff's retail model), Role of service-scape in layout design

**Service Quality:** SERVQUAL, Walk through Audit, Dimensions of Service quality & other quality tools

**UNIT III**

**Service Guarantee & Service Recovery:** Service guarantee and its types; Service failure – reasons for failure and service recovery strategies.

**UNIT IV**

**Forecasting Demand for Services:** A review of different types of forecasting methods for demand forecasting.

**Managing Capacity and Demand:** Strategies for matching capacity and demand, Psychology of waiting, Application of various tools used in managing waiting line in services.

**Managing Facilitating Goods:** Review of inventory models, Role of inventory in services

**Managing service supply relationship:** Understanding the supply chain/hub of service, Strategies for managing suppliers of service

**UNIT V**

**Service Innovation:** Services Productivity, Need for Services Innovation

**Student Project:**

Option 1: Choose any service organization around and present it from the perspective of: nature of service, classification of service, blueprint or service design analysis, service quality, and any additional perspective you would like to add.



Option 2: Choose any latest research paper in services and explain your understanding and feedback on the same.

**Text Books**

1. Fitzsimmons & Fitzsimmons, Service Management: Operations, Strategy, Information Technology, McGraw Hill publications (7<sup>th</sup> Edition)

**Reference Books**

1. Wilson, A., Zeithaml, V. A., Bitner, M. J., & Gremler, D. D. (2012). *Services marketing: Integrating customer focus across the firm*. McGraw Hill.
2. Lovelock, C. (2011). *Services Marketing, 7/e*. Pearson Education India
3. Reason, Ben, and Lovlie, Lavrans, (2016) *Service Design for Business: A Practical Guide to Optimizing the Customer Experience*, Pan Macmillan India,
4. Chesbrough, H. (2010). *Open services innovation: Rethinking your business to grow and compete in a new era*. John Wiley & Sons.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**IT PROJECT MANAGEMENT**  
**(OPEN ELECTIVE)**

**Course Code: GR22A4135**

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

**Course Outcomes**

1. Learn the techniques to effectively plan manage, execute the projects.
2. Learn the techniques to control projects within time and cost targets with a focus on Information Technology and Service Sector.
3. Learn various agile methodologies.
4. Apply agile project management techniques such as Scrum on real time applications.
5. Develop real time applications using agile project management techniques such as DevOps.

**UNIT I**

**Project Overview and Feasibility Studies-** Identification, Market and Demand Analysis, Project Cost Estimate, Financial Appraisal

**Project Scheduling:** Project Scheduling, Introduction to PERT and CPM, Critical Path Calculation, Precedence Relationship, Difference between PERT and CPM, Float Calculation and its importance, Cost reduction by Crashing of activity.

**UNIT II**

**Cost Control and Scheduling:** Project Cost Control (PERT/Cost), Resource Scheduling & Resource Leveling

**Project Management Features:** Risk Analysis, Project Control, Project Audit and Project Termination.

**UNIT III**

**Agile Project Management:** Introduction, Agile Principles, Agile methodologies, Relationship between Agile Scrum, Lean, DevOps and IT Service Management (ITIL).

**Other Agile Methodologies:** Introduction to XP, FDD, DSDM, Crystal

**UNIT IV**

**Scrum:** Various terminologies used in Scrum (Sprint, product backlog, sprint backlog, sprint review, retro perspective), various roles (Roles in Scrum), Best practices of Scrum.

**UNIT V**

**DevOps:** Overview and its Components, Containerization Using Docker, Managing Source Code and Automating Builds, Automated Testing and Test-Driven Development, Continuous Integration, Configuration Management, Continuous Deployment, Automated Monitoring.

**Text Books**

1. Mike Cohn, Succeeding with Agile: Software Development Using Scrum
2. Notes to be distributed by the course instructor on various topics.

**Reference Books**

1. Roman Pichler, Agile Product Management with Scrum
2. Ken Schwaber, Agile Project Management with Scrum (Microsoft Professional)



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**MARKETING RESEARCH AND MARKETING MANAGEMENT**  
**(OPEN ELECTIVE)**

**Course Code: GR22A4136**

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

**Course Outcomes**

1. The students understand the significance of marketing management concepts, marketing environment, consumer behavior elements and strategies related to STP.
2. The student will be able to understand various product management strategies and the importance of branding and packing.
3. Comprehend the dynamics of marketing mix elements such as pricing, distribution, and promotion mix elements to leverage marketing concepts for effective decision making.
4. Students will demonstrate analytical skills in identification and resolution of problems pertaining to marketing management and marketing research and uses of various statistical tools in marketing research.
5. Understanding the concepts of internet marketing and the fundamentals of business-to-business marketing strategy, CRM strategies.

**UNIT I**

**Marketing Concepts and Applications:** Introduction to Marketing & Core Concepts, Marketing of Services, Importance of marketing in service sector.

**Marketing Planning & Environment:** Elements of Marketing Mix, Analyzing needs & trends in Environment - Macro, Economic, Political, Technical & Social

**Understanding the consumer:** Determinants of consumer behavior, Factors influencing consumer behavior

**Market Segmentation:** Meaning & Concept, Basis of segmentation, selection of segments, Market Segmentation strategies, Target Marketing, Product Positioning

**UNIT II**

**Product Management:** Product Life cycle concept, New Product development & strategy, Stages in New Product development, Product decision and strategies, Branding & packaging

**UNIT III**

**Pricing, Promotion and Distribution Strategy:** Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity, 5M's of Advertising Management. Marketing Channels, Retailing, Marketing Communication, Advertising

**UNIT IV**

**Marketing Research:** Introduction, Type of Market Research, Scope, Objectives & Limitations Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, Media Research, Qualitative Research

**Data Analysis:** Use of various statistical tools – Descriptive & Inference Statistics, Statistical Hypothesis Testing, Multivariate Analysis - Discriminant Analysis, Cluster Analysis, Segmenting and Positioning, Factor Analysis

**UNIT V**

**Internet Marketing: Introduction to Internet Marketing.** Mapping fundamental concepts of Marketing (7Ps, STP); Strategy and Planning for Internet Marketing

**Business to Business Marketing:** Fundamental of business markets. Organizational buying process.



Business buyer needs. Market and sales potential. Product in business markets. Price in business markets. Place in business markets. Promotion in business markets. Relationships, networks, and customer relationship management. Business to Business marketing strategy

**Home Assignments:**

Written Analyses of Cases – Students are expected to report on their analysis and recommendations of what to do in specific business situations by applying concepts and principles learned in class (Case Studies to be shared by Faculty) e.g., “Marketing Myopia”

1. Field visit & live project covering steps involved in formulating Market Research Project
2. Measuring Internet Marketing Effectiveness: Metrics and Website Analytics

**Text Books**

1. Marketing Management (Analysis, Planning, Implementation & Control) – Philip Kotler
2. Fundamentals of Marketing – William J. Stanton & Others
3. Marketing Management – V.S. Ramaswamy and S. Namakumari
4. Marketing Research – Rajendra Nargundkar
5. Market Research – G.C. Beri
6. Market Research, Concepts, & Cases – Cooper Schindl



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**INTRODUCTION TO DATA SCIENCE**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3056**

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

**Prerequisites:**

Knowledge of Python programming, Linear algebra, Statistics, Probability and Calculus

**Course Outcomes**

1. Learn Numpy, Pandas for mathematical computation and Data Analysis
2. Analyze the importance of pre-processing techniques for Data Science
3. Learn and analyze various prediction and classification techniques on various datasets
4. Learn and analyze the applications of clustering techniques
5. Analyze Text data and Web scrapping data at morphological and syntactic and semantic levels using NLP techniques

**UNIT I**

Introduction to Data Science, Components of Data Science, Application of Data Science

**NumPy:** Array, Matrix and associated operations, Linear algebra and related operations

**Pandas: Series, Data Frames, Panels, Reading files, Exploratory data analysis, Data preparation, Indexing, Slicing, Merging and Joining data. Working with MySQL databases**

**Data Pre-processing Techniques:** Data Imputation, Data Encoding, Standardization and Normalization, Dimensionality reduction, Feature Selection methods

**UNIT II**

**Regression Analysis:** Introduction to Regression, Simple linear regression, Multi-linear regression, Evaluation metrics for regression

**Classification Methods:** Introduction to Classification, Naïve Bayes classifier, Decision Tree classifier, Support Vector Machines, Logistic Regression, Ensemble methods, Random Forest, Bagging, Boosting, Evaluation metrics for classification

**UNIT III**

**Clustering Methods:** Introduction to Clustering, Similarity distance measures, K-means algorithm, Hierarchical clustering algorithm, DB Scan algorithm, Evaluation metrics for clustering.

**UNIT IV**

**NLP Overview,** Tokenization, Stemming, stop words removal, POS tagging, Lemmatization, Feature extraction using SK learn, Text Classification, Text Clustering.

**UNIT V**

**Learning Best Practices for Model Evaluation:**

Pipelining, Hyperparameter Tuning, Debugging algorithms with learning and validation curves.

**Text Books**

1. Python Machine Learning, Second Edition by Sebastian Raschka Vahid Mirjalili Statistics and Machine Learning in Python Edouard Duchesnay,



### Reference Books

1. Data Science from Scratch: First Principles with Python, Second Edition (Greyscale Indian Edition) Paperback – 5 May 2019 by Joel Grus (Author)
2. Practical Data Science with Python: Learn tools and techniques from hands-on examples to extract insights from data by Nathan George (Author)
3. HANDS ON INTRODUCTION TO DATA SCIENCE Hardcover – 2 April 2020 by Chirag Shah (Author)
4. Essential Math for Data Science: Take Control of Your Data with Fundamental Linear Algebra, Probability, and Statistics by Thomas Nield (Author)



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**USER-CENTRIC HUMAN COMPUTER INTERACTION**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3127**

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

**Course Outcomes**

1. Learn the concepts of interaction design and how it relates to human computer interaction and other fields.
2. Design how technologies can be to change people's attitudes and behavior.
3. Apply the difference between qualitative and quantitative data and analysis.
4. Extract the social Mechanisms that are used by people to communicate and collaborate.
5. Explore the user Experience design and analyze the factors involved in design

**UNIT I**

**Introduction:** Introduction to User Centric Computing (UCC) and history, Issues and challenges, Latest research trends, User-Centric Design and Software Engineering.

**UNIT II**

**Engineering User-Centric Systems:** Components of SDLC - Contextual Inquiry, - Design Guidelines, Prototyping.

**UNIT III**

**User-Centric Computing:** The UCC framework with illustrative case study, User-Centric models- descriptive, predictive models and taxonomy, Introduction to GOMS family of models

**Computational user models (classical),** Keystroke-Level Model (KLM), (CMN)GOMS Model, The Fitts' Law, The Hick-Hyman Law.

**UNIT IV**

**Computational user models(contemporary):** 2D and 3D pointing models, The steering Law and constrained navigation, Model for hierarchical menu selection, Mobile typing models(single finger and two thumb typing), Model for touch performance(FFitts' law),

**Formal system models:** Introduction to formal models in UCD, Formal modelling of user-computer dialogue.

**UNIT V**

**Empirical Research Methods:** Introduction and research question formulation, Variables determination and experiment design, Data Analysis including model building.

**User-Centric Design Evaluation:** Introduction to User-Centric design evaluation and expert evaluation technique, User evaluation and model-based evaluation.

**Text Books**

1. Samit Bhattacharya (July, 2019). Human-Computer Interaction: User-Centric Computing for Design, McGraw-Hill India, Print Edition: ISBN-13: 978-93-5316-804-9; ISBN-10: 93-5316-804-X, E-book Edition: ISBN-13: 978-93-5316-805-6; ISBN-10: 93-5316-805-8
2. Alan Dix, Janet E. Finlay, Gregory D. Abowd and Russel Beale. (2003). Human-Computer Interaction (3rd



Edition), Pearson.

**Reference Books**

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen and Steven Jacobs. (2009). Designing the User Interfaces: Strategies for Effective Human-Computer Interaction (5th Edition), Pearson

**Website Links:**

[https://paragnachaliya.in/wp-content/uploads/2017/08/HCI\\_Alan\\_Dix.pdf](https://paragnachaliya.in/wp-content/uploads/2017/08/HCI_Alan_Dix.pdf)



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**DESIGN PATTERNS**  
**(OPEN ELECTIVE)**

**Course Code: GR22A4063**

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

**Course Outcomes**

1. Ability to analyze and apply different design patterns for real life scenarios.
2. Ability to solve Object oriented design problems with a case study of designing a Document Editor.
3. Illustrates the skill apply creational design patterns.
4. Demonstrates the ability to apply different structural design patterns.
5. Analyze and apply different behavioral design patterns.

**UNIT I**

**Introduction:** What Is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

**UNIT II**

**A Case Study:** Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

**UNIT III**

**Creational Patterns:** Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

**Structural Pattern Part-I:** Adapter, Bridge, Composite.

**UNIT IV**

**Structural Pattern Part-II:** Decorator, Façade, Flyweight, Proxy.

**Behavioral Patterns Part-I:** Chain of Responsibility, Command, Interpreter, Iterator.

**UNIT V**

**Behavioral Patterns Part-II:** Mediator, Memento, Observer, State, Strategy, Template Method Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns, A Brief History, The Pattern Community an Invitation, A Parting Thought.

**Text Books:**

1. Design Patterns by Erich Gamma, Pearson Education.

**Reference Books**

1. Pattern's in JAVA Vol-I by Mark Grand, Wiley DreamTech.
2. Pattern's in JAVA Vol-II by Mark Grand, Wiley DreamTech.
3. JAVA Enterprise Design Patterns Vol-III by Mark Grand, Wiley DreamTech.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**NON-CONVENTIONAL ENERGY SOURCES**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3019**

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

**Course Outcomes**

1. Illustrate the concepts of solar radiation at different instants.
2. Analyze the performance characteristics of PV modules.
3. Compare the performance of wind energy at various circumstances.
4. Make use of various sustainable energy resources for power generation.
5. Explain operation and performance of Wave energy, Fuel cells and Batteries.

**UNIT I**

Solar spectrum-Solar Radiation on Earth's surface- Solar radiation geometry-Solar radiation measurements-Solar radiation data-Solar radiation on horizontal and tilted surfaces. Solar Thermal Conversion-Flat plate collectors concentrated collectors- construction and thermal analysis- Solar Applications-Solar Ponds-Heliostat systems-water heater-air heater- solar still.

**UNIT II**

Photovoltaic Cells - Equivalent Circuit - V-I Characteristics- Photovoltaic Modules – Constructional details - Design considerations – Tracking - Maximum power point tracking – Algorithms - PV solar system design with energy backup - Solar Thermo electric conversion.

**UNIT III**

Fundamentals of wind energy-power available in wind-Betz Limit- Aerodynamics of wind turbine-Wind Turbines-Horizontal and vertical axis turbines – their configurations-Wind Energy conversion systems.

**UNIT IV**

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

**UNIT V**

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



**Text Books**

1. G.D. Rai, Non-Conventional Energy Sources, Khanna publishers.
2. D.P.Kothari, Singal, Rakesh, Ranjan, Renewable Energy sources and Emerging Technologies, PHI, 2009.

**Reference Books**

1. B.H.Khan, Non-Conventional Energy Sources, PHI Publications.
2. John Twidell & Wier, Renewable Energy Resources, CRC Press, 2009.
3. T. Ackermann, “Wind Power in Power Systems”, John Wiley and Sons Ltd., 2005.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**CONCEPTS OF CONTROL SYSTEMS**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3095**

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

**Course Outcomes**

1. Infer the basic concept control systems.
2. Develop the mathematical model of the systems.
3. Analyze the time domain specifications and steady state error.
4. Outline the concept of stability of the system.
5. Solve the frequency response analysis.

**UNIT I**

**BASIC CONCEPTS OF CONTROL SYSTEM**

Terminology - plant, process, system, disturbances, controlled variable, manipulated variable etc., Block diagram of basic control system, application areas with examples. Classifications of control systems

**UNIT II**

**MATHEMATICAL MODELLING OF SYSTEMS**

Translational and rotational mechanical systems, electrical systems, Force voltage and force current analogy, Block diagram and signal flow graph representation of physical systems along with rules, properties, comparison and limitation, Mason's gain formula.

**UNIT III**

**TIME RESPONSE ANALYSIS**

Standard test signals along with examples of their usage, steady state errors for step, ramp and parabolic inputs, analysis of first and second order systems, Transient response specifications with numerical examples, Basic control actions and two position, proportional, P, PI, PID controllers, Limitations of time domain analysis.

**UNIT IV**

**STABILITY**

Concept of stability, types of stability, Routh's stability criterion, special cases with numerical examples, stability of closed loop system, concept of root locus, open loop and closed loop transfer poles, step by step procedure for root loci, numerical examples.

**UNIT V**

**FREQUENCY RESPONSE ANALYSIS**

Need of frequency response analysis, Sinusoidal response of linear system, methods used in frequency response, Bode Plot, Frequency domain specifications.

**Text Books**

1. IJ Nagrath, M.Gopal, Control System Engineering, New Age International Publishers, 5<sup>th</sup> edition.
2. Norman S Nise, Control system engineering, John Wiley & Sons, Inc., 6<sup>th</sup> edition

**Reference Books**

1. Richard C. Dorf, Robert H Bishop, Modern control systems, Pearson Education International, Twelfth edition.
2. A Nagoor Kani, Control Systems, CBS Publishers.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ARTIFICIAL NEURAL NETWORKS AND FUZZY LOGIC**  
**(OPEN ELECTIVE)**

**Course Code: GR22A4022**

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

**Course Outcomes**

1. Outline importance of BNN, ANN and its learning techniques and architectures.
2. Summarize the algorithms for various applications using Back propagation networks.
3. Interpret the concept of Fuzzy and Crisp sets.
4. Model Fuzzy membership Function and rules for Applications.
5. Analyze the parameters of Genetic Algorithm.

**UNIT I**

**NEURAL NETWORKS I (Introduction & Architecture)**

Neuron, Nerve structure and synapse, Biological Neural network, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques.

**UNIT II**

**NEURAL NETWORKS II (Back Propagation Networks)**

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting back propagation training, application of Neural Networks in Load Forecasting.

**UNIT III**

**FUZZY LOGIC I (Introduction)**

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

**UNIT IV**

**FUZZY LOGIC II (Fuzzy Membership, Rules)**

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications & Defuzzification's, Fuzzy Controller, application of Fuzzy logic control in washing machines.

**UNIT V**

**GENETIC ALGORITHMS (GA)**

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, application of genetic algorithm in economic load dispatch.

**Text Books**

1. J M Zurada , “An Introduction to ANN”, Jaico Publishing House.
2. Neural Networks, Fuzzy Logic, And Genetic Algorithms: Synthesis and Applications - by S. Rajasekaran, G. A. Vijayalakshmi PAI, PHI publishers.

**Reference Books**

1. Hung T. Nguyen, Nadipuram R. Prasad, Carol L. Walker and Elbert A. Walker, “A First Course in Fuzzy and Neural Control” Chapman & Hall, CRC.
2. Driankov, Dimitra, “An Introduction to Fuzzy Control”, Narosa Publication.
3. Timothy J Ross, “Fuzzy Logic with Engg. Applications”, McGraw. Hill.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**PRINCIPLES OF COMMUNICATIONS**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3040**

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

**Course Outcomes:**

1. Apply concepts of modulation, frequency translation, gain and attenuation in communication systems.
2. Analyze the power spectrum characteristics of different modulation techniques.
3. Understand the role of multiplexing techniques in optimizing bandwidth utilization of Communication Systems.
4. Evaluate the suitability of specific digital modulation techniques for different communication applications.
5. Critically perform error analysis of each modulation scheme.

**UNIT - I: Basics of Communication Systems**

Definition and scope of communication systems, Types of communication systems: Analog and Digital, Block diagram of a communication system, Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

**UNIT - II: Analog Modulation**

Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation (PM) and its variants, Power Spectrum of different modulations, Comparison of modulation techniques.

**UNIT - III: Pulse Analog Modulation**

Ideal sampling, Sampling theorem, aliasing, interpolation, natural and flat top sampling in time and frequency domains. Introduction to PAM, PWM, PPM modulation schemes. Frequency Division Multiplexing (FDM) and Time division multiplexing (TDM).

**UNIT – IV: Digital Modulation**

Basics of digital modulation, Advantages of digital modulation over analog modulation, Types of digital modulation: ASK, FSK, PSK, QAM, Comparison of digital modulation techniques

**UNIT - V: Performance Analysis of Analog and Digital Modulation**

Sources of Noise in Communication Systems, Super heterodyne Receiver, Figure of Merit, Noise Figure. Signal-to-Noise Ratio (SNR) and  $E_b/N_0$  ratio, Bit Error Rate (BER) and its significance, Error performance analysis for different modulation schemes, Channel capacity and bandwidth efficiency.

**Text Books**

1. An Introduction to Analog and Digital Communications, 2<sup>nd</sup> Edition, Simon Haykin, Michael Moher, John Wiley, March 2006.
2. Communication Systems by Simon Haykin, Second Edition, Wiley Student Edition, 2007.
3. Digital Communications by John G. Proakis and Masoud Salehi, 5e, McGraw Hill Publications, 2014.

**Reference Books**

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education, 2005.
2. Digital & Analog Communication Systems By K.S. Shanmugam, John Wiley



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**SENSOR TECHNOLOGY**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3113**

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

**Course Outcomes**

1. Demonstrate the concept of resistive sensors which can be employed for real life applications.
2. Realize the concept of reactive sensors and understand the implications while deploying them in practice.
3. Understand the working principle of special purpose sensors and the need for developing smart sensors.
4. Comprehend the design and development of various wearable sensors for use in healthcare applications.
5. Able to design and perform experiments on the sensors and develop the projects based on the customer needs.

**UNIT-I**

General concepts and terminology of Sensor systems, Transducers classification-sensors and actuators, General input-output configurations, Static and dynamic characteristics of measurement system.

**UNIT-II**

Resistive sensors- Potentiometers, strain gages (piezo-resistive effect), resistive temperature detectors (RTD), thermistors, light dependent resistor (LDR), resistive hygrometers, resistive gas sensors.

**UNIT-III**

Inductive sensors - variable reluctance sensors, Hall effect, Eddy current sensors, Linear variable differential transformers (LVDT), variable transformers, magneto-elastic, magneto-resistive, and magnetostrictive sensors. Capacitive sensors- variable capacitor, differential capacitor.

**UNIT-IV**

Accelerometers: Characteristics and working principle, Types- Capacitive, Piezoresistive, piezoelectric; Gyroscopes: Characteristics and working principle, Rotor Gyroscope; Diaphragm Pressure Sensor – resistive & capacitive type (micro press sensor).

**UNIT-V**

Overview of various smart sensors: Digital temperature sensor (DS1621, TMP36GZ), Humidity sensor (DHT11, DHT22), Gas sensor (MQ2, MQ8), Pressure sensors (BMP180), Accelerometers (ADXL335); Structural health monitoring sensors, Introduction to MEMS and Flexible sensors.

**Text Books**

1. B. C. Nakra, K.K. Choudhury, “Instrumentation, Measurement and Analysis” -3<sup>rd</sup> Edition, Tata McGraw, 2009
2. Jacob Fraden, “Hand Book of Modern Sensors: physics, Designs and Applications”, 3<sup>rd</sup> Edition Springer, 2010.

**Reference Books**

1. A.K. Sawhney, “Electrical and Electronic Measurements and Instrumentation”, DhanpatRai.
2. Er. R.K. Rajput, “Electronic Measurements and Instrumentation”, S. Chand & Company Ltd. 3<sup>rd</sup>



Edition.

3. Bentley, John P., “Principles of Measurement Systems”, 4th edition, Pearson/Prentice Hall, 2005
4. Jon. S. Wilson, “Sensor Technology Hand Book”, Elsevier Inc., 2005.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
COMMUNICATION TECHNOLOGIES  
(OPEN ELECTIVE)**

**Course Code: GR22A4045**

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

**Course Outcomes**

1. Analyze the properties of basic Modulation techniques and apply them to Digital Communication
2. Apply error probability concepts to evaluate the performance of spread spectrum systems.
3. Understand the principle concepts of telecommunication systems and networking
4. Analyze link budgets for satellite communication, considering factors such as path loss, atmospheric effects, and antenna gain.
5. Evaluate the suitability of various technologies in cellular, mobile and wireless communication scenarios.

**UNIT- I: Review of Digital Communication System**

Review of fundamental concepts and parameters in Digital Communication. Digital modulation schemes, Power spectra of digital modulation signals.

**UNIT- II: Spread-Spectrum Modulation**

Introduction, Pseudo-Noise sequences, direct- sequence spread spectrum (DSSS) with coherent BPSK, processing gain, probability of error, frequency-hop spread spectrum (FHSS). Application of spread spectrum: CDMA.

**UNIT- III: Telecommunication Systems:** Telephones Telephone system, Paging systems, Internet Telephony. **Networking and Local Area Networks:** Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

**UNIT- IV**

**Satellite Communication:** Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.

**Optical Communication:** Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

**UNIT-V:**

**Cellular and Mobile Communications:** Cellular telephone systems, AMPS, GSM, CDMA, and WCDMA.

**Wireless Technologies:** Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless Networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

**Text Books:**

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education, 2005.
2. Simon Haykin and Michael Moher, “Modern Wireless Communications,” Pearson Education, 2005.
3. Marvin K. Simon, Sami M. Hinedi and W. C. Lindsay, “Digital Communication Techniques,” Eastern Economy Edition, 2010.



**Reference Books**

1. Principles of communication systems By Taub Schilling, T.M.H
2. Andrew J Viterbi, “CDMA principles spread spectrum communications,” Adison Wesley, 1995.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
INDUSTRIAL AUTOMATION AND CONTROL  
(OPEN ELECTIVE)**

**Course Code: GR22A3030**

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

**Prerequisites:** Manufacturing Technology

**Course Outcomes:**

1. Explain the major automation theories, approaches and methodologies used in manufacturing.
2. Apply the knowledge for implementing the automated flow lines.
3. Employ the assembly systems and line balancing for automation.
4. Implement the knowledge of material handling and storage systems in current industries.
5. Design adaptive control system for automated manufacturing.

**UNIT I**

**Introduction:** Introduction to automation, principles, reasons, types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools. Mechanical feeding, tool changing, and machine tool control transfer the automaton.

**UNIT II**

**Automated flow lines:** Methods of work part transport transfer, Mechanical buffer storage control function, design and fabrication consideration. Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

**UNIT III**

**Assembly system and line balancing:** Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

**UNIT IV**

**Automated material handling and storage systems:** Types of equipment, functions, analysis and design of material handling systems, conveyor systems, automated guided vehicle systems. Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

**UNIT V**

**Adaptive control systems:** Introduction, adaptive control with optimization, adaptive control with constraints, application of adaptive control in machining operations. Consideration of various parameters such as cutting force, temperatures, vibration and acoustic emission in the adaptive controls systems.

**Text Books**

1. Mikell P.Groover, Automation, Production Systems, and Computer- integrated Manufacturing, prentice Hall, 2014
2. Serope Kalpakjian and Steven R. Schmid, Manufacturing – Engineering and Technology, 7th edition, Pearson, 2013



### Reference Books

1. Automation, Production Systems, and Computer-Integrated Manufacturing. (2016). India: Pearson India.
2. Bolz, R. W. (2012). Manufacturing Automation Management: A Productivity Handbook. United States: Springer US.
3. Boucher, T. O. (2012). Computer Automation in Manufacturing: An Introduction. Switzerland: Springer US.
4. Altintas, Y. (2012). Manufacturing Automation: Metal Cutting Mechanics, Machine Tool Vibrations, and CNC Design. United States: Cambridge University Press.
5. Morriss, S. B. (1995). Automated manufacturing systems. United Kingdom: Glencoe.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**COMPOSITE MATERIALS**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3105**

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

**Prerequisites:** Material Engineering

**Course Outcomes**

1. Identify the types of composite materials and their characteristic features.
2. Explain the methods employed in composite fabrication.
3. Differentiate the strengthening mechanisms of composite and its corresponding effect on performance.
4. Analyze the various criteria for isotropic, anisotropic, and composite materials, prediction of laminates failure.
5. Examine experimental techniques utilized for failure mode of composites.

**UNIT I**

Definition and applications of composite materials, Fibers- glass, carbon, ceramic and aramid fibers; Matrices- polymer, graphite, ceramic and metal matrices; characteristics of fibers and matrices. Lamina- assumptions, macroscopic viewpoint, generalized Hooke's law, reduction of homogeneous orthotropic lamina, isotropic limit case, orthotropic stiffness matrix, commercial material properties, rule of mixtures, transformation matrix, transformed stiffness.

**UNIT II**

Manufacturing of composite materials, bag moulding, compression moulding, pultrusion, filament winding, other manufacturing processes

**UNIT III**

Basic assumptions of laminated anisotropic plates, symmetric laminates, angle ply laminates, cross ply laminates, laminate structural moduli, evaluation of lamina properties, determination of lamina stresses, maximum stress and strain criteria.

**UNIT IV**

Von Mises Yield criterion for isotropic materials, generalized Hill's criterion for anisotropic materials, Tsai- Hill's criterion for composites, prediction of laminate failure, thermal analysis of composite laminates.

**UNIT V**

Analysis of laminated plates- equilibrium equations of motion, energy formulation, static bending analysis, buckling analysis, free vibrations, natural frequencies.

**Text Books**

1. Gibson R.F. Principles of Composite Material Mechanics, second edition, McGraw Hill,1994.
2. Hyer M.W., Stress Analysis of Fiber- Reinforced Composite Materials, McGraw Hill,1998.



### Reference Books

1. Clyne, T. W. and Withers, P. J., “Introduction to Metal Matrix Composites”, Cambridge University Press, 1993.
2. Strong, A.B., “Fundamentals of Composite Manufacturing”, SME, 1989.
3. Sharma, S.C., “Composite materials”, Narosa Publications, 2000.
4. Broutman, L.J. and Krock,R.M., “ Modern Composite Materials”, Addison-Wesley, 1967.
5. Introduction to Composite Materials Design by Ever J. Barbero 3<sup>rd</sup> Edition 2017



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**OPERATIONS RESEARCH**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3018**

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

**Course Outcomes**

1. Apply the various linear programming techniques for optimal allocation of limited resources such as machine, material, and money.
2. Solve transportation problems to minimize cost and understand the principles of assignment of jobs and recruitment policies.
3. Solve sequencing problems and distinguish various inventory models and develop proper inventory policies.
4. Apply game theory to analyze various business competitions and analyze the various waiting line-oriented situations.
5. Develop optimum replacement policy and Dynamic Programming Techniques.

**UNIT I**

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

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

**UNIT II**

**Transportation models:** Formulation – Methods for finding feasible solutions; North west corner rule, least cost entry method, Vogel's approximation method. Optimal solution; MODI method. Unbalanced transportation problem and Degeneracy.

**Assignment models** - Formulation – Optimal solution - Variants of Assignment Problem

**UNIT III**

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

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

**UNIT IV**

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

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

**UNIT V**

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



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

**Text Books**

1. Operations Research - Prem Kumar Gupta and D S Hira/ S Chand Publishing/ 2015
2. Operations Research / S. D.Sharma / KedarNath RamNath Publication/2020

**Reference Books**

1. Operations Research / R.Panneerselvam, 3rd Edition/PHI Publications/ 2023
2. Operations Research An Introduction - Hamdy A Taha/8 th Edition/ Prentice Hall/2006
3. Principles of Operations Research: With Applications to Managerial Decisions - Harvey M. Wagner/Prentice-Hall Operations Research/2020
4. Operations Research - Kanthi Swarup, P.K. Gupta, Man Mohan Sultan Chand & Sons/ 2019
5. Operations Research / A.M.Natarajan, P.Balasubramani,A. Tamilarasi / Pearson Education/2006



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ENGINEERING MATERIALS FOR SUSTAINABILITY**  
**(OPEN ELECTIVE)**

**Course Code: GR22A3009**

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

**Pre-requisites:** Building materials and construction planning, Concrete Technology

**Course Outcomes:**

1. Describe the different types of environmental factors effecting materials
2. Report the work in sustainability for research and education
3. Illustrating the broad perspective in thinking for sustainable practices
4. Perform cost/benefit analysis and life-cycle analysis of green buildings.
5. Identify and compare cost and performance of building materials

**UNIT I**

Sustainability – Introduction, Need and concept of sustainability, Social- environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols – Clean Development Mechanism (CDM), Environmental legislations in India – Water Act, Air Act

**UNIT II**

Air Pollution, effects of Air Pollution; Water pollution-sources, Sustainable wastewater treatment, Solid waste-sources, impacts of solid waste, zero waste concept, 3R concept, Global environmental issues- Resource degradation, climatic change, Global warming, Ozone layer depletion, Regional and Local Environmental issues. Carbon credits and carbon trading, carbon foot print.

**UNIT III**

Green Building Materials, Basic concepts of sustainable habitat, green buildings, green materials for building construction, material selection for sustainable design, green building certification, Methods for increasing energy efficiency of buildings. Sustainably managed Materials, Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; non-renewable Energy of Materials

**UNIT IV**

Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds like acetone, formaldehyde, BTEX substances, Natural Non-Petroleum Based Materials, Recycled materials, Renewable and Indigenous Building Materials, Engineering evaluation of these materials.

**UNIT V**

Green Building Planning and Specifications, Environment friendly and cost effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green Strategies for Building Systems, Alternative Construction Methods, Energy Conservation Measures in Buildings, Waste & Water management and Recycling in Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar & Daylight, Plumbing and its Effect on Energy Consumption.



### **Text Books**

1. Alternative Building Materials and Technologies (2007) – K S Jagadeesh, B V Venkata RamaReddy & K S Nanjunda Rao – New Age International Publishers
2. Integrated Life Cycle Design of Structures (2002)– AskoSarja – SPON Press
3. Non-conventional Energy Resources (2012) – D S Chauhan and S K Srivastava – New AgeInternational Publishers

### **Reference Books**

1. Green Buildings (2007) McGraw hill publication by Gevorkian
2. Emerald Architecture (2008) case studies in green buildings, The Magazine of Sustainable Design
3. Understanding Green Building Guideline (2010): For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.
4. Understanding Green Building Materials (2011) Traci Rose Rider, W. W. Norton & Company Publisher.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**CONSTRUCTION PROJECT PLANNING AND SYSTEMS**  
**(OPEN ELECTIVE)**

**Course Code: GR22A4090**

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

**Pre-Requisite:** Building Materials and Construction planning, Computational methods.

**Course Outcomes:**

1. Understand how structures are built and projects are developed on the field.
2. Analyze good idea of basic construction dynamics- various stakeholders, project objectives, processes, resources required and project economics.
3. Interpret Plan, control and monitor construction projects with respect to time and cost, and also to Optimize construction projects based on costs.
4. Remember how construction projects are administered with respect to contract structures and issues.
5. Summarize ideas and understandings to others with effective communication processes.

**UNIT I**

**Construction Planning and Scheduling:** Definition of Projects; Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT Assumptions underlying PERT analysis, determining three-time estimates, analysis, slack computations, calculation of probability of completion. Allocation of Resources- materials, equipment, staff, labour and finance; resource levelling and optimal schedules; Project organization, documentation and reporting systems.

**UNIT II**

**Construction Methods and Contract Management:** Control & monitoring; Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems; Advent of Lean Construction; Importance of Contracts Management; Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation.

**UNIT III**

**Construction Materials and Resource Leveling:** Materials, concepts of planning, procurement, and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow, sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothing and levelling. Common Good Practices in Construction.

Introduction to formwork: Requirements and Selection of Formwork, Formwork Materials-Timber, Plywood, Steel, Aluminum, Plastic, and Accessories. Form work selection.



#### UNIT IV

**Project Monitoring & Control:** Project Monitoring & Control- Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modelling (BIM) in project management.

#### UNIT V

**Quality Control and Quality Assurance:** Quality control, concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.

#### Text Books

1. Varghese, P.C., “Building Construction”, Prentice Hall India, 2007.
2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
3. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

#### Reference Books

1. Chudley, R., Construction Technology, ELBS Publishers, 2007.
2. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011.
3. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006.
4. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015.



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY  
ENVIRONMENTAL IMPACT ASSESSMENT  
(OPEN ELECTIVE)**

**Course Code:GR22A4011**

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

**Pre-Requisites:** Environmental science

**Course Outcomes:**

1. Identify, predict, and evaluate the environmental effects of proposed actions and projects.
2. Explain the appropriate methodologies for environmental impact prediction and assessment.
3. Analyze the importance of Public Participation, Fault Tree Analysis and Consequence analysis in EIA.
4. Understand the activities in environmental auditing.
5. Plan EIA for developmental projects.

**UNIT I**

Introduction: Concepts of EIA methodologies – Sustainable development- Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – Evolution of EIA: Screening and scoping; Rapid EIA and Comprehensive EIA

**UNIT II**

Introduction to EIA, Criteria for the selection of EIA Methodology, General Framework for Environmental Impact Assessment, Characterization and site assessment. Environmental Risk Analysis, Definition of Risk, Matrix Method; Checklist method.

**UNIT III**

Prediction and Assessment: Public participation Fault tree analysis, Consequence Analysis; Socioeconomic aspects, measures of the effectiveness of pollution control activities;

**UNIT IV**

Environmental Legislation: Introduction to Environmental Management Systems; Environmental Statement - procedures; Environmental Audit: Cost-Benefit Analysis;

**UNIT V**

Life Cycle Assessment, Resource Balance, Energy Balance & Management Review - Operational Control - Case Studies on EIA with reference to Indian Scenario.

**Text Books**

1. Y Anjaneyulu, and Valli Manikkam, Environmental Impact Assessment Methodologies, BSP Books PVT Ltd., 2<sup>nd</sup> edition, 2011.
2. R.R. Barthwal, Environmental Impact Assessment, New Age International Private Limited, 2<sup>nd</sup> edition, 2012.
3. Canter R.L., Environmental Impact Assessment, Mc Graw Hill International Edition, 2<sup>nd</sup> edition, 1997.



### Reference Books

1. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff “Risk Assessment and Management Hand book”, McGraw Hill Inc., New York, 1996.
2. Judith Petts, Handbook of Environmental Impact Assessment Vol. I &II, Blackwell Science,1999.
3. Cutter, S.L., "Environmental Risk and Hazards", Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
4. Anji Reddy Mareddy, Environmental Impact Assessment: Theory and Practice, Butterworth-Heinemann publisher, 1st Edition, 2017.
5. MoEF & CC, Govt. of India: EIA notification and subsequent amendments