ACADEMIC REGULATIONS PROGRAMME STRUCTURE AND DETAILED SYLLABUS

GR22

Bachelor of Technology Computer Science & Business System

(Effective for the students admitted from the Academic Year 2022-23)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

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ACADEMIC REGULATIONS
PROGRAMME STRUCTURE
&
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Bachelor of Technology
Computer Science & Business System
(Four Year Regular Programme)
(Applicable for Batches Admitted from 2022-23)

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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 2022-23)

Under Graduate Degree Programme in Engineering and Technology (UG)

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

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

GR22 Regulations shall govern the above programmes offered by the Departments with effect from the students admitted to the programmes in 2022-23 academic year is given below.

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

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

3. **Programme Pattern:**
   a) Each Academic Year of study is divided into two semesters.
   b) Minimum number of instruction days in each semester is 90.
   c) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
   d) The total credits for the Programme are 160.
   e) A student has a choice to register for all courses in a semester / one less or one additional course from other semesters provided the student satisfies prerequisites.
   f) All the registered credits except Mandatory and Value Added Courses will be considered for the calculation of final CGPA.
   g) Each semester has 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC, and course structure as suggested by AICTE are followed. The terms 'subject' and 'course' imply the same meaning.
   h) 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 andSocial Sciences	Includes Management Courses
4	PC	Professional Core	Includes Core Courses related to the parent discipline/department/ branch ofEngineering
5	PE	Professional Elective	Includes Elective Courses related to the parent discipline/ department/ branch of Engineering
6	OE	Open Elective	Elective Courses from other technicaland/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 ofIndian Traditional Knowledge, Co and Extra Curricular Activities
9	VAC	Value Added Courses	Courses on current industry relevant topics improving breadth and depth in domain

4. **Award of B. Tech Degree:** The Undergraduate Degree of B. Tech shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfill all the following academic requirements for the award of the degree
   a) A student pursues the course of study and completes it successfully in not less than four academic years and not more than eight academic years.
   b) A student has to register for all the 160 credits and secure all credits (with CGPA $\geq$ 5).
   c) A student must fulfill all the academic requirements for the award of the degree.

5. Attendance Requirements:

a) A student shall be eligible to appear for the semester-end examinations if he/she puts in a minimum of 75% of attendance in aggregate in all the courses concerned in the semester.

b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in a semester may be granted. A committee headed by Dean (Academic Affairs) shall be the deciding authority for granting the condonation.

c) Students who have been granted condonation shall pay a fee as decided by theFinance 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**.

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

S. No	Subject	Marks Allotted	Type of Assessment	Scheme of Examinations
3	Graphics for Engineers	40	Internal Examination & Continuous Evaluation	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 Day-to-Day activity -15 marks Continuous Evaluation using **Assignment – 05 marks** **Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks**
		60	Semester end examination	The semester-end examination isfor a duration of 3 hours

d) Mini Project:

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations

1	Mini Project	40	Continuous Evaluation & Internal Evaluation	1) The supervisor continuously assesses the students for 20 marks
				   i) Continuous Assessment – 15 marks
				  • Abstract Presentation – 3 marks
				  • Architectural Design Presentation – 3 marks
				  • Modules Presentation – 3 marks
				  • Execution Cycle 1 Presentation – 3 marks
				  • Execution Cycle 2 Presentation – 3 marks
				   ii) Report – 5 marks
				2) At the end of the semester, Mini Project shall be displayed in the road show at the department level. Mini Project is evaluated by Mini Project Review Committee for **10 marks**.
				3) Technical Event Participation in project area/MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/ Book Publication – **10 marks**

		60	External Evaluation	The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for **60 marks**.

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

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

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

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

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

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

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

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

- I Year courses: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he/she (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

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

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

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

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

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

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

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

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

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

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

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

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

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

S.No	Promotion	Conditions to be fulfilled
1	First year first semester to First year second semester	Regular course of study of First year first semester.
2	First year second semester to Second year first semester	**i)** Regular course of study of First year second semester. **ii)** Must have secured at least 25% credits up to First year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Second year first semester to Second year second semester	Regular course of study of Second year first semester.
4	Second year second semester to Third year first semester	**(i)** Regular course of study of Second year second semester **(ii)** Must have secured at least 25% credits up to Second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to Third year second semester	Regular course of study of Third year first semester.
6	Third year second semester to Fourth year first semester	Regular course of study of Third year second semester.
7	Fourth year first semester to Fourth year second semester	Regular course of study of Fourth year first semester.

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

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

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

f) Under Mandatory Courses

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

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

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

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

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

Computation of SGPA and CGPA:

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

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

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

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

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

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

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

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

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

Equivalence of grade to marks
Marks % = (CGPA -0.5)*10

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 2022-23)

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 toSecond year second semester.	Regular course of study of Second year first semester.
2	Second year second semester to Third year first semester.	Regular course of study of Second year second semester. Must have secured at least 25% credits up to Second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester toThird year second semester.	Regular course of study of Third year first semester.
4	Third year second semester toFourth year first semester.	Regular course of study of Third year second semester.
5	Fourth year first semester to Fourth year second semester.	Regular course of study of Fourth year first semester.

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

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

Academic Regulations for B.Tech with Minors Programme under GR22
(Applicable for Batches Admitted from 2022-23)

1. Objectives

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

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

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

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

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

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

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

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

   i) Prior to registration of MOOCS courses, formal approval of the courses, by the University is essential. University before the issue of approval considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.

   ii) Minimum credits for MOOCS course must be equal to or more than the credits specified in the Minor course structure provided by the University.

   iii) Only Pass-grade/marks or above shall be considered for inclusion of grades in minor grade memo.

   iv) Any expenses incurred for the MOOCS courses are to be met by the students only.

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

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

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

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

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

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

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

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

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

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

4. Registration for the courses in Minor Programme

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

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

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

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

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

5. Minor courses and the offering departments

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Bachupally, Kukatpally, Hyderabad–500090, India.

B. Tech Computer Science and Business System GR22 Course Structure

I B.Tech (CSBS) - 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	GR22A1024	Discrete Mathematics for Engineers	3	1	0	4	3	1	0	4	40	60	100
2	Maths	BS	GR22A1025	Introductory Topics in Statistics, Probability and Calculus	3	0	0	3	3	0	0	3	40	60	100
3	CSE	ES	GR22A1026	Fundamentals of Computer Science	3	0	0	3	3	0	0	3	40	60	100
4	EEE	ES	GR22A1027	Principles of Electrical Engineering	2	0	0	2	2	0	0	2	40	60	100
5	Physics	BS	GR22A1028	Physics for Computing Science	2	0	0	2	2	0	0	2	40	60	100
6	CSE	ES	GR22A1029	Fundamentals of Computer Science Lab	0	0	2	2	0	0	4	4	40	60	100
7	EEE	ES	GR22A1030	Principles of Electrical Engineering Lab	0	0	1	1	0	0	2	2	40	60	100
8	Physics	BS	GR22A1031	Physics for Computing Science Lab	0	0	1	1	0	0	2	2	40	60	100
9	English	HS	GR22A1032	Business Communication and Value Science – I	2	0	0	2	2	0	0	2	40	60	100
			TOTAL		15	1	4	20	15	1	8	24	360	540	900

I B.Tech(CSBS) - 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	GR22A1033	Linear Algebra	3	1	0	4	3	1	0	4	40	60	100
2	Maths	BS	GR22A1034	Statistical Methods	3	0	0	3	3	0	0	3	40	60	100
3	CSE	ES	GR22A1035	Data Structures and Algorithms	2	1	0	3	2	1	0	3	40	60	100
4	ECE	BS	GR22A1036	Principles of Electronics	2	0	0	2	2	0	0	2	40	60	100
5	Mgmt	HS	GR22A1037	Fundamentals of Economics	2	0	0	2	2	0	0	2	40	60	100
6	Maths	BS	GR22A1038	Statistical Methods Lab	0	0	1	1	0	0	2	2	40	60	100
7	CSE	ES	GR22A1039	Data Structures and Algorithms Lab	0	0	2	2	0	0	4	4	40	60	100
8	ECE	BS	GR22A1040	Principles of Electronics Lab	0	0	1	1	0	0	2	2	40	60	100
9	English	HS	GR22A1041	Business Communication and Value Science – II	2	0	0	2	2	0	0	2	40	60	100
			TOTAL		14	2	4	20	14	2	8	24	360	540	900

II B.Tech(CSBS) -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	CSBS	PC	GR22A2088	Theory of Computation	3	0	0	3	3	0	0	3	40	60	100
2	CSBS	PC	GR22A2089	Computer Organization and Architecture	3	0	0	3	3	0	0	3	40	60	100
3	CSBS	PC	GR22A2090	Object Oriented Programming	2	0	0	2	2	0	0	2	40	60	100
4	CSBS	PC	GR22A2091	Computational Statistics	3	0	0	3	3	0	0	3	40	60	100
5	CSBS	PC	GR22A2092	Fundamentals of Database Systems	3	0	0	3	3	0	0	3	40	60	100
6	CSBS	PC	GR22A2093	Computer Organization and Architecture Lab	0	0	2	2	0	0	4	4	40	60	100
7	CSBS	PC	GR22A2094	Object Oriented Programming Lab	0	0	2	2	0	0	4	4	40	60	100
8	CSBS	PC	GR22A2095	Computational Statistics Lab	0	0	1	1	0	0	2	2	40	60	100
9	CSBS	PC	GR22A2096	Databases Lab	0	0	1	1	0	0	2	2	40	60	100
			TOTAL		**14**	**0**	**6**	**20**	**14**	**0**	**12**	**26**	**360**	**540**	**900**
10	Mgmt	MC	GR22A2003	Constitution of India	0	0	0	0	2	0	0	2	40	60	100

II B.Tech(CSBS) -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	CSBS	PC	GR22A2097	Operating Systems Concepts	3	0	0	3	3	0	0	3	40	60	100
2	CSBS	PC	GR22A2098	Principles of Software Engineering	3	0	0	3	3	0	0	3	40	60	100
3	CSBS	PC	GR22A2099	Algorithm Design and Analysis	3	0	0	3	3	0	0	3	40	60	100
4	Mgmt	HS	GR22A2100	Introduction to innovation, IP Management and Entrepreneurship	3	0	0	3	3	0	0	3	40	60	100
5	ME	PC	GR22A2101	Operational Research	2	0	0	2	2	0	0	2	40	60	100
6	CSBS	PC	GR22A2102	Operating Systems Concepts Lab	0	0	1	1	0	0	2	2	40	60	100
7	CSBS	PC	GR22A2103	Software Engineering Lab	0	0	1	1	0	0	2	2	40	60	100
8	CSBS	PC	GR22A2104	Algorithm Design and Analysis Lab	0	0	1	1	0	0	2	2	40	60	100
9	ME	PC	GR22A2105	Operational Research Lab	0	0	1	1	0	0	2	2	40	60	100
10	Mgmt	HS	GR22A2106	Design and Critical Thinking	3	0	0	3	3	0	0	3	40	60	100
			TOTAL		17	0	4	21	17	0	8	25	400	600	1000
11	Mgmt	MC	GR22A2107	Essence of Indian Traditional Knowledge	0	0	0	0	2	0	0	2	40	60	100
12	CSE	MC	GR22A2109	Real-time Research Project/ Societal Related Project	0	0	2	2	0	0	4	4	50	--	50

III B.Tech(CSBS) - 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	CSBS	PC	GR22A3059	Software Design withUML	2	0	0	2	2	0	0	2	40	60	100
2	CSBS	PC	GR22A3060	Compiler Construction	3	0	0	3	3	0	0	3	40	60	100
3	Mgmt	HS	GR22A3061	Fundamentals of Management	2	0	0	2	2	0	0	2	40	60	100
4	Mgmt	HS	GR22A3062	Business Strategy	2	0	0	2	2	0	0	2	40	60	100
5	English	HS	GR22A3063	Business Communication and Value Science – III	2	0	0	2	2	0	0	2	40	60	100
6	CSBS	PE		Elective I	3	0	0	3	3	0	0	3	40	60	100
7	CSBS	PC	GR22A3067	Software Design with UML Lab	0	0	2	2	0	0	4	4	40	60	100
8	CSBS	PC	GR22A3068	Compiler Construction Lab	0	0	2	2	0	0	4	4	40	60	100
9	CSBS	PC	GR22A3075	Machine Learning with R Programming Lab	0	0	1	1	0	0	2	2	40	60	100
10	CSBS	PW	GR22A3149	Mini Project	0	0	1	1	0	0	2	2	40	60	100
	TOTAL				14	0	6	20	14	0	12	26	400	600	1000
11	Chemistry	MC	GR22A2001	Environmental Science	0	0	0	0	2	0	0	2	40	60	100

PROFESSIONAL ELECTIVE – I			
S. No.	BOS	Course Code	COURSE
1	CSBS	GR22A3064	Conversational Systems
2	CSBS	GR22A3065	Cloud, Microservices and Application
3	CSBS	GR22A3066	Machine Learning with R Programming
1	CSBS	GR22A3064	Conversational Systems

III B.Tech (CSBS) - 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	CSBS	PC	GR22A3129	ComputerCommunications	3	0	0	3	3	0	0	3	40	60	100
2	CSBS	PC	GR22A3130	Information Security	3	0	0	3	3	0	0	3	40	60	100
3	CSBS	PC	GR22A3131	Fundamentals of Artificial Intelligence	3	0	0	3	3	0	0	3	40	60	100
4	Mgmt	HS	GR22A3132	Financial and Cost Accounting	3	0	0	3	3	0	0	3	40	60	100
5	English	HS	GR22A3133	Business Communication and Value Science – IV	3	0	0	3	4	0	0	4	40	60	100
6	CSBS	PE		Elective II	3	0	0	3	3	0	0	3	40	60	100
7	CSBS	PC	GR22A3137	Computer Networks and Security Lab	0	0	1	1	0	0	2	2	40	60	100
8	CSBS	PC	GR22A3138	Fundamentals of Artificial Intelligence Lab	0	0	1	1	0	0	2	2	40	60	100
9	CSBS	PC	GR22A3139	Data Mining and Analytics Lab	0	0	1	1	0	0	2	2	40	60	100
TOTAL					**18**	**0**	**3**	**21**	**19**	**0**	**6**	**25**	**360**	**540**	**900**
Industrial Project (6-8 weeks)															

PROFESSIONAL ELECTIVE – II			
S. No.	BOS	Course Code	COURSE
1	CSBS	GR22A3134	Modern Day Robotics and its IndustrialApplications
2	CSBS	GR22A3135	Modern Web Applications
3	CSBS	GR22A3136	Data Mining and Analytics

IV B.Tech(CSBS) - 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	CSBS	PC	GR22A4066	Usability Design of Software Applications	2	1	0	3	2	1	0	3	40	60	100
2	Mgmt	HS	GR22A4067	Financial Management	3	0	0	3	3	0	0	3	40	60	100
3	Mgmt	HS	GR22A4068	Human Resource Management	3	0	0	3	3	0	0	3	40	60	100
4	CSBS	PE		Elective III	3	0	0	3	3	0	0	3	40	60	100
5	CSBS	PE		Elective IV	3	0	0	3	3	0	0	3	40	60	100
6	CSBS	PC	GR22A4075	Usability Design of Software Applications Lab	0	0	1	1	0	0	2	2	40	60	100
7	CSBS	PC	GR22A4076	Mobile Computing Lab	0	0	1	1	0	0	2	2	40	60	100
8	CSBS	PW	GR22A4082	Project Work Phase- I	0	0	6	6	0	0	12	12	40	60	100
		TOTAL			14	1	8	23	14	1	16	31	320	480	800

PROFESSIONAL ELECTIVE – III			
S. No.	BOS	Course Code	COURSE
1	CSBS	GR22A4069	Cognitive Science and Analytics
2	CSBS	GR22A4070	Introduction to IoT
3	CSBS	GR22A4071	Cryptology

PROFESSIONAL ELECTIVE – IV			
S. No.	BOS	Course Code	COURSE
1	CSBS	GR22A4072	Quantum Computation and Quantum Information
2	CSBS	GR22A4073	Advanced Social, Text and Media Analytics
3	CSBS	GR22A4074	Mobile Computing

IV B.Tech (CSBS) -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		OE		Open Elective -I	3	0	0	3	3	0	0	3	40	60	100
2		PE		Elective V	3	0	0	3	3	0	0	3	40	60	100
3		PE		Elective VI	3	0	0	3	3	0	0	3	40	60	100
4	CSBS	PW	GR22A4145	Project Work Phase-II	0	0	6	6	0	0	12	12	40	60	100
			TOTAL		**9**	**0**	**6**	**15**	**9**	**0**	**12**	**21**	**160**	**240**	**400**

OPEN ELECTIVE – I			
S. No.	BOS	Course Code	COURSE
1	Mgmt	GR22A4134	Services Science and ServiceOperational Management
2	CSBS	GR22A4135	IT Project Management
3	Mgmt	GR22A4136	Marketing Research and Marketing Management

PROFESSIONAL ELECTIVE – V			
S. No.	BOS	Course Code	COURSE
1	Mgmt	GR22A4137	Behavioral Economics
2	Mgmt	GR22A4138	Computational Finance & Modeling
3	Mgmt	GR22A4139	Industrial Psychology

PROFESSIONAL ELECTIVE – VI			
S. No.	BOS	Course Code	COURSE
1	Mgmt	GR22A4140	Enterprise Systems
2	Mgmt	GR22A4141	Advance Finance
3	CSBS	GR22A4142	Image Processing and Pattern Recognition

PROFESSIONAL ELECTIVES – 3 THREADS

S. No.	Theory andAlgorithms	Applications	Data Science and Machine Intelligence
1	ConversationalSystems	Cloud, Microservices and Application	Machine Learning with R Programming
2	Modern Day Robotics and its Industrial applications	Modern Web Applications	Data Mining and Analytics
3	Cognitive Science and Analytics	Introduction to IoT	Cryptology
4	Quantum Computation and Quantum Information	Mobile Computing	Advanced Social, Text and Media Analytics
5	Behavioral Economics	Computational Finance & Modeling	Industrial Psychology
6	Enterprise Systems	Advance Finance	Image Processing and Pattern Recognition

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)	CSE
	Data Analytics using Open Source Tools (GR22A3120)	
	Augmented Reality and Virtual Reality (GR22A4054)	
	Basics of Java Programming (GR22A3072)	CSE (AIML)
	Introduction to DBMS (GR22A3141)	
	Introduction to Data Mining (GR22A4080)	
	Programming in Python (GR22A3077)	CSE (DS)
	Internet of Things (GR22A3147)	
	Scripting Languages (GR22A4085)	
	Services Science and Service Operational Management (GR22A4134)	CSBS
	IT Project Management (GR22A4135)	
	Marketing Research and Marketing Management (GR22A4136)	
	Introduction to Data Science (GR22A3056)	IT
	User Centric Human Computer Interaction (GR22A3127)	
	Design Patterns (GR22A4063)	
	Non Conventional Energy Sources (GR22A3019)	EEE
	Concepts of Control Systems (GR22A3095)	
	Artificial Neural Networks and Fuzzy Logic (GR22A4022)	
	Principles of Communications (GR22A3040)	ECE
	Sensor Technology (GR22A3113)	
	Communication Technologies (GR22A4045)	
	Industrial Automation and Control (GR22A3030)	ME
	Composite Materials (GR22A3105)	
	Operations Research (GR22A3018)	
	Engineering Materials for Sustainability (GR22A3009)	CE
	Construction Project Planning and Systems (GR22A4090)	
	Environmental Impact Assessment (GR22A4011)	
	Basics of Java Programming (GR22A3072)	CSE (AI)
	Introduction to DBMS (GR22A3141)	
	Introduction to Data Mining (GR22A4080)	
	Introduction to Data Science (GR22A3056)	CSIT
	User Centric Human Computer Interaction (GR22A3127)	
	Design Patterns (GR22A4063)	

I YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DISCRETE MATHEMATICS FOR ENGINEERS

CourseCode: GR22A1024   **L/T/P/C:3/1/0/4**
I Year I Semester

Course Outcomes

1. Relate characteristics of Sets, Groups, Rings and Fields
2. Apply propositional calculus to establish tautology, contradiction, and contingency
3. Apply combinatorial mathematics in counting principles
4. Analyze the design of various combinational & sequential logic circuitsusing the concepts of Boolean Algebra
5. Apply graph theoretical models to solve some discrete optimization problems

UNIT I
Abstract Algebra
Sets, Finite sets, Power sets, Set Operations, Algebra of sets and duality, Partitions, Relations, Types of relations, Closure properties, Equivalence relations, Partial Ordering, Groups, subgroups, Lagrange's theorem on finite groups, Introduction to Ring, Integral domain and Field.

UNIT II
Logic
Propositional calculus - propositions and connectives, syntax; Semantics – truth assignments and truth tables, validity and satisfiability, tautology; Adequate set of connectives; Equivalence and normal forms; Compactness and resolution; Formal reducibility - natural deduction system and axiom system; Soundness and completeness.

UNIT III
Combinatorics
Basic counting, balls and bins problems, generating functions, recurrence relations.Proof techniques, principle of mathematical induction, pigeonhole principle.

UNIT-IV
Boolean algebra
Introduction of Boolean algebra, truth table, basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map.

UNIT V
Graph Theory
Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Trees, Properties of trees, spanning trees, Minimal Spanning trees using Kruskal's and Prims Algorithms.
Graph Theory Applications
Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments, Planar graphs, Euler's formula, dual of a planer graph, independence number and clique number, chromatic number,statement of Four-color theorem.

Textbooks:

1. Topics in Algebra, I. N. Herstein, 2nd Edition, John Wiley and Sons, 1975.
2. Digital Logic & Computer Design, M. Morris Mano, 2nd Edition, Pearson, 2017.
3. Discrete Mathematics for Computer scientists and Mathematician, 2nd Edition, Joe L. Mott, Abraham Kandel, Theodore P. Baker (PHI)
4. Discrete Mathematics and its applications, Eighth Edition, Kemmeth H. Rosem(Mc.Graw hill Education)
5. Mathematical Logic for Computer Science, L. Zhongwan, 2nd Edition,WorldScientific, Singapore, 1998.

Reference Books:

1. Discrete and Combinational Mathematics,5thEdition, Rudph P.Grimaldo (PearsonEducation)
2. Discrete Mathematics with graph Thoery, 3rd edition, Edgar G Goodair(PearsonEducation)
3. Graph Theory with Applications to Engineering and Computer Science, N.Deo,Prentice Hall, Englewood Cliffs, 1974.
4. Introduction to Mathematical Logic, (Second Edition), E. Mendelsohn, Van-Nostrand,London.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INTRODUCTORY TOPICS IN STATISTICS PROBABILITY AND CALCULUS

Course Code: GR22A1025   **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Outcomes
1. Estimate the chance of occurrence of various uncertain events in different random experiments with strong basics of probability.
2. Evaluate random processes which occur in engineering applications governed by the Binomial, Poisson, Normal and Exponential distributions.
3. Apply descriptive statistics for data analysis.
4. Determine series approximations of univariate functions and extreme values of bivariate functions.
5. Apply multiple integrals to determine areas and volumes.

UNIT I
Introduction to Statistics and Descriptive Statistics
Definition of Statistics. Basic objectives, Applications in various branches of science with examples; Collection of Data: Internal and external data, Primary and secondary Data; Population and sample, Representative sample.
Classification and tabulation of univariate data; graphical representation, Frequency curves, Descriptive measures - Central tendency and Dispersion.

UNIT-II
Basic Probability and Mathematical Expectations
Concept of experiments, sample space, event, Definition of Combinatorial Probability, Conditional Probability, Bayes' Theorem. Discrete and continuous random variables expected values and moments: mathematical expectation and its properties, Moments (including variance) and their properties (Statements), interpretation, Moment generating function.

UNIT-III
Probability Distributions
Discrete distributions: Binomial, Poisson and Geometric distribution. Continuous distributions: Uniform, Exponential, Normal distributions. Exact Sampling distributions: Chi-square, t and F distributions.

UNIT-IV
Differential Calculus
Limit of functions, continuity, derivatives. Taylor's and Maclaurin's series expansions, Partial derivatives, Maxima and minima of function of two variables.

UNIT-V
Integral Calculus
Length of a plane curve, Volume of solid of revolution, Area of surface of a solid of revolution (Cartesian form). Multiple Integrals- double integrals with constant and variable limits (Cartesian and polar form), change of order of integration (Cartesian form), triple integrals (Cartesian coordinates), applications of double and triple integrals: Area as double integration in Cartesian coordinates and Volume as a triple integration.

Text Books:
1. S. M. Ross, "Introduction of Probability Models", Academic Press,N.Y.
2. Sheldon M. Ross, "Introduction to probability and statistics for Engineers and scientists", third edition, Academic Press.

Reference Books:
1. R. Miller, J.E. Freund and R. Johnson, "Probability and Statistics for Engineers". Fourth Edition,PHI.
2. Peter V O'Neil, "Advanced Engineering Mathematics", seventh edition, Thomson learning.
3. M.D. Greenberg, "Advanced Engineering Mathematics", second edition, Pearson Education.
4. P.N. Wartikar and J.N. Wartikar, "Applied Mathematics", Vol. I&II, Vidyarthi Prakashan.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF COMPUTER SCIENCE

Course Code: GR22A1026   **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Outcomes:
1. Design Algorithms and flowcharts for a problem by applying the fundamentals of the language.
2. Implement selection statements, iterative statements and arrays for solving givenproblem.
3. To decompose a problem into functions and work with standard and user definedlibraries.
4. Exercise on programs using pointers, structures and unions.
5. Interpret solution for a given problem using files in C and an idea of unix file system.

UNIT I

General problem-Solving concepts: Algorithm, and Flowchart for problem solving with Sequential Logic Structure.
Imperative languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C)
Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation, Type Conversion.

UNIT II

Decisions and Loops: Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, goto labels, structured and un- structured programming.
Input and Output: Standard I/O, Formatted Output – printf, Formatted Input – scanf,
Arrays: One Dimensional, Two Dimensional and Multi-dimensional array and Row/column major formats.

UNIT III

Functions and Program Structure with discussion on standard library: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Standard Library Functions and return types.
Programming Method: Pre-processor, Debugging, Macro,
User Defined Header, User Defined Library Function, make file utility

UNIT IV

Structures: Basic Structures, Structures and Functions, Array of structures, Table look up, typedef, unions, Bit-fields
Pointers: Pointers and address, Pointer to functions, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Initialisation of Pointer Arrays, Pointer of structures, Self-referral structures.

UNIT V

Files: Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O(related miscellaneous functions).Command line arguments, complicated declarations and how they are evaluated.

Unix system Interface: File Descriptor, Low level I/O – read and write, open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator.

Text Books:

1. The C Programming Language, B. W. Kernighan and D. M. Ritchi, Second Edition, PHI.
2. Programming in C, B. Gottfried, Second Edition, Schaum Outline Series.

References:

1. C: The Complete Reference, Herbert Schildt, Fourth Edition, McGraw Hill.
2. Let Us C, Yashavant Kanetkar, BPB Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PRINCIPLES OF ELECTRICAL ENGINEERING

Course Code: GR22A1027   **L/T/P/C: 2/0/0/2**
I Year I Semester

Course Outcomes:
1. Understand the basic concepts and terminology of electrical quantities
2. Analyze the DC circuit using various network theorems
3. Analyze the electrical parameters of AC circuits with R-L-C elements
4. Interpret the working principle of Electrical machines.
5. Apply the concept of sensors in measurement of various electrical quantities and understand the electrical safety norms

UNIT I
BASIC CIRCUIT CONCEPTS
Concept of Potential difference, voltage, current, Fundamental linear passive and active elements to their functional current-voltage relation, Terminology and symbols in order to describe electric networks, voltage source and current sources, ideal and practical sources, concept of dependent and independent sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis, Concept of work, power, energy, and conversion of energy.

UNIT II
DC CIRCUITS
Current - Voltage relations of the electric network by mathematical equations to analyze the network (Thevenin's theorem, Norton's Theorem, Maximum Power Transfer theorem) Simplifications of networks using series-parallel, Star/Delta transformation. Superposition theorem.

UNIT III
AC CIRCUITS
AC waveform definitions, form factor, peak factor, study of R-L, R-C,RLC series circuit, R-L-C parallel circuit, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3 phase Balanced AC Circuits (人-Δ&人-人).

UNIT IV
ELECTROSTATICS AND ELECTRO-MECHANICS
Electrostatic field, electric field strength, concept of permittivity in dielectrics, capacitor composite, dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors, Electricity and Magnetism, magnetic field and

Faraday's law, self and mutual inductance, Ampere's law, Magnetic circuit, Single phase transformer, principle of operation, EMF equation, voltage ratio, current ratio, KVA rating, efficiency and regulation, Electromechanical energy conversion. DC generator construction, principle, EMF generated, types, DC motor principle, back EMF.

UNIT V

MEASUREMENTS AND SENSORS

Introduction to measuring devices/sensors and transducers (Piezoelectric and thermo-couple) related to electrical signals, Elementary methods for the measurement of electrical quantities in DC and AC systems(Current & Single-phase power). Electrical Wiring and Illumination system: Basic layout of the distribution system, Types of Wiring System &Wiring Accessories, Necessity of earthing, Types of earthing, Safety devices & system.

Text Books:

1. Electric Machinery,(Sixth Edition) A.E. Fitzgerald, Kingsely Jr Charles, D. Umans Stephen, Tata McGraw Hill.
2. A Textbook of Electrical Technology,(vol. I),B. L. Theraja, Chand and CompanyLtd., New Delhi.
3. .Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
4. Theory and problems of Basic Electrical Engineering, (SecondEdition), J. Nagrathand Kothari, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Basic of Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press.
2. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
3. Introduction to Electrodynamics, D. J. Griffiths, (Fourth Edition), CambridgeUniversity Press.
4. Engineering Circuit Analysis, William H. Hayt& Jack E. Kemmerly, McGraw-Hill Book Company Inc.
5. Fundamentals of Electrical and Electronics Engineering,Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PHYSICS FOR COMPUTING SCIENCE

Course Code: GR22A1028   **L/T/P/C: 2/ 0/ 0/ 2**
I Year I Semester

Course Outcomes:
1. Solve for the solutions and describe the behavior of a damped harmonic oscillator.
2. Apply the principles of interference, diffraction and polarization of light in engineering applications.
3. Recall the importance of electromagnetism and laws of thermodynamics and their applications.
4. Outline the developments of quantum mechanics and identify the types of crystal and their properties.
5. Analyze the properties of Laser and its propagation in different types of optical fibers.

UNIT I

Oscillation: Periodic motion, Simple harmonic motion, Characteristics of simple harmonic motion, Vibration of simple spring mass system, Resonance definition, Damped harmonic oscillator: heavy, critical and light damping, Energy decay in a damped harmonic oscillator, Quality factor.

UNIT II

Interference: Principle of superposition, Young's experiment, Theory of interference fringes, Types of interference, Fresnel's prism, Newton's rings, Diffraction: Two kinds of diffraction, Differences between interference and diffraction, Fraunhofer diffraction at single slit, Temporal and spatial coherence.
Polarization of light: Polarization, Concept of production of polarized beam of light from two SHM acting at right angle, Plane, Elliptical and Circularly polarized light, Brewster's law, Double refraction.

UNIT III

Basic Idea of Electromagnetism: Continuity equation for current densities, Maxwell's equation in vacuum and non-conducting medium.
Thermodynamics: Zeroth law of thermodynamics, First law of thermodynamics, Brief discussion on application of 1st law, Second law of thermodynamics and concept of Engine, Entropy, Change in entropy in reversible and irreversible processes.

UNIT IV

Quantum Mechanics: Introduction, Planck's quantum theory, Matter waves, de-Broglie wavelength, Heisenberg's Uncertainty principle, Time independent Schrödinger's wave equation, Physical significance of wave function, Particle in a one-dimensional potential box.
Crystallography: Introduction, Types of crystal systems, Bravais lattices, Miller indices, Interplanar spacing, Atomic packing factor for SC, BCC and FCC.
Semiconductor Physics: Basic concept of Band theory: Bloch theorem, Kronig-Penny model and its conclusions, Differences between Conductors, Semiconductors and Insulators.

UNIT V

Laser and Fiber optics: Properties of laser beam: mono-chromaticity, coherence, directionality and brightness, Einstein's theory of matter radiation interaction and A and B coefficients, Amplification of light by population inversion, Different types of lasers: Ruby and CO2, Applications of lasers, Fiber optics and applications, Types of optical fibers.

Teaching methodologies:

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

Text Books:

1. Concepts of Modern Physics, (Fifth Edition) A Beiser, McGraw Hill International.
2. Fundamentals of Physics, David Halliday, Robert Resnick and Jearl Walker, Wileyplus.

Reference Books:

1. Optics, (Fifth Edition) Ajoy Ghatak, Tata McGraw Hill.
2. Sears & Zemansky University Physics, Addison-Wesley.
3. Fundamentals of Optics, (Third Edition) Jenkins and White, McGraw-Hill.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF COMPUTER SCIENCE LAB

Course Code: GR22A1029   **L/T/P/C: 0/0/4/2**
I Year I Semester

Course Outcomes:
1. Design algorithms and convert them to programs to solve simple problems.
2. Design, implement, debug a given problem using selection and looping constructs.
3. Implement programs using modular approach using functions and recursion.
4. Solve a given problem using C language arrays, strings and structures and pointers.
5. Implement various operations of files and make use of user defined libraries.

LIST OF EXPERIMENTS:

TASK-1 (Basic Programs):
a) Write a C program to implement operators in c?

b) Write a C program to find the greatest and smallest among three numbers using conditional operator.

c) Write a C program to implicit and explicit type conversion in c?

TASK-2 (Basic Programs):
a) Write a C program to find the roots of a quadratic equation using if-else.
b) The program should request the user to input two numbers and display one of the following as per the desire of user:
   i. Sum of numbers

   ii. Difference of numbers

   iii. Product of the numbers

   iv. Division of the numbers.

c) Write a C program using switch statement to accomplish the above TASK.
d) Write a C program to find the GCD of a given number.

TASK-3 (Small but tricky codes):
a) Write a C program to find Maximum and minimum of two numbers without using any loop or condition.

b) Write a C program to check if two numbers are equal without using arithmetic operators or comparison operators.

TASK-4 (Proper parameter passing):
a) Write a C program to swap two numbers using call by value.
b) Write a C program to swap two numbers using call by reference

TASK-5(Command line Arguments):

a) Write a C program to find sum of n numbers using command line arguments.
b) Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

TASK-6 (Variable parameter):

a) Write a C program to demonstrate the working of variable parameters to find average of multiple numbers.
b) Write a C program using functions to accept n number of arguments using variable length arguments. Return maximum of all values.

TASK-7(Pointer to functions):

a) Write a c program using functions and pointers that compares two strings to see whether they are identical. The function returns 1 if they are identical, 0 otherwise.
b) Write a C program that uses functions to perform the following:
   i. Addition of Two Matrices
   ii. Multiplication of Two Matrices-
   iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.

TASK-8 (User defined header):

a) Write a c program to implement the following pre-processor directives.
   (i) define (ii) ifdef (iii) undef (iv) ifndef.
b) Write a c program to create a user defined header file to find product and greatest of two numbers.

TASK-9 (Make file utility):

a) Write a C program to merge two files into a third file.
b) Write a C program to reverse the contents of a file and display it.

TASK-10(Multi file program and user defined libraries):

a) Write a c program to implement a multi file program to set and print the value of a variable.
b) Write a C program to implement a multi file program to read, write and update a student record containing the fields name, roll number, marks.

TASK-11(Interesting substring matching / searching programs):

a) Write a C program that uses functions to insert a sub-string into a given mainstring from a given position.
b) Write a C program that uses functions to delete n characters from a given position in a given string.

TASK-12(Parsing related assignments):

a) Write a C program for implementing type checker.
b) Write a C program to implement predictive parser.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PRINCIPLES OF ELECTRICAL ENGINEERING LAB

Course Code: GR22A1030   **L/T/P/C :0/0/2/1**
I Year I Semester

Course Outcomes:
1. Understand the basic concepts and terminology of electrical quantities
2. Analyze the DC circuit using various network theorems
3. Understand the response of different types of electrical circuits to different excitations
4. Understand the measurement, calculation and relation between the basic electrical parameters.
5. Compare the basic characteristics of Electrical machines

LIST OF EXPERIMENTS

1. Familiarization of electrical Elements, sources, measuring devices and transducersrelated to electrical circuits
2. Verification of KVL and KCL
3. Verification of Thevenin's and Norton's theorems
4. Verification of superposition theorem
5. Verification of maximum power transfer theorem
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits.
7. Verification of relation between phase and line quantities in a 3-phase balanced star and delta connected systems.
8. Measurement of Active and Reactive Power in a balanced Three-phase circuit.

9. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/CompoundMotor
10. Load test on single phase transformer.
11. Demonstration of measurement of electrical quantities in DC and AC systems.

Textbooks:
1. Basic Electrical Engineering, D. C. Kulshreshtha, 2nd Edition, TMH, Revised 2019.
2. Basic of Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, OxfordUniversity Press, 2011.
3. Electromagnetic Field Theory, K. A. Gangadhar, P. M. Ramanathan, Sixteenth Edition, Khanna Publishers, 2011.

Reference Books:
1. Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
2. Circuits and Networks Analysis and Synthesis, A. Sudhakar, Shyammohan S. Palli, Tata McGraw Hill, 2010.
3. Engineering Electromagnetics, William H. Hayt, Jr. John A. Buck, 8th Revised Edition, McGraw Hill Higher Education, 2011.
4. Fundamentals of Electrical and Electronics Engineering, SmarjithGhosh, Prentice Hall (India) Pvt. Ltd., 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PHYSICS FOR COMPUTING SCIENCE LAB

Course Code: GR22A1031   **L/T/P/C :0/0/2/1**
I Year I Semester

Course Outcomes:
1. Analyze the behavior of magnetic fields with the help of graphs.
2. Calculate the Plank's constant through photoelectric effect.
3. Interpret the properties of light like interference and diffraction throughexperimentation.
4. Asses the characteristics of Lasers and infer the losses in optical fibers.
5. Compare the rigidity modulus of wires of different materials and infer the type of semiconductor material.

LIST OF EXPERIMENTS:
1. Magnetic field along the axis of current carrying coil – Stewart and Gee's apparatus.
2. Determination of Hall coefficient of semi-conductor.
3. Determination of Planck's constant.
4. Determination of wavelength of light by Laser diffraction method.
5. Determination of wavelength of light by Newton's Ring method.
6. Determination of laser parameters.
7. Determination of optical fiber parameters.
8. Determination of rigidity modulus of wire using Torsional pendulum.
9. Determination of energy gap of a semiconductor.
10. Determination of time constant of R-C circuit.

Note: Any 8 experiments are to be performed.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BUSINESS COMMUNICATION AND VALUE SCIENCE – I

Course Code: GR22A1032   **L/T/P/C: 2/ 0/ 0/ 2**
I Year I Semester

Course pre-requisites:
1. Basic communication in tenses (past, present, future)
2. Awareness of common words (adjectives used in daily verbal communication)
3. Basic idea of sentence formation and thereby paragraph building and writing
4. Communication according to daily and varied contextual scenarios
5. Basic communication model/channel (sender, receiver and feedback), Active and passive listening skills
6. Basic social etiquettes and knowledge of group work and communication that willenhance their professional growth

Course Outcomes
1. Recognize the need for life skills and values
2. Recognize own strengths and opportunities
3. Apply the life skills to different situations
4. Understand the basic tenets of communication
5. Apply the basic communication practices in different types of communication

UNIT I
Overview of Leadership Oriented Learning:
i) Self-Introduction
ii) Recognize the need of life Skills and Values
iii) Overview of Business Communication
iv) Identify Strengths and Opportunities
v) Stress- Management

UNIT II
A. Essential Grammar – I:

i) Parts of speech
ii) Tenses
iii) Sentence Formation (General & technical)
iv) Common errors
v) Voices

B. Overview of Communication Skills:

i) Importance of effective communication
ii) Types of communication- verbal and non - verbal
iii) Barriers of communication, effective communication
iv) Importance of Questioning
v) Listening Skills: Law of nature- Importance of listening skills, Differencebetween listening and hearing; Types of listening.

UNIT III
Verbal Communication and Vocabulary Enrichment:

A. Vocabulary Enrichment:
i) Exposure to words from General Service List (GSL) by West,
ii) Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms,
iii) Significant abbreviations formal business vocabulary

B. Phonetics:
i) Pronunciation, Clarity of Speech
ii) Reduction of MTI in spoken English
iii) Importance of Questioning: Question formation with emphasis on common errors made during conversation.

UNIT IV
Written Communication:
i) Letter Writing –Formal and Informal letter writing, Application letters, Job application letter
ii) Summary writing
iii) Story Writing
iv) Report writing
v) Building Curriculum Vitae.

UNIT V
Realities of Facing Life:
i) Stress management Working with rhythm and balance, Teamwork
ii) Need for Life skills and values, importance, Critical life skills
iii) Multiple Intelligences- Embracing diversity
iv) Values: Leadership, Teamwork, dealing with ambiguity, motivation, creativity, result orientation.

Textbooks:
1. There are no prescribed texts for semester I – there will be handouts and reference links shared.

Reference Books:
1. Strategic Writing, Charles Marsh
2. The Seven Basic Plots, Christopher Booker
3. Business Communication, Saroj Hiremath
4. English vocabulary in Use, Alan McCarthy and O'Dell

Web References:

- **Train your mind to perform under pressure- Simon sinek**

https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-under- pressure-capture-your-flag/

- **Brilliant way one CEO rallied his team in the middle of layoffs**

https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people- before-numbers.html

- **Will Smith's Top Ten rules for success**

https://www.youtube.com/watch?v=bBsT9omTeh0

Online Resources:

- https://www.coursera.org/learn/learning-how-to-learn
- https://www.coursera.org/specializations/effective-business-communication

Reservations & Suggestions:

1. The external experts expressed the need for flexibility regarding the change of title and components of the syllabus.
2. They also suggested to have flexible teaching methodologies.
3. The experts mentioned to have clarity regarding testing patterns and practicality of executing the course.
4. Credit parity in relation to other B. Tech. courses
5. Suggested semester – II syllabus to be given in advance for consultation with faculty and subject experts before finalizing the syllabus.

I YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
LINEAR ALGEBRA

Course Code: GR22A1033   **L/T/P/C: 3/1/0/4**
I Year II Semester

Course Pre-Requisites: Elementary knowledge of vectors, matrices and pre-calculus

Course Outcomes:
1. Determine the inverse, generalized inverse and rank of a matrix.
2. Interpret vector spaces and subspaces and apply their properties.
3. Determine the eigenvalues and eigenvectors of a square matrix and perform matrix factorization.
4. Solve a system of linear algebraic equations for an exact or approximate solutions.
5. Perform SVD, PCA and apply them to some problems in engineering.

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

UNIT-II
VECTOR SPACES

Definition of a vector space- Subspace of a vector space- Linear Span, Basis and dimension of a vector space
Definition of the 4 fundamental sub-spaces (Column space Ax, Row space A^Ty, null space $Ax=0$, null space $A^Ty = 0$)- Linear transformation- Formal definitions of rank and nullity of a linear transformation

UNIT-III
MATRIX EIGENVALUE PROBLEM AND MATRIX DECOMPOSITION
Determination of eigenvalues and eigenvectors of a matrix- Properties of eigenvalues and eigenvectors (without proof)- Similarity of matrices- Diagonalization of a matrix- Definiteness of a symmetric matrix- Orthogonal diagonalization of a symmetric matrix
LU decomposition of a square matrix- The Gram-Schmidt orthonormalization process-QR factorization.

UNIT-IV
SOLUTION OF A LINEAR ALGEBRAIC SYSTEM OF EQUATIONS
Solution of a homogeneous and non-homogeneous system of equations using Gaussian elimination Least squares approximation of an over determined system of equations using QR factorization andthe generalized inverse

UNIT-V

SINGULAR VALUE DECOMPOSITION AND PRINCIPAL COMPONENT ANALYSIS

Low rank matrix approximation- Computation of the full singular value decomposition of a realmatrix- Application to image approximation

Covariance matrix of multivariate data- Determination of principal components- Elementary treatment of principal component analysis to dimension reduction and face recognition

TEXTBOOKS:

1. Advanced Engineering Mathematics, R.K.Jain & S.R.K.Iyengar, Narosa
2. Higher Engineering Mathematics-B.S.Grewal- Khanna publications

REFERENCES:

1. Advanced Engineering Mathematics, Peter V. O'Neil, 7th Edition, Cengage,2012.
2. Advanced Engineering Mathematics, Michael. D. Greenberg, 2nd Edition, Pearson,2017.
3. Introduction to Linear Algebra, Gilbert Strang, 5^{th}Edition, Wellesley,2017.
4. Applied Mathematics, Vol. I & II, P. N. Wartikar& J. N. Wartikar, Pune Vidyarthi GrihaPrakashan,2010.
5. Digital Image Processing, R. C. Gonzalez and R. E. Woods, 4^{th}Edition, Kluwer, 1997.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
STATISTICAL METHODS

Course Code: GR22A1034   **L/T/P/C: 3/ 0/ 0/ 3**
I Year II Semester

Pre-requisites: Elementary statistics and Linear algebra

Course Outcomes

1. Apply sampling distribution techniques
2. Apply statistical estimation methods
3. Apply Inferential Statistics to make predictions or judgments about the population from whichthe sample data is drawn.
4. Forecast using Regression analysis models
5. Interpret data using Time series analysis

UNIT-I
Sampling and Estimation
Sampling Techniques: Random sampling. Sampling from finite and infinite populations. Sampling distribution and Standard error (sampling with and without replacements), Sampling distribution of sample mean.
Estimation: Concepts of Point and interval estimation, criteria for good estimates (un-biasedness, consistency and Sufficiency) and applications. Estimation of parameters of Binomial, Poisson, Exponential and Normal distributions using Maximum Likelihood Estimation.

UNIT-II
Testing of hypothesis (parametric Inference)
Concept and formulation, Type I and Type II errors.
Procedures of Parametric testing of Single and two population means in small and large samplings, Single and two population Proportions in large sampling, Analysis of variance : one- way and two- wayclassifications.

UNIT-III
Testing of hypothesis (Non-parametric Inference)
Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test, Kendall's test.

UNIT-IV
Linear Statistical Models
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), Residual Analysis and Concept of Multicollinearity

UNIT-V
Time Series
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) and Estimation of seasonal component by Ratio to Trend method and Ratio to Moving averages method, Stationary, ARIMA Model: Identification, Estimation and Forecasting.

TEXTBOOKS:

1. Probability and Statistics for Engineers(4thEdition), I.R. Miller, J.E. Freund and R.Johnson, Pearson.
2. Fundamentals of Statistics (Vol. I & Vol. II), A. Goon, M. Gupta and B. Dasgupta, World Press.
3. The Analysis of Time Series: An Introduction, Chris Chatfield, Chapman and Hall/CRC.
4. Introduction to Linear Regression Analysis, D.C. Montgomery & E. Peck, Wiley.
5. Hands-on Programming with R, Garrett Grolemund, O'Reilly.

REFERENCE BOOKS:

1. Introduction to the Theory of Statistics, A.M. Mood, F.A. Graybill& D. C. Boes, McGraw-Hill.
2. Applied Regression Analysis, N. Draper & H. Smith, John Wiley & Sons.
3. R for Everyone: Advanced Analytics and Graphics, Jared P. Lander, Addison-Wesley Professional.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA STRUCTURES AND ALGORITHMS

Course Code: GR22A1035   **L/T/P/C: 2/ 1/ 0/ 3**
I Year II Semester

Course Pre-Requisites: C Language

Course Outcomes:
1. To analyse the performance of algorithms using asymptotic notations
2. Implement all operations on different linear data structures.
3. Interpret various operations on non-linear data structure Tree.
4. Analyse various operations on graphs.
5. Apply various searching, sorting and indexing techniques

UNIT I
Basic Terminologies & Introduction to Algorithm and Data Organization: Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O,Omega and Theta notation, Programming style, Refinement of coding-Time-Space Trade Off, Testing, Data Abstraction

UNIT II
Linear Data Structure: Array**,** Stack, Queue, Linked list and its types, Various Representations, Operations & Applications of Linear Data Structures.

UNIT III
Non-linear Data Structure: Trees: Binary Tree – Terminology and basic operations (no implementation), Binary Search Tree – Insert, delete, search, traversal and implementation, B Tree, B+ Tree, AVL Tree, Splay Tree (B, B+, AVL trees only definitions no implementation).

UNIT IV
Non-linear Data Structure: Graphs: Basic Terminologies, Directed, Undirected and Representations, Graph search and Traversal algorithms Breadth First Search, Depth First Search and complexity analysis, Applications of Non-Linear Data Structures.

UNIT V
Searching and Sorting on Various Data Structures: Sequential Search, Binary Search, Insertion Sort, Selection Sort, Shell Sort, Heap Sort, Divide and Conquer Sort: Merge Sort, Quick Sort, Comparison Trees (Decision tree), Introduction to Hashing.
File: Organization Sequential, Direct, Indexed Sequential, Hashed, and various types of accessing schemes (no implementation).

TEXTBOOKS:
1. Fundamentals of Data Structures, E. Horowitz and S. Sahni, 1977.
2. Data Structures and Algorithms, Alfred V. Aho, John E. Hopperoft, Jeffrey D.UIlman.

REFERENCES:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning), 31stEdition, Pat Morin.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PRINCIPLES OF ELECTRONICS

Course Code: GR22A1036   **L/T/P/C: 2/ 0/ 0/ 2**
I Year II Semester
Course Pre-Requisite: Fundamentals of Physics
Course Outcomes:
1. Explain the principles of operation and substantiate the applications of
2. various semiconductor devices
3. Compare the functionalities of various electronic devices
4. Understand the effect of feedback in amplifiers
5. Apply the knowledge of analog IC's Use several digital IC's in various applications

UNIT I

Semiconductors: Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors & Insulators: electrical properties, band diagrams; Semiconductors: intrinsic & extrinsic, energy band diagram, P and N-type semiconductors, drift & diffusion currents.

UNIT II

Diodes and Diode Circuits: Formation of P-N junction, energy band diagram, formationof depletion zone, built-in-potential, forward and reverse biased P-N junction, V-I characteristics, Linear piecewise model, Junction capacitance, Zener breakdown, Avalanche breakdown, Zener diode and its reverse characteristics. Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, regulation.

UNIT-III

Bipolar Junction Transistors: Formation of PNP / NPN junctions; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut- off, active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors; Biasing and Bias stability: calculation of stability factor.
Field Effect Transistors: Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET structure and characteristics, MOSFET structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles.

UNIT IV

Feed Back Amplifier, Oscillators and Operational Amplifiers: Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability; effect of positive feedback: instability and oscillation, condition of oscillation, Barkhausen criteria. Introduction to integrated circuits, operational amplified and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator

UNIT V

Digital Electronics Fundamentals: Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map, Logic ICs, half and full adder/subtractor, multiplexers, de-multiplexers, flip-flops, shift registers, counters.

TEXTBOOKS:

1. Millman's Integrated Electronics, Jacob Millman, Christos Halkias, Chetan Parikh, 2nd Edition, TMH, 2010.
2. Op-Amps and Linear ICs, Ramakanth A. Gayakwad, 4th Edition, PHI, 2016.
3. Digital Logic & Computer Design, M. Morris Mano, 4th Edition, PHI, 2016.

REFERENCES:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky, 11th Edition, Pearson Publishers, 2015.
2. Solid State Electronic Devices, Ben Streetman, Sanjay Banerjee, 7th Edition, PHI, 2016.
3. Electronic Principle, Albert Paul Malvino, 3rd Edition, TMH, 2010.
4. Microelectronics, Jacob Millman, Arvin Grabel, 2nd Edition, TMH, 2000.
5. Electronics Devices and Circuits, S. Salivahanan, N. Suresh Kumar, A. Vallavaraj, 2nd Edition, TMH, 2011.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF ECONOMICS

Course Code: GR22A1037   **L/T/P/C: 2/ 0/ 0/ 2**
I Year II Semester

Course Outcomes:
1. Providing the fundamental understand of economics and explain the theory of the firm and various micro-economics tools such as demand and supply analysis that would help in forward planning and decision making
2. Summarize production theories, factors of production, various costs, and revenue concepts
3. Apply the above conceptual knowledge to the various market structures under perfect and imperfect competition
4. Classify the components of National income with the help of income determination tools
5. Examine the policies and procedures of Government sector and external sectors of imports and exports in monitory operations by considering demand and supply of money and provide a brief view of monetary, fiscal policies, functioning of central bank of India.

UNIT I
Microeconomics 1: Principles of Demand and Supply - Supply Curves of Firms - Elasticity of Supply; Demand Curves of Households - Elasticity of Demand; Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve); Welfare Analysis - Consumers' and Producers' Surplus - Price Ceilings and Price Floors.

UNIT II
Microeconomics 2: Consumer Behaviour - Axioms of Choice - Budget Constraints and Indifference Curves; Consumer's Equilibrium - Effects of a Price Change, Income and Substitution Effects -Derivation of a Demand Curve; Applications - Tax and Subsidies - Intertemporal Consumption - Suppliers' Income Effect;

UNIT III
Microeconomics 3: Theory of Production - Production Function and Iso-quants - Cost Minimization; Cost Curves - Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly and Monopolistic Competition.

UNIT IV
Macroeconomics 1: National Income and its Components - GNP, NNP, GDP, NDP; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector - Taxes and Subsidies; External Sector - Exports and Imports;

UNIT V
Macroeconomics 2: Money - Definitions; Demand for Money -Transactionary and Speculative Demand; Supply of Money - Bank's Credit Creation Multiplier; Integrating Money and Commodity Markets - IS, LM Model; Business Cycles and Stabilization - Monetary and Fiscal Policy - Central Bank and the Government; The Classical Paradigm - Price and Wage Rigidities - Voluntary and Involuntary Unemployment

TEXTBOOKS:

1. Microeconomics, Pindyck, Robert S., and Daniel L. Rubinfeld, 8th Edition, PearsonEducation, 2017.
2. Macroeconomics, Dornbusch, Fischer and Startz, 13th Edition, McGraw-Hill, 2018.
3. Economics, Paul Anthony Samuelson, William D. Nordhaus, 19th Edition, McGraw- Hill,2012.

REFERENCES:

1. Intermediate Microeconomics: A Modern Approach, Hal R. Varian, 9th Edition,
2. Springer, 2014.
3. Principles of Macroeconomics, N. Gregory Mankiw, 7th Edition, Cengage India, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
STATISTICAL METHODS LAB

Course Code: GR22A1038   **L/T/P/C: 0/0/2/1**
I Year II Semester

Course Outcomes:
1. Build various data types for a specified problem.
2. Apply tests of significance
3. Compute descriptive statistics
4. Forecast in cross sectional and Time Series Data.
5. Create Graphics

Task 1: Write an R program to create an array, passing in a vector of values and a vector of dimensions.Also provide names for each dimension.

Task 2: Write an R program to find the factors of a given number using functions.

Task 3: Write an R program to create a list of random numbers in normal distribution and countoccurrences of each value.

Task 4: Write an R program for addition and Multiplication of two matrices.

Task 5: Write an R program to create a Data Frame which contain details of 5 employees and displaysummary of the data.

Task 6: Write an R program to read the .csv file and perform the following: (i) Summary statistics on thedata, (ii) Remove outliers from the data.

Task 7: Plot the data using ggplot

Task 8: Test a hypothesis about the data using Z and t – tests.

Task 9: Write an R program for modeling Cross sectional data with Multiple Regression.

Task 10: Write an R program for modeling Time series with ARIMA.

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

Course Code: GR22A1039   **L/T/P/C: 0/ 0/ 4/ 2**
I Year II Semester

Course Outcomes:
1. Implement operations on various linear and non-linear data structures.
2. To identify the appropriate data structure for solving a given problem.
3. Acquire practical knowledge on applications of various data structures.
4. Implement various searching and sorting techniques.
5. To effectively trouble shoot, debug and run programs in C.

LIST OF EXPERIMENTS:

TASK 1
a) Write a C program to implement Towers of Hanoi.
b) Write a C program to implement Stack using Arrays.
c) Write a C program to implement Queue using Arrays.

TASK 2
a) Write a C program to evaluate a Postfix Expression.
b) Write a C program to implement Circular Queue using Arrays.

TASK 3
a) Write a C program to implement reading, writing, and addition of polynomials.

TASK 4
a) Write a C program to implement the operations – create, insert, delete, search and traversalof a Double linked list

TASK 5
a) Write a C program to implement the following Binary search tree operations- insert, delete, search.

TASK 6
a) Write a C program to implement BFS and DFS traversal on a Binary Search Tree.

TASK 7
a) Write a C program to implement Breadth First Search on graphs.

b) Write a C program to implement Depth First Search on graphs.

TASK 8
a) Write a C program to implement sequential search
b) Write a C program to implement Binary search

TASK 9
a) Write a C program to implement Insertion Sort.
b) Write a C program to implement Selection Sort.

TASK 10

a) Write a C program to implement Shell Sort.
b) Write a C program to implement Heap Sort.

TASK 11

a) Write a C program to implement Merge Sort.
b) Write a C program to implement Quick Sort.

TASK 12

a) Write a C program to implement Line editors with line count, word count showing on thescreen.
b) Write a C program to perform the following:
   (i) Construct a Binary Search Tree from a file. (retrieving non-linear data structure from afile)
   (ii) Display the contents of a Binary Search Tree on a file. (Saving a non-linear datastructure in a file)

TEXT BOOKS:

1. Fundamentals of Data Structures, E. Horowitz and S. Sahni, 1977.
2. Data Structures and Algorithms, Alfred V. Aho, John E. Hopperoft, Jeffrey D. UIlman.

REFERENCES:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest,Clifford Stein.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning), 31st Edition, PatMorin.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PRINCIPLES OF ELECTRONICS LAB

Course Code: GR22A1040   **L/T/P/C: 0/ 0/ 2/ 1**
I Year II Semester

Course Outcomes:
1. Analyze the characteristics of various semiconductor devices.
2. Apply the knowledge of semiconductors.
3. Understand the functionality of analog and digital IC's.
4. Design various circuits based on the characteristics of the components.
5. Verify the theoretical concepts through laboratory and simulation.

LIST OF EXPERIMENTS:

Simulation of any 3 or 4 experiments using open-source software

1. Forward and Reverse Bias V-I characteristics of PN junction Diode.

2. V-I characteristics of Zener diode.

3. Full wave rectifier.

4. Characteristics of a BJT under CB configuration.

5. Characteristics of a BJT under CE configuration.

6. JFET characteristics under CS configuration.

7. MOSFET characteristics under CS configuration.

8. Hartly oscillator

9. Inverting and Non-Inverting amplifiers using IC 741 Op-Amp.

10. Adder, subtractor and comparator using IC 741 Op-Amp.

11. Integrator and Differentiator using IC 741 Op-Amp.

12. Truth table verification of Logic gates.

13. Truth table verification of Half-Adder and Full Adder.

14. Truth table verification of Multiplexer and De-multiplexer

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BUSINESS COMMUNICATION AND VALUE SCIENCE – II

Course Code: GR22A1041   **L/T/P/C: 2/ 0/ 0/ 2**
I Year II Semester

Course Outcomes:
1. Use electronic/social media to share concepts and ideas
2. Understand the basics of presentation
3. Understand tools for quick reading
4. Identify individual personality types and role in a team
5. Students will have learned the basic concepts of Morality and Diversity

UNIT I
Reading - Skimming – Scanning – Active and Passive Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading - Reading the job advertisements and the profile of the company concerned – Speed reading – reading passages with time limit – Critical reading, Comprehension skills - Developing analytical skills, Deductive and inductive reasoning - Extensive and Intensive Reading.

UNIT II
Writing - Elements of good and bad writing (e.g. ABC of writing, cohesion & coherence, etc.) - Common errors - Rules of Punctuation – Use of Words - Lucid Writing - Catherine Morris and Joanie McMahon's writing techniques.

UNIT III
A. Presentation and Personality Skill – Elements of Presentation Strategies – Objectives – Medium
– Key Ideas – Structuring the material – Organizing content – Audio visual aids – Handouts – Use of Power point – Clarity of presentation – Non-verbal Communication – Seminar Paper presentation Discussion – Work with an NGO and make a presentation – ORAI App
B. Group Discussion – Types - Dos – Don'ts

UNIT IV
A. Personality - Types – Traits – Dr. Meredith Belbin and his research on teamwork and how individuals contribute - Dr. Meredith Belbin's 8 Team Roles - Lindgren's Big 5 personality traits - Belbin's 8 team player styles

B. Interpersonal Skill: Teamwork, Team effectiveness, Group discussion, Decision making - Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics. Multicultural teamactivity

UNIT V
Inclusion – Definition – concept of inclusion – workplace inclusion – 7 pillars of inclusion – Howto promote inclusion - Examples
Morality – Definition – Purpose – Importance -Types – Examples – Morality vs. Ethics
Diversity – Definition – Different forms of diversity in our society – Examples Discussion on TCS values, Respect for Individual and Integrity.

TEXTBOOKS:

1. Essentials of Business Communication- Rajendra Pal & J.S. Koralahalli
2. Communication for Business – Shirley Taylor.
3. Business Communication Today- Bovee, Thill, Schatzman
4. Advanced Business Communication- Penrose, Rasberry, Myers
5. Doing Business on the Internet- Simon Collins.
6. Business Communication- Process and Product- Mary Ellen Guffey

REFERENCES:

1. Guiding Souls: Dialogues on the purpose of life; Dr. A.P.J Abdul Kalam, 2005; Co-author--Arun Tiwari
2. The Family and the Nation; Dr. A.P.J Abdul Kalam, 2015; Co- author: AcharyaMahapragya
3. The Scientific India: A twenty First Century Guide to the World around Us; Dr. A.P.JAbdul Kalam, 2011; Co-author- Y.S.Rajan
4. Forge Your Future: Candid, Forthright, Inspiring; Dr. A.P.J Abdul Kalam, 2014
5. Abundance: The Future is Better Than You Think; Peter H. Diamandis and Steven Kotler,21 Feb 2012; Free Press
6. Start With Why: How Great Leaders Inspire Everyone to Take Action; Simon Sinek, 6October 2011; Penguin
7. Advertising & IMC: Principles and Practice; Sandra Moriarty, Nancy D. Mitchell, William D. Wells, 15 June 2016; Publiher: Pearson Education India

WEB REFERENCES:

1. Ethics Fundamentals and Approaches to Ethics https://www.eolss.net/Sample Chapters/C14/E1-37-01-00.pdf
2. A Framework for Making Ethical Decisions, https://www.brown.edu/academics/science-and-technology-studies/framework - making- ethical-decisions
3. Five Basic Approaches to Ethical Decision- http://faculty.winthrop.edu/meelerd/docs/rolos/5_Ethical_Approaches.pdf

ONLINE RESOURCES:

1. https://youtu.be/CsaTslhSDI
2. https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M
3. https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y
4. https://m.youtube.com/watch?v=dT_D68RJ5T8&feature=youtu.be
5. https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu

II YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
THEORY OF COMPUTATION

Course Code: GR22A2088   **L/T/P/C: 3 /0/ 0/ 3**
II Year I Semester

Course Outcomes:
1. Design Regular Expressions and equivalent automata models.
2. Construct Regular Grammars and regular languages
3. Formulate Context-free languages and pushdown automata.
4. Design Turing machines models
5. Analyse Undecidability and Complexity

UNIT I
Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.
Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA.

UNIT II
Regular grammars: Regular grammars and equivalence with finite automata, properties of regular languages, Kleene's theorem, pumping lemma for regular languages, Myhill-Nerode theorem and its uses, minimization of finite automata.

UNIT III
Context-free languages and pushdown automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.
Context-sensitive languages: Context-sensitive grammar (CSG) and languages, linear bounded automata and equivalence with CSG.

UNIT IV
Turing machines: The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

UNIT V
Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

Basic Introduction to Complexity: Introductory ideas on Time complexity of deterministic and nondeterministic Turing machines, P and NP, NP- completeness, Cook's Theorem, other NP -Complete problems.

TEXTBOOKS:

1. Introduction to Automata Theory, Languages, and Computation John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman.

REFERENCE BOOKS:

1. Elements of the Theory of Computation, Harry R. Lewis and Christos H. Papadimitriou.
2. Automata and Computability, Dexter C. Kozen.
3. Introduction to the Theory of Computation, Michael Sipser.
4. Introduction to Languages and the Theory of Computation, John Martin.
5. Computers and Intractability: A Guide to the Theory of NP Completeness, M. R. Garey and D. S. Johnson.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER ORGANIZATION AND ARCHITECHTURE

Course Code: GR22A2089   **L/T/P/C: 3/ 0/ 0/3**
II Year I Semester

Course Outcomes:
1. Demonstrate knowledge of register organization of a basic computer system
2. Incorporate In-depth understanding of design formats and arithmetic operations.
3. Understand the memory design and performance of I/O interfaces.
4. Analyze and emphasize various parallel processing techniques and pipeline hazards.
5. Develop an ability to analyze the types of memory hierarchy.

UNIT I
Revision of basics in Boolean logic and Combinational/Sequential Circuits.
Functional blocks of a computer: CPU, memory, input-output subsystems, control unit.
Data representation: Signed number representation, fixed and floating-point representations,character representation.
Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

UNIT II
Introduction to x86 architecture.
CPU control unit design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU.
Computer arithmetic: Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring andnon-restoring techniques, floating point arithmetic, IEEE 754 format.

UNIT III
Memory system design: Semiconductor memory technologies, memory organization.
Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions,software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB

UNIT IV
Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.
Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cachecoherency.

UNIT V
Memory organization: Memory interleaving, concept of hierarchical memory organization, cachememory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

TEXTBOOKS:
1. Computer System Architecture M. M. Mano:, 3rd ed., Prentice Hall of India, New Delhi, 1993.

2. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John.
3. Computer Organization and Embedded Systems, Carl Hamacher.

REFERENCES:
1. Computer Architecture and Organization, John P. Hayes.
2. Computer Organization and Architecture: Designing for Performance, William Stallings.
3. Computer System Design and Architecture, Vincent P. Heuring and Harry F. Jordan.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OBJECT ORIENTED PROGRAMMING

Course Code: GR22A2090   **L/T/P/C: 2/ 0/ 0/2**
II Year I Semester

Prerequisites: A course on "Procedural programming".

Course Outcomes:
1. Understand the concepts of procedural programming language
2. Distinguish procedural and object-oriented approach in developing programs of C and C++Understand)
3. Experiment with various object-oriented concepts like Inheritance, exceptions to solve different problems (Apply)
4. Select suitable inheritance mechanism, overloading/overriding of C++ to implement solutionfor problem on hand.
5. Code a foolproof application using the concepts of generic programming and apply objected methodology to generate different diagrams of UML design document.

UNIT I
Procedural programming, An Overview of C: Types Operator and Expressions, Scope and Lifetime, Constants, Pointers, Arrays, and References, Control Flow, Functions and Program Structure, Namespaces, error handling, Input and Output (*C*-way), Library Functions (*string*, *math*, *stdlib*), Command line arguments, Pre-processor directive

UNIT II
Some difference between C and C++: Single line comments, Local variable declaration within function scope, function declaration, function overloading, stronger type checking, Reference variable, parameter passing – value vs reference, passing pointer by value or reference, ~~#define constant vs const~~, Operator new and delete, the typecasting operator, Inline Functions in contrast to macro, default arguments

UNIT III
The Fundamentals of Object-Oriented Programming: Necessity for OOP, Data Hiding, Data Abstraction, Encapsulation, Procedural Abstraction, Class and Object.
More extensions to C in C++ to provide OOP Facilities: Scope of Class and Scope Resolution Operator, Member Function of a Class, private, protected and public Access Specifier, this Keyword, Constructors and Destructors, friend class, error handling (exception)

UNIT IV
Essentials of Object-Oriented Programming: Operator overloading, Inheritance – Single and Multiple, Class Hierarchy, Pointers to Objects, Assignment of an Object to another Object, Polymorphism through dynamic binding, Virtual Functions, Overloading, overriding and hiding, Error Handling

UNIT V
Generic Programming: Template concept, class template, function template, template specialization
Input and Output: Streams, Files, Library functions, formatted output

Object Oriented Design and Modelling: UML concept, Use case for requirement capturing, Classdiagram, Activity diagram and Sequence Diagram for design, Corresponding C++ code from design

TEXTBOOKS:

1. The C++ Programming Language, Bjarne Stroustrup, Addison Wesley.
2. C++ and Object-Oriented Programming Paradigm, Debasish Jana, PHI Learning Pvt. Ltd.

REFERENCE BOOKS:

1. Programming – Principles and Practice Using C++, Bjarne Stroustrup, Addison Wesley.
2. The Design and Evolution of C++, Bjarne Stroustrup, Addison Wesley.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTATIONAL STATISTICS

Course Code: GR22A2091   **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Outcomes:
1. Correlate statistical inference methods for testing hypothesis and plot the graphs.
2. Exemplify multivariate normal distribution methods and relevant properties.
3. Analyze the importance of principal components and their role in plot graphs
4. Develop linear and multiple linear regression models to solve real time problems
5. Implement different kinds of clustering algorithms.

UNIT I
Multivariate Normal Distribution: Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters.

Multivariate Regression: Assumptions of Multivariate Regression Models, Parameter estimation, Multivariate Analysis of variance and covariance.

UNIT II
Multiple Linear Regression Model: Standard multiple regression models with emphasis on detection of collinearity, outliers, non-normality and autocorrelation, Validation of model assumptions.

UNIT III
Discriminant Analysis: Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.

UNIT IV
Principal Component Analysis: Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.
Factor Analysis: Factor analysis model, extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores.

UNIT V
Cluster Analysis: Introduction, Types of clustering, Correlations and distances, clustering by partitioning methods, hierarchical clustering, overlapping clustering, K-Means Clustering-Profiling and Interpreting Clusters.

TEXTBOOKS:
1. An Introduction to Multivariate Statistical Analysis, T.W. Anderson.
2. Applied Multivariate Data Analysis, Vol I & II, J.D. Jobson.
3. Statistical Tests for Multivariate Analysis, H. Kris.
4. Programming Python, Mark Lutz.
5. Python 3 for Absolute Beginners, Tim Hall and J-P Stacey.
6. Beginning Python: From Novice to Professional, Magnus Lie Hetland. Edition, 2005.

REFERENCE BOOKS:

1. Regression Diagnostics, Identifying Influential Data and Sources of Collinearety, D.A. Belsey, E. Kuh and R.E. Welsch
2. Applied Linear Regression Models, J. Neter, W. Wasserman and M.H. Kutner.
3. The Foundations of Factor Analysis, A.S. Mulaik.
4. Introduction to Linear Regression Analysis, D.C. Montgomery and E.A. Peck.
5. Cluster Analysis for Applications, M.R. Anderberg.
6. Multivariate Statistical Analysis, D.F. Morrison.
7. Python for Data Analysis, Wes Mc Kinney.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF DATABASE SYSTEMS
Course Code: GR22A2092 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Outcomes:
1. Illustrate the usage of data models in designing the database
2. Correlate the query in SQL with Relational Query Languages
3. Interpret the purpose of normalization and indexing in database optimization
4. Summarize the schedulers and concurrency control mechanisms for transactions
5. Examine the security models for database authentication

UNIT I

Introduction: Introduction to Database, Hierarchical, Network and Relational Models, Database System Architecture, Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).
Data Models: Entity-Relationship Model, Network Model, Relational and Object-oriented Data Models, Integrity Constraints, and Data Manipulation Operations.

UNIT II

Relational Query Languages: Relational Algebra, Tuple and Domain Relational Calculus, SQL3, DDL and DML Constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, and SQL server.

UNIT III

Relational Database Design: Domain and Data Dependency, Armstrong's Axioms, FunctionalDependencies, Normal Forms, Dependency Preservation, Lossless Design.
Query Processing and Optimization: Evaluation of Relational Algebra Expressions, QueryEquivalence, Join Strategies, Query Optimization Algorithms.
Storage Strategies: Indices, B-Trees, Hashing.

UNIT IV

Transaction Processing: Concurrency Control, ACID Property, Serializability of Scheduling, Locking and Timestamp Based Schedulers, Multi-Version and Optimistic Concurrency Control Schemes, Database Recovery.

UNIT V
Database Security: Authentication, Authorization and Access Control, DAC, MAC and RBACModels, Intrusion Detection, SQL Injection.
Advanced Topics: Object oriented Databases, Object Relational Databases, Logical Databases, WebDatabases, Distributed Databases, Data Warehousing and Data Mining.

TEXTBOOKS:

1. Database System Concepts. Abraham Silberschatz, Henry F. Korth and S. Sudarshan

REFERENCES:

1. Principles of Database and Knowledge – Base Systems, Vol 1 by J. D. Ullman.
2. Fundamentals of Database Systems. R. Elmasri and S. Navathe.
3. Foundations of Databases. Serge Abiteboul, Richard Hull, Victor Vianu.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER ORGANIZATION AND ARCHITECHTURE LAB

Course Code:GR22A2093   **L/T/P/C: 0/0/4/2**
II Year I Semester

Course Outcomes
1. Incorporate logic gates with different combinations.
2. Develop sequential circuits for different applications.
3. Perform various operations using MLP.
4. Understand accessing communication port and memory locations.
5. Analyze the applications of different address modes.

Lab: Circuits on breadboard or simulators.

TASK 1

Implementation of Boolean Circuits: Operations of Logic Gates: OR, AND, NOT, NAND and NORgates.

TASK 2

Implementation of Combinational Circuits: Adder, Subtractor, Multiplication Module, DivisionModule.

TASK 3

Implementation of Multiplexer, De-multiplexer, Encoder, Decoder.

TASK 4

Implementation of Sequential Circuits: Counters, Linear Feedback Shift Registers (LFSR)

TASK 5

C/C++ programming to understand the formats of char, int, float, double, long etc.

TASK 6

Machine language programming on x86 or higher version kits or simulators:

(i) Add/subtract/multiplication/division/GCD/LCM.

TASK 7

Machine language programming: Accessing some specific memory locations/ports

TASK 8

Counting odd and even integers from a series of memory locations

TASK 9

Printing values of selected registers

TASK 10

Handing interrupts

TASK 11

Write a program for data transfer using different addressing modes

TASK 12

Write a program to convert binary number to BCD number and vice versa.

TEXTBOOKS:
1. Computer System Architecture M. M. Mano: 3rd ed., Prentice Hall of India, New Delhi, 1993.
2. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.
3. Computer Organization and Embedded Systems, Carl Hamacher.

Reference Books:
1. Computer Architecture and Organization, John P. Hayes.
2. Computer Organization and Architecture: Designing for Performance, William Stallings.
3. Computer System Design and Architecture, Vincent P. Heuring

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OBJECT ORIENTED PROGRAMMING LAB

Course Code: GR22A2094   **L/T/P/C:0/0/4/2**
II Year I Semester

Course Outcomes:
1. Recall the concepts of Object-oriented programming to solve real life problems
2. Demonstrate object-oriented programming skills by using overloading, overriding, inheritanceconcepts in developing solutions of a problem on hand.
3. Apply concepts of class hierarchy, templates and structure data using stacks and queue withhelp of OOP while developing programs.
4. Perceive and choose appropriate input-output formats and anipulators for developing interactive programs.
5. Build systems with the help of UML diagrams and OOPs concepts to solve real world problems.

TASK-1

a) Parameter passing: passing parameter by value vs by reference, passing array as constantpointer
b) Function overloading: writing string operations like strcat and strncat, strcpy and strncpy asoverloaded functions.
c) Dynamically allocating space for a pointer depending on input and doing this repeatedly, depending on different inputs and finally de-allocating the pointer.

TASK-2

a) Define class complex with all possible operations: constructor, destructor, copy constructor,assignment operator with the data members stored as pointer to integers.
b) Define class vector of integers with all possible operations like constructor, destructor, copyconstructor and assignment operators.
c) Define class matrix of integers with all possible operations like constructor, destructor, copyconstructor and assignment operators.
d) Define class matrix of integers using vector, with all possible operations like constructor,destructor, copy constructor and assignment operators.

TASK-3

1. Define class stack, queue, linked-list, array, set using some data-type (int) with data memberskept as private and functions kept in both protected and public sections.

TASK-4

a) Define class complex with all possible operators: constructor, destructor, copy constructor, assignment operator and operators $>$, $<$, $>=$, $<=$, $==$, $++$ (pre and post), $+$, $+=$, ( ), with the data members stored as pointer to integers.
b) Define class vector of integers with all possible operations like constructor, destructor, copy constructor and assignment operators$>$, $<$, $>=$, $<=$, $==$, $++$ (pre and post), $+$, $+=$, ( )

TASK-5

a) Define class matrix of integers with all possible operations like constructor, destructor, copyconstructor and assignment operators$>$, $<$, $>=$, $<=$, $==$, $++$ (pre and post), $+$, $+=$, ( ).

b) Define class matrix of integers using vector, with all possible operations like constructor,destructor, copy constructor and assignment operators>, <, >=, <=, ==, ++ (pre and post),+, +=, ( ).

TASK-6

a). Define stack and queue inherited from array class, with standard functions and operators

TASK-7

a) Define a class called 'array' with data type passed as template type with constructor, destructor, copy constructor and assignment operators and index operator.

b) Define template functions for compare and use it in the algorithms like bubble sort, insertionsort, merge sort.

TASK-8

a). Formatted input-output examples

TASK-9

a). Input manipulators

TASK-10

a). Overriding operators <<, >>

TASK-11

a). Define class model for complex number, student class, book class and show it using UML diagram as well as concrete class.

TASK-12

a). Show behavioural modelling through sequence diagram and activity diagram for workflow ina typical log-in, log-out situation.

TEXTBOOKS:

1. The C++ Programming Language, Bjarne Stroustrup, Addison Wesley.
2. C++ and Object-Oriented Programming Paradigm, Debasish Jana, PHI Learning Pvt. Ltd.

REFERENCE BOOKS:

1. Programming – Principles and Practice Using C++, Bjarne Stroustrup, Addison Wesley.
2. The Design and Evolution of C++, Bjarne Stroustrup, Addison Wesley.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTATIONAL STATISTICS LAB

Course Code: GR22A2095   **L/T/P/C: 0/0/2/1**
II Year I Semester

Course Outcomes:
1. Develop programs using Python concepts such as Flow control, Functions, Files.
2. Demonstrate various types of graphs using Matplotlib package.
3. Implement programs using Matplotlib package for annotating graphs and
4. Implement Multivariate regression, Multiple regression, Cluster analysis using Python
5. Implement PCA and LDA for dimensionality reduction using python

LIST OF EXPERIMENTS:
TASK-1 (Control Flow)

a) Write a program to check whether the given number is even or not.
b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3,1/4, . . . ,1/10
c) Write a program using a while loop that asks the user for a number and prints a countdown from that number to zero.

TASK-2 (Functions)

a) Write a python program to swap given numbers using Functions.
b) Write a python program to find Fibonacci Numbers using Recursive function

TASK-3 (Data Structures)

a) Write a program to count the numbers of characters in the string and store them ina dictionary data structure
b) Write a program to use split and join methods in the string and trace a birthday witha dictionary data structure.

TASK-4 (Files)

a) Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.

b) Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical orde

TASK-5 (Matplotlib package)

a) Import Iris dataset from UCI Machine learning repository and Wine Reviews datasetfrom Kaggle.
b) Scatter the Sepal Length against Sepal Width
c) Create a Line chart by plotting each column in dataset
d) Draw a Histogram and Bar chart for Wine Reviews scores

TASK-6 (Matplotlib package)

a) Using "text" command add text to the axes of figures.

b) Using "annotate" command, label the parts of the axes in figures.
c) Using Locator and Formatter objects , set the axis properties.

TASK-7 (Matplotlib package)
a) Draw a rectangle patch to a plot
b) Draw a circular patch at a given centre with a given radius in a plot.

TASK-8
a) Demonstrate the use of setp( ) and getp( ) methods.
b) Write a python program to implement Multiple regression.

TASK-9 (Multivariate Analysis).
a) Read Multivariate Analysis Data from Wine dataset
b) Plot Multivariate Data and calculate the summary statistics.

TASK-10 (Classification using Principal Component Analysis).
a) Read the Iris dataset
b) Apply Principal Component Analysis for Dimensionality reduction.
c) Classify the data using Random Forest Classifier
d) Evaluate the performance of the model.

TASK-11 (Classification using Linear Discriminant Analysis).

a) Read the iris dataset
b) Perform Linear Discriminant Analysis.
c) Classify the data using Random Forest Classifier.
d) Evaluate the performance of the model.
e) Compare the performance of LDA with PCA (results from TASK-10)

TASK-12(Cluster Analysis using K-Means).

a) Read the Titanic dataset from UCI Machine learning repository.
b) Apply data Preprocessing techniques.
c) Use PCA for dimensionality reduction.
d) Perform Cluster Analysis using K-Means algorithm

Textbooks:
1. An Introduction to Multivariate Statistical Analysis, T.W. Anderson.
2. Applied Multivariate Data Analysis, Vol I & II, J.D. Jobson.
3. Statistical Tests for Multivariate Analysis, H. Kris.
4. Programming Python, Mark Lutz.
5. Python 3 for Absolute Beginners, Tim Hall and J-P Stacey.
6. Beginning Python: From Novice to Professional, Magnus Lie Hetland. Edition, 2005.

Reference Books:
1. Regression Diagnostics, Identifying Influential Data and Sources of Collinearety, D.A. Belsey,E. Kuh and R.E. Welsch
2. Applied Linear Regression Models, J. Neter, W. Wasserman and M.H. Kutner.
3. The Foundations of Factor Analysis, A.S. Mulaik.
4. Introduction to Linear Regression Analysis, D.C. Montgomery and E.A. Peck.
5. Cluster Analysis for Applications, M.R. Anderberg.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATABASES LAB

Course Code: GR22A2096   **L/T/P/C:0/0/2/1**
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 database objects.
4. Compare the use of procedure and function in database.
5. Use SQLite to connect to database from C programs.

LIST OF EXPERIMENTS:

TASK-1 (DDL and DML Commands):
a) Practice queries on DDL Commands
b) Practise queries on DML Commands

TASK-2 (SQL Functions):
a) Practice queries using basic SQL operators.
b) Practice queries on between..And, like and not operators.
c) Use various built in SQL Functions and practice queries

TASK-3 (Aggregate Operators):
a) Perform aggregate operations and generate queries using them.
b) Implement the group by and having clauses with aggregate operators.

TASK-4 (Nested Queries):
a) Write queries to illustrate the use of pair wise sub queries.

b) Practice the single row and multiple row sub queries.

c) Use sub queries in Create, Insert, Update and delete commands

TASK-5 (Joins and Set Operators):
a) Practice queries on various kinds of joins.
b) Practice queries on set operators.

TASK-6 (Views):
a) Create a simple view and try modifications through it.

b) Create a complex view and understand the restrictions for modifications through it.

c) Practice the creation of sequence and synonym.

TASK-7(Indexes, Sequences and Synonyms):
a) Practice the creation of sequence and synonym.
b) Practice creation of function based indexes.
c) Create an index on attribute of a table.

TASK-8 (DCL Commands):

a) Practice grant and revoke of user level privileges.
b) Practice object-level privileges and creation of roles.

TASK-9 (PL/SQL Blocks, Named Blocks):

a) Write programs to use the anonymous blocks.
b) Develop PL/SQL named blocks-Procedures, Functions.

TASK-10(Cursor and Trigger):

a) Write a PL/SQL program to illustrate the purpose of cursors.
b) Write a PL/SQL program to exemplify the concept of triggers.

TASK-11(C Implementation for DB):

a) Write a C program to connect to SQLite Database and perform DDL and DML operations init.
b) Write a C program to perform all kinds of retrieval operations on SQLite database.

TASK-12(Case Study):

a) Download standard data of reasonable size (Unit level data of various rounds of NSS surveys)form the internet and implement various SQL commands.

TEXTBOOKS:

1. Database System Concepts. Abraham Silberschatz, Henry F. Korth and S. Sudarshan.

REFERENCE BOOKS:

1. Principles of Database and Knowledge – Base Systems, Vol 1 by J. D. Ullman.
2. Fundamentals of Database Systems. R. Elmasri and S. Navathe.
3. Foundations of Databases. Serge Abiteboul, Richard Hull, Victor Vianu.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CONSTITUTION OF INDIA

Course Code: GR22A2003   **L/T/P/C: 2/0/0/0**
II Year I Semester

Course Outcomes:
1. Know the importance of the Constitution and Government.
2. Become Good Citizens and know their fundamental rights, duties and principles.
3. Learn about the role of PM, President, Council of Ministers and Local Administration.
4. Understand the importance of Election Commission.
5. 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, Importance of grass root democracy.

UNIT V
Election Commission: 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 and women.

TEXT/REFERENCE BOOKS:
1. 'Indian Polity' by Laxmikanth 5th Edition, McGraw Hill Edition. 2.Indian Constitution by Subhash C. Kashyap, Vision Books Publisher
3. 'Introduction to Indian Constitution' by D.D. Basu, 21st Edition, LexisNexis Publisher
4. 'Indian Administration by avasthi and avasthi-by lakshminarain agarwal publication

II YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OPERATING SYSTEMS CONCEPTS

Course Code: GR22A2097   **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Outcomes:
1. Explain functions and structures of operating system and differentiate among different OStypes; Basics of process and threads
2. Implement and analyze various process management concepts and maximize CPU throughput.
3. Analyze synchronization problems and solutions; Design a deadlock management policy.
4. Optimize memory management for improved system performance.
5. Demonstrate disk management, implement disk scheduling, I/O and file system management,Able to use UNIX operating system

UNIT I
Introduction: Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS.
Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.
Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.

UNIT II
Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
Scheduling algorithms: Pre-emptive and non-pre-emptive, FCFS, SJF, RR; Multi processor scheduling: Real Time scheduling: RM and EDF.
Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention,Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT III
Inter-process Communication: Concurrent processes, precedence graphs, Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Strict Alternation, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem, Barber's shop problem.
Concurrent Programming: Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection and recovery.

UNIT IV
Memory Management: Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and

External fragmentation and Compaction.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

UNIT V

I/O Hardware: I/O devices, Device controllers, Direct Memory Access, Principles of I/O.

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation(linear list, hash table), efficiency and performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks.

Case study: UNIX OS file system, shell, filters, shell programming, programming with the standardI/O, UNIX system calls.

TEXTBOOKS:

1. Operating System Concepts Essentials. Abraham Silberschatz, Peter Baer Galvin and GregGagne.

REFERENCE BOOKS:

1. Operating Systems: Internals and Design Principles. William Stallings.
2. Operating System: A Design-oriented Approach. Charles Patrick Crowley.
3. Operating Systems: A Modern Perspective. Gary J. Nutt.
4. Design of the Unix Operating Systems. Maurice J. Bach.
5. Understanding the Linux Kernel, Daniel Pierre Bovet, Marco Cesati.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PRINCIPLES OF SOFTWARE ENGINEERING

Course Code:GR22A2098   **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Outcomes:
1. Apply software engineering principles and techniques.
2. Analyze project management and process improvement activities.
3. Produce efficient, reliable, robust and cost-effective software solutions.
4. Analyze the problem domain space, user requirements and design an application using software engineering concepts.
5. Apply various testing activities for real time applications.

UNIT I

Introduction: Programming in the small vs. programming in the large; software project failures and importance of software quality and timely availability; engineering approach to software development; role of software engineering towards successful execution of large software projects; emergence of software engineering as a discipline.

UNIT II

Software Project Management: Basic concepts of life cycle models – different models and milestones; software project planning – identification of activities and resources; concepts of feasibility study; techniques for estimation of schedule and effort; software cost estimation models and concepts of software engineering economics; techniques of software project control and reporting; introduction to measurement of software size; introduction to the concepts of risk and its mitigation; configuration management.

UNIT III

Software Quality and Reliability: Internal and external qualities; process and product quality; principles to achieve software quality; introduction to different software quality models like McCall, Boehm, FURPS / FURPS+, Dromey, ISO – 9126; introduction to Capability Maturity Models (CMM and CMMI); introduction to software reliability, reliability models and estimation.

UNIT IV

Problem Space Understanding:
How an industry works, how an IT company works, How IT supports business, Problem Space Understanding, Knowledge Driven Development (KDD), Domain knowledge framework of KDD,usage of domain knowledge framework in Insurance, Banking and Automobile, KDD as a project delivery methodology, Linking domain knowledge to software development, An example to illustrate this, A case study to produce a KDD artifact using Agile.

Software Requirements Analysis, Design and Construction: Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modeling – decision tables, event tables, state transition tables, Petri nets; requirements documentation through use cases; introduction to UML, introduction to software metrics and metrics-based control methods; measures of code and design quality.

UNIT V

Software Testing: Introduction to faults and failures; basic testing concepts; concepts of verification and validation; black box and white box tests; white box test coverage – code coverage, condition coverage, branch coverage; basic concepts of black-box tests – equivalence classes, boundary value tests, usage of state tables; testing use cases; transaction-based testing; testing for non-functional requirements – volume, performance and efficiency; concepts of inspection.

TEXTBOOKS:

1. Software Engineering, Ian Sommerville

REFERENCE BOOKS:

1. Fundamentals of Software Engineering, Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino
2. Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices,Michael Jackson
3. The Unified Development Process, Ivar Jacobson, Grady Booch, James Rumbaugh
4. Design Patterns: Elements of Object-Oriented Reusable Software, Erich Gamma, Richard Helm,Ralph Johnson, John Vlissides
5. Software Metrics: A Rigorous and Practical Approach, Norman E Fenton, Shari LawrencePfleeger
6. Software Engineering: Theory and Practice, Shari Lawrence Pfleeger and Joanne M. Atlee
7. Object-Oriented Software Construction, Bertrand Meyer
8. Object Oriented Software Engineering: A Use Case Driven Approach --Ivar Jacobson
9. Touch of Class: Learning to Program Well with Objects and Contracts --Bertrand Meyer
10. UML Distilled: A Brief Guide to the Standard Object Modeling Language --Martin Fowler

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ALGORITHM DESIGN AND ANALYSIS

Course Code: GR22A2099   **L/T/P/C :3/0/0/3**
II Year II Semester

Course Outcomes:
1. Analyze the performance of algorithms and represent using asymptotic notations.
2. Differentiate and demonstrate various algorithm design strategies.
3. Solve various problems using algorithmic design paradigms and can analyze their complexities.
4. Demonstrate and solve the tree traversal problems and analyze its complexity.
5. Distinguish NP complete and NP hard problems.

UNIT I

Introduction: Characteristics of Algorithm. Analysis of Algorithm: Asymptotic analysis of Complexity Bounds – Best, Average and Worst-Case behavior; Performance Measurements of Algorithm, Time and Space Trade-Offs, Analysis of Recursive Algorithms through Recurrence Relations: Substitution Method, Recursion Tree Method and Masters' Theorem.

UNIT II

Fundamental Algorithmic Strategies: Brute-Force, Heuristics, Greedy, Dynamic Programming, Branch and Bound and Backtracking methodologies; Illustrations of these techniques for Problem-Solving, Bin Packing, Knapsack, Travelling Salesman Problem.

UNIT III

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

UNIT IV

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reductiontechniques.

UNIT V

Advanced Topics: Approximation algorithms, Randomized algorithms, Class ofproblems beyond NP – P SPACE, Introduction to Quantum Algorithms.

TEXTBOOKS:
1. Fundamental of Computer Algorithms, E. Horowitz and S. Sahni.
2. The Design and Analysis of Computer Algorithms, A. Aho, J. Hopcroft and J. Ullman.

REFERENCE BOOKS:
1. "Introduction to Algorithms", T. H. Cormen, C. E. Leiserson and R. L. Rivest.
2. "Computer Algorithms: Introduction to Design and Analysis", S. Baase.
3. "The Art of Computer Programming", Vol. 1, Vol. 2 and Vol. 3, .D. E. Knuth.
4. "Quantum Computation and Quantum Information" Michael A. Nielsen .

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INTRODUCTION TO INNOVATION, IP MANAGEMENT AND
ENTREPRENEURSHIP

Course Code: GR22A2100   **L/T/P/C: 3/ 0/ 0/ 3**
II Year II Semester

Course Outcomes:
1. Studyand understand what and why innovation is required and its process andsources of innovation.
2. Investigate, understand, and internalize the process of building an innovativeorganization.
3. Recognize the characteristics of different types of entrepreneurships and learn to manage various types of IPR to protect competitive advantage
4. Independently formulate a business plan based on a business idea in technology, planand understanding the financial implication in entrepreneurship & financial planning.
5. Exceptional in IPR in Indian business perspective and IPR in international context.

UNIT I
Introduction to Innovation (What and Why) - Innovation as a core business process,Sources of innovation, Knowledge push vs. need pull innovations.
Class Discussion- Is innovation manageable or just a random gambling activity?

UNIT II
Building an Innovative Organization: Creating new products and services, exploiting openinnovation and collaboration, Use of innovation for starting a new venture
Class Discussion- Innovation: Co-operating across networks vs. 'go-it-alone' approach

UNIT III
Entrepreneurship: Opportunity recognition and entry strategies, Entrepreneurship as a Styleof Management, Maintaining Competitive Advantage- Use of IPR to protect Innovation

UNIT IV
Entrepreneurship- Financial Planning: Financial Projections and Valuation, Stages of financing, Debt, Venture Capital and other forms of Financing

UNIT V
Intellectual Property Rights (IPR): Introduction and the economics behind development of IPR: Business Perspective, IPR in India – Genesis and Development, International Context, Concept of IP Management, Use in marketing.
Types of Intellectual Property: Patent- Procedure, Licensing and Assignment, Infringement and Penalty, Trademark- Use in marketing, example of trademarks- Domain name, Geographical Indications- What is GI, why protect them? Copyright- What is copyright, Industrial Designs- What is design? How to protect?
Class Discussion- Major Court battles regarding violation of patents between corporate companies

Assignment:
Case study materials books will be given to students. Students are required to meet in groups

before coming to class and prepare in the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.

Further, the topic for class discussion will be mentioned beforehand and students should be ready to discuss these topics (in groups) in class. Students are required to meet in groups before coming to class and prepare on the topic. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

Topic 1- Is innovation manageable or just a random gambling activity?

Topic 2- Innovation: Co-operating across networks vs. 'go-it-alone' approach

Topic 3- Major Court battles regarding violation of patents between corporate companies

Textbooks:

1. Joe Tidd, John Bessant. Managing Innovation: Integrating Technological, Market and Organizational Change

2. Case Study Materials: To be distributed for class discussion.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OPERATIONAL RESEARCH

Course Code: GR22A2101   **L/T/P/C: 2/ 0/ 0/ 2**
II Year II Semester

Course Outcomes

1. To impart knowledge in concepts, tools of operations research and to understand and apply the theoretical workings method for linear programming and apply various linear programming techniques for optimal allocation of limited resources.
2. To be able to build and solve transportation and assignment problems using appropriate method
3. To be exceptional to design and solve simple models of project scheduling techniques such as PERT & CPM in developing critical thinking and objective analysis of decision problems.
4. To understand the inventory management elements including the relevant related costs and distinguish various inventory models for developing proper inventory control policies.
5. To examine situations in which queuing problems are generated and appreciate simulation methodology.

UNIT I

Introduction to OR: Origin of OR and its definition. Concept of optimizing performance measure, Types of OR problems, Deterministic vs. Stochastic optimization, Phases of OR problem approach – problem formulation, building mathematical model, deriving solutions, validating model, controlling, and implementing solution.

Linear Programming: Linear programming – Examples from industrial cases, formulation & definitions, Matrix form. Implicit assumptions of LPP.

Some basic concepts and results of linear algebra – Vectors, Matrices, Linear Independence / Dependence of vectors, Rank, Basis, System of linear eqns., Hyperplane, Convex set, Convexpolyhedron, Extreme points, Basic feasible solutions.

Geometric method: 2-variable case, Special cases – infeasibility, unboundedness, redundancy & degeneracy, Sensitivity analysis.

Simplex Algorithm – slack, surplus & artificial variables, computational details, big-M method, identification and resolution of special cases through simplex iterations.

Duality – formulation, results, fundamental theorem of duality, dual-simplex and primal-dual algorithms.

UNIT II

Transportation and Assignment problems: TP - Examples, Definitions – decision variables, supply & demand constraints, formulation, Balanced & unbalanced situations, Solution methods – NWCR, minimum cost and VAM, test for optimality (MODI method), degeneracy and its resolution.

AP - Examples, Definitions – decision variables, constraints, formulation, Balanced & unbalanced situations, Solution method – Hungarian, test for optimality (MODI method), degeneracy & its resolution.

UNIT III

PERT – CPM: Project definition, Project scheduling techniques – Gantt chart, PERT & CPM, Determination of critical paths, Estimation of Project time and its variance in PERT using statistical principles, Concept of project crashing/time-cost trade-off.

UNIT IV

Inventory Control: Functions of inventory and its disadvantages, ABC analysis, Concept of inventory costs, Basics of inventory policy (order, lead time, types), Fixed order-quantity models – EOQ, POQ & Quantity discount models. EOQ models for discrete units, sensitivity analysis and Robustness, Special cases of EOQ models for safety stock with known / unknown stock out situations, models under prescribed policy, Probabilistic situations.

UNIT V

Queuing Theory:

Definitions – queue (waiting line), waiting costs, characteristics (arrival, queue, service discipline) of queuing system, queue types (channel vs. phase).
Kendall's notation, Little's law, steady state behaviour, Poisson's Process & queue, Models with examples - M/M/1 and its performance measures; M/M/m and its performance measures; brief description about some special models.

Simulation Methodology:

Definition and steps of simulation, random number, random number generator, Discrete Event System Simulation – clock, event list, Application in Scheduling, Queuing systems andInventory systems.

Textbooks:

1. Operations Research: An Introduction. H.A. Taha.

Reference Books:

1. Linear Programming. K.G. Murthy.
2. Linear Programming. G. Hadley.
3. Principles of OR with Application to Managerial Decisions. H.M. Wagner.
4. Introduction to Operations Research. F.S. Hiller and G.J. Lieberman.
5. Elements of Queuing Theory. Thomas L. Saaty.
6. Operations Research and Management Science, Handbook: Edited By A. RaviRavindran.
7. Management Guide to PERT/CPM. Wiest & Levy.
8. Modern Inventory Management. J.W. Prichard and R.H. Eagle.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OPERATING SYSTEMS CONCEPTS LAB

Course Code: GR22A2102   **L/T/P/C: 0/0/2/1**
II Year II Semester

Course Outcomes:
1. Demonstrate the knowledge of UNIX using commands and shell programming
2. Evaluate the performance of different types of CPU scheduling algorithms and implement problems using semaphores.
3. Simulate Banker's algorithm for deadlock avoidance
4. Implement page replacement policies and memory allocation techniques in memory management.
5. Implement indexing and hashing strategies.

Laboratory

TASK 1

Experiment Unix commands (files directory, data manipulation, network communication etc)

TASK 2

Write programs using shell programming and use of vi editor

TASK 3

Simulate the following Scheduling algorithms using C program

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

TASK 4

To write a C program to implement concept of Shared memory

TASK 5

Simulate Thread and Multi Thread using a C program

TASK 6

To write a C program to implement concept of Inter Process Communication

TASK 7

Implement an Algorithm for Dead Lock Detection in C.

TASK 8

Simulate Bankers Algorithm for Deadlock Avoidance in C.

TASK 9

Simulate the Readers – Writer's problem using semaphores.

TASK 10

To write C program to implement concepts of Memory Management:

a)Simulate First Fit   b) Best Fit algorithm

TASK 11

To write C program to Simulate page replacement Algorithms for memory management:

a) FIFO   b) LRU

TASK 12

To write a C program to implement the concept of Indexing and Hashing

Textbooks:

1. Operating System Concepts Essentials. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne.

Reference Books:

1. Operating Systems: Internals and Design Principles. William Stallings.
2. Operating System: A Design-oriented Approach. Charles Patrick Crowley.
3. Operating Systems: A Modern Perspective. Gary J. Nutt.
4. Design of the Unix Operating Systems. Maurice J. Bach.
5. Understanding the Linux Kernel, Daniel Pierre Bovet, Marco Cesati.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOFTWARE ENGINEERING LAB

Course Code: GR22A2103   **L/T/P/C: 0/0/2/1**
II Year II Semester

Course Outcomes
1. Analyze and identify requirements for real time problems.
2. Design and implement various software design models.
3. Usage of modern engineering tools for specification, design, and implementation.
4. Provide appropriate solutions for real time problems using software engineering methodology.
5. Design test cases for various real time problems.

Software's Used: StarUML /Umbrello & JUNIT
Develop the following applications using software engineering methodologies.
1. Unified Library System 2. Online Railway Reservation System

TASK1

Prepare the problem statement for the above applications.

TASK2

Develop Software Requirement Specification (SRS) for the above applications.

TASK3

Design the data flow diagram for the above applications.

TASK4

Design the class diagrams for the above applications.

TASK 5

Design the Use-case diagrams for the above applications.

TASK 6

Design the interaction diagrams for the above applications.

TASK 7

Perform forward engineering for the above application and generate a report of the same.

TASK 8

Perform reverse engineering for the above application and generate a report of the same.

TASK 9

Write a C++ program to demonstrate the working of the fallowing constructs:
    i) while   ii) if …else   iii) Switch   iv) for Loops in C++ language

TASK 10

Create a test plan document for any application (e.g. Unified Library System)

TASK 11

Implement a Junit Test program and design test cases to find the maximum of an array of numbers.

TASK 12

Implement a Junit Test program and design test cases to count the number of elements in array of numbers.

TEXTBOOKS:
1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson,
2. Pearson Education.
3. UML 2 Toolkit, Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEYDreamtech India Pvt. Ltd.
4. Software Engineering, Ian Sommerville

REFERENCE BOOKS:
1. Fundamentals of Software Engineering, Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino
2. Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices, Michael Jackson
3. The Unified Development Process, Ivar Jacobson, Grady Booch, James Rumbaugh
4. Design Patterns: Elements of Object-Oriented Reusable Software, Erich Gamma,Richard Helm, Ralph Johnson, John Vlissides
5. Software Metrics: A Rigorous and Practical Approach, Norman E Fenton, ShariLawrence Pfleeger
6. Software Engineering: Theory and Practice, Shari Lawrence Pfleeger and Joanne M. Atlee
7. Object-Oriented Software Construction, Bertrand Meyer
8. Object Oriented Software Engineering: A Use Case Driven Approach --Ivar Jacobson
9. Touch of Class: Learning to Program Well with Objects and Contracts --Bertrand Meyer
10.UML Distilled: A Brief Guide to the Standard Object Modeling Language --Martin Fowler

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ALGORITHM DESIGN AND ANALYSIS LAB

Course Code: GR22A2104   **L/T/P/C: 0/ 0/ 2/1**
II Year II Semester

Course Outcomes:
1. Ability to write programs in C to solve problems using algorithm design techniques.
2. Compare and measure the performance of different algorithms.
3. Write programs in C to solve problems using divide and conquer strategy.
4. Implement programs in C to solve problems using backtracking strategy.
5. To write programs in C to solve minimum spanning tree for undirectedgraphs using Krushkal's and prim's algorithms.

List of Programs:

TASK 1

Implement and analyze time complexity in best & worst case for Binary Search andQuick Sort

TASK 2

Implement and analyze time complexity in best & worst case for Merge Sort and StrassenMatrix Multiplication

TASK 3

Implement and analyze time complexity of Greedy Application Problems.

TASK 4

Implement and analyze time complexity of Dynamic Programming ApplicationProblems.

TASK 5

Implement and analyze time complexity of Greedy Application Problems, Prims &Kruskal's Algorithms

TASK 6

Implement and analyze time complexity of Backtracking Application Problems.

TASK 7

Implement and analyze time complexity of Branch & Bound Application Problems.

TASK 8

Implement and analyze time complexity of BFS and DFS and their applications.

TASK 9

Implement and analyze time complexity of Dijkstra and Floyd Warshall Algorithms.

TASK 10

Implement and analyze time complexity of Topological sorting, Network Flow Problems.

TASK 11

Implement sample problem on P, NP, NP complete and NP hard

TASK 12

Implement and analyze time complexity of Randomized Quick Sort.

TEXTBOOKS:

1. Fundamental of Computer Algorithms, E. Horowitz and S. Sahni
2. The Design and Analysis of Computer Algorithms, A. Aho, J. Hopcroft and J. Ullman

REFERENCE BOOKS:

1. Introduction to Algorithms, T. H. Cormen, C. E. Leiserson and R. L. Rivest
2. Computer Algorithms: Introduction to Design and Analysis, S. Baase
3. The Art of Computer Programming, Vol. 1, Vol. 2 and Vol. 3, D. E. Knuth

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OPERATIONAL RESEARCH LAB

Course Code: GR22A2105   **L/T/P/C: 0 / 0/ 2 / 1**
II Year II Semester

Course Outcomes:
1. Finding the solutions to liner programming problems by Graphical and Simplex Method.
2. Implement optimal solutions of transportation and assignment problems.
3. Analyze the project network diagram.
4. Demonstrate the use of Inventory Models.
5. Implement Queuing & Simulation models

TASK 1
Formulation of linear programming problems.

TASK 2
Solution of linear programming problem using graphical method with:
    i. Multiple constraints
    ii. Unbounded solution
    iii. Infeasible solution
    iv. Alternative or multiple solution

TASK 3
Enumeration of all basic solutions for linear programming problem.

TASK 4
Solution of linear programming problem with simplex method.

TASK 5
Problem solving using Big M method.

TASK 6
Problem solving using two phase method.

TASK 7
Solution on primal problem as well as dual problem.

TASK 8
Solution based on dual simplex method.

TASK 9
Verification of weak duality, strong duality and complementary slackness property.

TASK 10
Solution of transportation problem.

TASK 11
Solution of assignment problem.

TASK 12
ABC analysis.

TASK 13
Inventory model.

TASK 14
Performance measures for M/M/1 queuing model.

TASK 15
Monte Carlo method.

TASK 16
Simulation: Random number generation.

TASK 17
Solution of integer programming problem using Branch and Bound method.

TASK 18
Solution of integer programming problem using Gomory's cutting plane method.

Textbooks:
1. Operations Research: An Introduction. H.A. Taha.

Reference Books:
1. Linear Programming. K.G. Murthy.
2. Linear Programming. G. Hadley.
3. Principles of OR with Application to Managerial Decisions. H.M. Wagner.
4. Introduction to Operations Research. F.S. Hiller and G.J. Lieberman.
5. Elements of Queuing Theory. Thomas L. Saaty.
6. Operations Research and Management Science, Handbook: Edited By A. Ravi Ravindran.
7. Management Guide to PERT/CPM. Wiest & Levy.
8. Modern Inventory Management. J.W. Prichard and R.H. Eagle.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DESIGN AND CRITICAL THINKING

Course Code: GR22A2106   **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Outcomes:
1. Understand the application of Design Thinking in engineering and businessapplication and how to empathize and identify the steps in the DT process
2. Create personas in the define phase of DT. Recognize the steps to create problem statements in the define phase of DT
3. Apply the steps in the ideate phase of DT. Recognize how doodling can help to express ideas. Apply storytelling in presenting ideas and prototypes
4. Create a prototype for the Idea chosen
5. Create a value proposition statement. Recognize the best practices of the testing phase in DT. Test a prototype created through a DT process. Recognize how DT can help in functional work

UNIT I
Design Thinking Overview and Motivation: Design Thinking for business – Stories, Examples and Case Studies; Design Thinking for Students; Introduction to Design Thinking – Stanford's 5-step model.
*Activities to understand Design Thinking and its applications

UNIT II
Doing Design: Empathize Phase: Empathy; Importance of Empathy; Empathy Tools; Introduction to Immersion Activity; Persona, Importance of Persona Creation; Data collection and Inferences
*Activities for Empathize Phase

UNIT III
Doing Design: Define Phase: Problem Statements – Introduction, Definition, Validation; Need Analysis: Types of Users, Types of Needs; Addressable Needs and Touchpoints; Structuring Need Statements.
*Activities for Define Phase

UNIT IV
Doing Design: Ideate Phase Ideation tools: Six Thinking Hats; Ideate to generate solutions; Doodling and Storytelling to present ideas.
*Activities for Ideate Phase

UNIT V
Doing Design:

Prototype Phase

Introduction to Prototype: Methods of Prototyping, Value proposition for the solution

Test Phase

Importance of testing; Feedback Collection, Documentation of Feedback, Inference from Feedback, Looping of Design Thinking, Agile and Design Thinking to deliver customer

satisfaction.

***Activities for Prototype Phase, Test Phase**

TEXTBOOKS:
1. There are no prescribed texts for Semester 5 – there will be handouts and reference links shared

Web References:

1. What is Design Thinking? Interaction Design Foundation
2. What are some of the good examples of design thinking? - Quora
3. Design thinking 101: Principles, Tools & Examples to transform your creative process

REFERENCES:
1. Nir Eval, Hooked. How to Build Habit-Forming Products, Penguin Publishing Group
2. Rod Judkins, The Art of Creative Thinking, Hodder & Stoughton
3. Dan Senor and Saul Singer, Start-up Nation. The Story of Israel's Economic Miracle,
4. Grand Central Publishing
5. Simon Sinek, Start with Why. How Great Leaders Inspire Everyone to Take Action, Penguin Books Limited

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (NON-CREDIT)

Course Code: GR22A2107   **L/T/P/C: 2/0/0/0**
II Year II Semester

Course Outcomes:
1. Impart knowledge in concepts and understand basic principles, thought process, reasoning and recognize wisdom of Sanskrit literature and its importance in modern society with rapid technological advancements.
2. Understand the legal framework and traditional knowledge and connect various enactments related to the protection of traditional knowledge.
3. Understand that sustainability is at the core of Indian Traditional Knowledge Systems through the evaluation of modern science in the mathematical era.
4. Be familiar with scientific worldview and basic principle's Indian philosophy andearly literature.
5. Familiarize Ayurveda importance in modern life and process for health & Well-beingwith Ayurveda.

UNIT I

Introduction to the basic structure of Indian knowledge system: The historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), Traditional Knowledge (TK) Vs western knowledge traditional knowledge vis-à-vis formal knowledge. Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT II

Various enactments related to the protection of traditional knowledge: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act).

UNIT III

Introduction to the modern science and Indian knowledge system: Mathematics in India, Early Historical Period, The Classical Period, The Classical Period, post-Āryabhaṭa, Features of Indian Mathematics.

UNIT IV

Modern Science and Indian philosophy: Early Chemical Techniques, Atomism in Vaiśeṣika, Chemistry in Early Literature, Indian Philosophy Sāṁkhya, Yoga, Vaiśeṣika, Nyāya, Mīmāṁsā, Vedānta, Sāṁkhya.

UNIT V

Yoga and Holistic Health care for human wellbeing: Ayurveda for Life, Health and Well-being Definition of Ayurveda, the principles of Ayurvedic healing, treating diseases to restore health, Astanga Ayurveda.

REFERENCES:
1. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya VidyaBhavan, Mumbai. 5th Edition, 2014.

2. Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan.
3. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino
4. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016

E-Resources:
1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/

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

Course Code: GR22A2107   **L/T/P/C: 0/0/4/2**
II Year II Semester

Course Outcomes:
At the end of this course, students will be able to:
1. Predict the Field domain in the specialized area under Engineering discipline.
2. Evaluate and Obtained the category of the solution with help of Real time studies
3. Analyse and Discuss the field problems using software tools /Modes/simulations and experimental investigations.
4. Implementing the solution of problem statement.
5. Prioritize the reports and deliver the final work with presentation.

III YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOFTWARE DESIGN WITH UML

Course Code: GR22A3059   **L/T/P/C: 2/0/0/2**
III Year I Semester

Course Outcomes:
1. Understand the concepts and principles of object-oriented programming concepts and the software development process models.
2. Interpret contemporary issues and discuss analysis and coding standards.
3. Describe the basic resource management responsibilities of dynamic diagrams of the UML.
4. Analyze the design methods and modeling techniques.
5. Design UML diagrams for real time problems.

UNIT 1
Introduction to Object Oriented Technologies and the UML Method.
Software development process: The Waterfall Model vs. The Spiral Model, The Software Crisis, description of the real world using the Objects Model, Classes, inheritance and multiple configurations, Quality software characteristics, Description of the Object-Oriented Analysis process vs. the Structure Analysis Model.

UNIT II
Introduction to the UML Language.
Standards, Elements of the language, General description of various models, The process of Object-Oriented software development. Description of Design Patterns. Technological Description of Distributed Systems.
Requirements Analysis Using Case Modeling
Analysis of system requirements. Actor definitions, writing a case goal, Use Case Diagrams, UseCase Relationships.

UNIT III
Transfer from Analysis to Design in the Characterization Stage: Interaction Diagrams. Description of goal, Defining UML Method, Operation, Object Interface, Class. Sequence Diagram. Finding objects from Flow of Events. Describing the process of finding objects using a SequenceDiagram.

UNIT IV
The Logical View Design Stage: The Static Structure Diagrams.
The Class Diagram Model, Attributes descriptions, Operations descriptions, Connectionsdescriptions in the Static Model, Association, Generalization, Aggregation, Dependency,Interfacing, Multiplicity.
Package Diagram Model.
Description of the model, White box, black box, Connections between packagers, Interfaces., Create Package Diagram, Drill Down.

UNIT V
Component Diagram Model.
Physical Aspect. Logical Aspect, Connections and Dependencies, User face Initial DB design in aUML environment.

Deployment Model.

Processors, Connections, Components Tasks, Threads, Signals and Events.

Textbooks:

1. Object-Oriented Software Engineering: using UML, Patterns, and Java. Bernd Bruegge andAllen H. Dutoit.

Reference Books:

1. Design Patterns: Elements of Reusable Object-Oriented Software. Erich Gamma, RichardHelm, Ralph Johnson, and John M. Vlissides.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPILER CONSTRUCTION

Course Code: GR22A3060   **L/T/P/C: 3/0/0/3**
III Year I Semester

Course Outcomes:
1. Understand the basic concepts and application of Compiler Design
2. Apply their basic knowledge Data Structure to design Symbol Table, Lexical Analyzer and Parser
3. Understand the Intermediate code generation techniques.
4. Analyze Various Code Optimization Techniques and Error Recovery mechanisms.
5. Understand various object-oriented features and non-imperative programming languages.

Unit I
Introduction: Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, relating regular expressions and finite automata, scanner generator (lex, flex).

Unit II
Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammarsand bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison)

Unit III
Semantic Analysis: Attribute grammar, syntax directed definition, evaluation, and flow of attribute in a syntax tree.
Symbol Table: Basic structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, scope.

Unit IV
Intermediate Code Generation: Translation of different language features, different types of intermediate forms.
Code Improvement (optimization): control-flow,data-flow dependence etc.;local optimization, global optimization, loop optimization, peep-hole optimization etc

Unit V
Architecture dependent code improvement: instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation.
Advanced topics: Type systems, data abstraction, compilation of Object-Oriented features andnon-imperative programming languages.

Textbooks:
1. Compilers: Principles, Techniques and Tools, V. Aho, R. Sethi and J. Ullman.

References:
1. The Design and Evolution of C++, Bjarne Stroustrup.
2. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF MANAGEMENT

Course Code: GR22A3061   **L/T/P/C: 2/0/0/2**
III Year I Semester

Course Outcomes:
1. The students understand the phases of evaluation of management and contributions of different authors.
2. The students will be familiar with management functions like planning, organizing, staffing,leading, and controlling aspects.
3. The student will be able to familiarize with the basic concepts of organization behavior, motivation, group dynamics, stress management, decision making and management of organizational culture.
4. The student will be able to understand classical and neo classical theories of organizationsand the concepts of leadership in an organizational environment.
5. The student is able to comprehend the importance of managerial / business ethics and the importance of corporate governance and corporate social responsibility.

UNIT I
Management Theories: Concept and Foundations of Management, Evolution of Management Thoughts [Pre-Scientific Management Era (before 1880), Classical management Era (1880-1930), Neo-classical Management Era (1930-1950), Modern Management era (1950-on word). Contribution of Management Thinkers: Taylor, Fayol, Elton Mayo etc.

UNIT II
Functions of Management- **Planning** – Planning process and types, **Organizing** – Organizing process and designing organization structure, **Staffing** – HR Planning, **Directing** – leading, motivating concepts, **Controlling-** controlling process and techniques.

UNIT III
Organization Behavior: Introduction, Personality, Perception, Learning and Reinforcement, Motivation, Group Dynamics, Power & Influence, Work Stress and Stress Management, Decision Making, Problems in Decision Making, Decision Making, Organizational Culture, Managing CulturalDiversity

UNIT IV
Organizational Design: Classical, Neoclassical and Contingency approaches to organizational design; Organizational theory and design, Organizational structure (Simple Structure, Functional Structure, Divisional Structure, Matrix Structure,
Leadership: Concept, Nature, Importance, Attributes of a leader, developing leaders across the organization, Leadership Grid

UNIT V
Managerial Ethics: Ethics and Business, Ethics of Marketing & advertising, Ethics of Finance & Accounting, Decision – making frameworks, Business and Social Responsibility, International Standards, Corporate Governance, Corporate Citizenship, Corporate Social Responsibility

Home Assignment:

The topic for class discussion will be mentioned beforehand and students should be ready to discussthese topics (in groups) in class. Students are required to meet in groups before coming to class and prepare on the topic. Few topics are mentioned below as examples. Instructor can add or change anytopic as per requirement.

1. Topic: Corporate social responsibility (CSR) and HRM implications: What does it mean to be socially responsible within an increasingly financially driven market economy?
2. Topic: Leaders are Born, Not Made! The debate

Textbooks:

1. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

2. Principles and Practice of Management, L. M. Prasad, Sultan Chand & Sons, 2012

3. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, Organizational Behavior

4. Organizational Behavior - An Evidence-Based Approach- by Fred Luthans, Published byMcGraw-Hill

Reference Books:

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.

2. Richard L. Daft, Understanding the Theory and Design of Organizations

3. Intellectual Property- Deborah E. Bouchoux, Cengage, 2012

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BUSINESS STRATEGY

Course Code: GR22A3062   **L/T/P/C: 2/0/0/2**
III Year I Semester

Course Outcomes:
1. To learn the fundamental concepts of strategic management to analyze business situations and apply these concepts to solve business problems.
2. To understand the fundamental principles for evaluation of internal environment of firm, to recognizing a firm's intellectual assetsthrough evaluating the businessprocessand capabilities.
3. To understand, examine the external environment of a firm and their competitive strategies for creating an efficient value chain.
4. To understand and explore the corporate growth strategies in relation to diversification, portfolio analysis, joint venture, and mergers& acquisition.
5. To determine the strategy implementation in a firm through its structure, systems, and corporate governance.

UNIT –I:
Introduction to Strategic Management
Importance of Strategic Management, Vision and Objectives of strategic Management, Schools of thought in Strategic Management, Strategy Content, Process, and Practice, Fit Concept and Configuration Perspective in Strategic Management

UNIT – II:
Internal Environment of Firm- Recognizing a Firm's Intellectual Assets
Core Competence as the Root of Competitive Advantage, Sources of Sustained Competitive Advantage, Business Processes and Capabilities-based Approach to Strategy

UNIT – III:
External Environments of Firm- Competitive Strategy Five Forces of Industry Attractiveness that Shape Strategy, The concept of Strategic Groups, and Industry Life Cycle, Generic Strategies, Generic Strategies, and the Value Chain

UNIT IV:
Corporate Strategy, and Growth Strategies The Motive for Diversification, Related and Unrelated Diversification, Business Portfolio Analysis Expansion, Integration and Diversification, Strategic Alliances, Joint Ventures,and Mergers & Acquisitions

UNIT V:
Strategy Implementation: Structure and Systems
The 7S Framework, Strategic Control and Corporate Governance
Final Project: Students (in groups/ individually) are required to work on a project and submit theproject report and deliver presentation. The topic of the project will be given later.

Home Assignment
1.Latest business events would be discussed in class and students should be ready to discuss

these events (in groups). The topic will be mentioned beforehand. Students are required to

meetin groups before coming to class and prepare on the topic.

2. There will be periodic homework assignments relating to the course concepts or mini cases. Specific instructions will be given separately.

Textbooks:

1. Robert M. Grant (2012). Contemporary Strategic Management, Blackwell, 7th Edition.

2. Strategic Management by Thompson and Strickland ,17th Edition, Tata McGraw-Hill EducationPrivate Limited,

Reference Books:

1. M.E. Porter, Competitive Strategy, 1980. M.E. Porter,
2. Competitive Advantage, 1985 Richard Rumelt (2011). Good Strategy Bad Strategy: TheDifference and Why It Matters.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BUSINESS COMMUNICATION AND VALUE SCIENCE – III

Course Code: GR22A3063   **L/T/P/C: 2/0/0/2**
III Year I Semester

Course Outcomes:
After completion of the course, the student should be able to
1. Apply & analyze the basic principles of SWOT & life positions.
2. Identify & respect pluralism in cultural spaces
3. Apply the science of Nation building
4. Understand, apply & analyze the tools of technical writing
5. Understand Artificial intelligence &recognize its impact in daily life

UNIT I
A) SWOT
- Understand SWOT and Life Positions through examples.
- Apply SWOT in real life scenarios, Create SWOT
- SWOT Vs. TOWS -The Balancing Act

B) Motivation
- Importance of Motivation in real life
- Leverage motivation in real-life scenarios.

UNIT II
A) Relevance of Cross-Cultural Communication
- Pluralism in cultural spaces
- Awareness and respect for pluralism in cultural spaces
- Rhythms of India with reference to Cultures in India
- Define and differentiate – 1) Global 2) local 3) Translocation
- Cross-cultural communication - Culture shock
- Gender awareness

UNIT III
A) Science of India
- Role of science and scientists in nation building
- Role of science post- independence
- Inventions –Inventors-Institutes-Information Technology

B) All about AI
- Artificial intelligence –Voice of the future
- Artificial intelligence in Everyday Life
- Communicating with machines

UNIT IV
A) Technical Writing
- Introduction to technical writing
- Basic rules of technical writing

- Applying technical writing in profession
- Scenario-based technical writing
- Best practices of technical writing

B) Situational Writing
- Summarizing & Synthesizing
- Abstract Writing
- Report Writing
- Product Description
- Description of a mechanism

UNIT –V
Community Oriented Learning (Through Projects)
- Introduction to Community Oriented Project Work
- Visit rural area /underprivileged parts of city to address some of the local issues.Suggest solutions to the issues.

Note: For Unit 5 students can form groups consisting of 5 students in each group. After completing the project should give presentation in the class and simultaneously submit the project to their respective Teachers.

Textbooks:
1. There are no prescribed texts for Semester 5 – there will be handouts and reference links.

References:
1. Effective Technical Communication (2005), Ashraf, Rizvi M, New Delhi: Tata McGraw Hill Publishing Company Limited, 2nd Edition
2. Technical Communication: A Reader-Centered Approach (2003), Anderson, Paul
3. V. Reports in Paul V. Anderson's 9th Edition, Boston: Heinle
4. Technical Communication: A Practical Approach, (2012) William S. Pfeiffer, 8th Edition, Pearson
5. Technical Communication (2001), Burnett, Rebecca, 6th Edition, Cengage Learning

Online Resources
https://youtu.be/CsaTslhSDI
https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M
https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y
https://m.youtube.com/watch?v=dT_D68RJ5T8&feature=youtu.be
https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu.be

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
CONVERSATIONAL SYSTEMS
(Professional Elective –I)

Course Code:GR22A3064   **L/T/P/C: 3/0/ 0/3**
III Year I Semester

Course Outcomes:
1. Review, critically analyse and synthesize conversational systems
2. Select appropriate Natural Language Processing Techniques for Conversationalsystems
3. Use appropriate methodologies for developing and evaluating conversationalsystems
4. Carry out testing of an implemented conversational system
5. Explain the purpose of virtual assistant agent's effect on the development,deployment, and evaluation of conversational Systems

UNIT I
Fundamentals of Conversational Systems: Introduction: Overview, Case studies, Explanation about different modes of engagement for a human being, History and impact of AI.
Underlying Technologies: Natural Language Processing, Artificial Intelligence and Machine Learning, NLG, Speech-To-Text, Text-To-Speech, Computer Vision etc. **Introduction to Top players in Market** – Google, MS, Amazon &Market trends. **Messaging Platforms** (Facebook, WhatsApp) and Smart speakers – Alexa, Google Home and other new channels. Ethical and Legal Considerations in AI Overview

UNIT II
Foundational Blocks for Programming: Basic Python programming concepts, NodeBasics.
Natural Language Processing: Introduction: Brief history, Basic Concepts, Phases of NLP, Application of chatbots etc.
General chatbot architecture, Basic concepts in chatbots: Intents, Entities, Utterances, Variables and Slots, Fulfillment. Lexical Knowledge Networks (WordNet, Verbnet, PropBank, etc). Lexical Analysis, Part-of-Speech Tagging, Parsing/Syntactic analysis, Semantic Analysis, Word Sense Disambiguation. Information Extraction, Sentiment Analysis), Affective NLG

UNIT III
Building a chatbot/Conversational AI system: Fundamentals of Conversational Systems (NLU, DM and NLG), Chatbot framework & Architecture, Conversational Flow & Design, Intent Classification (ML and DL based techniques), Dialogue Management Strategies, Natural Language Generation, UX design, APIs and SDKs, Usage of Conversational Design Tools.
Introduction to popular chatbot frameworks – Google Dialog flow, Microsoft Bot Framework, Amazon Lex, RASA Channels: Facebook Messenger, Google Home, Alexa, WhatsApp, Custom Apps. Overview of CE Testing techniques, A/B Testing, Introduction to Testing Frameworks - Botium /Mocha, Chai. Security & Compliance – Data Management, Storage, GDPR, PCI.

UNIT IV:
Role of ML/AI in Conversational Technologies –Brief Understanding on how Conversational Systems uses ML technologies in ASR, NLP, Advanced Dialog management,

Language Translation, Emotion/Sentiment Analysis, Informationextraction, etc. to effectively converse

UNIT V
Contact Centers: Introduction to Contact centers – Impact & Terminologies.
Conversation Analytics: The need of it, Introduction to Conversational Metrics.
Future – Where are we headed? Summary, Robots and Sensory Applications overview, XR Technologies in Conversational Systems, XR-Commerce, What to expect next? – Future technologies and market innovations overview.

 Textbooks:
1. Designing Voice User Interfaces: Principles of Conversational Experiences 1st Editionby Cathy Pearl, O'Reilly
2. Conversational Interfaces: Principles of Successful Bots, Chatbots & MessagingApps By Mariya Yao

Reference:
1. Bot Business 101: How to start, run & grow your Bot / AI business By Ekim Kaya
2. Designing Bots: Creating Conversational Experiences By Amir Shevat O'Reilly
3. Designing Conversational Interfaces By Alper Çuğun

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CLOUD, MICROSERVICES AND APPLICATIONS
(PROFESSIONAL ELECTIVE –I)

Course Code: GR22A3065   **L/T/P/C: 3/ 0/ 0/3**
III Year I Semester

Course Outcomes:
1. Understand the main concepts, Cloud service/Deployment Models Application of Cloud Computing
2. Describe the Monolithic & Distributed Architecture, Microservice fundamental and design approach
3. Analyze the API Fundamental, API management, API tools & fundamentals of DevOps
4. Design and developing solution steps using containers & containerization of application
5. Develop Use cases for various Cloud Applications.

UNIT I
Cloud Fundamentals: Cloud Service Components, Cloud service/Deployment Models. Application of Cloud Computing Cloud Components Guiding Principle with respect to utilization/Security/Pricing. and the applications of Cloud. Public Cloud Platforms overview andtheir usage.

UNIT II
Application architectures-Monolithic & Distributed Architecture, Microservice fundamental and design approach, Spring Boot fundamentals and Design of Microservices, Cloud Native applications-12 Factors App.

UNIT III
Application integration process/Application Process, API Fundamental, API management, APItools. Developer Portal. Applications of APIFICATION.

UNIT IV
DevOps fundamentals: Tools and Applications Containerization Process and application.

UNIT V
Python- Refresher, use cases for cloud application development, Design and developing solution steps using containers & containerization of application and deployment using Kubernetes, CloudSecurity and Monitoring Tools.

Textbooks:
1. Cloud Computing: Principles and Paradigms by RajkumarBuyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011
2. Cloud Computing Virtualization Specialist Complete Certification Kit - Study Guide Book, Ivanka Menken Gerard Blokdijk, 2009
3. Cloud Security: A Comprehensive Guide to Secure Cloud Computing By Ronald L. Krutz,Russell Dean Vines

REFERENCES:

1. Cloud Computing: A Practical Aprroach, Anthony T.Velte, TobeJ.Velte, Robert Elsenpeter, Publication Person Education, 2009
2. StorageVirtualization:TechnologiesforSimplifying Data Storageand Management, Tom Clark,Addison-Wesley, 2005
3. Cloud Computing Technologies and Strategies of the Ubiquitous Data Center, Curtis Franklin Jr.Brian J.S. Chee, 2010
4. Introduction to Cloud Computing: Business & Technology, Timothy Chou,2009

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MACHINE LEARNING WITH R PROGRAMMING
(PROFESSIONAL ELECTIVE –I)

Course Code:GR22A3066   **L/T/P/C: 3/ 0/ 0/3**
III Year I Semester

Course Outcomes:

1. Distinguish between, supervised, unsupervised and semi-supervised learning

2. Apply machine learning strategy for given supervised leaning based problem

3. Ability to get the skill to use advance machine learning techniques in real time applications

4. Implement the prediction models in various real time application areas

5. Understand the unsupervised machine learning techniques for clustering the given data

UNIT I
Introduction to Machine Learning (ML); Relationship between ML and human learning; A quicksurvey of major models of how machines learn; Example applications of ML.

UNIT II
Classification: Supervised Learning; The problem of classification; Feature Engineering; Training and testing classifier models; Cross-validation; Model evaluation (precision, recall, F1- measure, accuracy, area under curve); Statistical decision theory including discriminant functions and decision surfaces; Naive Bayes classification; Bayesian networks; Decision Tree and Random Forests; k-Nearest neighbor classification; Support Vector Machines; Artificial neural networks including backpropagation; Applications of classifications; Ensembles of classifiers including bagging and boosting.

UNIT III
Hidden Markov Models (HMM) with forward-backward and Vierbi algorithms; Sequence classification using HMM; Conditional random fields; Applications of sequence classification such as part-of-speech tagging.

UNIT IV
Regression: Multi-variable regression; Model evaluation; Least squares regression; Regularization; LASSO; Applications of regression. Association rule mining algorithms includingapriori, Expectation-Maximization (EM) algorithm for unsupervised learning.

UNIT V
Clustering: Average linkage; Ward's algorithm; Minimum spanning tree clustering; K-nearest neighbors clustering; BIRCH; CURE; DBSCAN, Anomaly and outlier detection methods.

Textbooks:
1. Machine Learning, Tom M. Mitchell, vMcGraw-Hill
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007

References:
1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
2. Machine Learning: The art and science of algorithms that make sense of data, Peter Flash,Cambridge. University press
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning,Springer 2009

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOFTWARE DESIGN WITH UML LAB

Course Code: GR22A3067   **L/ T/ P/ C: 0/0/4/2**
III Year I Semester

Course Outcomes:

1. Analyze and design the solutions for complex problems.
2. Determine how the object-oriented approach differs from the traditional approach to systems analysis and design.
3. Design various UML models using the appropriate notation.
4. Identify difference between various relationships, inheritance, association, aggregation, composition, and dependency relationships.
5. Understand the role and function of each UML model in developing object-oriented software.

Laboratory Experiments

Task1: Draw Class Diagram for ATM System.

Task2: Draw Object Diagram for ATM System.

Task3: Draw Use Case Diagram for ATM System.

Task4: Draw Sequence Diagram for ATM System.

Task5: Draw Collaboration Diagram for ATM System

Task6: Draw State Chart Diagram for ATM System.

Task7: Draw Activity Diagram for ATM System.

Task8: Draw Component Diagram for ATM System.

Task9: Draw Deployment Diagram for ATM System.

Task10: Draw UML Behavioral diagrams for Remote Procedure Call Implementation.

Task11: Draw UML Structural Diagrams for Remote Procedure Call Implementation.

Task12: Draw All UML Diagrams for Stock Maintenance System.

Textbooks:

1. The Unified Modelling Language User Guide. Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.
2. Object-Oriented Software Engineering: using UML, Patterns, and Java. Bernd Brueggeand Allen H. Dutoit.

References:
1. Design Patterns: Elements of Reusable Object-Oriented Software. Erich Gamma, RichardHelm, Ralph Johnson, and John M. Vlissides

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPILER CONSTRUCTION LAB

Course Code: GR22A3068   **L/T/P/C :0/ 0/ 4/ 2**
III Year I Semester

Course Outcomes:
1. Implement the techniques of Lexical Analyzer
2. Use lex to recognize token
3. Implement basic programs using yaac
4. Acquire practical knowledge on parsing
5. Implement three address code generation

LIST OF EXPERIMENTS:

TASK 1: Introduction to lex tools.
TASK 2: Lex program to count the number of words, characters, blank spaces and lines
TASK 3: LEX program to identify REAL PRECISION of the given number
TASK 4: LEX Program to recognize tokens

TASK 5: Implement a program to Elimination of Left Recursion in a grammar.

TASK 6: Program to implement Predictive Parsing.

TASK 7: Design LALR bottom-up parser for the above language.

TASK 8: Write program to generate machine code from the abstract syntax tree
           generated by the parser

TASK 9: Introduction to YACC.
TASK 10: Convert the BNF rules into Yacc form and Write code to generate abstract
           syntax tree.
TASK 11: YACC Program of an advanced desk calculator.
TASK 12: Program to Implement 3 Address Code.

Textbooks:
1. Compilers: Principles, Techniques and Tools, V. Aho, R. Sethi and J. Ullman.
2. lex&yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly

References:
1. The Design and Evolution of C++, Bjarne Stroustrup.
2. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs,Wileydreamtech

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MACHINE LEARNING WITH R PROGRAMMING LAB

Course Code: GR22A3075   **L/T/P/C: 0/ 0/ 2/1**
III Year I Semester

Course Outcomes:
1. Distinguish between, supervised, unsupervised and semi-supervised learning
2. Apply the appropriate machine learning strategy for any given problem
3. Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
4. Modify existing machine learning algorithms to improve classification efficiency
5. Compare the performance of various machine learning algorithms

Programs
TASK-1

(a) : Introduction to WEKA

(b) : Reading ARFF, CSV files and apply preprocessing techniques in Weka (UCI datasets)

TASK-2

(a) : Introduction to R Programming

(b) : Read dataset and practice basic programming concepts

TASK-3

(a): Perform Data exploration and pre-processing in R (use any UCI dataset)

(b): Perform Feature Engineering and Feature Selection Methods in R

TASK-4

(a): Implement regularized Linear regression in R (use any UCI dataset)

(b): Implement regularized logistic regression in R

TASK-5:
Implement Apriori association rule mining algorithm in R and Weka
TASK-6:
Implement K- means clustering algorithm in R and Weka
TASK-7:
Implement Decision Tree classification algorithm in R and Weka
TASK-8:
Implement Distance and density-based anomaly detection (K-NN) algorithm
TASK-9:
Implement Normal distribution in R programming for any dataset.
TASK-10:
Implement Expectation Maximization in R programming to solve exponential distribution
TASK-11:
Apply EM algorithm to cluster a set of data stored in a .CSV file and use the same data set forclustering using k-Means algorithm in R. Compare the results of these two algorithms and comment on the quality of clustering

TASK-12:

Write R program to construct a Bayesian network considering medical data. Use this model todemonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

Textbooks:

1. A First Course in Statistical Programming with R, W Braun (You?)|2016
2. Data Analytics Using R Paperback – 28 April 2018 by Seema Acharya (Author)
3. Machine Learning with R: Expert techniques for predictive modeling, 3rd Edition Paperback – Import, 15 April 2019 by Brett Lantz (Author)

References:

1. Beyond Spreadsheets with R: A beginner's guide to R and RStudio 1st Edition by Dr Jonathan Carroll (Author)
2. Data Science and Machine Learning with R Paperback – 30 July 2021by Reema Thareja (Author)
3. R.O. Duda, P.E. Hart, D.G. Stork, Pattern Classification, 2/e, Wiley, 2001.
4. Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
5. E. Alpaydin, Introduction to Machine Learning, 3/e, Prentice-Hall, 2014.
6. A. Rostamizadeh, A. Talwalkar, M. Mohri, Foundations of Machine Learning, MIT Press.
7. A. Webb, Statistical Pattern Recognition, 3/e, Wiley, 2011.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MINI PROJECT

Course Code: GR22A3149   **L/T/P/C: 0/0/2/1**
III Year I Semester

Course Outcome:
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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENVIRONMENTAL SCIENCE

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

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

UNIT 1: INTRODUCTION AND AWARENESS ACTIVITIES
Environmental Science: Introduction, Definition, scope and importance.
AWARENESS ACTIVITIES
Small group meetings about:
- Water management
- Wastewater treatment
- Projects Vs Environment
- Zero waste management
- Circular economy
- Impact of Science & Technology on Environment
- E-waste management
- Biodiversity loss
- Renewable Energy

UNIT 2: SLOGAN AND POSTER MAKING EVENT
- Food waste management
- Rainwater harvesting
- Climate change
- Green Power
- Water conservation
- Green at work
- Role of IT in environment and human health
- Sustainable development

UNIT 3: EXPERT LECTURES ON ENVIRONMENTAL SCIENCE
- Environmental Impact Assessment
- Industrial waste treatment
- Regenerative farming/Organic farming/Vertical gardens/Hydroponics
- Circular Economy

UNIT 4: CLEANLINESS DRIVE
- Indoor air pollution
- Vehicular pollution
- Visual pollution
- Waste management at home
- Composting

- Plastic recycling

UNIT 5: CASE STUDIES
- HPCL and LG Polymers disasters in Vizag
- Oleum gas leak in Delhi
- Mathura Refinery & Taj Mahal
- Conservation of Hussain Sagar Lake
- The Cleanliest city of India-Surat
- Green Buildings in India
- KBR park in Hyderabad (Environmental protection Vs Development)
- Fluorosis and remediation
- Evaluation of STP or ETP operation in Hyderabad
- Ecotourism & its impacts
- Positive Impact on Environment due to Lockdown Forced by Corona Pandemic

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

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

III YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER COMMUNICATIONS

Course Code: GR22A3129   **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Outcomes:
1. Understand modern network architectures from a design and technologies
2. Specify and identify deficiencies in existing protocols, and then Understand new and better protocols.
3. Analyze the topological and routing strategies for an IP based networking infrastructure
4. Understand the Application Layer functionalities and importance of Security in theNetwork
5. Understand the importance of Security in the Network

UNIT I
Introduction: Computer networks and distributed systems, Classifications of computer networks,Preliminaries of layered network structures.
Data communication Components: Representation of data and its flow, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media.

UNIT II
LAN: Wired LAN, Wireless LAN, Virtual LAN.
Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

UNIT III
Data Link Layer and Medium Access Sub Layer: Fundamentals of Error Detection and Error Correction, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go-back–N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA

UNIT IV
Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.
Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service (QoS), QoS improving techniques - Leaky Bucket and Token Bucket algorithms.

UNIT V
Application Layer: DNS, DDNS, TELNET, EMAIL, FTP, WWW, HTTP, SNMP, Bluetooth, Firewalls.
Network Security: Electronic mail, directory services and network management, Basic concepts of Cryptography.

Textbooks:
1. Computer Networks, A. Tannenbaum.
2. Data and Computer Communication, William Stallings.

References:
1. Network Security, Kaufman, R. Perlman and M. Speciner.
2. UNIX Network Programming, Vol. 1,2 & 3, W. Richard Stevens

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INFORMATION SECURITY

Course Code: GR22A3130   **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Outcomes:
1. Discuss the basics of information security
2. Illustrate the legal, ethical, and professional issues in information security
3. Demonstrate the aspects of risk management.
4. Become aware of various standards in the Information Security System
5. Design and implementation of Security Techniques.

UNIT I
Overview of Security Parameters: Confidentiality, integrity, and availability; Security violation and threats; Security policy and procedure; Assumptions and Trust; Security Assurance, Implementation and Operational Issues; Security Life Cycle.

UNIT II
Access Control Models: Discretionary, mandatory, roll-based, and task-based models, unified models, access control algebra, temporal, and spatio-temporal models.
Security Policies: Confidentiality policies, integrity policies, hybrid policies, non-interference andpolicy composition, international standards.

UNIT III
Systems Design: Design principles, representing identity, control of access and information flow, confinement problem. Assurance: Building systems with assurance, formal methods, evaluating systems.

UNIT IV
Logic-based System: Malicious logic, vulnerability analysis, auditing, intrusion detection.
Applications: Network security, operating system security, user security, program security.
Special Topics: Data privacy, introduction to digital forensics, enterprise security specification.

UNIT V
Operating Systems Security: Security Architecture, Analysis of Security in Linux/Windows.
Database Security: Security Architecture, Enterprise security, Database auditing.

Textbooks:
1. Security Engineering, Ross Anderson.
2. Computer Security: Art and Science, M. Bishop, Pearson Education.
3. Information Security: Principles and Practice, M. Stamp.

References:

1. Security in Computing, C.P. Pfleeger, S.L. Pfleeger, J. Margulies.
2. Secure Programming HOWTO, David Wheeler.
3. Browser Security Handbook, Michael Zalewski.
4. Handbook of Database Security, M. Gertz, S. Jajodia.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTTALS OF ARTIFICIAL INTELLIGENCE

Course Code: GR22A3131   **L/T/P/C: 3/ 0/ 0/3**
III Year II Semester

Course Outcomes:
1. Provide a strong foundation of fundamental concepts in Artificial Intelligence
2. Implement different search strategies and solve problems by applying a suitable search method
3. Design, implement and apply various knowledge representation techniques for a suitablecase study
4. Explore various concepts of reasoning, learning, and planning techniques for real time applications
5. Understand the Concepts of AI Probabilistic constraints and Expert Systems related techniques

UNIT I
Introduction, Overview of Artificial intelligence: Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents.

UNIT II
Problem Solving, Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

UNIT III
Search techniques: Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.
Constraint satisfaction problems: Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha- beta pruning, additional refinements, iterative deepening.

UNIT IV
Knowledge & reasoning: Knowledge representation issues, representation & mapping, approaches to knowledge representation. Using predicate logic, representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. Representing knowledge using rules, Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.

UNIT V
Probabilistic reasoning: Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Planning Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.
Expert Systems: Representing and using domain knowledge, expert system shells, and

knowledge acquisition.

Textbooks:
1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach
2. Artificial Intelligence, Russel, Pearson

References:
1. Artificial Intelligence, Ritch & Knight, TMH
2. Logic &Prolog Programming, Saroj Kaushik, New Age International
3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
4. Expert Systems, Giarranto, VIKAS

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FINANCIAL AND COST ACCOUNTING

Course Code: GR22A3132   **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Outcomes:
1. Create an awareness about the importance and usefulness of the accounting concepts and their managerial implications
2. Ability to prepare final accounts.
3. Ability to prepare cash flow and fund flow statements.
4. Create an awareness about cost accounting, different types of costing and costmanagement
5. Analyse and interpret the company accounts and audit reports

UNIT I
Accounting Concept: Introduction, Techniques and Conventions, Financial Statements-Understanding & Interpreting Financial Statements.

UNIT II
Accounting Process: Bookkeeping and Record Maintenance**,** Fundamental Principles and Double Entry**,** Cash Book and Subsidiary Books, Journal, Ledger, Trial Balance, Balance Sheet, Final Accounts**,** Rectification of Errors.

UNIT III
Financial Statements: Form and Contents of Financial Statements, Analyzing and Interpreting Financial Statements, Accounting Standards.
Cash Flow and Fund Flow Techniques: Introduction, how to prepare, difference between them.*Class Discussion: Corporate Accounting Fraud- A Case Study of Satyam*

UNIT IV
Costing Systems: Elements of Cost**,** Cost Behavior, Cost Allocation, OH Allocation**,** Unit Costing, Process Costing, Job Costing**,** Absorption Costing, Marginal Costing, Cost Volume Profit Analysis**,** Budgets**,** ABC Analysis.
Class Discussion: Application of costing concepts in the Service Sector

UNIT V
Company Accounts and Annual Reports: Audit Reports and Statutory Requirements**,** Directors Report**,** Notes to Accounts**,** Pitfalls.

Home Assignment:

Case study materials books will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.
Further, the topic for class discussion will be mentioned beforehand and students should be prepared to discuss these topics in class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Corporate Accounting Fraud: A Case Study of Satyam

2. Topic: Application of costing concepts in the Service Sector

Textbooks:

1. Robert N Anthony, David Hawkins, Kenneth Marchant, Accounting: Texts and Cases, McGraw-Hill

Case Study Materials: To be distributed for class discussion

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BUSINESS COMMUNICATION AND VALUE SCIENCE – IV

Course Code: GR22A3133   **L/T/P/C: 3/ 0/ 0/3**
III Year II Semester

Course Outcomes:
1 .Recognize the best practices of communicative writing and Public Speaking
2. Understand the importance of diversity in workplace
3. Apply emotional intelligence in real life scenarios
4. Understand the importance of corporate social responsibility (CSR)
5. Apply knowledge of multiple intelligences and learning styles in interpersonal interactions

UNIT I
Communicative Writing
i)   Principles of Communicative Writing
ii) Formal and Business letters
iii) Writing proposals
iv) Using charts and graphs in communicative writing
v) Applying communicative writing in real life scenarios

UNIT II
Public Speaking
i)   Need for public speaking
ii) Public speaking – best practices
iii) Applying public speaking in real life scenarios
iv) Selling your start-up ideas (activity)
v) Business Storytelling and Doodling methods

UNIT III
Emotional Intelligence
i)   Emotional intelligence
ii) Manifestations of Emotional intelligence
iii) Importance of emotional intelligence in personal and professional lives
iv) Ways to Build Emotional intelligence
v) Applying emotional intelligence in real life scenarios- Activity

UNIT IV
Corporate Social Responsibility (CSR)
i)   Importance of corporate social responsibility (CSR)
ii) The Need to conduct CSR activities
iii) Stories of corporate social responsibility

Diversity, Multiple Intelligences & Learner styles
iv) Multiple intelligences & Diversity
v) Learning styles in diversified environments
vi) Applying multiple intelligences and Learning styles in communication

UNIT V
A) Employability Skills
i) Attributes required for work and life
ii) Strategic thinking and planning
iii) Decision making
iv) Best practices to share and receive feedback
v) Attributes needed to function and grow in a corporate environment Image Management

B) Life Skills
i) Stress management
ii) Time Management
iii) Corporate etiquette
vii) Business idioms and Corporate Terms
viii) Conflict Resolution and Conflict Management

Note: 1. Through Activities the concepts should be taught. Chalk and Talk should beminimized.
2. For Unit '**5B**' real time case studies can be used as a source of discussion for betterunderstanding of the concepts.

Textbooks:
1. Emotional Intelligence: Why it Can Matter More Than IQ by Daniel Goleman
2. Putting Emotional Intelligence To Work by Ryback David
3. How to Develop Self Confidence and Improve Public Speaking - Time - Tested Methods of Persuasion by Dale Carnegie
4. TED Talks: The official TED guide to public speaking: Tips and tricks for givingunforgettable speeches and presentations

References:
Web Resources
1. https://www.tata.com/about-us/tata-group-our-heritage
2. https://economictimes.indiatimes.com/tata-success-story-is-based-on-humanity-philanthropy-and-ethics/articleshow/41766592.cms

Online Resources
1. https://youtu.be/reu8rzD6ZAE
2. https://youtu.be/Wx9v_J34Fyo
3. https://youtu.be/F2hc2FLOdhI
4. https://youtu.be/wHGqp8lz36c
5. https://youtu.be/hxS5He3KVEM
6. https://youtu.be/nMPqsjuXDmE

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MODERN DAY ROBOTICS AND ITS INDUSTRIAL APPLICATIONS
(Professional Elective –II)

Course Code: GR22A3134   **L/T/P/C: 3/ 0/ 0/3**
 III Year II Semester

Course Outcomes:
1. Understand basic concepts and technological advancements in AI and robotics.
2. Develop skills of using advanced software for solving practical problems in roboticspertaining to various industries
3. Understand and apply several statistical analysis techniques and business analytics for cognitive robotics
4. Apply several cloud computing techniques and business analytics for cognitive robotics
5. Understand and apply the programming of robots using python and R languages.

UNIT I

Introduction to Modern Day Robotics and their industrial applications: Industry 4.0 Concept: Background and Overview-Industry 4.0 technologies: implementation patterns in manufacturing companies-Evolution of Industrial Robots and their Applications-Advancements in Robotics and Its Future Uses-Types of robotics in various fields for applications.

Technologies essential for Cognitive Robotics: Computer systems and Technologies relevant to modern day robotics-Robotic Process Automation: Overview of RPA and its applications-RPA, AI, and Cognitive Technologies for Leaders-Introduction to Robotics: Analysis, Control, Applications

UNIT II

Introduction to computer vision and application of Vision Systems in Robotics: Concepts of computer vision and the how vision systems are becoming essential part of Robotics-Computer Vision: Models, Learning, and Inference -Mastering Computer Vision with TensorFlow 2.x:

Build advanced computer vision applications using machine learning and deep learning techniques- Machine Vision Applications-

Application areas for vision systems-Robot inspection case study-Autonomous driving using 3D imaging case study.

UNIT III

AI in the context of Cognitive Robotics and Role of AI in Robotics: Foundation for Advanced Robotics and AI- A Concept for a Practical Robot Design Process- Demo to train A Robot UsingAI - Deep learning core applications-Deep learning business applications

Data Science and Big Data in the context of Cognitive Robotics: Cognitive Technologies: The Next Step Up for Data and Analytics in robotics-Cognitive Deep Learning Technology for Big Data Cognitive Assistant Robots for Reducing Variability in Industrial Human-Robot Activities **Artificial Intelligence and Robotics** - The Review of Reliability Factors Related to IndustrialRobots -Failure analysis of mature robots in automated production- Data Analytics for PredictiveMaintenance of Industrial Robots - Failure Is an Option: How the Severity of Robot

Errors AffectsHuman-Robot Interaction

UNIT IV

Concepts of Cloud computing, cloud platforms and it applications in Robotics: Learning Cloud Computing: Core Concepts - Cloud Computing: Private Cloud Platforms -Robot as a Service in Cloud Computing -Cloud Computing Technology and Its Application in Robot Control- A Comprehensive Survey of Recent Trends in Cloud

Robotics Architectures and Applications - Google's cloud robotics and high computing needs of industrial automation and systems-The role of cloud and opensource software in the future of robotics-The Power of Cloud Robotics by Robotics Industry Association

UNIT V

Basics of Robotic operating System: ROS for beginners an overview- Introduction to the Robot Operating System (ROS) Middleware - Secure communication for the Robot Operating System - An Introduction to Robot Operating System: The Ultimate Robot Application Framework by Adnan Quality of Service and Cybersecurity Communication Protocols -Analysis for the Robot OperatingSystem Robotics systems communication- Threat modelling using ROS

Towards cloud robotic system: A case study of online co-localization for fair resource competence-A Case Study on Model-Based Development of Robotic Systems using Monti Arc with Embedded Automata

Introduction to Python and R Programming in the context of Robotics: Introduction to Python- Python Functions for Data Science-Basic ROS Learning Python for robotics- An introduction toR -The R in Robotics rosR: A New Language Extension for the Robot Operating System-

Textbooks:
1. Saeed Benjamin Niku, "Introduction to Robotics: Analysis, Control, Applications", Wiley Publishers, 2nd edition,2011.
2. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.
3. Francis X. Govers," Artificial Intelligence for Robotics: Build Intelligent Robots thatPerform Human Tasks Using AI Techniques", Packt publishing,2018.

References:
1. Krishnendu Kar, "Mastering Computer Vision with TensorFlow 2.x: Build Advanced Computer Vision Applications Using Machine Learning and Deep LearningTechniques",Packt publishing,2020.
2. Armando Vieira, Bernardete Ribeiro," Introduction to Deep Learning Business Applications for Developers from Conversational Bots in Customer Service to MedicalImage processing",Apress,2018.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MODERN WEB APPLICATIONS
(PROFESSIONAL ELECTIVE-II)

Course Code: GR22A3135   **L/T/P/C: 3/ 0/ 0/3**
III Year II Semester

Course Outcomes:
1. Analyze a web page and identify its elements and attributes.
2. Create web pages using XHTML and Cascading Styles sheets.
3. Installation and usage of Server software's.
4. Database Connectivity to web applications.
5. Design web applications using the scripting language with front-end and back-end Framework.

UNIT I
Introduction: Concept of website, its need and purpose, Types of websites: Static and dynamic website, Introduction to HTML, XML, JSON, Web Browsers, − Web Servers, Uniform Resource Locator, Tools and Web Programming Languages. Web Standards, Tiered Architecture: Client Server Model, Three Tier Model, Service Oriented Architectures, REST services,

UNIT II
Hyper Text Mark Up Language: - Languages used for website development, HTML5: basic tags, formatting tags, adding images, Lists, Embedding multimedia in Web pages, Inserting tables,Internal and External Linking, Frames, Forms
Cascading Style Sheets (CSS3): Basics of Cascading Style sheets, Advantages of CSS, ExternalStyle sheet, Internal style sheet, Inline style sheet, CSS Syntax, color, background, Font, images

UNIT III
Java Script: Features of JavaScript, extension of JavaScript, Syntax of JavaScript: data types, operators, variables, tag, Document Object Model (DOM)with JavaScript, Selection Statement using if and Switch, Iterative statement: for, for/in, while,do while, break and continue

UNIT IV
Front End Framework: Introduction to jQuery - Syntax, Selectors, Events, Traversing, AJAX; Introduction to Bootstrap – Basics, Grids, Themes ; Angular JS – Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, Validation

UNIT V
 Back End Technologies: Introduction to RESTful services, Resources, Messages (Request, Response), Addressing, Methods – (GET, POST, PUT, DELETE)

 TEXTBOOKS:
  1. Internet and World Wide Web: How to Program, Deitel P. J., Deitel H. M. and DeitelA. 5th Edition, Pearson Prentice Hall, 2012
  2. HTML & CSS: Design and Build Websites, Jon Duckett, John Wiley & Sons

REFERENCES:

1. Programming the World Wide Web, Sebesta R. W, 8th edition, Pearson, 2014
2. Web Engineering: a practitioner's approach, Pressman R. and Lowe D,1st Edition,Mc Graw Hill, 2008
3. Web Engineering: The Discipline of systematic Development of Web Applications,Kappel G., et al, 1st Edition, John Wiley & Sons, 2006
4. Web Engineering: Principles and Techniques, Suh W,Idea Group Inc, 2005
5. PHP for the Web: Visual Quick Start Guide, Ullman L, 5th Edition, Peachpit Press, 2016

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA MINING AND ANALYTICS
(Professional Elective –II)

Course Code: GR22A3136   **L/T/P/C: 3/ 0/ 0/3**
III Year II Semester

Course Outcomes:
1. Learn the concepts of database technology evolutionary path which has led to the needfor data mining and its applications.
2. Apply pre-processing statistical methods for any given raw data.
3. Evaluate data mining techniques, extract knowledge and report the output.
4. Perform statistical analysis on variety of data.
5. Explore recent trends in data analytics.

UNIT I
Introduction to Data Mining: What is data mining? Related technologies - Machine Learning, DBMS, OLAP, Statistics, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Applications

UNIT II
Data preprocessing: Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies, Installing Weka 3 Data Mining System, Experiments with Weka- filters, discretization
Data mining knowledge representation: Task relevant data, Background knowledge, Representing input data and output knowledge, Visualization techniques
Attribute-oriented analysis: Attribute generalization, Attribute relevance, Class comparison, Statistical measures

UNIT III
Data mining algorithms - **Association rules:** Motivation and terminology, Example: mining weather data, Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis
Data mining algorithms - Classification: Basic learning/mining tasks, Inferring rudimentary rules: 1R, algorithm, Decision trees, covering rules
Data mining algorithms – Prediction: The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbor), linear models

UNIT IV
Descriptive analytics: Data Modeling, Trend Analysis, Simple Linear Regression Analysis
Forecasting models: Heuristic methods, predictive modeling and pattern discovery, Logistic Regression: Logit transform, ML estimation, Tests of hypotheses, Wald test, LR test, score test, test for overall regression, multiple logistic regression, forward, backward method, interpretation of parameters, relation with categorical data analysis. Interpreting Regression Models, Implementing Predictive Models

Generalized Linear model: link functions such as Poisson, binomial, inverse binomial, inverse Gaussian, Gamma.

Non-Linear Regression (NLS): Linearization transforms, their uses & limitations, examination of non-linearity, initial estimates, iterative procedures for NLS, grid search, Newton-Raphson, steepest descent, Marquardt's methods. Introduction to semiparametric regression models, additive regression models. Introduction to nonparametric regression methods

UNIT V

Time Series Analysis: Auto - Covariance, Autocorrelation and their properties. Exploratory timeseries analysis, Test for trend and seasonality, Exponential and moving average smoothing, Holt –Winter smoothing, forecasting based on smoothing

Linear time series models: Autoregressive, Moving Average, Autoregressive Moving Average and Autoregressive Integrated Moving Average models; Estimation of ARMA models such as Yule-Walker estimation for AR Processes, Maximum likelihood and least squares estimation for ARMA Processes, Forecasting using ARIMA models

Prescriptive Analytics: Mathematical optimization, Networks modeling-Multi-objective optimization-Stochastic modeling, Decision and Risk analysis, Decision trees.

TEXTBOOKS:
1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 3rd ed, 2010.
2. Lior Rokach and Oded Maimon, "Data Mining and Knowledge Discovery Handbook", Springer, 2nd edition, 2010
3. Box, G.E.P and Jenkins G.M. (1970) Time Series Analysis, Forecasting and Control,Holden-Day.

REFERENCE BOOKS:
1. Draper, N. R. and Smith, H. (1998). Applied Regression Analysis (John Wiley) ThirdEdition.
2. Hosmer, D. W. and Lemeshow, S. (1989). Applied Logistic Regression (Wiley).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER NETWORKS AND SECURITY LAB

Course Code: GR22A3137   **L/T/P/C :0/ 0/ 2/ 1**
III Year II Semester

Course Outcomes:
1. Understand the various networking technologies
2. Use file sharing and routing techniques
3. Implement Dijkstra 's algorithm for routing.
4. Implement DES, AES and RSA Algorithms
5. Implement socket programming for client/server models.

LIST OF EXPERIMENTS:

TASK 1:
Study of Different types of cables and network IP

TASK 2:
Study of following network devices in detail
a) Repeater b) Hub c) Bridge d) Router e) Gateway f) Switch

TASK 3:
Study and practice the basic network configuration commands

TASK 4:
Implement on a data set of characters the three CRC polynomials

TASK 5:
Simulate framing methods such as character stuffing and bit stuffing
.
TASK 6:

Implement Dijkstra 's algorithm to compute the shortest path through a graph.

TASK 7:
Implement DES Encryption and Decryption

TASK 8:
Implement the AES Encryption and decryption

TASK 9:
Implement RSA Encryption Algorithm

TASK 10:
Study of Socket Programming and Client – Server model.

TASK 11:

Write a socket program (using c) for interaction between server and client processes usingUnix Domain sockets.

TASK 12:

Write a socket program (using c) for interaction between server and client processes using Internet Domain sockets.

TEXTBOOKS:
1. Data and Computer Communication, William Stallings.
2. Unix System Programming using C++, T.Chan, PHI.

REFERENCE BOOKS:
1. Data Communications and Networking – Behrouz A. Forouzan, 4thEdition TMH, 2006
2. Information Security: Principles and Practice, M. Stamp

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE LAB

Course Code: GR22A3138   **L/T/P/C: 0/ 0/ 2/1**
III Year II Semester

Course Outcomes:
1. Implement practical approach to solve and apply various search strategies
2. Demonstrate the adversarial search techniques
3. Design the use cases for knowledge representation techniques and predicate logic
4. Demonstrate expert systems by using domain knowledge
5. Apply AI classification techniques for classifying the data

TASK-1:
(**a**) Write a program to solve any problem using depth first search.
(**b**) Write a program to solve any problem using best first search algorithm.

TASK-2:
(**a**) Write a program to implement depth limit search.
(**b**) Write a program to solve 4-Queen's problem.

TASK-3:
Write a program to solve travelling salesman problem.

TASK-4:
Write a program to implement A*algorithm.

TASK-5:
Write a program to implement heuristic approach.

TASK-6:
Write a program to implement tic_tac_toe with min_max algorithm.

TASK-7:
Solve the logic programming for the mathematical expression using necessary librariesHint: pip install kanren, sympy.

TASK-8:
Demonstrate knowledge representation for the following using open-source tools:
a. Ram likes mango. b. Seema is a girl. c. Bill likes Cindy. d. Rose is red. e. John owns gold

TASK-9:
Simulate use cases in predicate logic by using open-source tools.

TASK-10:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

TASK-11:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

TASK-12:
Write a program to implement Bayesian network.

TEXTBOOKS:
1. Artificial Intelligence-A modern approach, Staurt Russel and peter Norvig, 1998, PHI
2. Artificial Intelligence, Elaine Rich & Kevin Knight, TMH Publication.

REFERENCE BOOKS:
1. Introduction to AI & Expert Systems, Dan W. Patterson, PHI Publication

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA MINING AND ANALYTICS LAB

Course Code: GR22A3139   **L/T/P/C: 0/ 0/ 2/1**
III Year II Semester

Course Outcomes:
1. Learn the concept of creating database tables in attribute relation file format(.arff).
2. Evaluate and implement the methods to facilitate the knowledge discovery
3. Apply pre-processing statistical methods for any given raw data.
4. Assess raw input data and process it to provide suitable input for a range of data mining algorithms
5. Acquire skills to effectively apply data mining techniques to solve real business problems

Implement the following Tasks using Weka Tool:

Task-1: Loading dataset in WEKA
Load the Weather dataset in weka tool and answer the following questions
a. How many instances are there in the dataset?
b. State the names of the attributes along with their types and values. What is the class attribute?
c. How will you view the instances in the dataset? How will you save the changes?
d. What happens with the Visualize All button is pressed?
e. Press the Visualize tab to view the Visualizer panel. Select one panel in the Visualizer and experiment with the buttons on the panel and report the findings.

Task-2: Using filters and statistics
a. Create a data set Student.arff with required data.
b. Apply the below unsupervised attribute filter
    i)Add
    ii) Remove
    iii) Discretize and
    iv) normalize for student dataset.
    v) Report the usage of filters and undo the effect of the filter.

Task-3: Using Weka to determine Association rules Perform the following tasks:
a) Create a data set Employee.arff by adding required data fields.
b) Apply Association rule mining on dataset Employee.arff (Use Apriori Algorithm)
c) List the rules that were generated.
d) How are their support and confidence values related?

Task-4: Perform classification and Build a Decision Tree using the Weka toolkit Load the Credit dataset and perform the following tasks:
a) Create the Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.
b) Train a Decision Tree again using cross-validation and report your results. Does your accuracy increase/decrease? Why?
c) Try reduced error pruning for training your Decision Trees using cross-validation and report the Decision Tree you obtain?
d) How can you convert a Decision Trees into "if-then-else rules". Report the rule obtained by

training PART and one R classifier. Rank the performance of j48, PART and one R.

Task-5: perform classification and make predictive analysis using naïve bayes in WEKA
Perform the following tasks:
a) Create a data set student.arff by adding required data fields.
b) Demonstrate Naïve Bayes classifier on Student.arff
c) Using Naïve Bayes classifier make a prediction of the class Buy_computer (YES,NO) to which the below cases belongs to:X1 = (age='31..40', income='high', student = 'yes', status='single') X2 = (age='<=30', income='high', student = 'yes', status='married') X3 = (age='>40, income='medium', student = 'no', status='married')

Task-6: Performing clustering using the data mining toolkitPerform the following tasks:
a) Load the 'iris.arff' data set in Weka.
b) Run the Simple K-Means clustering algorithm on the dataset and answer the following
   i)   How many clusters are created?
   ii) What are the number of instances and percentage figures in each cluster?
   iii) Tabulate the characteristics of the centroid of each cluster.
c) Visualize the results of this clustering (let the X-axis represent the cluster name, and the Y-axis represent the instance number)

Task-7: Classification by logistic regression Investigate two-class classification by regression
a) Open file diabetes.arff
b) Apply logistic regression for the given data set and report the classifier output
c) Visualize classifier errors for this model

Task-8: Classification by linear regressionPerform the following tasks:
a) Open file diabetes.arff
b) Use the NominalToBinary attribute filter to convert to numeric– but first set Class: class (Nom) to No class, because attribute filters do not operateon the class value
c) Choose functions>LinearRegression and Run
d) Visualize classifier errors for this model

Task-9: Pre-processing the dataset using knowledge flowPerform the following tasks:
a) Create a data set Weather.arff with required fields.
b) Using knowledge flow interface apply preprocessing techniques and attribute selection on dataset Weather.arff
c) Normalize Weather Table data using Knowledge Flow.
d) report the result using arff saver component in knowledge flow

Task-10: Mining Association Rule with WEKA Explorer on the real-world dataset.
Perform the following tasks:
a) Load the Supermarket Dataset for market-basket analysis
b) Run Apriori on this data with default settings.
c) Interpret the rules that are generated.
d) Comment and prepare brief report on the rules

Task-11: perform multi-class classification using j48 classifierPerform the following tasks:

a) Load the hypothyroid Dataset from weka datasets
b) Apply j48 classifier and report classifier output
c) Visualize the decision tree model

Task-12: Making predictions on new data using Wekaperform Model fitting using weka toolkit
a) Create animal.arff dataset with required data fields and class label as mammal
b) Train the dataset using j48 classifier model and report the result
c) Create a test dataset and make output predictions by applying the trained model

TEXTBOOKS:
1. Data Mining– Concepts and Techniques - Jiawei Han & MichelineKamber, Morgan KaufmannPublishers, Elsevier, Second Edition,2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearsoneducation.

REFERENCE BOOKS:
1. Data Mining Techniques – Arun K. Pujari, Second Edition, UniversitiesPress.
2. Data Warehousing in the Real World, Sam Aanhory and Dennis Murray, Pearson EdnAsia.

IV YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
USABILITY DESIGN OF SOFTWARE APPLICATIONS

Course Code: GR22A4066   **L/T/P/C: 2/1/0/3**
IV Year I Semester

Course Outcomes:
1. Understand the fundamentals of User Centered Design
2. Use heuristic evaluation practically with examples.
3. Understand the User Experiences and their relevance and contribution to businesses
4. Analyze the facets of User Experience (UX) Design, particularly as applied to the digital artefacts
5. Understand the development of prototypes for their project

UNIT I
Introduction to User Centered Design, Aspects of User Centered Design **Product Appreciation Assignment** – Evaluating the product from user centered design aspects such as functionality, ease of use, ergonomics, aesthetics.

UNIT II
Heuristic Evaluation: 10 Heuristic Principles, Examples, Heuristic Evaluation: Group Assignment initiation (Website and App), Evaluation for key tasks of the app or website for heuristic principles, severity, recommendations.

UNIT III
UX Research: Understanding users, their goals, context of use, environment of use. Research Techniques: Contextual Enquiry, User Interviews, Competitive Analysis for UX, Scenarios and Persona Technique, Presentation of Personas for the group project

UNIT IV
Design Thinking Technique, Discovery and brainstorming, Concept Development, Task flow detailing for the Project

UNIT V
Prototyping Techniques, Paper, Electronic, Prototyping Tools, Review and feedback

TEXTBOOKS:
1. Interaction Design: Beyond Human-Computer Interaction, 4th Edition, Jenny Preece, Helen Sharp and Yvonne Rogers
2. About Face, 4th Edition, Alan Cooper and Robert Reimann

REFERENCES:
1. Observing the User Experience, Second Edition: A Practitioner's Guide to User Research. Elizabeth Goodman, Mike Kuniavsky, Andrea Moed
2. The Elements of User Experience: User-Centered Design for the Web and Beyond. 2nd Edition, Jesse James Garrett
3. Understanding Design Thinking, Lean, and Agile - Jonny Schneider.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FINANCIAL MANAGEMENT

Course Code: GR22A4067   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Course Outcomes:
1. Apply future value and present value concepts to single sums, mixed streams, and annuities.
2. Apply the concept of risk, its measurement for single assets and portfolios and bond valuation.
3. Apply techniques for estimating the cost of each component of the cost of capital and theconcepts of financial and operating leverage.
4. Identify relevant cash flows for capital budgeting projects and apply various methods to analyze projects.
5. Apply strategies and techniques used to manage cash, accounts receivable and working capital.

UNIT I
Introduction: Introduction to Financial Management - Goals of the firm - Financial Environments.
Time Value of Money: Discounting, Simple and Compound Interest Rates, Amortization, Annuity Factor.

UNIT II
Risk & Return: Defining Risk and Return, Using Probability Distributions to Measure Risk, AttitudesToward Risk, Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model(CAPM)
Valuation of Securities: Bond Valuation, Preferred Stock Valuation, Common Stock Valuation,Concept of Yield and YTM.

UNIT III
Operating & Financial Leverage: Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study
Cost of Capital: Concept, Computation of Specific Cost of Capital for Equity - Preference – Debt,Weighted Average Cost of Capital – Factors affecting Cost of Capital

UNIT IV
Capital Budgeting: The Capital Budgeting Concept & Process - An Overview, Generating Investment Project Proposals, Estimating Project, After Tax Incremental Operating Cash Flows, Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods

UNIT V
Working Capital Management: Overview, Working Capital Issues, Financing Current Assets (Short Term and Long Term- Mix), Combining Liability Structures and Current Asset Decisions, Estimation of Working Capital.
Cash Management: Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring.
Accounts Receivable Management: Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period.

Textbooks:

1. Chandra, Prasanna - Financial Management - Theory & Practice, Tata McGraw Hill.

2. Khan and Jain, Financial Management - Tata McGraw Hill

References Books:

1. Srivastava, Misra: Financial Management, OUP

2. Van Horne and Wachowicz: Fundamentals of Financial Management, Prentice Hall/ Pearson Education.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HUMAN RESOURCE MANAGEMENT

Course Code:GR22A4068   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Course Outcomes:
1. The students understand the significance of human resource management concepts and challenges, practices in their profession of HR.
2. The students will be acquainted with the human resource system design and provide awareness on human resource information systems.
3. The student will be able to understand various functional areas of HRM and acquire knowledge related to compensation, employee relations, training and development and payroll system.
4. The student will obtain expertise in designing human resource planning and related to succession planning.
5. The student will be able to realize the concepts related to strategic management of humanresources and human resource management in the service sector.

UNIT I
Human Resource Management: Concept and Challenges, HR Philosophy, Policies, Procedures andPractices.

UNIT II
Human Resource System Design: HR Profession, and HR Department, Line Management Responsibility in HRM, Human resources accounting and audit.

UNIT III
Functional Areas of HRM: recruitment and staffing, benefits, compensation, employee relations, HR compliance, organizational design, training and development, human resource information systems (H.R.I.S.) and payroll.

UNIT IV
Human Resource Planning: Demand Forecasting, Action Plans– Retention, Training, Redeployment& Staffing, Succession Planning

UNIT V
Strategic Management of Human Resources: SHRM, relationship between HR strategy and overall corporate strategy, HR as a Factor of Competitive Advantage, Managing Diversity and cross culture in the Workplace
Human Resource Management in Service Sector- Special considerations for Service Sector including
- Managing the Customer – Employee Interaction
- Employee Empowerment and Customer Satisfaction
- Service Failure and Customer Recovery – the Role of Communication and Training
- Similarities and Differences in Nature of Work for the Frontline Workers and the Backend
- Support Services - Impact on HR Practices Stressing Mainly on Performance
- Flexible Working Practices – Implications for HR

Home Assignment:

Further, the topic for class discussion will be mentioned beforehand. Students are required to meet ingroups before coming to class and prepare for the topic to be discussed. Instructor may ask the studentgroups to present their analysis and findings to the class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Understanding the issues and challenges involved in managing a diverse workforce
2. Topic: Is The Only Purpose of a Corporation to Maximize Profit?
3. Topic: Similarities and Differences in Manufacturing and Service Sector - Impact on HR Practices

Textbooks:

1. Gary Dessler: Human Resource Management, 10/e, Pearson, 2009

2. K. Aswathappa: Human Resource and Personnel Management, TMH, 2009.

3. Subbarao: Human Resource Management, HPIL2009

4. David A. Decenzo & Stephen P. Robbins: Fundamentals of Human Resource Management,8/e, Wiley, 2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COGNITIVE SCIENCE AND ANALYTICS
(Professional Elective-III)

Course Code: GR22A4069   **L/T/P/C:3/0/0/3**
IV Year I Semester

Course Outcomes:
1. Understand the Foundational areas of analytics and cognitive science.
2. Interpret the Data theory and taxonomy of data
3. Analyse the Multivariate data analytics and cognitive analytics
4. Relate cognitive analytics with Artificial intelligence and machine learning
5. Apply the Approach and methodology of analytics.

UNIT I
Introduction to Analytics: Definition, Description & Evolution of Analytics, History of Analytics, and Applicability of Analytics with development of Technology and Computer, How Analytics entered mainstream.
Concepts of Analytics: Various overlapping concepts and fields of Analytics such as Data Mining, Machine Learning, Artificial Intelligence and Simulation.
Emerging Areas in Analytics: Understanding of emerging research areas of Analytics: Mathematical programming, Evolutionary computation, Simulation, Machine learning/data mining, Logic-based models, and Combinations of categories
Overview of Analytics: Descriptive Analytics Covering Exploratory Data Analysis & Basic of Statistics, Diagnostics Analytics: BI/Analysis, Trend, Pattern, Simultaneous Relationship, Predictive Analytics: Cause-Effect Relationship and Futuristic prediction in terms of probabilities, Continuous & Categorical Predictions, Simulation, Optimization, Multi-faceted Intelligent Technology driven Analytics combining Machine Intelligence with Human Brain Processing Abilities
Introduction & Evolution of Cognitive Science: Introduction to the study of cognitive sciences, Brief history of cognitive science development and Methodological concerns in philosophy

UNIT II
Understand Brain and Sensory Motor Information: Fundamentals of Neuroscience, Processing of sensory information in the brain, and Brain Imaging Elements.
Language & Linguistic Knowledge: Background and details of Syntax & Semantics, Understanding of Generative Linguistic.
Memory & Processing: Theory of Information Processing, Fundamentals of Short-term Memory.
Data as a whole: Understanding of Data as a whole for distinguishing and relating various types of data and Categorization of Data: Structured, Unstructured Data, Quantitative & Qualitative Data.
Views of Data: Understanding Data as an interdisciplinary framework for learning methodologies: covering statistics, neural networks, and fuzzy logic

UNIT III
Measurement & Scaling Concepts: Measurement of variables and commonly used statistical tools: Number of procedures for measurement of the variables,
Categorization procedures, Scale construction procedures and Techniques of data processingfor

qualitative as well as quantitative data.

Various types of Scales: Nominal, Ordinal, Interval & Ratio Scales

Overview: High level overview of Categorization of Techniques: Inter-dependenceRelationship Techniques and Dependence Relationship Techniques

Overview of Commonly Used Inter-Dependence Techniques: Factor Analysis, Principal Component Analysis (PCA), Cluster Analysis

Overview of Commonly Used Dependence Techniques: Regression, Logistic Regression.

UNIT IV
Analytics Value Chain &Application of Analytics across Value Chain:

Basic statistical concepts such as Descriptive & Diagnostics statistics, concept of random variables, discrete and continuous random variables, confidence interval, hypothesis testing, analysis of variance and correlation. Predictive analytics techniques such as multiple linear regression, logistic regression, decisiontree learning Clustering and forecasting techniques. Prescriptive analytics Concepts: linear programming, integer programming, goal programming & stochastic models. Cognitive analytics Concepts: Text Analytics, Learning Analytics, Data Mining, Cognitive Systems, Cognitive Computing, Learning Data Science, Machine Learning, Big data Analyticsand Business analytics.

Fundamentals of Artificial Intelligence: Various areas of AI:

Knowledge: Text Analytics, Topic Modelling, Natural Language Processing (NLP), Natural Language Generation (NLG), Natural Language Understanding (NLU), Named- entity recognition (NER)

Perception: Image Analytics, Video Analytics & Audio Analytics

Memory: Cognitive Engagement: BOTs, Virtual & Digital Assistants, Augmented Reality, Virtual Reality, Mixed Reality Learning: Intelligent Automation

UNIT V
Spectrum of AI Reactive Machine:

Lowmemory,worksonKnownrules,suchasObjectDetection/Games/Recommendations specific to known Rules ,Memory used to learn and improve continuously such as Most ML Models, Automated Vehicles

Theory of Mind: Machine Understands and responds such as BoTs/Virtual/Digital Assistants

Self-Aware: Human like intelligence such as Super Robots in Space etc.

World Standard Methodology: CRISP-DM Methodology, SEMMA Methodology

Real Life Work Around Multi-Variate Analytics: A few Selected Commonly Used Techniques: Predictive & Classification Models, Regression, Clustering

Real Life Work Around Artificial Intelligence, Machine Learning and Deep Learning: A few Selected Commonly Used Techniques & Algorithms: ANN (Artificial Neural Network), CNN (Convolutional Neural Network), RNN (Recurrent Neural Network);RN Architecture: LSTM, Bidirectional LSTM, Gated Recurrent Unit (GRU), CTRNN (Continuous Time RNN) CNN Architectures: VGG16, Alexnet, InceptionNet, RestNet, Google net.

Object Detection models: R-CNN, Fast R-CNN, Faster R-CNN, cascade R-CNN. Mask RCNN, Single Shot MultiBox Detector (SSD), You Only Look Once (YOLO), Single-Shot Refinement Neural Network for Object Detection (RefineDet), Retina-Net, **Autoencoders:** Denoising Autoencoder, GAN. **Transformers:** Attention based Encoder and Decoder: Eg-BERT (Bidirectional Encoder Representations from Transformers), Generative Pretrained Transformers GPT-3, GPT-2, BERT, XLNet, and RoBERTa

TEXTBOOKS:

1. Hall, P., Phan, W., & Whitson, K. (2016). Evolution of Analytics. O'Reilly Media Incorporated.
2. Cognitive Science: An Introduction to the Science of the Mind by José LuisBermúdez
3. Cognitive Computing and Big Data Analytics by Judith S. Hurwitz (Author), Marcia Kaufman (Author), Adrian Bowles (Author)
4. Cognitive Science and Artificial Intelligence Advances and Applications: Authors: Gurumoorthy, Sasikumar, Rao, B Narendrakumar, Gao, Xiao-Zhi
5. Cherkassky, V., & Mulier, F. M. (2007). Learning from data: concepts, theory, andmethods. John Wiley & Sons.
6. The visual display of Quantitative Information: Edward Tufte, Graphics Press, 2001.
7. Scaling Measurement and Statistical Tools for Extension Workers by Krunal D. Gulkari, Hemant V. Borate , Mayur S. Shitap , 2016.
8. Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). Multivariate data analysis. Englewood Cliff. New Jersey, USA, 5(3), 207-2019.
9. Kumar, U. D. (2017). Business analytics: The science of data-driven decision making.Wiley.
10. Özköse, H., Arı, E. S., & Gencer, C. (2015). Yesterday, today and tomorrow of big data. Procedia-Social and Behavioral Sciences, 195, 1042-1050.
11. Gudivada, Venkat N., M. T. Irfan, E. Fathi, and D. L. Rao. "Cognitive analytics: Going beyond big data analytics and machine learning." In Handbook of statistics, vol. 35, pp. 169-205. Elsevier, 2016.
12. . Kao, A., & Poteet, S. R. (Eds.). (2007). Natural language processing and textmining. Springer Science & Business Media.
13. Demystifying Artificial intelligence: Simplified AI and Machine Learning concepts for Everyone (English Edition) Paperback – Import, 5 January 2021by Prashant Kikani
14. Kelleher, J. D., Mac Namee, B., & D'arcy, A. (2020). Fundamentals of machine learning for predictive data analytics: algorithms, worked examples, and case studies. MIT press.
15. Goodfellow, Ian, Yoshua Bengio, Aaron Courville, and Yoshua learning. Vol. 1, no. 2. Cambridge: MIT press, 2016.Bengio. Deep

REFERENCES:

1. **Seminal Paper:** The evolution of analytics and implications for industry and academic programs MR Bowers, JD Camm, G Chakraborty - Interfaces, 2018 - pubsonline.informs.org.
2. **Cognitive Analytics:** Concepts, Methodologies, Tools, and Applications (4 Volumes) Information Resources Management Association (USA)A first course in Probability, S. M. Ross, Prentice Hall.
3. **Seminal paper:** Shneiderman, B. (2003). The eyes have it: A task by data type taxonomy for information visualizations. In The craft of information visualization (pp. 364-371).
4. **Morgan Kaufmann.C:** The Complete Reference, (Fourth Edition), Herbert Schildt, McGraw Hill.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INTRODUCTION TO IOT
(PROFESSIONAL ELECTIVE-III)

Course Code: GR22A4070   **L/T/P/C:3/0/0/3**
IV Year I Semester

Course Outcomes:
1. Understand building blocks of IoT and application areas of IoT.
2. Explore IoT architectures and IoT system encompassing the edge.
3. Familiarize with sensors, Transducers for IoT.
4. Identify the IoT networking components with respect to OSI layer.
5. Familiarize the data processing techniques of IoT.

UNIT I

Introduction to IoT and Use cases: Understanding basic concepts of IoT, Consumer IoT vs Industrial Internet, Fundamental building blocks, Use Cases of IoT in various industry domains,

UNIT II

Architecture: IoT reference architectures, Industrial Internet Reference Architecture, Edge Computing, IoT Gateways, Data Ingestion and Data Processing Pipelines, Data Stream Processing

UNIT III

Sensors and Industrial Systems: Introduction to sensors and transducers, integrating sensorsto sensor processing boards, introduction to industrial data acquisition systems, industrial control systems and their functions

UNIT IV

Networking and Communication for IoT: Recap of OSI 7 layer architecture and mapping to IoT architecture, Introduction to proximity networking technologies (ZigBee, Bluetooth, Serial Communication), Industrial network protocols (Modbus, CANbus), Communicating with cloud applications (web services, REST, TCP/IP and UDP/IP sockets, MQTT, WebSockets, protocols. Message encoding (JSON, Protocol Buffers)

UNIT V

IoT Data Processing and Storage: Time Series Data and their characteristics, time series databases, basic time series analytics, data summarization and sketching, dealing with noisy and missing data, anomaly and outlier detection,

TEXTBOOKS:

1. The Internet of Things, Samuel Greengard, MIT Press Essential Knowledge Series,

REFERENCE BOOKS / LINKS:

1. Industrial Internet Reference Architecture - http://www.iiconsortium.org/IIRA.htm

2. World Economic Forum Report on Industrial Internet of Things - https://www.weforum.org/reports/industrial-internet-things

3. 50 Sensor Applications for a Smarter World - http://www.libelium.com/resources/top_50_iot_sensor_applications_ranking/

4. Visualizing Data-Exploring and Explaining Data with the Processing Environment,By Ben Fry, Publisher: O'Reilly Media

5. Raspberry Pi Computer Architecture Essentials, by Andrew K Dennis

6. Getting Started with Arduino, M. Banzi, O Reilly Media

7. GSMA IoT Security Guidelines & Assessment - https://www.gsma.com/iot/future-iot-networks/iot-security-guidelines/

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CRYPTOLOGY
(Professional Elective-III)

Course Code: GR22A4071   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Course Outcomes:
1. Understand various Cryptographic Techniques
2. Apply various public key cryptography techniques
3. Implement Hashing and Digital Signature techniques
4. Understand the various Security Applications
5. Implement system level security applications

UNIT I
Introduction to Cryptography: Elementary number theory, Pseudo-random bit generation, Elementary cryptosystems.
Basic security services: confidentiality, integrity, availability, non-repudiation, privacy

UNIT II
Symmetric key cryptosystems: Stream Cipher: Basic Ideas, Hardware and Software Implementations, Examples with some prominent ciphers: A5/1, Grain family, RC4, Salsa and ChaCha, HC128, SNOW family, ZUC; Block Ciphers: DES, AES, Modes of Operation; Hash Functions; Authentication

UNIT III
Public Key Cryptosystems: RSA, ECC; Digital signatures

UNIT IV
Security Applications (Selected Topics): Electronic commerce (anonymous cash, micro-payments), Key management, Zero-knowledge protocols, Cryptology in Contact Tracing Applications, Issues related to Quantum Cryptanalysis

UNIT V
Introductory topics in Post-Quantum Cryptography, Cyber Supply Chain Risk Management,C-SCRM, Federal Cyber security and Privacy Professionals Forum.

TEXTBOOKS:
1. Cryptography, Theory and Practice. D. R. Stinson, CRC Press.
2. Handbook of Applied Cryptography. A. J. Menezes, P. C. van Oorschot, and S. A.Vanstone, CRC Press

REFERENCE BOOKS:

1. Refer to https://csrc.nist.gov/projects/post-quantum-cryptography unit 5
2. https://csrc.nist.gov/Projects/cyber-supply-chain-risk-management unit 5
3. (https://csrc.nist.gov/Projects/forum) unit 5
4. A course in number theory and cryptography. N. Koblitz:, GTM, Springer.
5. Cryptography and Network Security. W. Stallings, Prentice Hall.
6. Security Engineering, R. Anderson, Wiley
7. RC4 Stream Cipher and Its Variants. G. Paul and S. Maitra: CRC Press, Taylor
8. & Francis Group, A Chapman & Hall Book, 2012
9. Design & Cryptanalysis of ZUC - A Stream Cipher in Mobile Telephony. C. S. Mukherjee, D. Roy, S. Maitra, Springer 2020
10. Contact Tracing in Post-Covid World - A Cryptologic Approach. P. Chakraborty, S. Maitra, M. Nandi, S. Talnikar, Springer 2020

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
QUANTUM COMPUTATION AND QUANTUM INFORMATION
(PROFESSIONAL ELECTIVE-IV)

Course Code: GR22A4072   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Course Outcomes:
1. Understand the fundamentals of Quantum Computing and Quantum Information Principles.
2. Apply various quantum algorithms in different cryptosystems
3. Explore the design issues of quantumness and its applications
4. Perform Quantum key distribution techniques in Cryptosystems
5. Understand the fame work of post quantum cryptosystem.

UNIT I
Introduction to Quantum Information: States, Operators, Measurements, Quantum Entanglement: Quantum Teleportation, Super-dense coding, CHSH Game, Quantum gates and circuits.

UNIT II
Quantum Algorithms: Deutsch-Jozsa, Simon, Grover, Shor, Implication of Grover's and Simon's algorithms towards classical symmetric key cryptosystems, Implication of Shor's algorithm towards factorization and Discrete Logarithm based classical public key cryptosystems.

UNIT III
Quantum True Random Number Generators (QTRNG): Detailed design and issues of quantumness, Commercial products and applications.

UNIT IV
Quantum key distribution (QKD): BB84, Ekert, Semi-Quantum QKD protocols and their variations, Issues of Device Independence, Commercial products.

UNIT V
Introductory topics in Post-Quantum Cryptography:
Cyber Security Framework: Framework, Getting Started: background, framework basics, Online Learning: Components of the Framework, Uses and Benefits of the Framework, History and creations of the framework, The five functions, Introduction to the Framework Roadmap, update process.
Block Cipher Techniques: Overview Data Encryption Standard DES. **Cryptographic Standards and Guidelines:** Cryptographic Standards and Guidelines.

TEXTBOOKS:
1. Quantum Computation and Quantum Information. M. A. Nielsen and I. L. Chuang, Cambridge University Press
2. Presskil Lecture notes: Available online: http://www.theory.caltech.edu/~preskill/ph229/

REFERENCE BOOKS:
1. https://www.nist.gov/cyberframework/online-learning/informative-references. Unit 5
2. https://csrc.nist.gov/Projects/block-cipher-techniques. Unit 5

3. https://csrc.nist.gov/projects/cryptographic-standards-and-guidelines/example-values. Unit 5
4. https://csrc.nist.gov/projects/post-quantum-cryptography. Unit 5
5. An Introduction to Quantum Computing. P. Kaye, R. Laflamme, and M. Mosca, Oxford University Press, New York
6. Quantum Computer Science. N. David Mermin:, Cambridge University Press
7. Quantum Cryptography. D. Unruh:, Available online:

   https://courses.cs.ut.ee/all/MTAT.07.024/2017_fall/uploads/

8. NIST Post Quantum Cryptography, Available online: https://csrc.nist.gov/projects/post-

   quantum-cryptography/round-2-submissions

9. Quantum Algorithms for Cryptographically Significant Boolean Functions - An IBMQ

   Experience. SAPV Tharrmashastha, D. Bera, A. Maitra and S. Maitra, Springer 2020.

10. Quantum Algorithm Zoo. https://quantumalgorithmzoo.org/
11. Handbook of Applied Cryptography. A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone.

    CRC Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ADVANCED SOCIAL, TEXT AND MEDIA ANALYTICS
(PROFESSIONAL ELECTIVE -IV)

Course Code: GR22A4073   **L/T/P/C: 3/0/0/ 3**
IV Year I Semester

Course Outcomes:
1. Understand the text mining techniques and its application areas.
2. Apply various tools for Text Mining and carry out Pattern Discovery, Predictive Modelling
3. Explore the use of web analytics to understand the growing connectivity and complexity in the world around us on different scales – ranging from small groups to the World Wide Web
4. Perform social network analysis to identify important social actors, subgroups (i.e., clusters), and networkproperties in social media sites such as Twitter, Facebook, and YouTube
5. To distinguish the affiliations and identities in social networks context

UNIT I
Text Mining: Introduction, Core text mining operations, Pre-processing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications

UNIT II
Methods & Approaches: Content Analysis; Natural Language Processing; Clustering & Topic Detection; Simple Predictive Modeling; Sentiment Analysis; Sentiment Predict

UNIT III
Web Analytics: Web analytics tools, Clickstream analysis, A/B testing, online surveys; Web search and retrieval, Search engine optimization, Web crawling and Indexing, Ranking algorithms, Web trafficmodels

UNIT IV
Social Media Analytics: Social network and web data and methods. Graphs and Matrices. Basic measures for individuals and networks. Information visualization; Making connections: Link analysis.

UNIT V
Random graphs and network evolution. Social contexts: Affiliation and identity; Social network analysis, Case studies.

TEXTBOOKS:

1. Ronen Feldman and James Sanger, "The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data", Cambridge University Press, 2006.

2. Hansen, Derek, Ben Sheiderman, Marc Smith. 2011 Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann, 304

3. Avinash Kaushik. 2009. Web Analytics 2.0: The Art of Online Accountability.

4. Hanneman, Robert and Mark Riddle. 2005. Introduction to Social Network Method

REFERENCE BOOKS:

1. Wasserman, S. & Faust, K. (1994). Social network analysis: Methods and applications. New York: Cambridge University Press.

2. Monge, P. R. & Contractor, N. S. (2003). Theories of communication networks. New York: Oxford University Press. http://nosh.northwestern.edu/vita.html

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MOBILE COMPUTING
(PROFESSIONAL ELECTIVE-IV)

Course Code: GR22A4074   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Course Outcomes:

1. Describe the requirements for mobile applications

2. Develop design for mobile applications for specific requirements

3. Implement the design using Android SDK, Objective C and iOS

4. Deploy mobile applications in Android and iPhone marketplace for distribution

5. Demonstrate the ad hoc network concepts and its routing protocols

UNIT I

Introduction: Overview of wireless and mobile infrastructure; Preliminary concepts on cellular architecture; Design objectives and performance issues; Radio resource management and interface; Propagation and path loss models; Channel interference and frequency reuse; Cell splitting; Channel assignment strategies; Overview of generations: - 1G to 5G.

UNIT II

Location and handoff management: Introduction to location management (HLR and VLR); Mobility models characterizing individual node movement (Random walk, Fluid flow, Markovian, Activity based); Mobility models characterizing the movement of groups of nodes (Reference point-based group mobility model, Community based group mobility model); Static (Always vs. Never update, Reporting Cells, Location Areas) and Dynamic location management schemes (Time, Movement, Distance, Profile Based); Terminal Paging (Simultaneous paging, Sequential paging); Location management and Mobile IP; Overview of handoff process; Factors affecting handoffs and performance evaluation metrics; Handoff strategies; Different types of handoffs (soft, hard, horizontal, vertical).

UNIT III

Wireless transmission fundamentals: Introduction to narrow and wideband systems; Spread spectrum; Frequency hopping; Introduction to MIMO; MIMO Channel Capacity and diversity gain; Introduction to OFDM; MIMO-OFDM system; Multiple access control (FDMA, TDMA, CDMA, SDMA); Wireless local area network; Wireless personal area network (Bluetooth and ZigBee).

UNIT IV

Mobile Ad-hoc networks: Characteristics and applications; Coverage and connectivity problems; Routing in MANETs.

Wireless sensor networks: Concepts, basic architecture, design objectives and applications; Sensing and communication range; Coverage and connectivity; Sensor placement; Data relaying and aggregation; Energy consumption; Clustering of sensors; Energy efficient Routing (LEACH).

UNIT V

Cognitive radio networks: Fixed and dynamic spectrum access; Direct and indirect spectrum sensing; Spectrum sharing; Interoperability and co-existence issues; Applications of cognitive radio networks.

D2D communications in 5G cellular networks: Introduction to D2D communications; High level requirements for 5G architecture; Introduction to the radio resource management, power control and mode selection problems; Millimeter wave communication in 5G.

TEXTBOOKS:

1. Mobile Communications. Jochen Schiller, Pearson Education.

2. Wireless Communications. Andrea Goldsmith, Cambridge University Press.

REFERENCE BOOKS:
1. Wireless Communications: Principles and Practice. Theodore Rappaport, Pearson Education.

2. Wireless Communications. Ezio Biglieri, MIMO, Cambridge University Press.
3. Handbook of Wireless Networking and Mobile Computing. Ivan Stojmenovic, Wiley.
4. Dynamic Location Management in Heterogeneous Cellular Networks. James Cowling,
5. MIT Thesis. http://people.csail.mit.edu/cowling/hons/jcowling-dynamic-Nov04.pdf
6. Location Management in Wireless Cellular Networks. Travis Keshav,

   https://www.cse.wustl.edu/~jain/cse574- 06/ftp/cellular_location.pdf

7. Location Management in Wireless Data Networks. Fahd A. Batayneh, https://www.cse.

   wustl.edu/~jain/cse574-06/ftp/wireless_location.pdf

8. Principles of Mobile Communication. Gordon L. Stber, Springer.
9. Wireless Device-to- Device Communications and Networks. Lingyang Song, Dusit Niyato,

   Zhu

10. Han, and Ekram Hossain, Cambridge University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

USABILITY DESIGN OF SOFTWARE APPLICATIONS LAB

Course Code: GR22A4075   **L/T/P/C: 0/ 0/ 2/ 1**
IV Year I Semester

Course Outcomes:
1. Identify a project such as a website or mobile app to redesign
2. Analyze the existing project using Discovery and brainstorming
3. Implement the project using design life cycle such as define, design, implement and testing.
4. Understand the use of prototypes while designing the project
5. Understand the way of testing and presenting the project.

LIST OF EXPERIMENTS:

TASK 1:

Group Project identification: Design Thinking Technique

TASK 2:

Group Project identification: Discovery

TASK 3:

Group Project identification: brainstorming

TASK 4:

Redesign project: Discovery

TASK 5:

Redesign project: Define

TASK 6:

Redesign project: Design

TASK 7:

Project Prototyping Iteration 1

TASK 8:

Project Prototyping Iteration 2

TASK 9:

Implement (Design Prototype)

TASK 10:

Usability Testing

TASK 11:

Presentation of project:

TASK 12:

Review and feedback

TEXTBOOKS:

1. Observing the User Experience, Second Edition: A Practitioner's Guide to UserResearch. Elizabeth Goodman, Mike Kuniavsky, Andrea Moed

2. Interaction Design: Beyond Human-Computer Interaction, 4ᵗʰ Edition, Jenny Preece,Helen Sharp and Yvonne Rogers

REFERENCES:

1. The Elements of User Experience: User-Centered Design for the Web and Beyond.2nd Edition, Jesse James Garrett

2. Understanding Design Thinking, Lean, and Agile - Jonny Schneider

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MOBILE COMPUTING LAB

Course Code: GR22A4076   **L/T/P/C: 0/0/ 2/1**
IV Year I Semester

Course Outcome:
1. Recall the fundamentals of networking and protocols
2. Summarize the different categories of network technology
3. Experiment and evaluate the data flow using TCP/IP and UDP.
4. Experiment and evaluate the data flow in MANET and WSN.
5. Experiment and evaluate the WSN cluster using LEACH algorithm.

TASKS
PART - 1: STUDY EXPERIMENTS

1. Study of wired network, wireless network and protocols.

2. Study of MANET and protocols.

3. Study of Wireless Sensor Nodes and protocols.

4. Study of 3G, 4G and 5G network and comparison.

5. Study of Ns3 simulator and installation.

6. Study of OMNET++ simulator and installation.

PART-2: SIMULATION

Instructions:

- Students may use any simulator of their choice. (NS-3 and OMNET++ only)

- Simulation should contain appropriate network devices as per the experiment /environment specified.

- Analysis should be in graphical view.

1. Simulate a wired network and analyse the traffic flow with 10 nodes using TCP/IP.

2. Simulate two wired networks and analyse the traffic flow with other network usingTCP/IP.

3. Simulate a wired network and a wireless network, record the traffic pattern between these networks.

4. Simulate a wireless network with 50 nodes and analysis the traffic using UDP.

5. Simulate two wireless networks with 50 nodes each and analysis the traffic with others using UDP.

6. Simulate a MANET and check the traffic effect. Record the packet loss when inmotion.

7. Simulate a WSN network with 100 nodes. Analysis the Cluster using LEACHalgorithm.

TEXTBOOKS:

1. Mobile Communications. Jochen Schiller, Pearson Education.

2. *Wireless Communications.* Andrea Goldsmith, Cambridge University Press.

REFERENCE BOOKS:
1. Wireless Communications: Principles and Practice. Theodore Rappaport, PearsonEducation.

2. Wireless Communications. Ezio Biglieri, MIMO, Cambridge University Press.
3. Handbook of Wireless Networking and Mobile Computing. Ivan Stojmenovic, Wiley.
4. Dynamic Location Management in Heterogeneous Cellular Networks. JamesCowling,

5. MIT Thesis. http://people.csail.mit.edu/cowling/hons/jcowling-dynamic-Nov04.pdf
6. Location Management in Wireless Cellular Networks. Travis

   Keshav,https://www.cse.wustl.edu/~jain/cse574-06/ftp/cellular_location.pdf

7. Location Management in Wireless Data Networks.Fahd A.

   Batayneh,https://www.cse. wustl.edu/~jain/cse574-06/ftp/wireless_location.pdf

8. Principles of Mobile Communication. Gordon L. Stber, Springer.
9. Wireless Device-to- DeviceCommunications and Networks. Lingyang Song, Dusit Niyato,

   Zhu Han, and Ekram Hossain, Cambridge University Press.

10. Principles of Cognitive Radio. Ezio Biglieri, Andrea J. Goldsmith, Larry J. Greenstein,

    Narayan Mandayam and H. Vincent Poor, Cambridge University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROJECT WORK - PHASE I

Course Code: GR22A4082   **L/T/P/C: 0/0/12/6**

IV Year I Semester

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
BEHAVIORAL ECONOMICS
(PROFESSIONAL ELECTIVE-V)

Course Code: GR22A4137   **L/T/P/C: 3/0/0/3**
IV Year II Semester

Course Outcomes:
1. Students will be able to understand and apply various concepts in traditional and modernMicroeconomics
2. Students will be able to focus on decision making based on heuristics are efficient mentalprocesses that help humans solve problems or learn a new concept.
3. Students will be able to develop a holistic understanding of these concepts of utility theoryand their interconnections
4. They will be able to Outline decision and probability weighting. Apply the concepts in thefields of ownership and trade, income and consumption.
5. Students will be able to make a Strategic choice with the help of game theory and Nash equilibrium.

Unit   I
Introduction
The neoclassical/standard model and behavioral economics in contrast; historical background; behavioral economics and other social sciences; theory and evidence in the social sciences and in behavioral economics; applications – gains and losses, money illusion, charitable donation.
Basics of choice theory -Revisiting the neoclassical model; utility in economics and psychology; models of rationality; connections with evolutionary biology and cognitive neuroscience; policy analysis – consumption and addiction, environmental protection, retail therapy; applications – pricing,valuation, public goods, choice anomalies

Unit II
Beliefs, heuristics, and biases
Revisiting rationality; causal aspects of irrationality; different kinds of biases and beliefs; self-evaluation and self-projection; inconsistent and biased beliefs; probability estimation; trading applications – trade in counterfeit goods, financial trading behavior, trade in memorabilia

Unit III
Choice under uncertainty
Background and expected utility theory; prospect theory and other theories; reference points; loss aversion; marginal utility; decision and probability weighting; applications – ownership and trade, income and consumption, performance in sports.

Unit IV Intertemporal choice
Geometric discounting; preferences over time; anomalies of inter-temporal decisions; hyperbolic discounting; instantaneous utility; alternative concepts – future projection, mental accounts, heterogeneous selves, procedural choice; policy analysis – mobile calls, credit cards, organization of government; applications – consumption and savings, clubs and membership, consumption planning

Unit V

Review of game theory and Nash equilibrium – strategies, information, equilibrium in pure and mixed strategies, iterated games, bargaining, signaling, learning; applications – competitive sports, bargaining and negotiation, monopoly and market entry

Individual preferences; choice anomalies and inconsistencies; social preferences; altruism; fairness; reciprocity; trust; learning; communication; intention; demographic and cultural aspects; social norms; compliance and punishment; inequity aversion; policy analysis – norms and markets, labor markets, market clearing, public goods; applications – logic and knowledge, voluntary contribution, compensation design

Textbook:
1. An Introduction to Behavioral Economics, by N. Wilkinson and M. Klaes, Palgrave Macmillan; Second edition (10 April 2012)

References:
1. P.L. Mehta: Managerial Economics
2. Yogesh Maheswari: Managerial Economics

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTATIONAL FINANCE & MODELING
(PROFESSIONAL ELECTIVE-V)

Course Code: GR22A4138   **L/T/P/C: 3/0/0/3**
IV Year II Semester

Course Outcomes:
1. Students will understand existing financial models in a quantitative and mathematical way.
2. Students will be able apply these quantitative tools to solve complex problems in the areas ofportfolio management, risk management and financial engineering.
3. Students will be able to apply the approaches required to calculate the price of options.
4. Students will be able to identify the methods required to analyse information from financialdata and trading systems.
5. Students will be able to do statistical analysis of financial returns

UNIT I
Numerical methods relevant to integration, differentiation and solving the partial differential equationsof mathematical finance: examples of exact solutions including Black Scholes and its relatives, finite difference methods including algorithms and question of stability and convergence, treatment of near and far boundary conditions, the connection with binomial models, interest rate models, early exercise,and the corresponding free boundary problems, and a brief introduction to numerical methods for solving multi-factor models.

UNIT –II
Black-Scholes framework: Black-Scholes PDE: simple European calls and puts; put-call parity. The PDE for pricing commodity and currency options. Discontinuous payoffs - Binary and Digital options. The Greeks: theta, delta, gamma, Vega & rho, and their role in hedging. The mathematics of early exercise - American options: perpetual calls and puts; optimal exercise strategy and the smooth pasting condition. Volatility considerations - actual, historical, and implied volatility; local vol and volatility surfaces.

UNIT III
Simulation includes random variable generation, variance reduction methods and statistical analysisof simulation output. Pseudo random numbers, Linear congruential generator, Mersenne twister RNG. The use of Monte Carlo simulation in solving applied problems on derivative pricing is discussed in the current finance literature. The technical topics addressed include importance sampling, Monte Carlo integration, Simulation of Random walk and approximations to diffusion processes, martingale control variables, stratification, and the estimation of the "Greeks."

UNIT IV

Financial Products and Markets: Introduction to the financial markets and the products which are traded in them: Equities, indices, foreign exchange, and commodities. Options contracts and strategies for speculation and hedging. Application areas include the pricing of American options, pricing interest rate dependent claims, and credit risk. The use of importance sampling for Monte Carlo simulation of VaR for portfolios of options.

UNIT V

Statistical Analysis of Financial Returns: Fat-tailed and skewed distributions, outliers, stylized facts of volatility, implied volatility surface, and volatility estimation using high frequency data. Copulas, hedging in incomplete markets, American Options, Exotic options, electronic trading, Jump Diffusion Processes, High-dimensional covariance matrices, Extreme value theory, Statistical Arbitrage.

TEXTBOOKS:

1. R. Seydel: Tools for Computational Finance, 2nd edition, Springer-Verlag, New York, 2004.
2. P. Glasserman: Monte Carlo Methods in Financial Engineering, Springer-Verlag, New York, 2004.

References:

1. W. Press, S. Teukolsky, W. Vetterling and B. Flannery, Numerical Recipes in C: The Art of Scientific Computing, 1997. Cambridge University Press, Cambridge, UK. Available on-line at: http://www.nr.com/
2. A. Lewis: Option Valuation under Stochastic Volatility, Finance Press, Newport Beach, California, 2000.
3. A. Pelsser: Efficient Methods for Valuing Interest Rate Derivatives, Springer-Verlag, New York, 2000.
4. D. Ruppert, Statistics and Data Analysis for Financial Engineering
5. R. Carmona: Statistical Analysis of Financial Data in S-Plus
6. N. H. Chan, Time Series: Applications to Finance
7. R. S. Tsay, Analysis of Financial Time Series J. Franke, W. K. Härdle and C. M. Hafner,Statistics of Financial Markets: An Introduction

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INDUSTRIAL PSYCHOLOGY
(PROFESSIONAL ELECTIVE-V)

Course Code:GR22A4139   **L/T/P/C: 3/0/0/3**
IV Year II Semester

Course Outcomes:
1. Become conversant about the major content areas of Industrial Psychology (i.e., job analysis, recruitment, selection, employment law, training, performance management, and health/well-being issues in the workplace).
2. Gain further comfort with statistical concepts in the context of making personnel decisions.
3. Understand a series of elements such as performance evaluation and importance of coaching, feedback, and role of psychology in these human resource components.
4. Deepen the understanding of role of psychology in employee motivation, satisfaction and fairness and diversity in decision making.
5. Understand the importance of organizational psychology or human resource management in organizing the climate, culture, teams, work behavior, stress and leadership practices in a firm.

UNIT I
What is I/O Psychology? Research Methods, Statistics, and Evidence-based Practice, Introduction & Legal Context of Industrial Psychology, Job Analysis & Competency Modeling, Job Evaluation & Compensation, Job Design & Employee Well-Being, Recruitment.

UNIT II
Identifying Criteria & Validating Tests and Measures, Screening Methods, Intensive Methods,

UNIT – III
Performance Goals and Feedback, Performance Coaching and Evaluation, Evaluating Employee Performance,

UNIT IV
Employee Motivation, Satisfaction and Commitment, Fairness and Diversity

UNIT V
Leadership, Organizational Climate, Culture, and Development, Teams in Organizations, The Organization of Work Behavior, Stress Management: Demands of Life and Work

TEXTBOOKS:
1. Landy, F. J. and Conte, J. M. (2013). Work in the 21st Century (4th Edition). Oxford: Blackwell Publishing

Reference Books:
1. Industrial and Organizational Psychology: Linking Theory With Practice byEdwin A.
   Locke (Editor) and Cary L. Cooper (Editor)

2. Psychology Applied to Work: An Introduction to Industrial and Organizational Psychology by Paul M.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENTERPRISE SYSTEMS
(PROFESSIONAL ELECTIVE-VI)

Course Code: GR22A4140   **L/T/P/C: 3/0/0/3**
IV Year II Semester

Course Outcomes:
1. To summarize basic elements of enterprise systems.
2. To analyse the key characteristics and features of enterprise systems.
3. To integrate enterprise system applications.
4. To develop skills in understanding architecture and non-functional requirements in developing enterprise system development and their deployment.
5. To summarize the future trends in Enterprise architecture.

UNIT I
Introduction to Modern Enterprise Systems: Introduction to enterprise systems. Elements of enterprise systems – Business Information system, Decision support systems, Knowledge management systems, Financial and human resource systems. Kinds of Enterprise systems-B2C and B2B models.
Components of Enterprise systems: Channels (Mobile, web, desktop, partner integration), Data management, workflow, Controlling and Auditing, Accounting etc.
Sample Enterprise systems: ERP, SCM, CRM, Product Life cycle management (PLM), HR Systems(HRM), GL systems.
(See relevant chapters in Textbook -1 and 2)

UNIT II
Key characteristics of Enterprise systems: Distributivity, Managed, redundancy, Exception processing, Collaboration, Data transformation. (See relevant chapters in Textbook 2)
Enterprise System architectures: Batch processing, Monolithic, client server, ecommerce, serviceoriented, microservice, and cloud architectures.
Introduction to Enterprise Application architectures: Layer Architecture, Event driven Architecture, Service oriented Architecture, Microservice architecture, Plug-in architecture.

UNIT III
Application architecture Patterns: Layering, Organizing domain logic, Mapping to database, WebPresentation, Concurrency. (See Textbook 2)
Enterprise Application Integration: Introduction to Enterprise Integration, different integration styles. Elements of messaging-based Integration.
(Chapter 2, Chapter 3 from Greogor Hope's book on Enterprise Integration patterns)

Enterprise Integration patterns: Modern service integration techniques. Introduction to WSDL, SOAP. Introduction RESTFul webservices integration. Differences between SOAP and REST.

UNIT IV
Deployment of Enterprise applications: Key requirements in deployment - Stability, capacity, Security, availability, Network, Availability, and Transparency (Basic Introduction only). (Chapters Introducing stability, capacity, Networking, security, Availability, Transparency) **Concepts of Cloud computing, cloud platforms and their role in Enterprise**

systems: CoreConcepts – Types of Cloud: Private, public, and Hybrid clouds. Advantages of cloud computing – Scaling, Availability, and cost. Disadvantages – Technology overload, Security, Monitoring and troubleshooting, Testing, Latency etc. Cloud service models: - Infrastructure, platform, Software as a Service in Cloud Computing. Major public clouds: Google cloud, AWS, Azure.

UNIT V
Application development and deployment in cloud – Dockers, micro services, Kubernetes, Serverless. Continuous Integration/Continuous Delivery
Introduction to Enterprise Architecture: Importance of Enterprise Architecture. Enterprise architecture models. Zachman Framework, TOGAF Framework.

TEXTBOOKS:
1. Ralph Stair, George Reynold, "Principle of Information Systems", 10 ed.
2. Martin Fowler et al, "Pattern of Enterprise Application Architecture", Addison-Wesley, 2012
3. Gregor Hohpe, Bobby Woolf, Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions,
4. Mark Richards, Software Architecture patterns, 2015, O'Reilly.
5. Sam Newman, "Building Microservices", 2015, O'Reilly.
6. David Farley, Jez Humble, "Continuous Delivery: Reliable Software Releases through Build,Test, and Deployment Automation", Jan 2016

Reference Books:
1. Brendan Burns, Designing Distributed Systems, O'Reilly, 2016
2. Enterprise Integration Patterns - Messaging Patterns Overview
3. Software architecture in Practice 3rd Edition- 2014

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCE FINANCE
(PROFESSIONAL ELECTIVE-VI)

Course Code: GR22A4141   **L/T/P/C: 3/0/0/3**
IV Year II Semester

Course Outcomes:
1. Create an awareness about sources and their regulatory framework.
2. Ability to make dividend decisions and evaluate the lease contracts.
3. Create an awareness about corporate and financial restructuring.
4. Ability to manage working capital, cash, receivables, and inventory.
5. Familiarizing the students with the corporate and financial derivatives.

UNIT I
Sources of Funds (including regulatory framework): Types of securities, Issuing the capital in market, Pricing of issue, Valuation of Stocks and bonds.

UNIT II
Dividend Decisions: Traditional Approach, Dividend Relevance Model, Miller and Modigliani Model, Stability of Dividends, Forms of Dividends, Issue of bonus shares, Stock Split.
Evaluation of Lease Contracts- leasing, types of leases, evaluation.

UNIT III
Corporate Restructuring: Mergers and Acquisitions- Types of Mergers, Evaluation of Merger Proposal, Take-over, Amalgamation, Leverage buy-out, Management buy-out, Corporate Failure andLiquidation
Financial Restructuring: Share Split, Consolidation, Cancellation of Paid-up Capital.

UNIT IV
Working Capital Management: Working Capital Planning, Monitoring and Control of Working Capital, Working Capital Financing, Managing the Components of Working Capital- Cash Management, Receivable Management, Inventory Management.

UNIT V
Introduction to derivatives: Basics of Futures, Forwards, Options, Swaps, Interest rate Payoff Diagrams, Pricing of Futures, Put Call Parity, Option Pricing using Binomial Model and Black ScholesModel, Use of Derivatives for Risk-Return Management- Credit Default Swaps.

Home Assignment:

Case study materials books will be given to students. Students are required to meet in groups before coming to class and prepare in case for the day. Instructor may ask the student groups to present their analysis and findings to the class.

Further, the topic for class discussion will be mentioned beforehand and students should be prepared to discuss these topics in class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Historical perspectives of markets like major boom and busts, bull and bear cycles, major market crashes, bubbles

2. Topic: Major scams in the market, e.g., Satyam case

Textbooks:

1. Brealey, Myers and Allen, *Principles of Corporate Finance*

   Case Study Materials: To be distributed for class discussion

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

IMAGE PROCESSING AND PATTERN RECOGNITION

(PROFESSIONAL ELECTIVE – VI)

Course Code: GR22A4142   **L/T/P/C:3/ 0/ 0/3**
IV Year II Semester

Course Outcomes:
1. Understand the text mining techniques and its application areas
2. Apply various tools for Text Mining and carry out Pattern Discovery, Predictive Modelling
3. Explore the use of web analytics to understand the growing connectivity and complexity inthe world around us on different scales – ranging from small groups to the World Wide Web
4. Perform social network analysis to identify important social actors, subgroups (i.e., clusters), and network properties in social media sites such as Twitter, Facebook, andYouTube
5. To distinguish the affiliations and identities in social networks context

UNIT I

Introduction: Image processing systems and their applications. Basic image file formats

Image formation: Geometric and photometric models; Digitization - sampling, quantization; Image definition and its representation, neighborhood metrics.

UNIT II

Intensity transformations and spatial filtering: Enhancement, contrast stretching, histogram specification, local contrast enhancement; Smoothing, linear and order statistic filtering, sharpening, spatial convolution, Gaussian smoothing, DoG, LoG.

UNIT III

Segmentation: Pixel classification; Grey level thresholding, global/local thresholding; Optimum thresholding - Bayes analysis, Otsu method; Derivative based edge detection operators, edge detection/linking, Canny edge detector; Region growing, split/merge techniques, line detection, Hough transform.

UNIT IV

Image/Object features extraction: Textural features - gray level co-occurrence matrix; Moments; Connected component analysis; Convex hull; Distance transform, medial axis transforms, skeletonization/thinning, shape properties.

Registration: Mono-modal/multimodal image registration; Global/local registration; Transform

and similarity measures for registration; Intensity/pixel interpolation.

UNIT V

Colour image processing: Fundamentals of different colour models - RGB, CMY, HSI, YCbCr, Lab; False colour; Pseudo colour; Enhancement; Segmentation.

Morphological Filtering Basics: Dilation and Erosion Operators, Top Hat Filters.

TEXTBOOK:
1. Digital Image Processing. R. C. Gonzalez and R. E. Woods, Prentice Hall.

REFERENCE BOOKS:
1. Image Processing: The Fundamentals. Maria Petrou and Panagiota Bosdogianni, JohnWiley & Sons, Ltd.

2. Digital Image Processing. K. R. Castleman: Prentice Hall, Englewood Cliffs.

3. Visual Reconstruction. A. Blake and A. Zisserman, MIT Press, Cambridge.

4. Digital Pictures. A. N. Netravali and B. G. Haskell, Plenum Press.

5. Digital Images and Human Vision. A. B. Watson: MIT Press, Cambridge.

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

Course Outcome:
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.

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 report and proposals with appropriate formal expressions.
- Create 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 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 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).

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 dataframes, Recasting and joining of dataframes, 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 Halfspaces, 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, 1st 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, Multiplots.

UNIT II
Modeling Data: Guesstimation and the back of the envelope- Principles, Perturbation Theory and ErrorPropagation, 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 Euent 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, TheCare and Feeding of Your Data Zoo.

Text Books:

1. Philipp K. Janert, Data Analysis with Open Source Tools, O'Reilly Media, Inc, November 2010: First 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 (2nd 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(), getChars(), append(), insert(), reverse(), delete(), deleteCharAt(), replace().

UNIT IV:
Inheritance: Basics, Inheritance Types, Using Super, Multilevel Hierarchy, Super class References and Subclass Objects, Method Overriding, Abstract Classes, Using final.
Interfaces: Fundamentals, Creating and Implementing an Interface, Using Interface References, 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 Subclasses.

Text Books:
1. Herbert Schildt, Dale Skrien, Java Fundamentals A Comprehensive Introduction, 1/e, Tata McGraw Hill, 2017.
2. Herbert Schildt, The Java complete References, 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 3rdEdition
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 5th 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 witha 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, Multidimensional 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.

Textbooks:
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, PearsonEdn 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 multithreadedprogramming 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 lifetimeof 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 Limted, 2017

Reference Books:
1. The Internet of Things, Michael Miller, Pearson Education Limited, 2015
   IoT Applications, Security Threats, and Countermeasures, Padmalaya Nayak, Niranjan Ray, P. Ravichandran, Taylor &Francis,2021
2. Internet of Things: Architecture, Implementation and Security, MayurRamgir, 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-functionsand Methods, Modules in Python, Exception Handling.

Text Books:
1. The World of Scripting Languages, David Barron,Wiley India. Beginning PHP andMySQL, 3rd Edition, Jason Gilmore,Apress 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 and PHP, 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 services 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 ServiceDesign
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 demandforecasting.
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, Strategiesfor managing suppliers of service
Vehicle Routing Problem: Managing after sales service, understanding services that involve

transportation of people and vehicle, Techniques for optimizing vehicle routes

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 (7th 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 andcompete 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 asDevOps.

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. Pichler, Agile Product Management with Scrum
2. Roman 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, 5 M'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 SKlearn, 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(contemperory): 2D and 3D pointing models, The steering Law and constrained navigation, Model for hierarchial menu selection, Mobile typing models(sibgle 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 Edison), Pearson

Website Links:

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, Discussionof 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-BetzLimit- 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. I J Nagrath, M.Gopal, Control System Engineering, New Age International Publishers, Fifth edition.
2. Norman S Nise, Control system engineering, John Wiley & Sons, Inc., Sixth 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. Analyse 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 Eb/N0 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, 2nd 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" -3rd Edition, Tata McGraw, 2009
2. Jacob Fraden, "HandBook of Modern Sensors: physics, Designs and Applications", 3rd ed., Springer.

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. 3rd Edition.
3. Bentley, John P., "Principles of Measurement Systems", 4th edition, Pearson/Prentice Hall, 2005
4. Jon. S. Wilson, "Sensor Technology HandBook", 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. 4. Marvin K. Simon, Sami M. Hinedi and W. C. Lindsay, "Digital Communication Techniques.

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 criterions 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 fibol.ers; 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 welding, 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 3rd 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 to 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 modelwith 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 legislationsin 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 Age International 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, smoothening 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 - OperationalControl - Case Studies on EIA with reference to Indian Scenario
.

Text Books:
1. Y Anjaneyulu, and Valli Manikkam, Environmental Impact Assessment Methodologies, BSP BooksPVT Ltd., 2nd edition, 2011.
2. R.R. Barthwal, Environmental Impact Assessment, New Age International Private Limited, 2nd edition, 2012.
3. Canter R.L., Environmental Impact Assessment, Mc Graw Hill International Edition, 2nd edition,1997.

Reference Books:

1. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", 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 amendment