Academic Regulations
Programme Structure
and
Detailed Syllabus

Bachelor of Technology (B.Tech)
in
Computer Science and Business System

(Four Year Regular Programme)

(Applicable for Batches admitted from 2024-25)

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD

Academic Regulations for B.Tech (Regular) under GR24

(Applicable for Batches Admitted from 2024-25)

Under Graduate Degree Programme in Engineering and Technology (UG)

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

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

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

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

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

3. **Programme Pattern:**

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

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

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

d) The total credits for the Programme are 160.

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

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

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

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

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

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

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

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

a) A student pursues the course of study and completes it successfully in not less than four academic years and not more than eight academic years.

b) A student has to register for all the 160 credits and secure all credits (with CGPA ≥ 5).

c) A student must fulfill all the academic requirements for the award of the degree.

5. **Courses to be offered**

a) Open Electives: Students are to register an Open Elective (OE-I) during III year I semester, an Open Elective (OE-II) during III-year II semester, and a Open Elective (OE–III) in IV year I semester from the list of Open Electives given. OE-I and OE-II are to be selected from SWAYAM courses (MOOCs platform).

b) Professional Electives: The students have to choose six Professional Electives from the list of Professional Electives given in the course structure.

c) A course may be offered to the students, only if a minimum of 15 students opts for it.

d) More than one faculty member may offer the same subject.

e) A lab/practical may be included with the corresponding theory subject in the same semester) in any semester.

f) If more students opt for a particular course, then the priority shall be given to students firstly on 'first come first serve' basis and secondly based on CGPA (student who has higher CGPA is given more preference).

g) If more students opt for a particular course, then the concerned Head of the Department shall decide whether or not to offer such a course for two or more sections.

h) In case of options coming from students of other departments, priority shall be given to the student of the 'parent department'.

6. **Attendance Requirements:**

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

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

c) Students who have been granted condonation shall pay a fee as decided by the Finance Committee.

d) Shortage of Attendance more than 10% (attendance less than 65% in aggregate) shall in no case be condoned.

e) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. **They get detained and their registration for that semester shall stand canceled**, including all academic credentials (internal marks etc.,) of that semester. **They will not be promoted to the next semester**. They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking readmission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be reregistered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

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

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

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

b) Distribution and Weightage of marks

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

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

Assessment Procedure:

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

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

d) Mini Project:

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Mini Project	40	Continuous Evaluation & Internal Evaluation	1) The supervisor continuously assesses the students for 20 marks **i) Continuous Assessment – 15 marks** • Abstract Presentation - 3 marks • Architectural Design Presentation - 3 marks • Modules Presentation - 3 marks • Execution Cycle 1 Presentation - 3 marks • Execution Cycle 2 Presentation - 3 marks **ii) Report – 5 marks** 2) At the end of the semester, Mini Project shall be displayed in the road show at the department level. The Mini Project is evaluated by the 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 the 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 miniproject 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 the 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 the Project Review Committee in the presence of External Examiner and the same is evaluated for **60 marks**.

Note:

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

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

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

- A student is deemed to have satisfied the academic requirements and earned the credits allotted to Project Stage-I if the student secures not less than 40% of marks (40 marks out of 100 marks) in the evaluation of the same.
- A student is deemed to have failed if the student does not submit a report on work carried out during Project Stage-I or does not make a presentation of the same before the evaluation

committee as per schedule or secures less than minimum marks in the evaluation.

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

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

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

CIE is done for 50 marks as follows:

- There shall be two mid-term examinations during the semester conducted for 40 marks consisting of two parts with a total duration of 2 hours: Part A for 20 marks and Part B for 20 marks.
- Part A is an objective paper or a quiz and shall consist of multiple-choice questions, fill-in-the blanks, match the following, etc. for a total of 20 marks.
- Part B is a descriptive paper and shall contain 6 questions out of which, the student needs to answer 4 questions each carrying 5 marks.
- While the first mid-term examination shall be conducted for the first 50% syllabus, the second mid-term examination shall be conducted for the remaining 50% of the syllabus. The average of the two mid-term examinations shall be taken as final marks.
- Two assignments are evaluated for 5 marks each. The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The assignments shall be given by the subject teachers. The average of the two assignments shall be taken as the final marks.
- The remaining 5 marks may be evaluated by conducting viva-voce in the subject or by evaluating the performance of the student in PPT/Poster/Case-Study presentation on a topic in the concerned subject before the second mid-term examination.

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

CIE is done for 50 marks as follows:

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

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

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

  A student is deemed to have failed in Real-Time/Field-Based Research Project, if he (i) does not submit a report on the same or (ii) does not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in evaluation of the same.
  A student who is failed in either Real-Time/Field-Based Research Project may reappear once for the evaluation when they are scheduled again; if the student fails again in the evaluation of 'one such reappearance', the student has to reappear for the same in the subsequent semester, as and when it is offered.

- **Mandatory Courses** are evaluated for **50 marks**. The CIE for 50 marks shall be done through first and second mid-term examinations. The average marks of two mid-term examinations are taken as final marks in CIE. Students shall have to earn 40% i.e. 20 marks out of 50 marks in the average of two mid-term examinations. There shall be **NO external evaluation**. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Computation of SGPA and CGPA:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

18. Transitory Regulations

A. For students detained due to shortage of attendance:

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

B. For students detained due to shortage of credits:

3. A student of GR22 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of GR24 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both GR22 & GR24 regulations. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission. The GR24 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in GR24 Regulations:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including GR24 Regulations. **There is NO exemption of credits in any case**.
6. If a student is readmitted to GR24 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in GR24 Regulations will be substituted by another subject to be suggested by the college academic administration.

Note:

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

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

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

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

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

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

20. General Rules

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

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

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

d. The college may change or amend the academic regulations or syllabi at any time 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 GR24
(Applicable for Batches Admitted from 2025-26)

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

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

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

S. No.	Promotion	Conditions to be fulfilled
1	Second year first semester to Second year second semester.	Regular course of studyof Second year first semester.
2	Second year second semester to Third year first semester.	(i) Regular course of study of Second year second semester. (**i**) Must have secured at least 50% credits up to Second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to Third year second semester.	Regular course of studyof Third year first semester.
4	Third year second semester to Fourth year first semester.	(i) Regular course of study of Third year second semester. (**i**) Must have secured at least 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to Fourth year second semester.	Regular course of studyof 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 GR24

(Applicable for Batches Admitted from 2024-25)

1. Objectives

The keyobjectives 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 bythe 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 programmes. No course should be identical to that of the regular B.Tech course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

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

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

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

5. Minor courses and the offering departments

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
Bachupally, Kukatpally, Hyderabad–500090, India. (040)65864440
COMPUTER SCIENCE AND BUSINESS SYSTEM (CSBS)
GR24 Course Structure

I B. Tech – CSBS - I Semester

S.No	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int.	Ext	Total Marks
1	Maths	BS	GR24A1029	Discrete Mathematics for Computer Science	3	1	0	4	40	60	100
2	Maths	BS	GR24A1030	Introductory Topics in Statistics, Probability and Calculus	3	0	0	3	40	60	100
3	CSBS	ES	GR24A1031	Fundamentals of Computer Science	2	0	0	2	40	60	100
4	EEE	ES	GR24A1032	Principles of Electrical Engineering	2	0	0	2	40	60	100
5	Physics	BS	GR24A1003	Applied Physics	3	1	0	4	40	60	100
6	CSBS	ES	GR24A1033	Fundamentals of Computer Science Lab	0	0	3	1.5	40	60	100
7	EEE	ES	GR24A1034	Principles of Electrical Engineering Lab	0	0	2	1	40	60	100
8	Physics	BS	GR24A1018	Applied Physics Lab	0	0	3	1.5	40	60	100
9	English	HS	GR24A1035	Business Communication and Value Science – I	2	0	0	2	40	60	100
		TOTAL			**15**	**2**	**8**	**21**	**360**	**540**	**900**

I B. Tech CSBS - II Semester

S. No	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int.	Ext	Total Marks
1	Maths	BS	GR24A1036	Linear Algebra	3	1	0	4	40	60	100
2	Maths	BS	GR24A1037	Statistical Methods and Modelling	3	0	0	3	40	60	100
3	CSBS	ES	GR24A1038	Data Structures and Algorithms	2	0	0	2	40	60	100
4	ECE	ES	GR24A1039	Principles of Electronics	2	0	0	2	40	60	100
5	Mgmt	HS	GR24A1040	Design and Critical Thinking	2	0	0	2	40	60	100
6	CSE	ES	GR24A1027	Python Programming	1	0	0	1	50	---	50
7	Maths	BS	GR24A1041	Statistical Methods and Modelling Lab	0	0	2	1	40	60	100
8	CSBS	ES	GR24A1042	Data Structures and Algorithms Lab	0	0	2	1	40	60	100
9	ECE	ES	GR24A1043	Principles of Electronics Lab	0	0	2	1	40	60	100
10	English	HS	GR24A1044	Business Communication and Value Science – II	2	0	0	2	40	60	100
				TOTAL	**15**	**1**	**6**	**19**	**410**	**540**	**950**

II B. Tech –CSBS - I Semester

S. No	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int.	Ext	Total Marks
1	CSBS	PC	GR24A2086	Theory of Computation	3	0	0	3	40	60	100
2	CSBS	PC	GR24A2087	Computer Organization and Architecture	3	0	0	3	40	60	100
3	CSBS	PC	GR24A2088	Object Oriented Programming	2	0	0	2	40	60	100
4	CSBS	PC	GR24A2089	Computational Statistics	3	0	0	3	40	60	100
5	CSBS	PC	GR24A2090	Fundamentals of Database Systems	3	0	0	3	40	60	100
6	CSBS	PC	GR24A2091	Computer Organization and Architecture Lab	0	0	4	2	40	60	100
7	CSBS	PC	GR24A2092	Object Oriented Programming Lab	0	0	4	2	40	60	100
8	CSBS	PC	GR24A2093	Computational Statistics Lab	0	0	2	1	40	60	100
9	CSBS	PC	GR24A2094	Databases Lab	0	0	2	1	40	60	100
		TOTAL			**14**	**0**	**12**	**20**	**360**	**540**	**900**
10	Chemistry	MC	GR24A2001	Environmental Science	2	0	0	0	50	--	50

II B. Tech –CSBS - II Semester

S.No	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int.	Ext	Total Marks
1	CSBS	PC	GR24A2095	Operating Systems Concepts	2	0	0	2	40	60	100
2	CSBS	PC	GR24A2096	Principles of Software Engineering	2	0	0	2	40	60	100
3	CSBS	PC	GR24A2097	Algorithm Design and Analysis	3	0	0	3	40	60	100
4	Mgmt	HS	GR24A2098	Introduction to innovation, IP management and Entrepreneurship	3	0	0	3	40	60	100
5	ME	PC	GR24A2099	Operational Research	2	0	0	2	40	60	100
6	Mgmt	HS	GR24A2100	Fundamentals of Economics	2	0	0	2	40	60	100
7	CSBS	PC	GR24A2101	Operating Systems Concepts Lab	0	0	2	1	40	60	100
8	CSBS	PC	GR24A2102	Software Engineering Lab	0	0	2	1	40	60	100
9	CSBS	PC	GR24A2103	Algorithm Design and Analysis Lab	0	0	2	1	40	60	100
10	ME	PC	GR24A2104	Operational Research Lab	0	0	2	1	40	60	100
11	CSBS	MC	GR24A2106	Real-time Research Project/ Societal Related Project	0	0	4	2	50	--	50
		TOTAL			**14**	**0**	**12**	**20**	**450**	**600**	**1050**
12	Mgmt	MC	GR24A2105	Essence of Indian Traditional Knowledge	2	0	0	0	50	--	50

III B. Tech –CSBS - I Semester

S.No	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int.	Ext	Total Marks
1	CSBS	PC	GR24A3106	Software Design with UML	2	0	0	2	40	60	100
2	CSBS	PC	GR24A3107	Cloud,Microservices and Application	3	0	0	3	40	60	100
3	Mgmt	HS	GR24A3108	Fundamentals of Management	2	0	0	2	40	60	100
4	CSBS	PC	GR24A3109	Machine Learning with R	2	0	0	2	40	60	100
5	English	HS	GR24A3110	Business Communication and Value Science – III	2	0	0	2	40	60	100
6	CSBS	PE		**Professional Elective I**	2	1	0	3	40	60	100
7	CSBS	PC	GR24A3114	Software Design with UML Lab	0	0	4	2	40	60	100
8	CSBS	PC	GR24A3115	Compiler Construction Lab	0	0	4	2	40	60	100
9	CSBS	PC	GR24A3116	Machine Learning with R Lab	0	0	2	1	40	60	100
10	CSBS	PW	GR24A3117	Mini Project	0	0	2	1	40	60	100
		TOTAL			**13**	**1**	**12**	**20**	**400**	**600**	**1000**
11	Mgmt	MC	GR24A2003	Constitution of India	2	0	0	0	50	--	50

PROFESSIONAL ELECTIVE – I				
S. No.	**BOS**	**Group**	**Course Code**	**COURSE**
1	CSBS	PE	GR24A3111	Conversational Systems
2	CSBS	PE	GR24A3112	Compiler Construction
3	Mgmt	PE	GR24A3113	Business Strategy

III B. Tech –CSBS – II Semester

S.No	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int.	Ext	Total Mark s
1	CSBS	PC	GR24A3118	Computer Communications	3	0	0	3	40	60	100
2	CSBS	PC	GR24A3119	Information Security	3	0	0	3	40	60	100
3	CSBS	PC	GR24A3120	Fundamentals of Artificial Intelligence	3	0	0	3	40	60	100
4	Mgmt	HS	GR24A3121	Financial and Cost Accounting	3	0	0	3	40	60	100
5	English	HS	GR24A3122	Business Communication and Value Science – IV	2	0	0	2	40	60	100
6	CSBS	PE		**Professional Elective II**	3	0	0	3	40	60	100
7	CSBS	PC	GR24A3126	Computer Networks and Security Lab	0	0	2	1	40	60	100
8	CSBS	PC	GR24A3127	Fundamentals of Artificial Intelligence Lab	0	0	2	1	40	60	100
9	CSBS	PC	GR24A3128	Data Mining and Analytics Lab	0	0	2	1	40	60	100
		TOTAL			**17**	**0**	**6**	**20**	**360**	**540**	**900**

PROFESSIONAL ELECTIVE – II				
S.No.	**BOS**	**Group**	**Course Code**	**COURSE**
1	CSBS	PE	GR24A3123	Modern Day Robotics and its Industrial Applications
2	CSBS	PE	GR24A3124	Modern Web Applications
3	CSE(AIML)	PE	GR24A3125	Natural language Processing

IV B. Tech –CSBS – I Semester

S. No	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int.	Ext	Total Mark s
1	CSBS	PC	GR24A4106	Usability Design of Software Applications	2	1	0	3	40	60	100
2	Mgmt	HS	GR24A4107	Financial Management	3	0	0	3	40	60	100
3	Mgmt	HS	GR24A4108	Human Resource Management	3	0	0	3	40	60	100
4	CSBS	PE		**Professional Elective III**	2	1	0	3	40	60	100
5	CSBS	PE		**Professional Elective IV**	2	1	0	3	40	60	100
6	CSBS	PC	GR24A4113	Usability Design of Software Applications Lab	0	0	4	2	40	60	100
7	CSBS	PC	GR24A4114	Mobile Computing Lab	0	0	4	2	40	60	100
8	CSBS	PW	GR24A4016	Project Work Phase- I	0	0	12	6	40	60	100
		TOTAL			**12**	**3**	**20**	**25**	**320**	**480**	**800**

PROFESSIONAL ELECTIVE – III				
S. No.	**BOS**	**Group**	**Course Code**	**COURSE**
1	CSBS	PE	GR24A4109	Cognitive Science and Analytics
2	CSBS	PE	GR24A4110	Introduction to IoT
3	CSE(DS)	PE	GR24A3139	Information Retrieval Systems

PROFESSIONAL ELECTIVE – IV				
S. No.	**BOS**	**Group**	**Course Code**	**COURSE**
1	CSBS	PE	GR24A4111	Quantum Computation and Quantum Information
2	CSBS	PE	GR24A4123	Generative AI
3	CSBS	PE	GR24A4112	Mobile Computing

IV B. Tech –CSBS – II Semester

S.No	BOS	Group	Course Code	Course Name	L	T	P	Credits	Int.	Ext	Total Marks
1		OE		**Open Elective -I**	3	0	0	3	40	60	100
2		PE		**Professional Elective V**	3	0	0	3	40	60	100
3		PE		**Professional Elective VI**	3	0	0	3	40	60	100
4	CSBS	PW	GR24A4026	Project Work Phase-II	0	0	12	6	40	60	100
TOTAL					**9**	**0**	**12**	**15**	**160**	**240**	**400**

PROFESSIONAL ELECTIVE – V				
S. No.	**BOS**	**Group**	**Course Code**	**COURSE**
1	Mgmt	PE	GR24A4118	Behavioral Economics
2	Mgmt	PE	GR24A4119	Computational Finance & Modeling
3	Mgmt	PE	GR24A4120	Industrial Psychology

PROFESSIONAL ELECTIVE – VI				
S. No.	**BOS**	**Group**	**Course Code**	**COURSE**
1	Mgmt	PE	GR24A4121	Enterprise Systems
2	Mgmt	PE	GR24A4122	Advance Finance
3	CSE	PE	GR24A4099	Cyber Security

PROFESSIONAL ELECTIVES – 3 THREADS

S. No.	Theory and Algorithms	Applications	Data Science and Machine Intelligence
1	Business Strategy	Compiler Construction	Conversational Systems
2	Modern Day Robotics and its Industrial Applications	Modern Web Applications	Natural Language Processing
3	Cognitive Science and Analytics	Introduction to IoT	Information Retrieval Systems
4	Quantum Computation and Quantum Information	Generative AI	Mobile Computing
5	Behavioral Economics	Computational Finance & Modeling	Industrial Psychology
6	Enterprise Systems	Advance Finance	Cyber Security

OPEN ELECTIVE- THREADS

THREAD 1	THREAD 2	OFFERED BY
1. Human Resource Development and Organizational Behavior(GR24A3010) 2. Cyber Law and Ethics(GR24A3024) 3. Economic Policies in India(GR24A4013) 4. Indian knowledge system(GR24A3023) 5. Personality Development through Life Enlightenment skills(GR24A4012)	1. Engineering Materials for Sustainability(GR24A3009)	CE
	2. Geographic Information Systems and Science(GR24A3022)	
	3. Plumbing (Water and Sanitation)(GR24A4011)	
	1. Non-Conventional Energy Sources(GR24A3035)	EEE
	2. Concepts of Control Systems(GR24A3046)	
	3. Artificial Neural Networks and Fuzzy Logic(GR24A4037)	
	1. Industrial Automation and Control(GR24A3056)	ME
	2. Operations Research(GR24A3034)	
	3. Composite Materials(GR24A3066)	
	1. Digital Electronics For Engineering(GR24A3076)	ECE
	2. Sensor Technology(GR24A3085)	
	3. Communication Technologies GR24A4078	
	1. Data Science for Engineers (GR24A3092)	CSE
	2. Data Analytics using open source tools (GR24A3103)	
	3. Augmented Reality and Virtual Reality GR24A4096)	
	1.Services Science and Service Operational Management(GR24A4115)	CSBS
	2. IT Project Management(GR24A4116)	
	3. Marketing Research and Marketing Management(GR24A4117)	
	1.Basics for java programming (GR24A3133)	CSE (AIML)
	2. Introduction to DBMS (GR24A3141)	
	3. Introduction to Data Mining (GR24A4124)	
	1. Introduction to Operating System (GR24A3143)	CSE (DS)
	2. Internet of Things (GR24A3145)	
	3. Scripting Languages (GR24A4134)	

I YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DISCRETE MATHEMATICS FOR COMPUTER SCIENCE

Code: GR24A1029 **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 circuits using 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 Prim's 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 planar 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,
4. N. Deo,Prentice Hall, Englewood Cliffs, 1974.
5. 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: GR24A1030 **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 bythe 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, Collection of Data: Internal and externaldata, Primaryand 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.

Unit-III

Probability Distributions

Discrete distributions: Binomial, Poisson and Geometric distribution.

Continuous distributions: Uniform, Exponential, Normal distributions.

Unit-IV

Differential Calculus

Limit of functions, continuity, derivatives. Taylor's and McLaurin's series expansions, Partial derivatives of first and second order, Maxima and minima of function of two variables without constraints.

Unit-V

Integral Calculus

Multiple Integrals- double integrals with constant and variable limits (Cartesian 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.
3. Goon, M. Gupta and B. Dasgupta, "Fundamentals of Statistics", vol. I & II, WorldPress.

Reference Books*:*

1. R. Miller, J.E. Freund and R. Johnson, "Probability and Statistics for Engineers". Fourth Edition,PHI.
2. M. Mood, F.A. Graybill and D.C. Boes, "Introduction to the Theory of Statistics", McGraw Hill Education.
3. Peter V O'Neil, "Advanced Engineering Mathematics", seventh edition, Thomson learning.
4. M.D. Greenberg, "Advanced Engineering Mathematics", second edition, Pearson Education.
5. 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: GR24A1031 **L/T/P/C: 2/0/0/2**

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 a given problem.
3. To decompose a problem into functions and work with standard and user defined libraries.
4. Exercise on programs using pointers, structures and unions.
5. Interpret solution for a given problem using files in C and an idea of a 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: GR24A1032 **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 (ϒ-Δ&ϒ-ϒ).

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 Company Ltd., 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. Nagrath and 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), Cambridge University 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

APPLIED PHYSICS

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

Course Outcomes:

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

UNIT I: Quantum Physics and Solids

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

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

UNIT II: Semiconductors and devices

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

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

UNIT III: Magnetic materials and Superconductivity

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

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

UNIT IV: Lasers and Fiber Optics

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

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

UNIT V: Nanotechnology

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

Text books:

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

References:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FUNDAMENTALS OF COMPUTER SCIENCE LAB

Course Code: GR24A1033 **L/T/P/C: 0/0/3/1.5**
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 a 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 ofthe numbers.

c) Write a C program using switch statements 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 the sumof 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 the 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 the same.

TASK-8 (User defined header):

a) Write a c program to implement the following preprocessor 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 main string 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: GR24A1034 **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 transducers related 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/Compound Motor
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, Oxford University 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. Engineering Electromagnetics, William H. Hayt, Jr. John A. Buck, 8th Revised Edition, McGraw Hill Higher Education, 2011.
3. Fundamentals of Electrical and Electronics Engineering, SmarjithGhosh, Prentice Hall (India) Pvt. Ltd., 2010.
4. Basic Electrical Engineers, P. Ramana, M. Surya Kalavathi, G. T. Chandra Sekhar, S. Chand Technical Publications, 2018.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPLIED PHYSICS LAB

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

Course Outcomes:

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

List of Experiments:

1. Energygap of P-N junction diode: To determine the energygap of a semiconductor diode.

2. Solar Cell: To study the V-I Characteristics of solar cell.

3. Light emitting diode: To study V-I characteristics of light emitting diode.

4. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.

5. Hall effect: To determine Hall coefficient of a given semiconductor.

6. Photoelectric effect: To determine the work function of a given material and Planck's constant.

7. LASER: To studythe V-I characteristics of LASER sources.

8. Optical fiber: To determine the bending losses of Optical fibers.

9. Optical fiber: To determine the Numerical Aperture of Optical fibers.

10. Melde's experiment: To determine the frequency of a tuning fork using Melde's arrangement.

Note: Any 8 experiments are to be performed.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BUSINESS COMMUNICATION AND VALUE SCIENCE – I

Course Code: GR24A1035 **L/T/P/C: 2/ 0/ 0/ 2**
I Year I Semester

COURSE PREREQUISITES:

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 therebyparagraph 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 will enhance 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, Difference between 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,

ii. Job application letter

iii. Summary writing

iv. Story Writing

v. Report writing

vi. 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:

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 flexibilityregarding the change of title and components of the syllabus.
2. Theyalso 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: GR24A1036 **L/T/P/C: 3/1/0/4**
I Year II Semester

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

Course Outcomes: After completion of the course, the student will be able to

1. Determine the inverse, generalized inverse and rank of a matrix.
2. Solve a system of linear algebraic equations for an exact solutions
3. Determine the eigen values and eigenvectors of a square matrix and perform matrix factorization
4. Interpret vector spaces and subspaces and apply their properties
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
Rank of a matrix- Linear independence of vectors- Orthogonal projection of vectors

UNIT-II:

SOLUTION OF A LINEAR ALGEBRAIC SYSTEM OF EQUATIONS

Solution of a homogeneous and non-homogeneous system of equations using Gaussian elimination-The Gram-Schmidt orthonormalization process-QR factorization

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.

UNIT-IV:

VECTOR SPACES

Definition of a vector space- Subspace of a vector space- Linear Span, Basis and dimension of a vector space Linear transformation- Rank and Nullity of a linear transformation

UNIT-V:

Singular Value Decomposition And Principal Component Analysis

Low rank matrix approximation- Computation of the full singular value decomposition of a real matrix- 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

TEXT BOOKS

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, 5thEdition, 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, 4thEdition, Kluwer, 1997.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STATISTICAL METHODS & MODELLING

Course Code: GR24A1037 **L/T/P/C: 3/ 0/ 0/3**
I Year II Semester

Pre-requisites: Elementary statistics and Linear algebra

Course Outcomes : At the end of the course, the student will be able to

1. Apply sampling distribution techniques
2. Apply statistical estimation methods
3. Apply Inferential Statistics to make predictions or judgments about the population from which the 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 (unbiasedness, 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- way classifications.

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.

TEXT BOOKS:

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 Theoryof 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: GR24A1038 **L/T/P/C: 2/ 0/ 0/ 2**
I Year II Semester

Course Prerequisites: C Language

Course Outcomes:

1. To analyze 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 trees.
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 UIlman.

REFERENCES:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald 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, Pat Morin.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF ELECTRONICS

Course Code: GR24A1039 **L/T/P/C: 2/ 0/ 0/ 2**
I Year II Semester

Course Prerequisite: 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, formation of 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

Feedback 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 amplifier 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

DESIGN AND CRITICAL THINKING

Course Code: GR24A1040 **L/T/P/C: 2/0/0/2**
I Year II Semester

Course Outcomes:

1. Understand the application of Design Thinking in engineering and business application and how to empathize and identify the steps in the DT process
2. Create personas in the defined 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

PYTHON PROGRAMMING

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

I Year II Semester

Course Outcomes:

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

UNIT I

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

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

UNIT II

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

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

UNIT III

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

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

UNIT IV

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

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

UNIT V

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

Teaching methodologies:

- PowerPoint Presentations
- Tutorial Sheets
- Assignments

TEXTBOOKS

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

REFERENCE BOOKS

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STATISTICAL METHODS & MODELLING LAB

Course Code: GR24A1041 **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

Task1: 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 count occurrences of each value.

Task4: Write an R program for addition and Multiplication of two matrices.

Task 5: Write an R programto create a Data Frame whichcontains details of 5 employees and display summary of the data.

Task 6: Write an R program to read the .csv file and perform the following: (i) Summary statistics on the data, (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: GR24A1042 **L/T/P/C: 0/ 0/ 2/ 1**
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 troubleshoot, 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 traversal of a Double linked list

TASK 5

a) Write a C program to implement the following Binarysearch 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 Binarysearch

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 the screen.
b) Write a C program to perform the following:
(i) Construct a Binary Search Tree from a file. (retrieving non-linear data structure from a file)
(i) Display the contents of a Binary Search Tree on a file. (Saving a non-linear data structure in a file)

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
2. Knuth
3. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.
4. Open Data Structures: An Introduction (Open Paths to Enriched Learning), 31st Edition, Pat Morin.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF ELECTRONICS LAB

Course Code:GR24A1043 **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: GR24A1044 **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 Powerpoint – 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 team activity

UNIT V

Inclusion – Definition – concept of inclusion – workplace inclusion – 7 pillars of inclusion – How to 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: Acharya Mahapragya
3. The Scientific India: A twenty First Century Guide to the World around Us; Dr. A.P.J Abdul 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, 6 October 2011; Penguin
7. Advertising & IMC: Principles and Practice; Sandra Moriarty, Nancy D. Mitchell, William 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: GR24A2086 **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. Analyze 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.
6. R. Gareyand D. S. Johnson.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTER ORGANIZATION AND ARCHITECTURE

Course Code: GR24A2087 **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 microprogrammed 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 and non-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 cache coherency.

UNIT V

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, 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 Patterson and John L. Hennessy.
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: GR24A2088 **L/T/P/C: 2/ 0/ 0/2**

II Year I Semester

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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 solution for 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 documents.

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 type casting 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, Class diagram, 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: GR24A2089 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Outcomes:

1. Correlate statistical inference methods for testing hypotheses 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: GR24A2090 **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, Functional Dependencies, Normal Forms, Dependency Preservation, Lossless Design.
Query Processing and Optimization: Evaluation of Relational Algebra Expressions, Query Equivalence, 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 RBAC Models, Intrusion Detection, SQL Injection.
Advanced Topics: Object oriented Databases, Object Relational Databases, Logical Databases, Web Databases, 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 ARCHITECTURE LAB

Course Code: GR24A2091 **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 ports 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 NOR gates.

TASK 2

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

TASK 3

Implementation of Multiplexer, Demultiplexer, 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 numbers to BCD numbers 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: GR24A2092 **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, inheritance concepts in developing solutions of a problem on hand.
3. Apply concepts of class hierarchy, templates and structure data using stacks and queue with help of OOP while developing programs.
4. Perceive and choose appropriate input-output formats and manipulators 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, parameter by value vs by reference, passing array as constant pointer.

b) Function overloading: writing string operations like strcat and strncat, strcpy and strncpy as overloaded 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 a class vector of integers with all possible operations like constructor, destructor, copy constructor and assignment operators.
c. Define class matrix of integers with all possible operations like constructor, destructor, copy constructor and assignment operators.
d. Define a class matrix of integers using vectors, with all possible operations like constructor, destructor, copy constructor and assignment operators.

TASK-3

3. Define class stack, queue, linked-list, array, set using some data type (int) with data members kept 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, copy constructor and assignment operators>, <, >=, <=, ==, ++ (pre and post), +, +=, ( ).

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

TASK-6

1. Define stack and queue inherited from arrayclass, with standard functions and operators

TASK-7

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.

a) Define template functions for comparison and use it in the algorithms like bubble sort, insertion sort, merge sort.

TASK-8

Formatted input-output examples

TASK-9

Input manipulators

TASK-10

Overriding operators <<, >>

TASK-11

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

TASK-12

Show behavioral modeling through sequence diagram and activity diagram for workflow in a 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: GR24A2093 **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 the 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 in a dictionary data structure.

b) Write a program to use split and join methods in the string and trace a birthday with a 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 order

TASK-5 (Matplotlib package)

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

TASK-6 (Matplotlib package)

a) Using the "text" command add text to the axes of figures.
b) Using the "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 center 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,
2. D.A. Belsey,E. Kuh and R.E. Welsch
3. Applied Linear Regression Models, J. Neter, W. Wasserman and M.H. Kutner.
4. The Foundations of Factor Analysis, A.S. Mulaik.
5. Introduction to Linear Regression Analysis, D.C. Montgomery and E.A. Peck.
6. Cluster Analysis for Applications, M.R. Anderberg.
7. Multivariate Statistical Analysis, D.F. Morrison.
8. Python for Data Analysis, Wes Mc Kinney.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATABASES LAB

Course Code: GR24A2094 **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 the database.
5. Use SQLite to connect to databases from C programs.

LIST OF EXPERIMENTS:

TASK-1 (DDL and DML Commands):

1. Practice queries on DDL Commands
2. Practice 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 pairwise sub queries.
b) Practice the single row and multiple row subqueries.
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 sequences and synonyms.

TASK-7(Indexes, Sequences and Synonyms):

a) Practice the creation of sequences and synonyms.
b) Practice creation of function based indexes.
c) Create an index on the 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 in it.

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

ENVIRONMENTAL SCIENCE

Course Code: GR24A2001 **L/T/P/C:2/0/0/0**
II Year I Semester

Course Outcomes:

1. Gain a variety of experiences & acquire a basic knowledge about the environment & its allied problems
2. Interpret the keycomponents 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 I: 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
- Impact of Science & Technology on Environment
- E-waste management
- Biodiversity loss
- Renewable Energy

UNIT II

SLOGAN AND POSTER MAKING EVENT

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

UNIT III

EXPERT LECTURES ON ENVIRONMENTAL SCIENCE

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

UNIT IV
CLEANLINESS DRIVE

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

UNIT V
CASE STUDIES

- HPCL and LG Polymers disasters in Vizag
- Oleum gas leak in Delhi
- Mathura Refinery & Taj Mahal
- Conservation of Hussain Sagar lake
- The Cleanest 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.

II YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATING SYSTEMS CONCEPTS

Course Code: GR24A2095 **L/T/P/C: 2/0/0/2**
II Year II Semester

Course Outcomes:

1. Explain functions and structures of operating system and differentiate among different OS types; 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; Multiprocessor 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, Dining 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 standard I/O, UNIX system calls.

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

PRINCIPLES OF SOFTWARE ENGINEERING

Course Code: GR24A2096 **L/T/P/C: 2/0/0/2**
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 Lawrence Pfleeger
6. Software Engineering: Theory and Practice, Shari Lawrence Pfleeger and Joanne
7. M. Atlee
8. Object-Oriented Software Construction, Bertrand Meyer
9. Object Oriented Software Engineering: A Use Case Driven Approach --Ivar Jacobson
10. Touch of Class: Learning to Program Well with Objects and Contracts --Bertrand Meyer
11. 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: GR24A2097 **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 Algorithms. 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 Reduction techniques.

UNIT V

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

TEXTBOOKS:

1. Fundamentals 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 and Isaac L. Chuang.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTRODUCTION TO INNOVATION, IP MANAGEMENT AND ENTREPRENEURSHIP

Course Code: GR24A2098 **L/T/P/C: 3/ 0/ 0/ 3**
II Year II Semester

Course Outcomes:

1. Study and understand what and why innovation is required and its process and sources of innovation.
2. Investigate, understand, and internalize the process of building an innovative organization.
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, plan and 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 open innovation 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 Style of 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 case for the day. Instructors 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. Instructors 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: GR24A2099 **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, Convex polyhedron, 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 and Inventory 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. 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

FUNDAMENTALS OF ECONOMICS

Course Code: GR24A2100 **L/T/P/C: 2/ 0/ 0/ 2**
II 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, Pearson Education, 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,Springer, 2014.
2. Principles of Macroeconomics, N. Gregory Mankiw, 7th Edition, Cengage India, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATING SYSTEMS CONCEPTS LAB

Course Code: GR24 A2101 **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: GR24A2102 **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
Performreverse 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 arrayof 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, Shari Lawrence 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: GR24A2103 **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 undirected graphs using Krushkal's and prim's algorithms.

List of Programs:

TASK 1

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

TASK 2

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

TASK 3

Implement and analyze time complexity of Greedy Application Problems.

TASK 4

Implement and analyze time complexity of Dynamic Programming Application Problems.

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: GR24A2104 **L/T/P/C: 0 / 0/ 2 / 1**
II Year II Semester

Course Outcomes:

1. Finding the solutions to linear 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 methods.

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 to transportation problems.

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

REAL-TIME RESEARCH PROJECT/ SOCIETAL RELATED PROJECT

Course Code: GR24A2106 **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 obtain the category of the solution with help of Real time studies
3. Analyze and discuss the field problems using software tools /Modes/simulations and experimental investigations.
4. Implementing the solution of a problem statement.
5. Prioritize the reports and deliver the final work with presentation.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (NON-CREDIT)

Course Code: GR24A2105 **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 the 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 the scientific worldview and basic principle's Indian philosophy and early literature.
5. Familiarize Ayurveda importance in modern life and process for health & Well-being with Ayurveda.

UNIT I

Introduction to the basic structure of the 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 Farmers 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 Vidya Bhavan, 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/

III YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SOFTWARE DESIGN WITH UML

Course Code: GR24A3106 **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 Sequence Diagram.

UNIT IV

The Logical View Design Stage: The Static Structure Diagrams.

The Class Diagram Model, Attributes descriptions, Operations descriptions, Connections descriptions 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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CLOUD, MICROSERVICES AND APPLICATIONS

Course Code: GR24A3107 **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, Micro service 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: Overview of Cloud Service Models (IaaS, PaaS, SaaS), Deployment Models (Public, Private, Hybrid, Community), Cloud Components, Application of Cloud Computing, Cloud Components Guiding Principle with respect to utilization/Security/Pricing. Overview of Public Cloud Platforms overview and their usage.

UNIT II

Application architectures-Monolithic & Distributed Architecture, Micro service fundamental and design approach, Spring Boot fundamentals and Design of Micro-services , Cloud Native applications and 12-Factors App methodology.

UNIT III

Application integration process/Application Process, API Fundamentals, RESTful APIs, API management, API tools. Developer Portal. Applications of APIFICATION

UNIT IV

DevOps fundamentals: Concepts, Tools and applications. Continuous Integration and Continuous Deployment (CI/CD) overview. Containerization Process and application using Docker and container lifecycle management

UNIT V

Python- Refresher, use cases for cloud application development, Design and developing solution steps using containers & containerization of application and deployment using Kubernetes, Cloud Security 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 Storage and 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

FUNDAMENTALS OF MANAGEMENT

Course Code: GR24A3108 **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 in 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 organizations and 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 Behaviour: 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 Cultural Diversity.

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, Business and Social Responsibility, Corporate Governance, Corporate Citizenship, Corporate Social Responsibility.

Home Assignment:

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.

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, 2018.
2. Principles and Practice of Management, L. M. Prasad, Sultan Chand & Sons, 2019
3. Organizational Behavior - An Evidence-Based Approach- by Fred Luthans, Published by McGraw-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

MACHINE LEARNING WITH R PROGRAMMING

Course Code: GR24A3109 **L/T/P/C: 2/ 0/ 0/2**
III Year I Semester

Course Outcomes:
At the end of the course, the student will be able to:

1. Distinguish between supervised, unsupervised, and semi-supervised learning techniques.
2. Apply suitable machine learning strategies for supervised learning problems.
3. Acquire skills to use sequence machine learning techniques in real-time applications.
4. Implement prediction models across various real-time application domains.
5. Analyse and apply unsupervised machine learning techniques for clustering data.

UNIT I

Introduction to Machine Learning: Basic concepts to Machine Learning (ML), Relationship between ML and human learning, Survey of major models of how machines learn, Example applications of ML.

Fundamentals of R Programming: Importance of R, Role of R in Machine Learning applications, Data types, Basic commands, R libraries for ML, Data preprocessing methods.

UNIT II

Classification Theory: The problem of classification, Feature Engineering, Training, and Testing classifier models, Cross-validation, Model evaluation- Precision, Recall, F1-measure, Accuracy, Area Under Curve (AUC), Statistical decision theory - discriminant functions and decision surfaces.

Classification Algorithms: Naive Bayes, Bayesian Networks, Decision Trees, Random Forests, k-Nearest Neighbor (kNN), Support Vector Machines (SVM), Artificial Neural Networks (ANN), including backpropagation, Applications of classification, Introduction to Ensembles of classifiers - bagging and boosting.

UNIT III

Sequence Classification Models: Introduction to Markov Chains (MC) and Hidden Markov Models (HMM), Forward-Backward algorithm, and Viterbi algorithm in HMM, Sequence classification using HMM and Conditional Random Fields (CRF), Applications of sequence classification – Part of Speech Tagging.

UNIT IV

Regression: Multi-variable Regression, Model Evaluation, Least Squares Regression, Regularization - LASSO and Ridge Regression, Applications of regression,

Association Rule Mining: Basics, Association Rule Mining algorithm - Apriori. Expectation Maximization (EM) algorithm for unsupervised learning.

UNIT V

Clustering: Fundamentals of clustering and similarity measures, Clustering methods - Average linkage, Ward's algorithm, Minimum Spanning Tree (MST) clustering, k-Nearest Neighbour clustering, Advanced clustering techniques - BIRCH, CURE, DBSCAN.

Outliers and Anomalies: Basics, Methods for Anomaly detection, and Outlier detection.

TEXTBOOKS:

1. Tom M. Mitchell, Machine Learning, McGraw-Hill.
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
4. Brett Lantz, *Machine Learning with R: Expert Techniques for Predictive Modeling* (3rd Edition), Packt Publishing, 2019 (3rd Edition).

REFERENCE BOOKS:

1. Stephen Marshland, Machine Learning: An Algorithmic Perspective, Taylor & Francis.
2. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer, 2009.
4. Hadley Wickham and Garrett Grolemund, R for Data Science, O'Reilly Media, 2016 (1st Edition).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY

BUSINESS COMMUNICATION AND VALUE SCIENCE – III

Course Code: GR24A3110 **L/T/P/C: 2/0/ 0/2**

III Year I Semester

Course Pre-Requisite(S): Basic Knowledge of English (verbal and written).

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:

C. 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) Glocal 3) Translocation
- Cross-cultural communication - Culture shock
- Gender awareness

UNIT – III:

D. Science of India

- Role of science and scientists in nation building
- Role of science post- independence
- Inventions –Inventors-Institutes-Information Technology

E. 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:

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

REFERENCE BOOKS:

1. Effective Technical Communication (2005), Ashraf, Rizvi M, New Delhi: Tata Mc Graw 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: GR24A3111 **L/T/P/C: 2/1/ 0/3**

III Year I Semester

Course Outcomes:

1. Review, critically analyse and synthesize conversational systems
2. Select appropriate Natural Language Processing Techniques for Conversational systems
3. Use appropriate methodologies for developing and evaluating conversational systems
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, Information extraction, 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 BOOKS:

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

COMPILER CONSTRUCTION

(Professional Elective –I)

Course Code: GR24A3112 **L/T/P/C: 2/1/0/3**

III Year I Semester

Course Outcomes:

1. Understand basic concepts and implement lexical analysis using regular expressions, finite automata, and scanner tools.
2. Construct syntax analyzers using LL and LR parsing techniques.
3. Understand semantic analysis, symbol table management, and run-time environment concepts.
4. Generate intermediate code and apply code optimization techniques.
5. Generate target code using register allocation techniques and apply advanced compilation concepts.

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) grammars and 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 and non-imperative programming languages.

TEXTBOOKS:

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

REFERENCE BOOKS:

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

BUSINESS STRATEGY
(Professional Elective – I)

Course Code: GR24A3113 **L/ T/ P/ C: 2/1/0/3**

III Year I Semester

Course Outcomes: This course will help students,

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 assets through evaluating the business process and capabilities.
3. To understand, examine the external environment of a firm and their competitive strategies for creating the 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 , Corporate Governance - Four pillars of corporate governance, dimensions of corporate governance.

Final Project: Students (in groups/ individually) are required to work on a project and submit the project report and deliver presentation. The topic of the project will be given later.

Home Assignment

- 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 meet in groups before coming to class and prepare on the topic.
- 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 Education Private Limited.

REFERENCE BOOKS:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SOFTWARE DESIGN WITH UML LAB

Course Code: GR24A3114 **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.

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 LAB

Course Code: GR24A3115 **L/T/P/C :0/ 0/ 4/ 2**

III Year I Semester

Course Outcomes:

1. Implement lexical analysis programs using LEX tools to recognize tokens and process input patterns.
2. Develop programs for left recursion elimination and predictive parsing.
3. Construct bottom-up parsers using LALR parsing techniques.
4. Use YACC tools to convert grammar rules and generate Abstract Syntax Trees.
5. Implement intermediate code generation and generate target code from ASTs.

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 programto 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: GR24A3116 **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.

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 for clustering 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 to demonstrate 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)

REFERENCE BOOKS:

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. Alpaydin, Introduction to Machine Learning, 3/e, Prentice-Hall, 2014.
6. Rostamizadeh, A. Talwalkar, M. Mohri, Foundations of Machine Learning, MIT Press.
7. Web, Statistical Pattern Recognition, 3/e, Wiley, 2011.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MINI PROJECT

Course Code: GR24A3117 **L/T/P/C: 0/ 0/ 2/1**

III Year I Semester

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

1. Make use of fundamental knowledge and practical knowledge to implement towards industries.
2. Evaluate and demonstrate the problem finding ability in Engineering Technologies
3. Utilizing software and design, analyze the engineering Knowledge in accordance with applicable standards.
4. Analyze project management skills and scheduling of work in stipulated time.
5. Develop technical information by means of written and oral reports

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONSTITUTION OF INDIA

Course Code: GR24A2003 **L/T/P/C: 2/ 0/ 0/0**

III Year I Semester

Course Outcomes:

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

UNIT-I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

TEXTBOOKS:

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

III YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTER COMMUNICATIONS

Course Code: GR24A3118 **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 the Network
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.

REFERENCE BOOKS:

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: GR24A3119 **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 and policy 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.

REFERENCE BOOKS:
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: GR24A3120 **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 suitable case 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.

REFERENCE BOOKS:

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: GR24A3121 **L/T/P/C: 3/ 0/ 0/3**
III Year II Semester

Course Outcomes:

1. Create 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 cost management
5. Analyse marginal costing and interpret the company accounts and audit reports

UNIT I

Accounting Concept: Introduction to Accounting, Concepts and Conventions, Bookkeeping and Record Maintenance, Fundamental Principles and Double Entry System.

UNIT II:

Accounting Process: Journal, Ledger, Subsidiary Books, Trial Balance, Final Accounts.

UNIT III

Financial Statements: Form and Contents of Financial Statements, Analysing and Interpreting Financial Statements- Cash Flow and Fund Flow statement (the basic differences between them and preparation of Cash Flow and Fund Flow statements).

UNIT IV

Costing Systems: Elements of Cost, Cost Behaviour, Cost Allocation, OH Allocation, Unit Costing, Process Costing, Job Costing, Absorption Costing,

UNIT V

Marginal Costing, Cost Volume Profit Analysis, Budgets, ABC Analysis. Company Accounts and Annual Reports: Audit Reports and Statutory Requirements, Directors Report, Notes to Accounts, Pitfalls.

Home Assignment:

Case study materials book 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
2. Financial Accounting: An Introduction, Pauline Weetman, Pearson Education, Year of Publication: 2019 (7th Edition)
3. Financial Accounting: Jerry J. Weygandt, Paul D. Kimmel, and Donald E. Kieso, Wiley: 2020 (11th Edition)
4. Financial and Managerial Accounting, Carl S. Warren, James M. Reeve, and Jonathan Duchac, Cengage Learning (14th Edition)
5. Cost Accounting: A Managerial Emphasis. Charles T. Horngren, Srikant M. Datar, Madhav V. Rajan, Pearson Education, 2020 (16th Edition)
6. Cost Management: A Strategic Emphasis, Edward Blocher, David Stout, Paul Juras, Steven Smit, McGraw-Hill Education,2019 (8th Edition)

Case Study Materials: To be distributed for class discussion

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BUSINESS COMMUNICATION AND VALUE SCIENCE - IV

Course Code: GR24A3122 **L/T/P/C: 2/ 0/ 0/2**

III Year II Semester

Course Pre-Requisite(S):
Basic Knowledge of English (verbal and written)

Course Outcomes: Upon completion of the course, students shall have ability to
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:

A. Corporate Social Responsibility (CSR)

i. Importance of corporate social responsibility (CSR)
ii. The Need to conduct CSR activities
iii. Stories of corporate social responsibility

B. Diversity, Multiple Intelligences & Learner styles

i. Multiple intelligences & Diversity
ii. Learning styles in diversified environments
iii. 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-
vi. ImageManagement

B. Life Skills

i. Stress management
ii. Time Management
iii. Corporate etiquette
iv. Business idioms and Corporate Terms
v. Conflict Resolution and Conflict Management

Note: 1. Through Activities the concepts should be taught. Chalk and Talk should minimized.
2. For Unit '5B' real time case studies can be used as a source of discussion for better understanding 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 giving unforgettable speeches and presentations.

REFERENCES:

Web Resources

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

Online Resources

https://youtu.be/reu8rzD6ZAE
https://youtu.be/Wx9v_J34Fyo
https://youtu.be/F2hc2FLOdhI
https://youtu.be/wHGqp8lz36c
https://youtu.be/hxS5He3KVEM
https://youtu.be/nMPqsjuXDmE

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MODERN DAY ROBOTICS AND ITS INDUSTRIAL APPLICATIONS

(Professional Elective-II)

Course Code: GR24A3123 **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 robotics pertaining 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 Tensor Flow 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 Using AI - 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 Industrial Robots -Failure analysis of mature robots in automated production- Data Analytics for Predictive Maintenance of Industrial Robots - Failure Is an Option: How the Severity of Robot Errors Affects Human-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 open source 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 Cyber security Communication Protocols -Analysis for the Robot Operating System Robotics systems communication- Threat modeling 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 to R -The R in Robotics ros R: 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 that Perform Human Tasks Using AI Techniques”, Packt publishing,2018.

REFERENCE BOOKS:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MODERN WEB APPLICATIONS

(Professional Elective-II)

Course Code: GR24A3124 **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, External Style 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.

REFERENCE BOOKS:

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

NATURAL LANGUAGE PROCESSING

(Professional Elective-II)

Course Code: GR24A3125 **L/T/P/C: 3/ 0/ 0/3**
III Year II Semester

Prerequisites: Students are expected to have knowledge in Formal Languages and Automata Theory, Compiler Design, and basic Python programming skills.

Course Outcomes

1. Summarize the role of NLP in various applications and explain both classical and modern language modelling approaches.
2. Analyze information retrieval systems and utilize lexical resources for processing natural language text.
3. Apply word-level analysis, syntactic analysis, and modern embedding techniques in NLP.
4. Demonstrate semantic analysis and discuss discourse processing of text, incorporating context-aware neural models.
5. Illustrate the automation of natural language generation and machine translation, with emphasis on Indian languages, neural approaches, and ethical considerations.

UNIT I

Overview: Origins and challenges of NLP, Language and Grammar, Processing Indian Languages, **Modern Applications of NLP** (chatbots, sentiment analysis, search engines, virtual assistants).

Language Modeling: Grammar-based Models, Statistical Models, and Neural Language Models (word embeddings, contextual embeddings).

UNIT II

Information Retrieval: Introduction, Design features of IR Systems, Classical, Non-classical, Vector Space Model, Evaluation metrics (Precision, Recall, F1).

Lexical Resources: WordNet, FrameNet, Stemmers, POS Tagger, Research Corpora.
Introduction to NLTK/spaCy for lexical processing**.**

UNIT III

Word Level Analysis: Regular Expressions, Morphological Parsing, Spelling Error Detection and Correction, Words and Word Classes, Part of Speech Tagging, TF, IDF, word embeddings (Word2Vec, GloVe).

Syntactic Analysis: Context-Free Grammar, Probabilistic Parsing, dependency parsing and Transition-based Parsing using NLP toolkits.

UNIT IV

Semantic Analysis: Meaning Representation, Ambiguity, Word Sense Disambiguation. Contextual Embeddings (BERT, mBERT) for semantic tasks.

Discourse Processing: Cohesion, Reference Resolution, Discourse Coherence and Structure.

Ethical NLP: Bias, fairness, and responsible AI considerations**.**

UNIT V

Natural Language Generation: Architecture, Generation Tasks and Representations, Applications (summarization, dialogue systems, report generation).

Machine Translation: Problems in MT, Characteristics of Indian Languages, Translation involving Indian Languages. Evaluation Metrics: BLEU, ROUGE, METEOR for NLG and MT.

NLP Applications – case study.

TEXTBOOKS:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
2. Daniel Jurafsky and James H. Martin, "Speech and Language Processing", 3rd Edition (Draft), Prentice Hall, 2023.

REFERENCE BOOKS:

1. James Allen, "Natural Language Understanding", 2nd Edition, Benjamin/Cummings, 1995.
2. Steven Bird, Ewan Klein, and Edward Loper, "Natural Language Processing with Python", O'Reilly, 2009.
3. HuggingFace, "Transformers: State-of-the-Art NLP with Python", Online Documentation.

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

Course Code: GR24A3126 **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:
Studyand 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:

Studyof Socket Programming and Client – Server model.

TASK 11:

Write a socket program (using c) for interaction between server and client processes using Unix 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: GR24A3127 **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 libraries.
Hint: 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: GR24A3128 **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. Statethe names ofthe 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 toolkit Perform 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.
    iv. 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 classifier Perform 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 Weka perform 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 & Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition,2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

REFERENCE BOOKS:

1. Data Mining Techniques – Arun K. Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory and Dennis Murray, Pearson EdnAsia

IV YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

USABILITY DESIGN OF SOFTWARE APPLICATIONS

Course Code: GR24A4106 **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 artifacts.
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

REFERENCE BOOKS:

1. Observing the User Experience, Second Edition: A Practitioner's Guide to UserResearch. 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 Understanding Design Thinking, Lean, and Agile – Jonny Schneider.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FINANCIAL MANAGEMENT

Course Code: GR24A4107 **L/T/P/C:3/0/0/3**
IV Year I Semester

Course Outcomes: After completion of the course, the student should be able to

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 the concepts 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, Agency Theory

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, Attitudes Toward 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 Pay-outs, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring.

Accounts Receivable Management: Credit & Collection Policies, Analysing 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.
3. Fundamentals of Financial Management (16th Edition), Eugene F. Brigham, Joel F. Houston, Publisher: Cengage Learning, 2021.
4. Financial Management: Theory & Practice (16th Edition), Authors: Eugene F. Brigham, Michael C. Ehrhardt, Publisher: Cengage Learning, 2021.
5. Principles of Managerial Finance (15th Edition), Authors: Lawrence J. Gitman, Chad J. Zutter, Publisher: Pearson, 2021.

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: GR24A4108 **L/T/P/C:3/0/0/3**
IV Year I Semester

Course Outcome(s):

1. The students understand the significance of human resource management concepts and challenges, practices in their profession of HR.
2. The students will be acquainting 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 the human resource planning and related to succession planning.
5. The student will be able to realize the concepts related to strategic management of human resources and human resource management in service sector.

UNIT – I

Human Resource Management: Concept and Challenges, HR Philosophy, Policies, Procedures and Practices.

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 in groups before coming to class and prepare for the topic to be discussed. Instructor may ask the student groups 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. Human Resource Management (16th Edition), Authors: Gary Dessler, Publisher: Pearson, 2021.
2. Fundamentals of Human Resource Management (9th Edition), Authors: Raymond A. Noe, Joh.
3. R. Hollenbeck, Barry Gerhart, Patrick M. Wright, Publisher: McGraw-Hill Education, 2021.

REFERENCE BOOKS:

1. K. Aswathappa: Human Resource and Personnel Management, TMH, 2009.
2. Subbarao: Human Resource Management, HPIL2009
3. 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 : GR24A4109 **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: Overview of Analytics, Definition, Description & Evolution of Analytics, Concepts of Analytics, History of Analytics, and Applicability of Analytics with development of Technology and Computer, How Analytics entered mainstream.
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.
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 processing for qualitative as well as quantitative data.
Various types of Scales: Nominal, Ordinal, Interval & Ratio Scales
Overview: High level overview of Categorization of Techniques: Inter-dependence Relationship 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, decision tree 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 Analytics and Business analytics.

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: Low memory,workson Known rules,such as Object Detection/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

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. 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-

8. 205. Elsevier, 2016.
9. Demystifying Artificial intelligence: Simplified AI and Machine Learning concepts for Everyone (English Edition) Paperback – Import, 5 January 2021by Prashant Kikani
10. 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.

REFERENCE BOOKS:

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.
3. M. Ross, Prentice Hall.
4. 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).
5. 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: GR24A4110 **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 sensors to 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, Web Sockets, 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:

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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INFORMATION RETRIEVAL SYSTEMS

(Professional Elective-III)

Course Code: **GR24A3139** **L/T/P/C: 3/0/0/3**

IV Year I Semester

Prerequisite: Students should have prior knowledge of Data Structures and Database Management Systems.

Course Outcomes:On successful completion of this course, students will be able to:

1. Apply IR principles to locate relevant information in extensive data collections.
2. Design and differentiate various indexing and document clustering algorithms.
3. Implement retrieval systems for web-based search tasks.
4. Analyze and apply user search techniques with ranking and feedback methods.
5. Design and evaluate an information retrieval system with visualization and multimedia retrieval features.

UNIT I

Introduction to Information Retrieval Systems: Definition, Objectives, and Functional Overview. Relationship to Database Management Systems, Digital Libraries, and Data Warehouses.

Information Retrieval System Capabilities: Capabilities include Search, Browse, and Miscellaneous Functions.

UNIT II

Cataloguing and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, **Information Extraction and Data Structures:** Introduction to Data Structures, Stemming Algorithms, Inverted File Structures, N-Gram Data Structures, PAT Data Structures, Signature File Structures, Hypertext and XML Data Structures, Hidden Markov Models.

UNIT - III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

UNIT - IV

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET, and Hypertext.

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies.

UNIT - V

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems.

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval.

Information System Evaluation: Introduction, Measures used in system evaluation, Measurement example – TREC results.

TEXTBOOKS:

1. Gerald J. Kowalski, Mark T. Maybury, Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Springer, 2009.
2. Ricardo Baeza-Yates, Berthier Ribeiro-Neto, *Modern Information Retrieval*, Pearson Education, 1999.

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons, 1997.

E-LEARNING RESOURCES:

1. Coursera – NLP Course (https://class.coursera.org/nlp/lecture/178)
2. Cosmo Learning – Database Design (http://cosmolearning.org/courses/database-design-417/video-lectures/)
3. NPTEL – Database & IR Lectures (http://nptel.ac.in/video.php?subjectId=106102064).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
QUANTUM COMPUTATION AND QUANTUM INFORMATION
(Professional Elective-IV)

Course Code: GR24A4111 **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 keydistribution 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

GENERATIVE AI

(Professional Elective-IV)

Course Code: GR24A4123 **L/T/P/C: 3/0/0/3**
IV Year I Semester

Course Outcomes:

On successful completion of this course, students will be able to:

1. Explain the fundamentals, architectures, and applications of Generative AI models.
2. Apply prompt engineering and model fine-tuning techniques to solve domain-specific problems.
3. Implement frameworks such as LangChain and RAG for text, image, and multimodal generation.
4. Evaluate generative AI systems considering bias, fairness, and ethical guidelines.
5. Develop and present real-life case studies demonstrating Generative AI solutions.

UNIT I – Introduction & Foundations of Generative AI

Overview of Generative AI: Concepts, Scope, and Applications in Various Domains. Mathematical & Computational Foundations: Linear Algebra (Vectors, Matrices, Eigenvalues), Probability, Statistics, and Optimization basics for Generative modelling.

Generative Model Categories: Autoregressive, Energy-based, Latent Variable Models. Variational Autoencoders (VAEs): Architecture, Loss functions, Applications. Generative Adversarial Networks (GANs): Architecture, Loss functions, Applications, and Variants (DCGAN, CycleGAN, StyleGAN).

UNIT II – Large Language Models (LLMs) and GPT

Introduction to Language Models: Statistical, Neural and Transformer-based. Transformer Architecture (Attention Is All You Need). GPT Architecture: Pre-training, Fine-tuning and Variants (GPT-2, GPT-3, GPT-4).

ChatGPT: Reinforcement Learning from Human Feedback (RLHF), Performance Improvement Techniques, Limitations. Case Studies: GPT-based Domain-specific Applications.

UNIT III – Prompt Engineering and Generative AI Frameworks

Prompt Engineering Fundamentals: Zero-shot, Few-shot, Chain-of-thought Prompting. Strategies for Controlling Model Behaviour & Output Quality. LangChain Framework: Architecture, Components, Chains, Memory, Tool integration.

Retrieval-Augmented Generation (RAG): Embeddings, Indexing, Vector databases, and Workflow. Practical Example: Building a Domain-specific Chatbot.

UNIT IV – Multimodal Generative AI and Applications

Code Generation: Codex, Copilot. Image Generation: DALL-E, Stable Diffusion, Midjourney. Audio generation: Text-to-Speech (TTS), Music Synthesis Models (e.g., MusicLM).

Video Generation: Current State-of-the-art Models (Runway Gen-2, Pika Labs, Sora by OpenAI). Multimodal AI: CLIP, Flamingo, GPT-4-Vision. Industrial Applications: Summarization, Creative Design, Education, Healthcare.

UNIT V – Ethics, Fairness, and Responsible AI

Bias in Datasets and Models; Fairness and Inclusivity. Risks: Hallucinations, Misinformation, Content Moderation. Privacy and Data Protection in Generative Systems.
Responsible Deployment and Governance Frameworks. Future Trends: Foundation Models, AI Agents, Explain ability. Real-Life Case Studies and Project Presentations.

TEXT BOOKS

1. Goodfellow, Y., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.
2. Auffarth, B., & Kuligin, A. (2024). Generative AI with LangChain (2nd ed.). Packt Publishing.
3. Alammar, J., & Grootendorst, M. (2023). Hands-On Large Language Models. O'Reilly Media.

REFERENCE BOOKS

1. Phoenix, J., Prompt Engineering for Generative AI. Packt Publishing, 2023.
2. Huyen, C., AI Engineering. O'Reilly Media, 2024.
3. Vurukonda, V, & Srivastava, A., Prompt Engineering for AI Systems. Manning Publications, 2024.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MOBILE COMPUTING

(PROFESSIONAL ELECTIVE-IV)

Course Code: GR24A4112 **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. Location Management in Wireless Data Networks. Fahd A. Batayneh.
6. Principles of Mobile Communication. Gordon L. Stber, Springer.
7. Wireless Device-to- Device Communications and Networks. Lingyang Song, Dusit Niyato, Zhu.
8. Han, and Ekram Hossain, Cambridge University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

USABILITY DESIGN OF SOFTWARE APPLICATIONS LAB

Course Code: GR24A4113 **L/T/P/C: 0/ 0/ 4/ 2**

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

REFERENCE BOOK:

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: GR24A4114 **L/T/P/C: 0/0/4/2**
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: GR24A4016 **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: GR24A4118 **L/T/P/C: 3/0/0/3**

IV Year II Semester

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

1. Students will be able to understand and apply various concepts in traditional and modern Microeconomics.
2. Students will be able to focus on decision making based on heuristics are efficient mental processes 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 theory and their interconnections.
4. They will be able to Outline decision and probability weighting. Apply the concepts in the fields 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

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.

TEXTBOOKS:

1. An Introduction to Behavioral Economics, by N. Wilkinson and M. Klaes, Palgrave Macmillan; Second edition (10 April 2012).

REFERENCE BOOKS:

1. P.L. Mehta : Managerial Economics.
2. Yogesh Maheshwari: Managerial Economics.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTATIONAL FINANCE & MODELING
(Professional Elective-V)

Course Code: GR24A4119 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Course Outcome: Post successful completion of this course, students will be able to:

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 of portfolio 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 financial data 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 equations of 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 including random variable generation, variance reduction methods and statistical analysis of simulation output. Pseudo random numbers, Linear congruential generator,

Mersenne twister RNG. The use of Monte Carlo simulation in solving applied problems on derivative pricing 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.

REFERENCE BOOKS:

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.
8. 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: GR24A4120 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Course Outcome(s): Students will be able to

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

Industrial organization Psychology, Research Methods in Industrial organization Statistics in Industrial organization and Evidence-based Practice, Introduction & Legal Context of Industrial Psychology, Job Analysis & Competency Modelling, Job Evaluation & Compensation, Job Design & Employee Well-Being, Recruitment.

UNIT – II

Identifying Criteria & Validating Tests and Measures, Screening Methods, Intensive Methods.

UNIT – III

Employee performance, Evaluating Employee Performance, performance methods, Performance Goals and Feedback, Performance Coaching and Evaluation.

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 Behaviour, 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 by Edwin Locke (Editor) and Cary L. Cooper (Editor)
2. Psychology Applied to Work: An Introduction to Industrial and Organizational Psychology by Paul M. Muchinsky.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENTERPRISE SYSTEMS
(Professional Elective-VI)

Course Code: GR24A4121 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Course Outcome(s): Students will be able to

1. To summarize about 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 architectures.

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 Text book -1 and 2)

UNIT – II

Key characteristics 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, service oriented, 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, Web Presentation, 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 REST Ful 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: Core Concepts – Types of Cloud: Private, public, and Hybrid clouds. Advantage 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: GR24A4122 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Course Outcomes: After completion of the course, the student should be able to

1. Create an awareness about sources and its 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 management of 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 and Liquidation

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 Scholes Model, Use of Derivatives for Risk-Return Management- Credit Default Swaps.

Home Assignment:

Case study materials book 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: 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 14th Edition, New York, NY McGraw-Hill Education [2020]
   Case Study Materials: To be distributed for class discussion

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CYBER SECURITY
(Professional Elective-VI)

Course Code: GR24A4099 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Course Outcomes:

1. Analyze cyber security fundamentals, layers, threat models, and methods of defense to understand the spectrum of attacks.
2. Demonstrate the legal, regulatory, and forensic frameworks of cyber security.
3. Evaluate the security challenges and organizational implications of mobile and wireless devices, and propose counter measures to mitigate cybercrimes in mobile environments.
4. Assess the impact of cybercrimes, intellectual property issues, and social media risks on organizations.
5. Examine data privacy principles and assess real-world cybercrime incidents to determine associated threats and legal or ethical considerations in diverse domains.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones

Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.
Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts, Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.
Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXTBOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCE BOOK:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.
3. Cyber Security: Comprehensive Beginners Guide to Learn the Basics and Effective Methods of Cyber Security, Brian Walker, Kindle Edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROJECT WORK PHASE - II

Course Code: GR24A4026 **L/T/P/C:0/ 0/ 12/6**

IV Year II 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.

OPEN ELECTIVES

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOUR
(OPEN ELECTIVE)

Course Code: GR24A3010 **L/T/P/C: 3/0/0/3**

Course Outcomes: After completing this course, students will be able to:
1. Acquaint with the determinants of intra -individual, inter-personnel and inter-group behaviour in organizational setting.
2. 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. 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. Impart and apprise the capable of applying the principles and techniques as professionals for developing human resources in an organization.
5. 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 :
Organisational Behaviour- Concept and Emergence of OB Concept; Nature and Theoretical frameworks; Models of Organisational Behaviour, Challenges and Opportunities for Organisational 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 Organisations: Selected cases covering HRD practices in government organisations, manufacturing and service industries and MNCs.

TEXT BOOKS:

1. Robbins, Stephen P. and Timothy A. Judge, Organisational 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: GR24A3024 **L/T/P/C: 3/0/0/3**

Course Outcomes: After completing this course, students will be able to:
1. Identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
2. Locate and apply case law and common law to current legal dilemmas in the technology field.
3. Apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.
4. Understand cybercrime and ethical practices and the student will be able to know and learn web technologies and related issues.
5. 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).

REFERENCE BOOKS:

1. Sudhir Naib, The Information Technology Act, 2005: A Handbook.
2. S. R. Bhansali, Information Technology Act, 2000
3. University Book House Pvt. Ltd. Jaipur (2003).
4. Vasu Deva, Cyber Crimes and Law Enforcement, Commonwealth Publishers, New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ECONOMIC POLICIES IN INDIA
(OPEN ELECTIVE)

Course Code: GR24A4013 **L/T/P/C: 3/0/0/3**

Course Outcomes: After completing this course, students will be able to:
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-I: 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-II: Factors and measure:
Meaning of Economic development, National income, Per capital income, Quality of life, Capital Formation – Savings, Investment.

UNIT-III: 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-IV: Private and Public Sector, Public Sector:
Role and growth, Achievements of the public sector, Private Sector – Importance Problems, New foreign Trade Policy.

UNIT-V: 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
INDIAN KNOWLEDGE SYSTEM
(OPEN ELECTIVE)

Course Code: GR24A3023 **L/T/P/C: 3/0/0/3**

Course Outcomes: After completing this course, students will be able to:
1. Understand nature, scope and related fields of Indian knowledge system.
2. Demonstrate the scientific literature available in ancient Indian traditions
3. Understanding the application of Bharatiya Jnana Parampara
4. Understand Indian approach towards Wellbeing
5. Appreciate vast contribution of ancient Indian researchers, engineers, scientists and architects to the modern world

UNIT-I: Introduction to Indian Knowledge Systems:
Meaning, Nature, Scope and Salient Aspects of Bharatiya Jnana Parampara - Introduction to Vedas, Upanishads, Vidya, Kala, Jnana, Shastra - Practices and Continuity of Tradition

UNIT-II: Overview of History of Indian Education and Scientific Literature:
Gurukul System - Role of Sanskrit in Natural Language Processing - Scientific Literature – Vedic. Literature - Available Scientific Treatises - Interlinkings

UNIT-III: Introduction to Scientific Theories from Pure Sciences from Ancient Indian Knowledge Systems:
Overview of theories from available ancient Indian Literature about Physics, Chemistry and Mathematics - Interlinking's and applications

UNIT-IV: Introduction to Ancient Indian Wellness Systems:
Concept of Wellness – Yoga System - Ayurveda System - Ancient Indian Aesthetics Achievements of the public sector, Private Sector – Importance Problems, New foreign Trade Policy.

UNIT-V: Development of Engineering, Science, Technology & Fine Arts in India:
Various Industries - Silk, Cotton and Ship Building - Evolution of Indian Fine Arts – Cave and Temp Architecture, Vastu - Vidya, Sculpture, Forts and Stepwells, Observatories and Paintings - Music and Natyakala - Cultural Traditions & Folk Arts.

Pedagogy for Teachers: Apart from Classroom Instruction, the following Methods are Suggested.
1. Project based activities and learning.
2. Presentation and case studies.
3. Film screening and book reviews.
4. Visit to historical places, archives centre, research centre or library nearby.

Note: Activities mentioned above are only suggestive. Teacher-educators should encourage students to be innovative.

TEXT BOOKS:
1. B. Mahadevan, Bhat Vinayak and Nagendra Pavan R.N., (2022) 'Introduction to Indian

Knowledge Systems: Concepts and Applications' PHI learning PVT, New Delhi ISBN [9789391818203]
2. Dharmapal (1971) 'Indian Science and Technology in the Eighteenth Century'. Other India Press, Goa.
3. Kapil Kapoor, Singh Avdhesh Kumar, (2005) 'Indian Knowledge Systems' D.K. Printworld (P) Ltd. ISBN 10: 8124603367 / ISBN 13: 9788124603369
4. Chakradeo, Ujwala, Temples of Bharat, Aayu Publications, New Delhi, 2024.
5. D.N. Bose, S.N. Sen and B. V. Subbarayappa, A Concise History of Science in India, Indian National Science Academy, New Delhi, 2009.
6. Datta B. and A. N. Singh, History of Hindu Mathematics: Parts I and II, Asia Publishing House, Bombay, 1962.
7. Kapoor, K. (2021), Indian Knowledge System: Nature, Philosophy, Character in Indian Knowledge System, vol. 1, Pub. Indian Institute of Advanced Studies, Shimla
8. Mahadevan, B., Bhat, V.R., Pavana, N. (2022), Philosophical Systems, in Introduction to Indian Knowledge System, Pub. PHI Learning, New Delhi.
9. Mahadevan, B., Bhat, V.R., Pavana, N. (2022), Knowledge: Framework and Classification, in Introduction to Indian Knowledge System, Pub. PHI Learning, New Delhi.

VIDEO RESOURCES:

1. Introductory lectures by Prof. Gauri Mahulikar
2. Introductory lectures by Prof. Kapil Kapoor

WEBSITES:

- https://iksin dia.org/index.php
- Official Website of IKS- Indian Knowledge System
- https://www.youtube.com/watch?v=uKcf-hSlcUE
- Address by Prof Kapil Kapoor | Indian Institute of Advanced Study (FDP 2021)
- https://www.youtube.com/watch?v=MDJTXNiH2_A
- Mukul Kanitkar on Bharatiya Knowledge System
- https://www.youtube.com/watch?v=uARMhv97pjk
- https://www.youtube.com/watch?v=oTwgf56GbsA
- Scientific History of India | Mukul Kanitkar Lecture in DTU
- https://youtu.be/gNJNmPJqXJc?si=WFBbuUT65mLZzpOW
- Ancient India's Scientific Achievements & Contribution in Mathematics, Astronomy, Science & Medicine

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
A PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
(OPEN ELECTIVE)

Course Code: GR24A4012 **L/T/P/C: 3/0/0/3**

Course Outcomes:
1. Study of Shrimad- Bhagwad-Gita wiil help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neethishatakam will help in developing versatile personality of students
4. To develop self-developing attitude towards work without self-aggrandizement and to develop suffering free meditative mind
5. To develop tranquil attitude in all favorable and unfavorable situations and to develop high spiritual intelligence

UNIT-I: Neetisatakam-Holistic development of personality
- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II: Neetisatakam-Holistic development of personality
- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III: Approach to day to day work and duties
- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV: Statements of basic knowledge
- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:
- Classification, Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCE BOOKS:
1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING MATERIALS FOR SUSTAINABILITY
(OPEN ELECTIVE)

Course Code: GR24A3009 **L/T/P/C: 3/0/0/3**

Course Outcomes: After completing this course, students will be able to:
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 by utilizing the engineering knowledge and principles gained from this course
4. Perform cost/benefit analysis and life-cycle analysis of green buildings.
5. Identify the balance affordability, functionality, and environmental responsibility to create sustainable and effective building designs.

UNIT-I: Sustainability:
Introduction, need, and concept of sustainability, Social- environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols – Clean Development Mechanism (CDM), Environmental legislations in India – Water Act, Air Act

UNIT-II: Environmental management standards:
ISO 14000 series, Life Cycle Analysis (LCA) – Scope and Goal, Bio-mimicking, Environment Impact Assessment (EIA) – Procedures of EIA in India

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; Embodied Energy of Materials

UNIT-IV:
Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds (VOC's), 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 – By K S Jagadeesh, B V Venkata Rama

Reddy & K S Nanjunda Rao – New Age International Publishers, 2007
2. Integrated Life Cycle Design of Structures – By AskoSarja – SPON Press, 2011
3. Non-conventional Energy Resources – By D S Chauhan and S K Srivastava – New Age International Publishers, 2021

REFERENCE BOOKS:

1. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design, 2008
2. Understanding Green Building Guidelines: For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.2009
3. Understanding Green Building Materials, Traci Rose Rider, W. W. Norton & Company Publisher.2011
4. Green Buildings (McGraw hill publication): by Gevorkian, 2006

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GEOGRAPHIC INFORMATION SYSTEMS AND SCIENCE
(OPEN ELECTIVE)

Course Code: GR24A3022 **L/T/P/C: 3/0/0/3**

Course Outcomes: After completing this course, students will be able to:
1. Interpret the fundamental concepts of Geographic Information Science and Technology along with different data structures.
2. Demonstrate Map creation and design principles, including thematic map display, employment of map projections and cartographic design.
3. Analyze the types of digital maps for different themes.
4. Apply the spatial analysis to remote sensing data to generate thematic maps.
5. Solve the real-life problems associated with geospatial and remote sensing.

UNIT-I:
Fundamentals of GIS – Information Systems, Modelling Real World Features Data, Data Formats, Applications of GIS, – Spatial and Non-spatial, Components, Data Collection and Input, Data Conversion, Database Management – Database Structures, Files; Standard Data Formats, Compression Techniques, Hardware – Computing, printing and scanning systems; Software – Standard Packages like Arc view, ArcGIS (commercial) & Auto-CAD Map, Map Info etc. QGIS open software- Salient features.

UNIT-II:
Topology – Types of Errors, Editing and Error Rectification, Types of Topology, Modeling topological Relationships, Tolerances.

UNIT-III:
Map – mapping concepts, analysis with paper-based maps, limitations, Computer Automated Cartography– History and Developments, GIS- Definition, advantages of digital maps.

UNIT-IV:
Spatial Analysis and Modelling – Proximity Analysis, Overlay Analysis, Buffer Analysis, Network Analysis, Spatial Auto Correlation, Gravity Modelling, DTM/DEM, Integration with Remote Sensing data

UNIT-V:
GIS Project Planning and Implementation – Under Standing the Requirements, Phases of Planning, Specifications, Data Procurement, Tendering, Human Resources, Back Up, Monitoring Progress

TEXT BOOKS:
1. Concepts & Techniques of GIS by C. P. Lo Albert, K. W. Yonng, Prentice Hall (India) Publications, 2nd edition, 2016.
2. Fundamental of GIS by Mechanical designs John Wiley &Sons, 4th edition, 2008.
3. Principals of Geographic Information Systems – Peter Beur and Rachael A.Mc Donnell, Oxford Publishers 2016.

4.

REFERENCE BOOKS:

1. Remote Sensing and Geographical Information systems by M. Anji Reddy JNTU Hyderabad.4th Edition 2014, B. S. Publications.
2. Introduction to Geographic Information Systems by Kang-tsung Chang, Tata McGraw-Hill Publishing Company Limited- 2008.
3. Remote sensing of the environment –An earth resource perspective by John R Jensen, Prentice Hall 4. GIS by Kang – tsung chang, TMH Publications & Co., 2nd edition, 2013.
4. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications, 1st edition,2016.
5. Remote Sensing and its applications by LRA Narayana, UniversityPress 1999.
6. Remote sensing and image interpretation by Thomas Lillesand, 7th Edition, John Wiley & sons,6th Edition 2011.
7. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, Wiley Publishers, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PLUMBING -WATER AND SANITATION
(OPEN ELECTIVE)

Course Code: GR24A4011 **L/T/P/C: 3/0/0/3**

Course Outcomes: After completing this course, students will be able to:
1. Coordinate plumbing works from inception to completion with Owners, Architects, other consultants, and contractors.
2. Select proper plumbing materials and systems.
3. Read and interpret plumbing drawings.
4. Supervise code based plumbing installations. Understand methods to conserve water and energy, Protect health and safety of end users.
5. Enjoy better job opportunities and career options

UNIT-I: Introduction to Plumbing and Sanitation Importance of Codes, Architectural and Structural Coordination Codes and Standards: Scope, purpose; codes and standards in the building industry, UIPC-I (Uniform Illustrated Plumbing Code-India), NBC (National Building Code) and other codes, Local Municipal Laws, approvals, general regulations, standards, water supply, sewerage system, drainage system, workmanship, water conservation, protection of pipes and structures, waterproofing. of GIS – Information Systems, Modelling Real World Features Data, Data Formats, Applications of GIS, – Spatial and Non-spatial, Components, Data Collection and Input, Data Conversion, Database Management – Database Structures, Files; Standard Data Formats, Compression Techniques, Hardware – Computing, printing and scanning systems; Software – Standard Packages like Arc view, ArcGIS (commercial) & Auto-CAD Map, Map Info etc. QGIS open software- Salient features.
Architectural and Structural coordination: Provisions for plumbing systems, coordination during the planning stage, various agencies involved and their roles, space planning for plumbing systems, water tanks, pump room, centralized hot water systems, toilet locations.

UNIT-II: Plumbing Terminology:
Definitions, use/purpose of the following. ***Plumbing Fixtures:*** accessible, readily accessible, aerated fittings, bathroom group, carrier, flood level rim, floor sink, flush meter valve, flush tanks, lavatories, macerating toilet, plumbing appliances, plumber. ***Traps:*** indirect waste, vent, blow off, developed length, dirty arm, indirect waste, receptors, slip joints, trap, and vent. ***Drainage:*** adapter fitting, adjusted roof area, air break, air gap, area drain, base, bell and spigot joint, building drain, branch, (DFU) Drainage Fixture Units, grease interceptor, joints, roof drain, smoke test, stack. ***Water supply:*** angle valve, anti-scald valve, backflow, bypass, check valve, cross connection, gate valve, gray water, joints.

UNIT-III: Plumbing Fixtures and Fittings:
Definitions of plumbing fixtures, fittings, appliances and appurtenances; maximum flow rates, water closets, urinals, flushing devices, washbasins, bath/shower, toilets for differently abled, kitchen sinks, water coolers, drinking fountain, clothes washer, dish washer, mop sink, overflows, strainers, prohibited fixtures, floor drains, floor, location of valves, hot water temperature controls, installation standard dimensions in plan and elevation.

UNIT-IV:

Traps, Interceptors, Indirect Waste and Vents Traps required, trap arms, developed length, trap seals, venting to traps, trap primers, prohibited traps, building traps. Discharge for indirect waste piping, nature of contents or systems, proper methods to install indirect waste piping, air gap and air break, sink traps, dish washers. Vent requirement, purpose of venting, trap seal protection, materials, vent connections, **Sanitary Drainage and Storm Drain** Preamble, one pipe and two pipe systems, different pipe materials and jointing methods, special joints, hangers and supports, protection of pipes and structures, alternative materials, workmanship, prohibited fittings and practices.

Water Supply, Gray and Reclaimed Water: Preamble, one pipe and two pipe systems, different pipe materials and jointing methods, special joints, hangers and supports, protection of pipes and structures, alternative materials, workman ship, prohibited fittings and practices, change in direction of flow, T and Y fittings, Storm drain required, prohibited connections, subsoil drains, sub-drains, gutters, channels or scuppers, roof drains, catchment, collect/capture storm water, discharging storm water, Rain Water Harvesting (RWH) definition, need, catchment, conduits, settlement tanks, treatment, possible uses, recharging pits, NBC requirements.

UNIT-V:

Water Supply, Gray and Reclaimed Water (Preamble, sources of water, potable and non- potable water, reclaimed water, calculating daily water requirement and storage, hot and cold water distribution system. pipe materials and jointing methods, alternative materials, hangers and supports, workmanship, prohibited fittings and practices, protection of pipes and Plumbing (Water and Sanitation) structures, pressure controls, unions, thermal expansion, types of valves, Definition of gray water, approvals, specifications and drawings, safety, total gray water discharge, holding tanks, valves and piping.

Introduction to water treatment plant (WTP) and STP: Introduction to Net Zero concept, need to reduce and reuse, rating of Water Efficient Plumbing fixtures and fittings, 24x7 water supply, metering and sub-metering, typical daily water and wastewater calculations for a project.

TEXT BOOKS:

1. Elements of Water Pollution Control Engineering, O.P. Gupta, Khanna Book Publishing, New Delhi. Edition ·1, 2019.
2. Plumbing Engineering" Author: R. G. Saran Publisher: S. K. Kataria & Sons Latest Edition: 2022 (Revised Edition)
3. "Water Supply and Sanitary Engineering" Authors: G. S. Birdie and J. S. Birdie Publisher: Dhanpat Rai Publishing Company Latest Edition: 2022 (33rd Revised Edition)
4. "Plumbing: Design and Installation" Author: L. G. Wade Publisher: Cengage Learning Latest Edition: 2019 (4th Edition)

REFERENCE BOOKS:

1. "Plumbing Engineering Design Handbook" (Volumes I & II) Publisher: American Society of Plumbing Engineers 2022 Edition (Volume 1: Fundamentals; Volume 2: Systems)
2. Water Efficiency and Sanitation Standard published by IPA Indian Plumbing Association (IPA) and IAPMO International Association of Plumbing and Mechanical Officials (India) Water Pollution, Berry, CBS Publishers, 2023 edition.
3. 'A Guide to Good Plumbing Practices', a book published by IPA, 2016 edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
NON-CONVENTIONALENERGYSOURCES
(OPEN ELECTIVE)

Course Code: GR24A3035 **L/T/P/C: 3/0/0/3**

Course Outcomes: After completing this course, students will be able to:
1. Recall the concepts of Solar Energy and Solar collectors.
2. Illustrate the PVSolar system with energy backup.
3. Analyze the basic physics of wind power generation.
4. Determine the energy generation from biomass, biogas, and geothermal energy.
5. Discuss Tidal power systems and fuel cells.

UNIT-I: Solar Radiation:
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: Photo Voltaic System:
Photo voltaic 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: Wind Energy:
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: Biogas and Geothermal Energy:
Various fuels-Sources- Conversion technologies–Dry Processes-Biogas generation–Aerobic and anaerobic digestion- Factors affecting the generation of biogas –Classification of biogas plants-Different Indian digesters- Digester design considerations- Gasification process-Gasifiers-Applications. Geothermal Energy-sources-Hydro thermal convective-Geo-pressure resources-Petro-thermal systems(HDR)-Magma Resources-Prime Movers

UNIT-V: Tidal Energy:
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 andPrincipleofoperation-TypesofFuelCells-Advantagesanddisadvantages-TypesofElectrodes-Applications-Basics of Batteries –Constructional details of Lead acid batteries- Ni-Cd Batteries.

TEXT BOOKS:
1. John Twidell & Wier, Renewable Energy Resources,CRCPress,2009.
2. D.P.Kothari, Singal, Rakesh, Ranjan, Renewable Energy Sources and Emerging Technologies,

PHI, 2009.

REFERENCE BOOKS:

1. G.D.Rai–Non-Conventional Energy sources, Khanna publishers.
2. B.H.Khan,"Non-ConventionalEnergyResources",2ndedition,TataMcGraw-Hill,New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONCEPTSOF CONTROLSYSTEMS
(OPEN ELECTIVE)

Course Code: GR24A3046 **L/T/P/C: 3/0/0/3**

Course Outcomes: On completion of the course, the student will be able to

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. IJNagrath, M.Gopal, Control System Engineering,New Age International Publishers, Fifth edition.
2. NormanSNise, Control system engineering, JohnWiley& Sons,Inc.,Sixth edition

REFERENCE BOOKS:

1. RichardC.Dorf, Robert HBishop, Modern control systems, Pearson Education International, Twelfth edition.
2. ANagoorKani, Control Systems, CBS Publishers. Jon. S. Wilson; "Sensor Technology Hand

Book", Elsevier Inc., 2005.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ARTIFICIALNEURAL NETWORKS AND FUZZY LOGIC
(OPEN ELECTIVE)

Course Code: GR24A4037 **L/T/P/C: 3/0/0/3**

Course Outcomes: On completion of the course, the student will be able to
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 Crispsets.
4. Model Fuzzy membership Function and rules for Applications.
5. Analyze the parameters of Genetic Algorithm.

UNIT-I: NEURALNETWORKS 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.
to Information Theory, Shanon Capacity, Multimedia Data, Data Processing, Boolean Logics, Information Content, Entropy, Source Coding, Channel Coding, Modulation Schemes, Internet.

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: FUZZYLOGIC I (Introduction):
Basic concepts of fuzzy logic, Fuzzy sets and Crispsets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT-IV: FUZZYLOGIC 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: GENETICALGORITHMS(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. JMZurada,"An Introduction to ANN",JaicoPublishing House.
2. Neural Networks, Fuzzy Logic, And Genetic Algorithms: Synthesis and Applications -byS. Rajasekaran, G. A. Vijayalakshmi Pai, PHI publishers.

REFERENCE BOOKS:

1. HungT.Nguyen,Nadipuram R.Prasad,CarolL. Walker andElbertA.Walker,“AFirstCourse in Fuzzy and Neural Control” Chapman & Hall, CRC.
2. Driankov,Dimitra,“AnIntroductiontoFuzzyControl”,NarosaPublication.
3. TimothyJRoss, “Fuzzy Logic with Engg. Applications”,McGraw.Hill.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INDUSTRIAL AUTOMATION AND CONTROL
(OPEN ELECTIVE)

Course Code: GR24A3056 **L/T/P/C: 3/0/0/3**

Course Outcomes: After completing this course, students will be able to:
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, 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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATIONS RESEARCH
(OPEN ELECTIVE)

Course Code: GR24A3034 **L/T/P/C: 3/0/0/3**

Course Outcomes: On completion of the course, the student will be able to

1. Formulate and solve linear programming problems using simplex and duality approaches for resource allocation.
2. Apply non-linear optimization techniques (single and multi-variable unconstrained methods) to practical engineering and management problems.
3. Analyze and solve transportation and assignment models for effective decision-making in logistics and resource allocation.
4. Evaluate inventory control systems and queuing models to optimize stock management and service efficiency.
5. Apply replacement and dynamic programming models for long-term decision-making in capital budgeting, maintenance, and system optimization.

UNIT-I: Introduction & Linear Programming:

Introduction: Development, Definition, Characteristics and Phases of Operations Research, Types of models: Operations Research models – Applications: Linear Programming Problem (LPP) formulation, Graphical solution method, Simplex method – Artificial variables techniques (Two–phase method, Big-M method), Duality principle

UNIT-II: Non-Linear Programming:

Introduction – Difference between linear and nonlinear programming, applications in engineering & management; **Single-variable unconstrained optimization**: Uni-modal functions, Elimination methods – Bisection/interval halving, Fibonacci method, Golden Section method; **Multi-variable unconstrained optimization**: Gradient of a function, optimality condition, Gradient methods – Steepest Descent Method, Conjugate Gradient Method (Fletcher–Reeves)

UNIT-III: Transportation & Assignment Models:

Transportation models: Formulation, Methods for finding feasible solution and optimal solution, Unbalanced transportation problems, degeneracy; **Assignment models**: Formulation, Optimal solution, Variants of Assignment Problem (e.g., unbalanced, maximization, traveling salesman problem)

UNIT-IV: Inventory & Queuing Models:

Inventory models: Single-item deterministic models, Purchase inventory models with one price break and multiple price breaks, Shortages not allowed, Stochastic models – demand as discrete or continuous variable, Instantaneous production, instantaneous demand and continuous demand (no setup cost)

Queuing models: Introduction, Single-channel system: Poisson arrivals, exponential service times, infinite/finite population, Multi-channel systems: Poisson arrivals, exponential service times with infinite population

UNIT-V: Replacement & Dynamic Programming:

Replacement models: Replacement of items that deteriorate with time (with and without time value of money), Replacement of items that fail completely, Group replacement policy
Dynamic programming: Introduction – Bellman's Principle of Optimality Applications: capital budgeting, shortest path problem, linear programming problem

TEXT BOOKS:

1. Operations Research/ Prem Kumar Gupta, Dr. D.S. Hira
2. Operations Research / S. D.Sharma-Kedarnath
3. Operation Research /J.K.Sharma/MacMilan.

REFERENCE BOOKS:

1. A.K. Operations Research / R.Pannerselvam,PHI Publications.
2. Introduction to O.R /Taha/PHI
3. Operations Research / Wagner/ PHI Publications.
4. Introduction to O.R/Hiller and Libermann (TMH).
5. Operations Research /A.M.Natarajan, P.Balasubramani,A. Tamilarasi/Pearson Education.
6. Operations Research: Methods and Problems / Maurice Saseini, ArhurYaspan and Lawrence Friedman
7. O.R/Wayne L.Winston/Thomson Brooks/cole

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPOSITE MATERIALS
(OPEN ELECTIVE)

Course Code: GR24A3066 **L/T/P/C: 3/0/0/3**

Course Outcomes: On completion of the course, the student will be able to
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 fibers; Matrices- polymer, graphite, ceramic and metal matrices; characteristics of fibers and matrices. Lamina- assumptions, macroscopic viewpoint, generalized Hooke's law, reduction of homogeneous orthotropic lamina, isotropic limit case, orthotropic stiffness matrix, commercial material properties, rule of mixtures, transformation matrix, transformed stiffness

UNIT-II:
Manufacturing of composite materials, bag moulding, compression moulding, pultrusion, filament 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

DIGITAL ELECTRONICS FOR ENGINEERING

(OPEN ELECTIVE)

Course Code: GR24A3076 **L/T/P/C: 3/0/0/3**

Course Outcomes: After completing this course, students will be able to:

1. Get basic knowledge on logic gates, Universal gates and their switching logics.
2. Realize Boolean expressions using NAND/NOR gates and reduce them using K map.
3. Know all types of combinational and sequential circuits.
4. Acquire knowledge on realization of logic families using diodes and transistor, and also on different types of integrated circuits.
5. Understand the characteristics and applications of operational amplifiers in different modes of operation.

UNIT-I: Number Systems:

Number systems, Complements of Numbers, Codes- Weighted and Nonweighted codes and its properties. Boolean Algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT-II: Minimization of Boolean functions:

Karnaugh Map Method - Up to four Variables, Don't Care Map Entries, Tabular Method, Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

UNIT-III: Sequential Circuits Fundamentals:

Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Fundamentals of shift registers, ripple and decade counters.

UNIT-IV: Realization of Logic Gates Using Diodes & Transistors:

AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL, CML and CMOS Logic Families and its Comparison, standard TTL NAND Gate Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tristate outputs, CMOS transmission gate.

UNIT-V: Integrated Circuits:

Classification, chip size and circuit complexity, basic information of op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC Characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

TEXT BOOKS:

1. Switching and Finite Automata Theory - ZviKohavi& Niraj K. Jha, 3rd Edition, Cambridge, 2010.
2. Modern Digital Electronics – R. P. Jain, 3rd Edition, 2007- Tata McGraw-Hill
3. Linear Integrated Circuits, D. Roy Chowdhury, New Age International(p) Ltd.

4. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, PHI

REFERENCE BOOKS:

1. Digital Design- Morris Mano, PHI, 4th Edition,2006
2. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI
3. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SENSOR TECHNOLOGY
(OPEN ELECTIVE)

Course Code: GR24A3085 **L/T/P/C: 3/0/0/3**

Course Outcomes: On completion of the course, the student will be able to
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 or 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: Introduction to Sensor Systems:
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 magneto strictive sensors. Capacitive sensors- variable capacitor, differential capacitor.

UNIT-IV: Accelerometers:
Characteristics and working principle of accelerometer sensors, 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, "Hand Book of Modern Sensors: Physics, Designs and Applications", 3rd Edition.,

REFERENCE BOOKS:

1. Er. R.K. Rajput, "Electronic Measurements and Instrumentation", S. Chand & Company Ltd. 3rd Edition.
2. A.K.Sawhney, "Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai.
3. Bentley, John P., "Principles of Measurement Systems", 4th Edition, Pearson/Prentice Hall, 2005
4. Jon. S. Wilson; "Sensor Technology Hand Book", Elsevier Inc., 2005.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMMUNICATION TECHNOLOGIES
(OPEN ELECTIVE)

Course Code: GR24A4078 **L/T/P/C: 3/0/0/3**

Course Outcomes: On completion of the course, the student will be able to
1. Understand the information theory and its coding styles.
2. Acquire knowledge on wireless communications and services.
3. Understand the various mobile networks and generations
4. Acquire knowledge on optical communications.
5. Know about network security through encryption and decryption.

UNIT-I: Information Theory:
Introduction to Information Theory, Shanon Capacity, Multimedia Data, Data Processing, Boolean Logics, Information Content, Entropy, Source Coding, Channel Coding, Modulation Schemes, Internet.

UNIT-II: Wireless Communication Technologies:
Introduction to Wireless Communication Technologies, WLAN, Wifi, Bluetooth, Other Wireless PAN And WAN Technologies, Satellite Communications, Broadcast Services.

UNIT-III: Cellular Mobile Networks:
Introduction to Cellular Mobile Networks, GSM(2G), UMTS (3G), LTE(4G), 5G Mobile Networks, Mobile Network Planning Aspects.

UNIT-IV: Optical Communication:
Introduction to Optical Communications, Optical Fiber, FTTC, FTTH, FTTBS, Free Space Optical Link, Channel Model with Different Factors, Deep Space Optical Communications.

UNIT-V: Network Security and Management:
Introduction to Network Security and Management, Symmetrical Encryption, Asymmetrical Encryption, Authentication, Hash-Value, Integrity Check, Telecommunications Management Network, SNMP, Functionalities of Network Management, Trends and Future Development.

TEXT BOOKS:
1. Shun-Ping Chen, "Fundamentals of Information and Communication Technologies" 2020
2. B.P. Lathi, "Communication systems"- BS Publications, 2006..

REFERENCE BOOKS:
1. Simon Haykin, John Wiley "Digital Communications" 2005.
2. Herbert Taub, Donald L Schilling Gautham Saha "Principles of Communication systems" 3rd edition McGraw-Hill 2008.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA SCIENCE FOR ENGINEERS

(OPEN ELECTIVE)

Course Code: GR24A3092 **L/T/P/C: 3/0/0/3**

Course Outcomes: After completing this course, students will be able to:

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.

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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: GR24A3103 **L/T/P/C: 3/0/0/3**

Course Outcomes: On completion of the course, the student will be able to

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 Error Propagation, Models from scaling arguments- Models, Arguments from Scale, Mean-Field Approximations, Common Time-Evolution Scenarios, Arguments from probability models- The Binomial Distribution and Bernoulli Trials, The Gaussian Distribution and the Central Limit Theorem, Power-Law Distributions and Non-Normal Statistics, Bayesian Statistics.

UNIT-III: Mining Data:

Simulations- Monte Carlo Simulations, Resampling Methods, Discrete 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, The Care and Feeding of Your Data Zoo.

TEXT BOOKS:

1. Philipp K. Janert, Data Analysis with Open Source Tools, O'Reilly Media, Inc, November2010:

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: GR24A4096 **L/T/P/C: 3/0/0/3**

Course Outcomes: On completion of the course, the student will be able to
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

SERVICES SCIENCE AND SERVICE OPERATIONAL MANAGEMENT

(OPEN ELECTIVE)

Course Code: GR24A4115 **L/T/P/C: 3/0/0/3**

Course Pre-Requisite(s): Fundamentals of Management, Operations Research

Course Outcomes: After completing this course, students will be able to:

1. Understand concepts of services and its 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 Service Design.

Locating facilities and designing their layout: models of facility locations (Huff's retail model), Role of service-scape in layout design.

Service Quality: SERVQUAL, Walk through Audit, Dimensions of Service quality & other quality tools.

UNIT-III:

Service Guarantee & Service Recovery: Service guarantee and its types; Service failure – reasons for failure and service recovery strategies.

UNIT-IV:

Simple Forecasting Demand for Services: A review of different types of forecasting methods for demand forecasting.

Managing Capacity and Demand: Strategies for matching capacity and demand, Psychology of waiting, Application of various tools used in managing waiting line in services.

Managing Facilitating Goods: Review of inventory models, Role of inventory in services

Managing service supply relationship: Understanding the supply chain/hub of service, Strategies for managing suppliers of service

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 and compete in a new era. John Wiley & Sons.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

IT PROJECT MANAGEMENT
(OPEN ELECTIVE)

Course Code: GR24A4116 **L/T/P/C: 3/0/0/3**

Course Outcomes: On completion of the course, the student will be able to

1. Learn the techniques to effectively plan manage, execute the projects.
2. Learn the techniques to control projects within time and cost targets with a focus on Information Technology and Service Sector.
3. Learn various agile methodologies.
4. Apply agile project management techniques such as Scrum on real time applications.
5. Develop real time applications using agile project management techniques such as DevOps.

UNIT-I:

Project Overview and Feasibility Studies- Identification, Market and Demand Analysis, Project Cost Estimate, Financial Appraisal

Project Scheduling: Project Scheduling, Introduction to PERT and CPM, Critical Path Calculation, Precedence Relationship, Difference between PERT and CPM, Float Calculation and its importance, Cost reduction by Crashing of activity.

UNIT-II:

Cost Control and Scheduling: Project Cost Control (PERT/Cost), Resource Scheduling & Resource Leveling **Project Management Features:** Risk Analysis, Project Control, Project Audit and Project Termination.

UNIT-III:

Agile Project Management: Introduction, Agile Principles, Agile methodologies, Relationship between Agile Scrum, Lean, DevOps and IT Service Management (ITIL).

Other Agile Methodologies: Introduction to XP, FDD, DSDM, Crystal

UNIT-IV:

Reporting **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: GR24A4117 **L/T/P/C: 3/0/0/3**

Course Outcomes: On completion of the course, the student will be able to
1. Understand the significance of marketing management concepts, marketing environment, consumer behaviour elements and strategies related to STP.
2. Understand various product management strategies and importance of branding, 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. 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 about 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. Relationship, 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 Schindler.

REFERENCE BOOKS:

1. Marketing Management – Rajan Saxena.
2. Marketing Management – S.A. Sherlekar.
3. Service Marketing – S.M. Zha.
4. Journals – The IUP Journal of Marketing Management, Harvard Business Review.
5. Research for Marketing Decisions by Paul Green, Donald, Tull.
6. Business Statistics, A First Course, David M Levine at al, Pearson Publication.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BASICS OF JAVA PROGRAMMING

(OPEN ELECTIVE)

Course Code: GR24A3133 **L/T/P/C: 3/0/0/3**

Course Outcomes: After completing this course, students will be able to:

1. Apply OOP principles by writing Java programs using data types, operators, and control structures.
2. Analyze Java programs by implementing classes, constructors, arrays, and inheritance, and differentiate overloading and overriding.
3. Demonstrate modular design with packages, interfaces, and abstract classes, and evaluate exception handling.
4. Implement multithreading and synchronization and utilize collections for efficient data management.
5. Design modern Java applications using JavaFX, Spring Boot, and Hibernate/JPA

UNIT-I:

Object Oriented Thinking: Introduction, Need of object-oriented programming, principles of object-oriented languages, Applications of OOP, history of JAVA, Java Virtual Machine, Java features, Program structures, Installation of JDK.

Variables, Primitive data types, Identifiers- Naming Conventions, Keywords, Literals, Operators-Binary, Unary and Ternary, Expressions, Primitive Type conversion and casting, flow of control-branching, conditional, loops.

UNIT-II:

CLASSES, INHERITANCE, POLYMORPHISM:

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

Strings: String, String Buffer, String Tokenizer

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

UNIT-III:

INTERFACES, PACKAGES, EXCEPTIONS

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

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

UNIT-IV:

MULTI-THREADING, COLLECTIONS

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

Collections: Overview of Collection Framework : Array List, LinkedList, Vector, HastSet, Tree Set, HashMap, Hash Table, Tree Map, Iterator, Comparator

UNIT-V:

Introduction to Spring Framework Overview of the Spring ecosystem, concepts of Inversion of Control (IoC) and Dependency Injection (DI), Spring Boot basics for rapid application development, and building a simple REST API with Spring Boot.

Data Access with Java Introduction to JDBC, an overview of JPA (Java Persistence API), using Hibernate with Spring Data JPA, and creating a simple CRUD application as an example.

Teaching Methodologies:

Power Point Presentations
Tutorial Sheets
Assignments

TEXT BOOKS:

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

REFERENCE BOOKS:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTRODUCTION TO DBMS
(OPEN ELECTIVE)

Course Code: GR24A3141 **L/T/P/C: 3/0/0/3**

Course Outcomes: On completion of the course, the student will be able to

1. Demonstrate the concepts of data mining, its applications
2. Apply data preprocessing techniques such as cleaning, integration, transformation, and reduction.
3. Implement clustering algorithms and evaluate their performance using similarity measures
4. Analyze association rules using Apriori and other frequent pattern mining techniques.
5. Examine outlier detection methods and justify their applications in real-world scenarios.

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.

Teaching Methodologies:

Power Point Presentations
Tutorial Sheets
Assignments

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 Management Systems", P. Radha Krishna HI-TECH Publications 2005.
2. "Database Management System", Elmasri Navate, Pearson Education.
3. "Database Management System", Mathew Leon, Leo

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTRODUCTION TO DATA MINING

(OPEN ELECTIVE)

Course Code: GR24A4124 **L/T/P/C: 3/0/0/3**

Prerequisites: Students are expected to have knowledge of transactional and relational databases, probability, and statistics.

Course Outcomes: On completion of the course, the student will be able to

1. Demonstrate the concepts of data mining, its applications
2. Apply data preprocessing techniques such as cleaning, integration, transformation, and reduction.
3. Implement clustering algorithms and evaluate their performance using similarity measures
4. Analyze association rules using Apriori and other frequent pattern mining techniques.
5. Examine outlier detection methods and justify their applications in real-world scenarios.

UNIT-I:

Introduction: Why Data mining, What is Data Mining, What Kinds of Data Can Be Mined, What Kinds of Patterns Can Be Mined, Which Technologies are used, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.

UNIT-II:

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction.

UNIT-III:

Association Rule Mining: Introduction to association rule mining. Apriori algorithm and other frequent pattern mining techniques. Measuring the strength of association rules.

UNIT-IV:

Classification: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, k-Nearest-Neighbor Classifiers.

UNIT-V:

Clustering: Introduction to clustering and similarity measures.
Clustering algorithms: k-means, hierarchical clustering, density-based clustering.
Evaluating clustering results: silhouette score, Davies-Bouldin index.

Teaching Methodologies:

Power Point Presentations
Tutorial Sheets
Assignments

TEXT BOOKS:

1. Data Mining Concepts and Techniques - Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Third Edition, 2012.

2. Introduction to Data Mining Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education.

REFERENCE BOOKS:

1. Data Mining Techniques – Arun K. Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory and Dennis Murray, Pearson Edn Asian

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INTRODUCTION TO OPERATING SYSTEMS
(OPEN ELECTIVE)

Course Code: GR24A3143 **L/T/P/C: 3/0/0/3**

Prerequisite: Students should have prior knowledge of:
- Basics of Programming, and
- Fundamentals of Data Structures and Algorithms, such as stacks, queues, and linked lists.

Course Outcomes: After completing this course, students will be able to:
1. Explain the objectives, structure, and functions of an operating system, including process, memory, storage, and security management, and demonstrate how OS services interact with users and hardware.
2. Apply process management concepts such as process states, scheduling algorithms, and interprocess communication; design and solve synchronization problems using semaphores, monitors, and classical solutions.
3. Analyze memory management strategies such as paging, segmentation, and swapping, and evaluate virtual memory techniques including demand paging, page replacement, and thrashing control.
4. Implement basic file operations and explain file system structure, directory management, allocation methods, and disk scheduling techniques for efficient storage management.
5. Identify, prevent, and recover from deadlocks; apply system protection principles and access control mechanisms to safeguard resources and files in different operating system environments.

UNIT-I: Introduction:
Overview, Objectives, User view, System view, Operating system definition, Computer System Organization, Computer System Architecture, OS Structure, OS Operations, Process Management, Memory Management, Storage Management, Protection and Security.
Operating System services, User and OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure.

UNIT-II: Process and CPU Scheduling:
Process concepts: The Process, Process State, Process Control Block, Threads, Process Scheduling-Scheduling Queues, Schedulers, Context Switch, Operations on Processes, System calls-fork(), exec(), wait(), exit(), Interprocess communication.
Process Scheduling: Basic concepts, Scheduling Criteria, Scheduling algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Thread scheduling. Process Synchronization, Critical Section Problem, Peterson's solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

UNIT-III: Memory Management and Virtual Memory:
Memory Management Strategies - Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.
Virtual Memory Management - Background, Demand Paging, Page Replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing.

UNIT-IV: Storage Management and File System:

Storage Management - File System, Concept of a File, System calls for File Operations – open (), read (), write (), close (), seek (), unlink (), Access methods - Directory and Disk Structure, File System Mounting, File Sharing, Protection.

File System Structure, File System Implementation, Directory Implementation, Allocation methods, Free-space Management, Efficiency, and Performance. Mass Storage Structure – Overview, Disk Structure, Disk Attachment, Disk Scheduling.

UNIT-V: Deadlocks and Protection:

Deadlocks - System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Protection – System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Access Control, Revocation of Access Rights, Capability-based Systems, Language-based Protection.

TEXT BOOKS:

1. William Stallings, Operating Systems: Internals and Design Principles, 9th Edition, PHI, 2019.
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles, 7th Edition, Wiley, 2006.

REFERENCE BOOKS:

1. Andrew S. Tanenbaum, Modern Operating Systems, 5th Edition, PHI, 2022.
2. Gary J. Nutt, Operating Systems: A Modern Perspective, 3rd Edition, Addison-Wesley, 2004.
3. R. Elmasri, A.G. Carrick, D. Levine, Operating Systems, First Edition, McGraw Hill, 2009.
4. Charles Crowley, Operating System: A Design-oriented Approach, Irwin Publishing, First Edition, 1996.

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INTERNET OF THINGS
(OPEN ELECTIVE)

Course Code: GR24A3145 **L/T/P/C: 3/0/0/3**

Prerequisite:
The fundamental knowledge in C programming, Data Structures and Operating Systems

Course Outcomes: On completion of the course, the student will be able to

1. Understand IoT architecture and fundamental networking protocols and models.
2. Develop Arduino-based IoT applications integrating sensors and actuators.
3. Program Raspberry Pi using Python for cloud-connected IoT solutions.
4. Analyse various IoT applications including smart home and industrial systems.
5. Apply cloud and edge computing for IoT data analytics.

UNIT-I:

Introduction to IoT and Sensor Networks: Introduction to Internet of Things (IoT), Characteristics and Applications of IoT, IoT Architecture and Reference Models(IETF, ITU-T), Physical Design of IoT- Devices, Gateways, and Data Centers, Functional Blocks of IoT- Sensing, Actuation, Communication, Enabling Technologies: RFID, Wireless Sensor Networks.

Networking and Communication Protocols: MQTT, CoAP, ZigBee, HTTP Sensor Networks-Types, Topologies, and Protocols, Introduction to IoT Security and Privacy Fundamentals.

UNIT-II:

Machine to Machine (M2M) and Embedded Programming for IoT: Machine-to-Machine Communications Overview, Difference between IoT and M2M, Interoperability in IoT, Standards and Protocols.

Arduino: Introduction to Arduino Programming for IoT, Integration of Sensors and Actuators with Arduino, Hands-on Exercises- Sensor Data Acquisition and Actuator Control, Basic Communication Protocols, Implementation on Arduino-IoT Device Interoperability, Challenges and Solutions.

UNIT-III:

Raspberry Pi with Python Programming for IoT: Introduction to Python Programming , Basics, Overview of Raspberry Pi and its Role in IoT, Interfacing Raspberry Pi with Sensors and Actuators (UART, SPI, I2C).

Data Acquisition and Processing: Data Acquisition and Local Processing, Sending Data to Cloud Platforms, Implementation of IoT Projects Using Raspberry Pi.

Case Studies: Smart Home Automation, Healthcare Monitoring, Environmental Sensing.

UNIT-IV:

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.

UNIT-V:

Cloud and Edge Computing Models with IoT Use Cases: Introduction to Cloud Computing

and Cloud Storage Models, Edge and Fog Computing Concepts for IoT, Web Servers and Cloud Platforms for IoT (AWS IoT, Azure IoT, etc.).
IoT Use Cases: Smart Cities, Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT

TEXT BOOKS:

1. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.
2. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach", 2015.
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. Terokarvinen, kemo, karvinen and villeyvaltokari, "Make sensors": 1st edition, Maker Media, 2014.
2. Waltenegus Dargie, Christian Poellabauer, Fundamentals of Wireless Sensor Networks: Theory and Practice, 2010.
3. Charles Bell, Beginning Sensor networks with Arduino and Raspberry Pi, Apress, 2013.
4. Fei Hu, Security and Privacy in Internet of Things (IoTs), CRC Press, Taylor & Francis Group, 2020.
5. S. Sahoo, S. Sahoo, S. Mishra, Software-Defined Networking for Future Internet Technology: Concepts and Applications, Routledge, 2022.

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SCRIPTING LANGUAGES
(OPEN ELECTIVE)

Course Code: GR24A4134 **L/T/P/C: 3/0/0/3**

Prerequisites: Basic knowledge of programming concepts (loops, functions, arrays) and fundamentals of databases.

Course Outcomes: On completion of the course, the student will be able to

1. Understand PHP basics including variables, constants, control structures, arrays, and functions for web application development.
2. Apply MySQL database concepts with PHP to design, query, and manage relational databases securely.
3. Implement advanced PHP features such as authentication, file upload, email handling, and encryption in dynamic websites.
4. Design and develop Perl programs using arrays, hashes, subroutines, and advanced features like file system interaction, modules, and object-oriented constructs.
5. Apply Python programming concepts including functions, built-in modules, exception handling, and OOP paradigms for web and general-purpose scripting.

UNIT-I: PHP Basics:

Basics - Features, Data types, Variables, Constants, Expressions, String interpolation, Control structures, Embedding PHP Code in Web pages.

Functions: Creating a Function, Function Libraries, Arrays, Strings and Regular Expressions.

UNIT-II: MySQL Basics:

Introduction: Database Concepts, Overview of MySQL database, Installation. Connection establishment and Accessing MySQL Server, Querying the database. Data Definition Language. Functions and Logical operators, Access Privilege System.

UNIT-III: Advanced PHP Programming:

PHP and Web Forms, Files, PHP Authentication and Methodologies - File-based, Database-based, IP-based. Uploading Files with PHP, Sending Email, PHP Encryption Functions, 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, Syntax and Indentation, Statements, Functions, Built-in-Functions, Basics of Object-Oriented Paradigm, Modules and Packages, Exception Handling.

TEXT BOOKS:

1. David Barron, The World of Scripting Languages, Wiley India Pvt. Ltd., 1st Edition, 2003.

2. Jason Gilmore, Beginning PHP and MySQL, From Novice to Professional, Apress (Dreamtech India), 3rd Edition, 2008.
3. Steve Holden and David Beazley, Python Web Programming, New Riders Publications, 1st Edition, 2001.

REFERENCE BOOKS:

1. James Lee and Brent Ware, Open Source Web Development with LAMP: Using Linux, Apache, MySQL, Perl, and PHP, Addison-Wesley (Pearson Education), 1st Edition, 2003.
2. Julie Meloni and Matt Telles, PHP 6 Fast & Easy Web Development, Cengage Learning, 1st Edition, 2008.
3. Ivan Bayross and Sharanam Shah, PHP 5.1, The X Team, SPD Publications, 1st Edition, 2006.