Academic Regulations
Programme Structure
and
Detailed Syllabus

Master of Technology (M.Tech.)
in
Computer Science and Engineering

(Two Year Regular Programme)

(Applicable for Batches admitted from 2025)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

Bachupally, Kukatpally, Hyderabad- 500 090

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD

Academic Regulations for M.Tech. (Regular) under GR25

(Applicable for Batches Admitted from 2025-26)

Post Graduate Degree Programme in Engineering and Technology (PG)

Gokaraju Rangaraju Institute of Engineering & Technology (GRIET) offers a 2-year (4 Semesters) Master of Technology (M.Tech.) degree programme. The following programmes are offered in GRIET.

S.No	Department	Programme Code	Programme
1	Civil Engineering	20	M.Tech. Structural Engineering
2	Computer Science and Engineering	58	M.Tech. Computer Science and Engineering

GR25 Regulations shall govern the above programmes offered by the Departments with effect from the students admitted to the programmes in 2025-26 academic year is given below

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

2. **Admission:** Admission into the M.Tech. Programme in any discipline shall be made subject to the eligibility and qualifications prescribed by the University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in GATE, PGCET conducted by the APSCHE for M.Tech. Programmes or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government 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) The total credits for the Programme are 68.
   d) 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).
   e) A student has a choice of registering for credits from the courses offered in the programme.
   f) All the registered credits will be considered for the calculation of final CGPA.

g) Each Semester shall have 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) are taken as 'references' for the present set of Regulations. The terms 'SUBJECT' and 'COURSE' imply the same meaning here and refer to 'Theory Subject', or 'Lab Course', or 'Design/Drawing Subject', or 'Mini Project with Seminar', or 'Dissertation', as the case may be.

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

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	PC	Professional Core	Includes Core Courses related to the parent discipline/department/ branch of Engineering
2	PE	Professional Elective	Includes Elective Courses related to the parent discipline/ department/ branch of Engineering
3	OE	Open Elective	Elective Courses from other technical and/or emerging subjects
4	Audit	Audit Courses	Mandatory non creditable courses
5	PW	Project Work/Dissertation	Mini Project work, Dissertation Phase-I, II.

4. Award of M.Tech. Degree: A student will be declared eligible for the award of the M.Tech. Degree if he/she fulfills the following academic requirements:

a) A student shall be declared eligible for the award of M.Tech. degree, if he/she pursues the course of study and completes it successfully in not less than two academic years and not more than four academic years.

b) A Student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the date of admission, shall forfeit his/her seat in M.Tech. programme.

c) The Degree of M.Tech. shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfilled all the requirements for the award of the degree.

5. Attendance Requirements

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

b) Condonation of shortage of attendance 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 Academic Council.

d) Students whose attendance is less than 65% in any course are detained and are not eligible to take their end examination of that course. They may seek re-registration for that course when offered next with the academic regulations of the batch into which he/she gets re-registered.

e) A student shall put in a minimum required attendance in at least three theory subjects (excluding audit (non-credit course) in first Year I semester for promotion to first Year II Semester.

f) A student shall put in a minimum required attendance in at least three theory subjects (excluding audit (non-credit course) in first Year II semester for promotion to second Year I Semester.

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

a) Paper setting and Evaluation of the Answer Scripts shall be done as per the procedures laid down by the Academic Council of the College from time to time.

b) The following is the division of marks between internal and external evaluations.

S. No	Components	Internal Evaluation	External Evaluation	Total
1	Theory	40	60	100
2	Practical	40	60	100
3	Mini Project with Seminar	100	--	100
4	Dissertation	50	50	100
5	Audit Courses	50	--	50

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

Assessment Procedure

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Theory	40	Internal Examination & Continuous Evaluation	1) Two mid semester examination shall be conducted for 30 marks each for a duration of 120 minutes. Average of the two mid exams shall be considered **i) Subjective – 20 marks** **ii) Objective – 10 marks** 2) Continuous Evaluation is by conducting Assignments and Quiz exams at the end of each unit **i) Assignment – 5 marks** **ii) Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 5 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**

d) Project Review Committee: For approval and evaluating mini project, Dissertation-I and Dissertation-II, a Project Review Committee (PRC) will be constituted by the Head of the Department. The composition of PRC is as follows

i) Head of the Department

ii) One senior faculty relevant to the specialization

iii) Coordinator of the specialization.

e) Mini Project with Seminar: The Mini Project is to be taken up with relevance to Industry and is evaluated for 100 marks. Student shall carryout the mini project in consultation with the mini project supervisor. The Project Review Committee (PRC) along with supervisor will review the progress of the mini project during the internal evaluation for 50 marks. Mini Project Viva Voce will be evaluated by the PRC for another 50 marks before the semester end examinations. The student must secure a minimum of 50% of marks in i) internal evaluation and ii) mini project viva voce, to be declared successful. If he fails to obtain the minimum marks, he/she must reappear for the same as and when scheduled.

Internal Evaluation: Tentative presentation dates and marks distribution of the mini project with Seminar.

S.No	Date	Review	Marks
Internal Marks (50)			
1	First week of the semester	Abstract submission*	10
2	Fourth week of the semester	First Review	10
2	Mid of the semester	Second Review	10
3	Last week of the semester	Last Review	20

Following are the guidelines for the abstract submission

The faculty are requested to check the document submitted in the first review and should contain following:

1. Title of the project and Literature review.
2. Schematic/Block diagram which gives the broad idea of the entire project.
3. Timeline or milestone of the project. It should clearly indicate deliverables/outcomes of the project.
4. Components required with approximate cost.
5. References.
6. Plagiarism check is compulsory for mini project report as per the plagiarism policy of GRIET.

External Evaluation: (50 Marks) The mini project report is presented before PRC along with the supervisor.

Guidelines to award 50 marks:

S. No	Date	Review/ PRC report	Marks
External Evaluation Marks (50)			
1	Last week of the semester	Final Presentation and report Submission	10
2	Project report: Project report should be written as per IEEE guidelines.	Verified by PRC	10
3	Project Deliverables • Hardware prototype • Simulation in any authorized software • Submission of research articles in any Scopus Indexed conference /Journal	Verified by PRC	20
4	Results and Discussion	Verified by PRC	10

f) Dissertation (Phase I & Phase II): Every candidate shall be required to submit a dissertation on a topic approved by the Project Review Committee (PRC).

- The candidate must present in **Dissertation Work Review - I**, in consultation with his/her Dissertation Supervisor, the title, objective and plan of action of his/her Dissertation work to the PRC for approval ***within four weeks*** from the commencement of **Second year First Semester**. Only after obtaining the approval of the PRC can the student initiate the Dissertation work.
- If a candidate wishes to change his/her supervisor or topic of the Dissertation, he/she can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his/her initial plans of Dissertation proposal. If yes, his/her date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.
- The candidate shall submit his/her Dissertation progress report in two stages at least with a gap of **three** months between them.
- The work on the Dissertation shall be initiated at the beginning of the II year and the duration of the Dissertation is two semesters. A candidate is permitted to submit Dissertation Thesis only after successful completion of all theory and practical courses with the approval of PRC ***not earlier than 40 weeks*** from the date of approval of the Dissertation work. For the approval of PRC, the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.
- **The Dissertation Work Review - II** in II Year I Semester carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and DRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Dissertation Work. A candidate must secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - II. If he/she fails to obtain the minimum required marks, he has to reappear for Dissertation Work Review - II as and when conducted.
- **The Dissertation Work Review - III** in II Year II Sem. carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The PRC will examine the overall progress of the Dissertation Work and decide whether the Dissertation is eligible for final submission. A candidate

must secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - III. If he/she fails to obtain the required minimum marks, he/she must reappear for Dissertation Work Review - III as and when conducted. For Dissertation Evaluation (Viva Voce) in II Year II Semester there are external marks of 100 and it is evaluated by the external examiner. The candidate must secure a minimum of 50% marks in Dissertation Evaluation (Viva- Voce) examination.

- Dissertation Work Reviews - II and III shall be conducted in Phase I (Regular) and Phase II (Supplementary). Phase II will be conducted only for unsuccessful students in Phase I. The unsuccessful students in Dissertation Work Review - II (Phase II) shall reappear for it at the time of Dissertation Work Review - III (Phase I). These students shall reappear for Dissertation Work Review- III in the next academic year at the time of Dissertation Work Review - II only after completion of Dissertation Work Review - II, and then Dissertation Work Review - III follows. The unsuccessful students in Dissertation Work Review - III (Phase II) shall reappear for Dissertation Work Review – III in the next academic year only at the time of Dissertation Work Review - II (Phase I).
- A student shall present the progress of the dissertation through Dissertation Reviews II and III with at least a gap of three months between the reviews.
- After approval from the DRC, a soft copy of the thesis should be submitted for ANTI-PLAGIARISM Check from the approved agency with a similarity index not more than 24% and the plagiarism report and be included in the final thesis. If the similarity index has more than the required percentage, the student is advised to modify accordingly and resubmit the soft copy of the thesis after one month. The maximum number of re-submissions of thesis after plagiarism check is limited to ***TWO***. The candidate must register for the Dissertation work and work for two semesters. After three attempts, the admission is liable to be cancelled.
- Three copies of the Dissertation Thesis certified by the supervisor shall be submitted to the Institute, after submission of a research paper related to the Dissertation work in a SCOPUS/Web of Science/UGC approved journal. A copy of the submitted research paper shall be attached to thesis.
- The thesis shall be adjudicated by an external examiner selected by the University. For this, the Principal of the Institute shall submit a panel of **three** examiners from among the list of experts in the relevant specialization as submitted by the supervisor concerned and Head of the Department.
- If the report of the external examiner is unsatisfactory, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unsatisfactory again, the thesis shall be summarily rejected. Subsequent actions for such dissertations may be considered, only on the specific recommendations of the external examiner and /or Dissertation Review Committee. No further correspondence in this matter will be entertained if there is no specific recommendation for resubmission.
- If the report of the examiner is satisfactory, the Head of the Department shall coordinate and decide for the conduct of Dissertation Viva-Voce examination. The Dissertation Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis. The candidate must secure a minimum of 50% of marks in Dissertation Evaluation (Viva-Voce) examination.
- If he/she fails to fulfill the requirements of minimum 50% of marks, he/she will reappear for the Dissertation Viva-Voce examination ***only after three months***. In the reappeared examination also, if he/she fails to fulfill the requirements, he/she will not be eligible for the award of the degree, unless he/she is asked to revise and resubmit his/her Dissertation Work by the board within a specified time period (within ***four*** years from the date of commencement of his/her first year first semester).

g) The evaluation of Audit Courses having ONLY CIE is as follows:

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

  CIE is done for 50 marks as follows:

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

8. **Recounting of Marks in the End Examination Answer Books:** A student can request for re-counting 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 in an end semester examination can appear for a supplementary examination, as per the schedule announced by the College/Institute.

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

    a) A student shall be deemed to have secured the minimum academic requirement in a subject if he / she secures a minimum of 40% of marks (i.e.,16 marks out of 40 marks) in CIE, 40% of marks (i.e.,24 marks out of 60 marks) in SEE and a minimum aggregate of 50%(i.e.,50 marks out of 100 marks) of the total marks in the Semester-end examination (SEE) and Internal Evaluation (CIE) taken together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 40% (16 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 40% of CIE marks (16 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

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

c) In order to qualify for the award of M.Tech. Degree, the student shall complete the academic requirements of passing in all the Courses as per the course structure including Seminars and Project if any.

d) In case a student does not secure the minimum academic requirement in any course, he/she has to reappear for the Semester-end Examination in the course, or re-register for the same course when next offered or re-register for any other specified course, as may be required. However, one more additional chance may be provided for each student, for improving the internal marks provided the internal marks secured by a student are less than 50% and he/she failed finally in the course concerned. In the event of taking another chance for re-registration, the internal marks obtained in the previous attempt are nullified. In case of re-registration, the student has to pay the re-registration fee for each course, as specified by the Dean Admissions of College.

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

Letter Grade	Grade Points	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 (Above Average)	6	Marks >= 50 and Marks < 60
F (Fail)	0	Marks < 50
Ab (Absent)	0	

Earning of Credit:

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range O-B. Letter grade 'F' in any Course implies failure of the student in that course and no credits 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) $\mathbf{S_k}$ the SGPA of k^{th} semester (1 to 4) 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 $\mathbf{C_i}$ is the number of credits of the i^{th} course and $\mathbf{G_i}$ is the grade point scored by the student in the i^{th} course and **n** is the number of courses registered in that semester.

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

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

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

13. **Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of M.Tech. Degree by JNTUH, he/she shall be placed in one of the following four classes:

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA ≥ 7.50
2	First Class	CGPA ≥ 6.50 and CGPA < 7.50
3	Second Class	CGPA ≥ 6.00 and CGPA < 6.50

Equivalence of grade to marks

Marks % = (CGPA -0.5)*10

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

15. **Re-Admission/Re-Registration (Re-Admission for Discontinued Student)**

- A student, who has discontinued the M. Tech. degree programme due to any reason whatsoever, may be considered for 'readmission' into the same degree programme (with the same specialization) with the academic regulations of the batch into which he gets readmitted, with prior permission from the authorities concerned.
- If a student is detained in a subject (s) due to shortage of attendance in any semester, he/she may be

permitted to re-register for the same subject(s) in the same category (core or elective group) or equivalent subject, if the same subject is not available, as suggested by the Board of Studies of that department, as and when offered in the subsequent semester(s), with the academic regulations of the batch into which he/she seeks re-registration, with prior permission from the authorities concerned

- A candidate shall be given only one-time chance to re-register and attend the classes for a maximum of two subjects in a semester, if the internal marks secured by a candidate are less than 40% and failed in those subjects but fulfilled the attendance requirement. A candidate must re-register for failed subjects within four weeks of commencement of the class work, in the next academic year and secure the required minimum attendance. In the event of the student taking this chance, his Continuous

Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stand cancelled.

16. **Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/Universities:** Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/Universities shall be considered only on case-to-case basis by the Academic Council of the Institute.

17. **Transitory Regulations:** Students who have discontinued or have been detained for want of attendance, or who have failed after having undergone the PG degree Programme, may be considered eligible for readmission to the same or equivalent subjects as and when they are offered.

18. **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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Bachupally, Kukatpally, Hyderabad-500090, India(040)6586440

COMPUTER SCIENCE AND ENGINEERING

M.Tech(C.S.E) GR25 Course Structure

I YEAR - I SEMESTER

S. No	BOS	Group	Course Code	Course Name	Credits			
					L	T	P	Total
1	CSE	PC	GR25D5032	Mathematical Foundations of Computer Science	3	0	0	3
2	CSE	PC	GR25D5026	Advanced Data Structures	3	0	0	3
3	CSE	PE -I		Professional Elective - I	3	0	0	3
4	CSE	PE-II		Professional Elective - II	3	0	0	3
5	CSE	PC	GR25D5034	Advanced Data Structures Lab	0	0	4	2
6	CSE	PE-I		Professional Elective - I Lab	0	0	4	2
7	HS	PC	GR25D5011	Research Methodology and IPR	2	0	0	2
	TOTAL				**14**	**0**	**8**	**18**
8	HS	AC		Audit Course – 1	2	0	0	0

PROFESSIONAL ELECTIVE – I				
S. No.	**BoS**	**Group**	**Course Code**	**COURSE**
1	CSE	PE	GR25D5028	Database Programming With PL/Sql
2	CSE	PE	GR25D5029	Natural Language Processing
3	CSE	PE	GR25D5030	Deep Learning
PROFESSIONAL ELECTIVE – II				
1	CSE	PE	GR25D5031	Applied Cryptography
2	CSE	PE	GR25D5027	Software Quality Engineering
3	CSE	PE	GR25D5035	Mining Massive Datasets
PROFESSIONAL ELECTIVE – I LAB				
1	CSE	PE	GR25D5037	Database Programming With PL/Sql Lab
2	CSE	PE	GR25D5038	Natural Language Processing Lab
3	CSE	PE	GR25D5039	Deep Learning Lab

I YEAR - II SEMESTER

S. No.	BOS	Group	Course Code	Course Name	Hours			Total Credits
					L	T	P	
1	CSE	PC	GR25D5036	Advanced Algorithms	3	0	0	3
2	CSE	PC	GR25D5040	Advanced Computer Architecture	3	0	0	3
3	CSE	PE		Professional Elective – III	3	0	0	3
4	CSE	PE		Professional Elective – IV	3	0	0	3
5	CSE	PC	GR25D5046	Advanced Algorithms Lab	0	0	4	2
6	CSE	PE		Professional Elective – III Lab	0	0	4	2
7	CSE	PW	GR25D5048	Mini Project	0	0	4	2
TOTAL CREDITS					**12**	**0**	**12**	**18**
8	HS	Audit		Audit course – II	2	0	0	0

PROFESSIONAL ELECTIVE – III				
S. No.	**BoS**	**Group**	**Course Code**	**COURSE**
1	CSE	PE	GR25D5025	Data Analytics and Visualization
2	CSE	PE	GR25D5041	Cyber Security
3	CSE	PE	GR25D5042	Advanced Unix Programming
PROFESSIONAL ELECTIVE – IV				
1	CSE	PE	GR25D5043	Bioinformatics
2	CSE	PE	GR25D5044	Robotic Process Automation
3	CSE	PE	GR25D5045	Generative AI
PROFESSIONAL ELECTIVE – III LAB				
1	CSE	PE	GR25D5033	Data Analytics and Visualization Lab
2	CSE	PE	GR25D5061	Cyber Security Lab
3	CSE	PE	GR25D5062	Advanced Unix Programming Lab

II`YEAR - I SEMESTER

S. No.	BOS	GROUP	Course Code	Course Name	Hours			Total Credits
					L	T	P	
1	CSE	PE		Professional Elective – V	3	0	0	3
2	CSE	OE		Open Elective	3	0	0	3
3	CSE	PW	GR25D5049	Dissertation Phase – I	0	0	20	10
TOTAL CREDITS					**6**	**0**	**20**	**16**

PROFESSIONAL ELECTIVE – V				
S. No.	**BOS**	**GROUP**	**Course Code**	**COURSE**
1	CSE	PE	GR25D5047	Digital Forensics
2	CSE	PE	GR25D5063	Quantum Computing
3	CSE	PE	GR25D5064	Prompt Engineering

II YEAR - II SEMESTER

S. No.	BoS	Group	Course Code	Course Name	Hours			Total Credits
					L	T	P	
1	CSE	PW	GR25D5050	Dissertation Phase – II	0	0	32	16
Total Credits					**0**	**0**	**32**	**16**

OPEN ELECTIVE				
S. No.	**BoS**	**Group**	**Course Code**	**COURSE**
1	CSE	OE	GR25D5052	Intrusion Detection Systems
2	STE	OE	GR25D5051	Cost Management of Engineering Projects
3	Mgmt	OE	GR25D5065	Human Resource Management

Audit Courses I & II					
S. No.	**Year**	**BoS**	**Group**	**COURSE CODE**	**COURSE**
1	I	HS	Audit	GR25D5053	English for Research Paper Writing
2	I	HS	Audit	GR25D5054	Disaster Management
3	I	HS	Audit	GR25D5055	Sanskrit for Technical Knowledge
4	I	HS	Audit	GR25D5056	Value Education
5	II	HS	Audit	GR25D5057	Indian Constitution
6	II	HS	Audit	GR25D5058	Pedagogy Studies
7	II	HS	Audit	GR25D5059	Stress Management by Yoga
8	II	HS	Audit	GR25D5060	Personality Development through Life Enlightenment Skills

I YEAR

I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE APPLICATIONS

Course code: GR25D5032 **L/T/P/C: 3/0/0/3**

I Year I Semester

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

1. Ability to understand and construct precise mathematical proofs.
2. Ability to use logic and set theory to formulate precise statements.
3. Ability to analyze and solve counting problems on finite and discrete structures.
4. Ability to describe and manipulate sequences.
5. Ability to apply graph theory in solving computing problems.

UNIT-I

The Foundations Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

UNIT-II

Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations: Sets, Functions, Sequences & Summations, Cardinality of Sets and Matrices Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

UNIT-III

Algorithms, Induction and Recursion: Algorithms, the Growth of Functions, Complexity of Algorithms. Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.

UNIT-IV

Discrete Probability and Advanced Counting Techniques:
An Introduction to Discrete Probability. Probability Theory, Bayes' Theorem, Expected Value and Variance. Advanced Counting Techniques:
Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

UNIT-V

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCE:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED DATA STRUCTURES

Course Code: GR25D5026 **L/T/P/C: 3/0/0/3**

I Year I Semester

Course Outcomes

1. Apply heap structures in implementing priority queues and related algorithms.
2. Evaluate the efficiency of different hash functions such as Division, Multiplication, Mid-Square, and Folding methods.
3. Construct and compare OBST, AVL, Red-Black, and Splay Trees.Design programs.
4. Illustrate the construction and usage of Binary Tries, Patricia Tries, and Multiway Tries.
5. Evaluate time and space complexity of string matching algorithms in real-world applications.

UNIT - I
Heap Structures
Introduction, Min-Max Heaps, Leftist trees, Binomial Heaps, Fibonacci heaps.

UNIT - II
Hashing and Collisions
Introduction, Hash Tables, Hash Functions, different Hash Functions:- Division Method, Multiplication Method, Mid-Square Method, Folding Method, Collisions

UNIT - III
Search Structures
OBST, AVL trees, Red-Black trees, Splay trees,
Multiway Search Trees
B-trees, 2-3 trees

UNIT - IV
Digital Search Structures
Digital Search trees, Binary tries and Patricia, Multiway Tries, Suffix trees, Standard Tries, Compressed Tries

UNIT - V
Pattern matching
Introduction, Brute force, the Boyer –Moore algorithm, Knuth-Morris-Pratt algorithm, Naïve String, Harspool, Rabin Karp

TEXT BOOKS:

1. Fundamentals of data structures in C++ Sahni, Horowitz, Mehatha, Universities Press.
2. Introduction to Algorithms, TH Cormen, PHI

REFERENCES:

1. Design methods and analysis of Algorithms, SK Basu, PHI.
2. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education.
3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATABASE PROGRAMMING WITH PL/SQL

(PROFESSIONAL ELECTIVE-I)

Course code: GR25D5028 **L/T/P/C: 3/0/0/3**

I Year I Semester

Course Outcomes:

1. Identify and describe PL/SQL block structure, variable behavior, and data types.
2. Implement explicit and implicit cursors and bulk statements effectively.
3. Implement and differentiate pass-by-value vs. pass-by-reference approaches for functions and procedures.
4. Develop and deploy packages using variables, functions, procedures, and types.
5. Manage trigger restrictions, limitations, and data type constraints including LONG and LONG RAW.

Unit I
PL/SQL Basics

Block Structure, Behavior of Variables in Blocks, Basic Scalar and Composite Data Types, Control Structures, Exceptions, Bulk Operations, Functions, Procedures, and Packages, Transaction Scope

Unit II
Language Fundamentals & Control Structures

Lexical Units, Variables and Data Types, Conditional Statements, Iterative Statements, Cursor Structures, Bulk Statements, Introduction to Collections, Object Types: Varray and Table Collections, Associative Arrays, Oracle Collection API

Unit III
Functions and Procedures

Function and Procedure Architecture, Transaction Scope, Calling Subroutines, Positional Notation, Named Notation, Mixed Notation, Exclusionary Notation, SQL Call Notation, Functions, Function Model Choices, Creation Options, Pass-by-Value Functions, Pass-by-Reference Functions, Procedures, Pass-by-Value Procedures, Pass-by-Reference Procedures, Supporting Scripts.

Unit IV
Packages

Package Architecture, Package Specification, Prototype Features, Serially Reusable Precompiler Directive, Variables, Types, Components: Functions and Procedures, Package Body, Prototype Features, Variables, Types, Components: Functions and Procedures, Definer vs. Invoker Rights Mechanics, Managing Packages in the Database Catalog, Finding, Validating, and Describing Packages, Checking Dependencies, Comparing Validation Methods: Timestamp vs. Signature.

Unit V
Triggers

Introduction to Triggers, Database Trigger Architecture, Data Definition Language Triggers, Event Attribute Functions, Building DDL Triggers, Data Manipulation Language Triggers, Statement-Level Triggers, Row-Level Triggers, Compound Triggers, INSTEAD OF Triggers, System and Database Event Triggers, Trigger Restrictions, Maximum Trigger Size, SQL Statements, LONG and LONG RAW Data Types.

TEXT BOOKS:

1. Oracle Database 12c PL/SQL Programming Michael McLaughlin, McGraw Hill Education.

REFERENCES:

1. Benjamin Rosenzweig, Elena Silvestrova Rakhimov, Oracle PL/SQL by example Fifth Edition.
2. Dr. P. S. Deshpande, SQL & PL / SQL for Oracle 11g Black Book.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

NATURAL LANGUAGE PROCESSING

(PROFESSIONAL ELECTIVE-I)

Course code: GR25D5029 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Outcomes:

1. Examine methods for identifying document structures and evaluate their computational complexity.
2. Demonstrate understanding of parsing techniques for natural language syntax.
3. Compare system paradigms for semantic analysis and word sense disambiguation.
4. Employ software tools to implement predicate-argument and meaning representation models.
5. Apply n-gram and advanced language modeling techniques for natural language processing.

UNIT - I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT - II

Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

UNIT - III

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT - IV

Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT - V

Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross Lingual Language Modeling

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

REFERENCES:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DEEP LEARNING

(PROFESSIONAL ELECTIVE - I)

Course code: GR25D5030 **L/T/P/C: 3/0/0/3**

I Year I Semester

Course Outcomes:

1. Implement deep learning algorithms, understand neural networks and traverse the layers of data
2. Learn topics such as convolutional neural networks, recurrent neural networks, training deep networks and high-level interfaces
3. Understand applications of Deep Learning to Computer Vision
4. Understand and analyze Applications of Deep Learning to NLP

UNIT - I

Introduction: Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout

UNIT - II

Convolutional Neural Networks: Architectures, convolution/pooling layers, Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures. Deep Unsupervised Learning: Auto encoders, Variational Auto-encoders, Adversarial Generative Networks, Auto-encoder and DBM Attention and memory models, Dynamic Memory Models

UNIT - III

Applications of Deep Learning to Computer Vision: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models, Attention Models for computer vision tasks

UNIT -IV

Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics, Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Glove, Evaluations and Applications in word similarity

UNIT -V

Analogy reasoning: Named Entity Recognition, Opinion Mining using Recurrent Neural Networks: Parsing and Sentiment Analysis using Recursive Neural Networks: Sentence Classification using Convolutional Neural Networks, Dialogue Generation with LSTMs

TEXT BOOKS:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

REFERENCES:

1. Bishop, C, M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan, C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

Extensive Reading:

1. http://www.deeplearning.net
2. https://www.deeplearningbook.org/
3. https://developers.google.com/machine-learning/crash-course/ml-intro
4. www.cs.toronto.edu/~fritz/absps/imagenet.pdf
5. http://neuralnetworksanddeeplearning.com/

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

APPLIED CRYPTOGRAPHY

(PROFESSIONAL ELECTIVE-II)

Course code: GR25D5031 **L/T/P/C: 3/0/0/3**

I Year I Semester

Course Outcomes:

1. Understand the computer algorithms for secure communication and analyze the role of large numbers in cryptographic security.
2. Differentiate among algorithm types and encryption modes such as ECB, CBC, CFB, OFB, and Counter Mode.
3. Apply public-key algorithms for secure encryption and key exchange in practical scenarios.
4. Analyze advanced cryptographic protocols such as secret sharing, zero-knowledge proofs, subliminal channels, and blind signatures.
5. Apply cryptographic standards and messaging protocols in practical secure communication scenarios.

Unit I

Foundations:

Terminology, Steganography, Substitution Ciphers and Transposition Ciphers, Simple XOR, One- Time Pads, Computer Algorithms, Large Numbers,

Cryptographic Protocols: Protocol Building Blocks

Introduction to Protocols, Communications Using Symmetric Cryptography, One-Way Functions, One- Way Hash Functions, Communications Using Public-Key Cryptography, Digital Signatures, Digital Signatures with Encryption, Random and Pseudo-Random-Sequence Generation

Unit II Cryptographic Techniques

Key length: Symmetric Key length, Public key length, comparing symmetric and public key length. **Algorithm types and modes:** Electronic Codebook Mode, Block Replay, Cipher Block Chaining Mode, Stream Cipher, Self-Synchronizing Stream Ciphers, Cipher-Feedback Mode, Synchronous Stream Ciphers, Output-Feedback Mod, Counter Mode, Other Block-Cipher Modes.

Unit III Public-Key Algorithms

Background, Knapsack Algorithms, RSA, Pohlig-Hellman, Rabin, ElGamal, McEliece, Elliptic Curve Cryptosystems, LUC, Finite Automaton Public-Key Cryptosystems

Public-Key Digital Signature Algorithms: Digital Signature Algorithm (DSA), DSA Variants, Gost Digital Signature Algorithm, Discrete Logarithm Signature Schemes, Ong-Schnorr-Shamir, ESIGN

Unit IV Special Algorithms for Protocols

Multiple-Key Public-Key Cryptography, Secret-Sharing Algorithms, Subliminal Channel, Undeniable Digital Signatures, Designated Confirmer Signatures, Computing with Encrypted Data, Fair Coin Flips, One-Way Accumulators, All-or-Nothing Disclosure of Secrets, Fair and Failsafe Cryptosystems, Zero- Knowledge Proofs of Knowledge, Blind Signatures, Oblivious Transfer, Secure Multiparty Computation, Probabilistic Encryption, Quantum Cryptography

Unit V Real World Approaches

IBM Secret key management protocol, ISDN, Kerberos, KryptoKnight, Privacy enhanced mail (PEM), Message security protocol (MSP), PGP, Public-Key Cryptography Standards (PKCS), Universal Electronic Payment System (UEPS).

TEXT BOOKS:

1. Bruce Schneier, Applied Cryptography, Second Edition: Protocols, Algorithms, and Source Code in C (cloth).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SOFTWARE QUALITY ENGINEERING

(PROFESSIONAL ELECTIVE-II)

Course code: GR25D5027 **L/T/P/C: 3/0/0/3**

I Year I Semester

Course Outcomes:

1. Understand the quality frameworks such as ISO-9126 and their applicability to software development.
2. Apply defect prevention techniques such as formal methods, training, and education in software projects.
3. Develop quality planning strategies including goal setting and strategy formation for software projects.
4. Plan and prepare effective software tests, including execution and result checking.
5. Apply checklist-based testing techniques and analyze their limitations in real-world scenarios.

Unit I Software Quality

Quality: perspectives and expectations, Quality frameworks and ISO-9126, correctness and defects: Definitions, properties and Measurements, A historical perspective of quality, software quality.

Unit II Quality Assurance

Classification: QA as dealing with defects, Defect prevention- Education and training, Formal method, Other defect prevention techniques, Defect Reduction - Inspection: Direct fault detection and removal, Testing: Failure observation and fault removal, other techniques and risk identification, Defect Containment- software fault tolerance, safety assurance and failure containment

Unit III Quality Engineering

Quality Engineering: Activities and process, Quality planning: Goal setting and Strategy formation, Quality assessment and Improvement, Quality engineering in software process.

Unit IV Test Activities, Management and Automation

Test planning and preparation, Test execution, Result checking and measurement, Analysis and follow- up, Activities People and Management, Test Automation.

Unit V Coverage and usage testing based on checklist and partitions

Checklist based testing and its limitations, Testing for partition Coverage, Usage based Statistical testing with Musa's operational profiles, Constructing operational profiles

Case Study: OP for the cartridge Support Software

TEXT BOOKS:

1. Jeff Tian, Software Quality Engineering, Testing, Quality Assurance, and Quantifiable improvement
2. Richard N. Taylor, Software Architecture: Foundations, Theory, and Practice

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MINING MASSIVE DATASETS

(PROFESSIONAL ELECTIVE - II)

Course code: GR25D5030 **L/T/P/C: 3/0/0/3**

I Year I Semester

Course Outcomes:

1. Handle massive data using MapReduce.
2. Develop and implement algorithms for massive data sets and methodologies in the context of data mining.
3. Understand the algorithms for extracting models and information from large datasets
4. Develop recommendation systems.
5. Gain experience in matching various algorithms for particular classes of problems.

UNIT I

Data Mining-Introduction-Definition of Data Mining-Statistical Limits on Data Mining, **MapReduce and the New Software Stack-**Distributed File Systems, MapReduce, Algorithms Using MapReduce.

UNIT II

Similarity Search: Finding Similar Items-Applications of Near-Neighbor Search, Shingling of Documents, Similarity-Preserving Summaries of Sets, Distance Measures.
Streaming Data: Mining Data Streams-The Stream Data Model , Sampling Data in a Stream, Filtering Streams

UNIT III

Link Analysis-PageRank, Efficient Computation of PageRank, Link Spam
Frequent Itemsets-Handling Larger Datasets in Main Memory, Limited-Pass Algorithms, Counting Frequent Items in a Stream.
Clustering-The CURE Algorithm, Clustering in Non-Euclidean Spaces, Clustering for Streams and Parallelism

UNIT IV

Advertising on the Web-Issues in On-Line Advertising, On-Line Algorithms, The Matching Problem, The Adwords Problem, Adwords Implementation.
Recommendation Systems-A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering, Dimensionality Reduction, The NetFlix Challenge.

UNIT V

Mining Social-Network Graphs-Social Networks as Graphs, Clustering of Social-Network Graphs, Partitioning of Graphs, Simrank, Counting Triangles

TEXT BOOKS:

1. Jure Leskovec, Anand Rajaraman, Jeff Ullman, Mining of Massive Datasets, 3rd Edition.

REFERENCE BOOKS:

1. Jiawei Han & Micheline Kamber , Data Mining – Concepts and Techniques 3rd Edition Elsevier.
2. Margaret H Dunham, Data Mining Introductory and Advanced topics, PEA.
3. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED DATA STRUCTURES LAB

Course code: GR25D5034 **L/T/P/C: 0/0/4/2**

I Year I Semester

Course Outcomes:

1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and B-trees.

List of Programs

1. Write a program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from a binary search tree.
   c) Search for a key element in a binary search tree.

2. Write a program for implementing the following sorting methods:
   a) Merge sort b) Heap sort c) Quick sort

3. Write a program to perform the following operations:
   a) Insert an element into a B- tree.
   b) Delete an element from a B- tree.
   c) Search for a key element in a B- tree.

4. Write a program to perform the following operations:
   a) Insert an element into a Min-Max heap
   b) Delete an element from a Min-Max heap
   c) Search for a key element in a Min-Max heap

5. Write a program to perform the following operations:
   a) Insert an element into a Lefiist tree
   b) Delete an element from a Leftist tree
   c) Search for a key element in a Leftist tree

6. Write a program to perform the following operations:
   a) Insert an element into a binomial heap
   b) Delete an element from a binomial heap.
   c) Search for a key element in a binomial heap

7. Write a program to perform the following operations:
   a) Insert an element into an AVL tree.
   b) Delete an element from an AVL search tree.
   c) Search for a key element in an AVL search tree.

8. Write a program to perform the following operations:
   a) Insert an element into a Red-Black tree.
   b) Delete an element from a Red-Black tree.
   c) Search for a key element in a Red-Black tree.

9. Write a program to implement all the functions of a dictionary using hashing.

10. Write a program for implementing Knuth-Morris-Pratt pattern matching algorithm.

11. Write a program for implementing Brute Force pattern matching algorithm.

12. Write a program for implementing Boyer pattern matching algorithm.

TEXT BOOKS:

1. Fundamentals of Data structures in C, E. Horowitz, S. Sahni and Susan Anderson Freed, 2nd Edition, Universities Press
2. Data Structures Using C – A.S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.
3. Introduction to Data Structures in C, Ashok Kamthane, 1st Edition, Pearson.

REFERENCES:

1. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
3. Data structures: A Pseudocode Approach with C, R.F. Gilberg And B.A. Forouzan, 2nd Edition, Cengage Learning.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATABASE PROGRAMMING WITH PL/SQL LAB

Course code: GR25D5037 **L/T/P/C: 0/0/4/2**

I Year I Semester

Course Outcomes:

1. Develop PL/SQL programs using control structures (loops, conditionals, exceptions) to handle data processing tasks.
2. Apply cursors, procedures, and functions to efficiently query and manipulate relational database records.
3. Design and implement advanced PL/SQL constructs such as packages and triggers to support modularity and automation in databases.
4. Demonstrate the integration of PL/SQL with host programming languages (C/Java) to implement real-world applications like transaction management.
5. Analyze, test, and validate PL/SQL programs for correctness, robustness, and reliability in managing database operations.

List of Experiments:

1. Write a Pl/SQL program using FOR loop to insert ten rows into a database table.
2. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID), write a cursor to select the five highest paid employees from the table.
3. Illustrate how you can embed PL/SQL in a high-level host language such as C/Java and demonstrates how a banking debit transaction might be done.
4. Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into a given relation.
5. Write a PL/SQL program to demonstrate Exceptions.
6. Write a PL/SQL program to demonstrate Cursors.
7. Write a PL/SQL program to demonstrate Functions.
8. Write a PL/SQL program to demonstrate Packages.
9. Write PL/SQL queries to create Procedures.
10. Write PL/SQL queries to create Triggers.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

NATURAL LANGUAGE PROCESSING LAB

(LAB - II)

Course code: GR25D5038 **L/T/P/C: 0/0/4/2**

I Year I Semester

Course Outcomes:

1. Implement basic text preprocessing techniques such as tokenization, stemming, and stop-word removal using Python.
2. Analyze word-level linguistic features through word analysis, word generation, and part-of-speech tagging.
3. Apply morphological analysis and chunking to extract meaningful linguistic structures from text.
4. Construct and evaluate statistical language models using N-grams and smoothing techniques.
5. Integrate natural language processing (NLP) methods into practical applications, demonstrating the ability to process and represent text computationally.

List of Experiments

Implement the following using Python

1. Tokenization
2. Stemming
3. Stop word removal (a, the, are,.)
4. Word Analysis
5. Word Generation
6. Pos tagging
7. Morphology
8. chunking
9. N-Grams
10. N-Grams Smoothing

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

REFERENCES:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DEEP LEARNING LAB

(LAB -II)

Course code: GR25D5039 **L/T/P/C: 0/0/4/2**

I Year I Semester

Course Outcomes:

1. Set up Python development environments and utilize deep learning libraries such as Keras, TensorFlow, and PyTorch for model development.
2. Apply Convolutional Neural Networks (CNNs) to solve computer vision tasks including image classification on benchmark datasets.
3. Implement deep learning models for Natural Language Processing (NLP) applications such as sentiment analysis using RNN, LSTM, and GRU.
4. Develop and evaluate unsupervised learning models including Autoencoders for data encoding and feature extraction.
5. Design and implement Generative Adversarial Networks (GANs) for image generation and other generative tasks.

LIST OF EXPERIMENTS:

1. Setting up the Spyder IDE Environment and Executing a Python Program
2. Installing Keras, Tensorflow and Pytorch libraries and making use of them
3. Applying the Convolution Neural Network on computer vision problems
4. Image classification on MNIST dataset (CNN model with Fully connected layer)
5. Applying the Deep Learning Models in the field of Natural Language Processing
6. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes
7. Applying the Autoencoder algorithms for encoding the real-world data
8. Applying Generative Adversial Networks for image generation and unsupervised tasks.

TEXT BOOKS:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

REFERENCES:

1. Bishop, C, M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan, C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

Extensive Reading:

1. http://www.deeplearning.net
2. https://www.deeplearningbook.org/
3. https://developers.google.com/machine-learning/crash-course/ml-intro
4. www.cs.toronto.edu/~fritz/absps/imagenet.pdf
5. http://neuralnetworksanddeeplearning.com/

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

RESEARCH METHODOLOGY AND IPR

Course code: GR25D5011 **L/T/P/C: 2/0/0/2**

I Year I Semester

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

1. Apply suitable approaches for investigating solutions to research problems.
2. Perform effective literature surveys and apply systematic approaches to study prior research.
3. Apply appropriate formatting and presentation techniques in research documentation.
4. Apply knowledge of patenting processes in technological research and innovation.
5. Use patent information systems and databases for research and innovation.

UNIT-I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT-III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT-IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. C.R. Kothari, Research Methodology, methods & techniques, 2nd edition, New age International publishers

REFERENCES:

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
7. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECCHNOLOGY

ENGLISH FOR RESEARCH PAPER WRITING

Course Code: GR25D5053 **L/T/P/C: 2/0/0/2**

I Year I Semester

Course Outcomes:

At the end of the course students will be able to

1. Give a view of what writing is all about
2. Understand Research and its process
3. Comprehend the steps and methods involved in research process
4. Have learned various skills necessary that are necessary for doing research
5. Have learned how to write quality research papers along with other research areas

Unit 1: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit 2: Hedging and Critiquing, Paraphrasing and Plagiarism, Sections of a Paper

Unit 3:

A: Abstracts and writing an Introduction, Review of the Literature, Methods and Results

B: Key skills that are needed when writing a Title, an Abstract, an Introduction, and Review of the Literature,

Unit 4:

A. Methods, the Results, Discussion, Conclusions, the Final Check, Clarifying Who Did What, Highlighting Your Findings

B. Key Skills that are needed when writing the Methods, the Results, the Discussion,and the Conclusion.

Unit 5:

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Reference Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .
4. Ian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

DISASTER MANAGEMENT

Course Code: GR25D5054 **L/T/P/C:2/0/0/2**
I Year I Semester

Course Outcomes:

1. Capacity to integrate knowledge and to analyze, evaluate and manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.
2. Capacity to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
3. Capacity to work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery) and relate their interconnections, particularly in the field of the Public Health aspects of the disasters.
4. Capacity to manage the Public Health aspects of the disasters.
5. Capacity to obtain, analyze, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.

Unit 1:

Introduction: Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Unit 2:

Repercussions of Disasters and Hazards: **Economic Damage**, Loss of Human And Animal Life, Destruction Of Ecosystem. **Natural Disasters**: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Unit 3:

Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone To Floods And Droughts, Landslides and Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

Unit 4:

Disaster Preparedness and Management: Preparedness: Monitoring Of Phenomena Triggering

A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

Unit 5:

Risk Assessment: Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co- Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival. Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Code: GR25D5055 **L/T/P/C:2/0/0/2**

I Year I Semester

Course Outcomes*:*

1. Understanding basic Sanskrit alphabets and Understand tenses in Sanskrit Language.
2. Enable students to understand roots of Sanskrit language.
3. Students learn engineering fundamentals in Sanskrit.
4. Students can attempt writing sentences in Sanskrit.
5. Ancient Sanskrit literature about science & technology can be understood.

Unit 1: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

Unit 2: Order, Introduction of roots, technical information about Sanskrit Literature

Unit 3: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics and Applications of OCR for Sanskrit and Indian Languages, Tool and Techniques, Survey

Unit 4: Interactive Sanskrit Teaching Learning Tools: Interactive Sanskrit Learning Tools, Introduction, Why Interactive Tools for Sanskrit? E-learning, Basics of Multimedia, Web based tools development HTML, Web page etc., Tools and Techniques

Unit 5: Standard for Indian Languages (Unicode) Unicode Typing in Devanagari Scripts, Typing Tools and Software, Text Processing and Preservation Tools, Text Processing, Preservation, Techniques, Text Processing and Preservation, Tools and Techniques, Survey

Reference Books:

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.
4. Bharti A., R. Sangal, V. Chaitanya, "NL, Complexity Theory and Logic" in Foundations of Software Technology and Theoretical Computer Science, Springer, 1990.
5. Tools developed by Computational Linguistics Group, Department of Sanskrit, University of Delhi, Delhi-110007 available at: http://sanskrit.du.ac.in
6. Basic concept and issues of multimedia: http://www.newagepublishers.com/samplechapter/001697.pdf

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
VALUE EDUCATION

Course Code: GR25D5056 **L/T/P/C:2/0/0/2**

I Year I Semester

Course Outcomes: Students will be able to

1. Knowledge of self-development
2. Learn the importance of Human Values
3. Developing the Professionalism Ethics, Risks, Responsibilities and Life Skills.
4. Student will be able to realize the significance of ethical human conduct and self-development
5. Students will be able to inculcate positive thinking, dignity of labor and religious tolerance.

Unit 1: Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

Unit 2: Importance of cultivation of values, Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

Unit 3: Personality and Behaviour Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

Unit 4: Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

Unit 5: Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

Reference Books:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi
2. Jagdish Chand, “Value Education” N. Venkataiah, “ Value Education”, APH Publishing, 1998 - Education

I YEAR

II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED ALGORITHMS

Course Code: GR25D5036 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Outcomes: After completion of course, students would be able to:

1. Analyze performance of different algorithms.
2. Determine the appropriate data structure for solving a particular set of problems.
3. Apply algorithmic paradigms for advanced algorithmic problems.
4. Apply various mathematical techniques for solving the problems.
5. Categorize the different problems in various classes according to their complexity.

UNIT – I

Sorting:

Review of various sorting algorithms, topological sorting

Graph:

Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkstra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

UNIT – II

Matroids:

Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST.

Graph Matching:

Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

UNIT - III

Flow-Networks:

Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

Matrix Computations:

Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

UNIT - IV

Shortest Path in Graphs:

Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.

Modulo Representation of integers/polynomials:

Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.

Discrete Fourier Transform (DFT):

In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm.

UNIT - V

Linear Programming: Geometry of the feasibility region and Simplex algorithm

NP-completeness: Examples, proof of NP-hardness and NP-completeness.

Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

REFERENCES:

1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithms".
2. Aho, Hopcroft, Ullman "The Design and Analysis of Computer Algorithms".
3. Kleinberg and Tardos."Algorithm Design".

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED COMPUTER ARCHITECTURE

Course Code:GR25D5040 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Outcomes: Gain knowledge of

1. Analyze multiprocessors, multicomputers, multivector, SIMD computers, and PRAM/VLSI models.
2. Demonstrate knowledge of scalable performance principles, metrics, and measures.
3. Analyze the design of linear and non-linear pipeline processors.
4. Assess multiprocessor system interconnects and synchronization mechanisms.
5. Analyze multivector multiprocessors and compound vector processing approaches.

UNIT - I

Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

UNIT - II

Principles of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors

UNIT - III

Shared-Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

UNIT - IV

Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms, Multivetor and SIMD computers.

UNIT - V

Vector Processing Principles, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-5.

TEXT BOOK:

1. Advanced Computer Architecture, Kai Hwang, 2nd Edition, Tata McGraw Hill Publishers.

REFERENCES:

1. Computer Architecture, J.L. Hennessy and D.A. Patterson, 4th Edition, ELSEVIER.
2. Advanced Computer Architectures, S.G.Shiva, Special Indian edition, CRC, Taylor &Francis.

3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G. Wellein, CRC Press, Taylor & Francis Group.
4. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.
5. Computer Architecture, B. Parhami, Oxford Univ. Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA ANALYTICS AND VISUALIZATION
(PROFESSIONAL ELECTIVE-III)

Course Code:GR25D5025 **L/T/P/C: 3/0/0/3**

I YEAR II SEMESTER

Course Outcomes:

1. Illustrate R programming for data analytics.
2. Interpret Summary Statistics by connecting R to NoSQL databases.
3. Demonstrate Regression analysis and correlation.
4. Compare various Verticals - Engineering, Financial and others.
5. Summarize the recent trends in visualization techniques and their applications for real World problems.

UNIT I

Introduction to Analytics and R programming

Introduction to R, RStudio (GUI): R Windows Environment, introduction to various data types, Numeric, Character, date, data frame, array, matrix etc., Reading Datasets, Working with different file types .txt, .csv etc. Outliers, Combining Datasets, R Functions and loops.

UNIT II

SQL using R and Statistics

Introduction to NoSQL, Connecting R to NoSQL databases. Excel and R integration with R connector.

Summary Statistics - Summarizing data with R, Probability, Expected, Random, Bivariate Random variables, Probability distribution. Central Limit Theorem etc.

UNIT III

Regression Analysis and Correlation

Assumptions of OLS Regression, Regression Modelling. Correlation, ANOVA, Forecasting, Heteroscedasticity, Autocorrelation, Introduction to Multiple Regression etc.

UNIT IV

Introduction to Visualization

Visualization process, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

UNIT V

Introduction to Tableau

Tableau Architecture, Tableau Server Architecture VizQL, introduction to Tableau Prep, Tableau Prep Builder User Interface, Data Preparation techniques using Tableau Prep Builder tool, Features of Tableau Desktop Connect to data from File and Database, Types of Connections, Joins and Unions, Data Blending, Tableau Desktop User Interface.

TEXT BOOKS:

1. Student's Handbook for Associate Analytics.
2. A First Course in Statistical Programming with R, Braun W. J., Murdoch D. J.. — Cambridge University Press, 2007
3. Joshua N. Milligan, Learning Tableau 2019 Tools for Business Intelligence, data prep and visual analytics Third Edition.

REFERENCE BOOKS:

1. Data Manipulation with R, Jaynal Abedin and Kishore Kumar Das, Second Edition, Packt publishing, BIRMINGHAM – MUMBAI.

2. Beginning R The Statistical Programming language- Mark Gardener, John Wiley & Sons, Inc., 2012

3. Introduction to Probability and Statistics Using R, ISBN: 978-0-557-24979-4, is a textbook written for an undergraduate course in probability and statistics.

4. Andy Kirk, Data Visualization – A hand book for data driven design, Sage publications 2016.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CYBER SECURITY

(PROFESSIONAL ELECTIVE - III)

Course Code: GR25D5041 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Outcomes:

1. Analyze the fundamental concepts of Cyber Security including vulnerabilities, threats, and harmful acts.
2. Understand the principles of digital forensics science to collect, preserve, and analyze digital evidence.
3. Apply the security challenges posed by mobile devices and registry settings for protection.
4. Analyze different web-based threats and their implications on organizational security and privacy.
5. Analyze real-world case studies of cybercrimes such as website hacking, financial frauds, and spoofing.

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, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., 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

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, 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

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, etc

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.

TEXT BOOKS:

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

REFERENCES:

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&FGroup.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED UNIX PROGRAMMING

(PROFESSIONAL ELECTIVE-III)

Course Code:GR25D5042 **L/T/P/C: 3/0/0/3**
I Year II Semester

Course Outcomes:

1. Apply Linux file handling and security utilities.
2. Utilize process, disk, and networking utilities
3. Develop skills in text processing and backup utilities
4. Design and implement shell scripts using Bash
5. Analyze and handle advanced shell programming features

UNIT- I

Linux Utilities - File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities.

Shell programming with Bourne again shell (bash) - Introduction, shell responsibilities, pipes and Redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

UNIT- II

Files and Directories - File Concept, File types, File System Structure, file metadata- Inodes, kernel support for files, system calls for file I/O operations- open, creat, read, write, close, lseek, dup2, file status information-stat family, file and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown, fchown, links-soft links and hard links – symlink, link, unlink. **Directories**

- Creating, removing and changing Directories- mkdir, rmdir, chdir, obtaining current working directory- getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions.

UNIT- III

Process – Process concept, Layout of a C program image in main memory, Process environment- environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process control - process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process, system call interface for process management- fork, vfork, exit, wait, waitpid, exec family, Process Groups, Sessions and Controlling Terminal, Differences between threads and processes.

Signals – Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions.

UNIT- IV

Interprocess Communication - Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pipes-creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs (Named pipes), differences between unnamed and named pipes, popen and pclose library functions. **Message Queues** - Kernel support for messages, APIs for message queues, client/server example. **Semaphores** - Kernel support for semaphores, APIs for semaphores, file locking with semaphores.

UNIT- V

Shared Memory - Kernel support for shared memory, APIs for shared memory, shared memory example. **Sockets** - Introduction to Berkeley Sockets, IPC over a network, Client-Server model, Socket address structures (Unix domain and Internet domain),Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs-Single Server-Client connection, Multiple simultaneous clients, Socket options-setsockopt and fcntl system calls, Comparison of IPC mechanisms.

TEXT BOOKS:

1. Unix System Programming using C++, T. Chan, PHI.
2. Advanced Programming in the Unix Environment, 2nd edition, W. R. Stevens and S. A. Rago, Pearson Education.
3. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.
4. Unix Network Programming, W. R. Stevens, PHI.

REFERENCE BOOKS:

1. C Programming Language, Kernighan and Ritchie, PHI.
2. Beginning Linux Programming, 4th Edition, N. Matthew, R. Stones, Wrox, Wiley India Edition.
3. Unix for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson.
4. System Programming with C and Unix, A. Hoover, Pearson.
5. Unix System Programming, Communication, Concurrency and Threads, K. A. Robbins and S. Robbins, Pearson Education.
6. Unix shell Programming, S. G. Kochan and P. Wood, 3rd edition, Pearson Education.
7. Shell Scripting, S. Parker, Wiley India Pvt. Ltd.
8. Unix and Shell programming, B. A. Forouzan and R. F. Gilberg, Cengage Learning.
9. Linux System Programming, Robert Love, O'Reilly, SPD.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BIOINFORMATICS

(PROFESSIONAL ELECTIVE - IV)

Course Code:GR25D5043 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Outcomes:

1. Analyze the organization of DNA and proteins to understand their biological significance in bioinformatics.
2. Implement biological operations such as transcription, reverse complement, and motif finding using Perl.
3. Evaluate different database interfaces and their effectiveness for biological data access and integration.
4. To use computational tools and techniques for performing biological sequence alignment.
5. To apply distance-based methods such as Neighbor Joining and Fitch/Margoliash for phylogenetic tree construction.

UNIT -I : The Central Dogma & XML (Bio XML) for Bioinformatics: Watson's definition, information flow, from data to knowledge, Convergence, the organization of DNA, the organization of Proteins, Introduction, Differences between HTML and XML, fundamentals of XML, fundamentals of XML namespaces. Introduction to DTDs, Document type Declarations, Declaring elements, declaring attributes, working with entities XML Schemas, Essential Concepts, working with simple types, working with complex types, Basic namespaces issues.

UNIT -II : Perl (Bioperl) for Bioinformatics: Representing sequence data, program to store a DNA sequence, concatenating DNA fragments, Transcription, Calculating the reverse complement in Perl, Proteins, files, reading proteins in files, Arrays, Flow control, finding motifs, counting Nucleotides, exploding strings into arrays, operating on strings, writing to files, subroutines and bugs.

UNIT -III : Databases: Flat file, Relational, object oriented databases, object Relational and Hypertext, Data life cycle, Database Technology, Database Architecture, Database Management Systems and Interfaces.

UNIT -IV : Sequence Alignment Algorithms: Biological motivations of sequence analysis, the models for sequence analysis and their biological motivation, global alignment, local alignment, End free-space alignment and gap penalty, Sequence Analysis tools and techniques.

UNIT -V : Phylogenetic Analysis: Introduction, methods of Phylogenetic analysis, distance methods, the neighbor- Joining (NJ) method, The Fitch/ Margoliash method, character-based methods, Other methods, Tree evaluation and problems in phylogenetic analysis, Clustering, Protein structure visualization and Protein structure prediction.

TEXT BOOKS:

1. S.C. Rastogi, N. Mendiratta, "Bioinformatics Methods and Applications", CBS publications, 2004
2. James D. Tisdall, "Beginning Perl for Bioinformatics" O'Reilly media, 1st Edition, 2001

REFERENCE BOOKS:

1. D.R. Westhead, J.H. Parish, "Bioinformatics" Viva books private limited, New Delhi (2003)
2. Att Wood, "Bioinformatics" Pearson Education, 2004
3. Bryan Bergeron, M.D, "Bioinformatics Computing" Pearson Education, 2003

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ROBOTIC PROCESS AUTOMATION

(PROFESSIONAL ELECTIVE - IV)

Course Code:GR25D5044 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Outcomes:

1. Understand the fundamental concepts of Robotic Process Automation (RPA), its significance, and real-world use cases across various industries.
2. Demonstrate navigation through the Dashboard, including Home, Bots, Devices, Audit, Workload, and Insights panels.
3. Apply workload management concepts including queues and SLA calculators.
4. Apply the Task Editor to manage variables, design logic, and structure automation workflows.
5. Apply terminal emulator and PDF integration commands to automate legacy and document-based systems.

Unit I

Introduction to Robotic Process Automation & Bot Creation Introduction to RPA and Use cases – Automation Anywhere Enterprise Platform – Advanced features and capabilities – Ways to create Bots

Unit II

Web Control Room and Client Introduction - Features Panel - Dashboard (Home, Bots, Devices, Audit, Workload, Insights) - Features Panel – Activity (View Tasks in Progress and Scheduled Tasks)
- Bots (View Bots Uploaded and Credentials)

Unit III

Devices (View Development and Runtime Clients and Device Pools) - Workload (Queues and SLA Calculator) - Audit Log (View Activities Logged which are associated with Web CR) - Administration (Configure Settings, Users, Roles, License and Migration) - Demo of Exposed API's – Conclusion – Client introduction and Conclusion.

Unit IV

Bot Creator Introduction – Recorders – Smart Recorders – Web Recorders – Screen Recorders - Task Editor – Variables - Command Library – Loop Command – Excel Command – Database Command - String Operation Command - XML Command

Unit V

Terminal Emulator Command - PDF Integration Command - FTP Command - PGP Command - Object Cloning Command - Error Handling Command - Manage Windows Control Command - Workflow Designer - Report Designer

TEXT BOOKS:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots. with the leading RPA tool – UiPath Kindle Edition.

REFERENCES:

1. Robotic Process Automation A Complete Guide - 2020 Edition Kindle Edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

GENERATIVE AI

(PROFESSIONAL ELECTIVE - IV)

Course Code:GR25D5045 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Outcomes

1. Understand the historical evolution of AI, ML, NLP, and DL, and explain their interrelationships in building generative AI.
2. Analyze the architecture and working mechanisms of Generative Adversarial Networks (GANs).
3. Apply pre-training and fine-tuning techniques to customize GPT models for domain-specific applications.
4. Analyze collaboration and orchestration techniques in multi-agent systems for generative tasks.
5. Understand the LangChain framework and its components for LLM-based application development.

UNIT 1

Foundations of AI and Generative Models

Introduction and historical evolution to Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP)and Deep Learning (DL), Structure of Artificial Neural Networks (ANNs), Mathematical and computational foundations of generative modeling, Overview of generative models and their applications across various domains; Importance of Generative AI in modern applications, Transfer learning and in advancing Generative AI

UNIT 2

Advanced Neural Architectures for Generative AI

Variational Autoencoders (VAEs): principles and applications, Generative Adversarial Networks (GANs): architecture and working principles; Transformer architecture and attention mechanisms (in detail); Long Short-Term Memory Networks (LSTMs) and the limitations of traditional RNNs/LSTMs, Advanced Transformer architectures and techniques, Pre-training and transfer learning strategies for generative models

UNIT 3

Large Language Models and Prompt Engineering

Overview of Large Language Models (LLMs), GPT architecture, variants, and working principles, Pré- training and fine-tuning GPT models for applications (e.g., chatbots, text generation), Case study: GPT-based customer support chatbot, BERT architecture, pre-training objectives, and fine-tuning, Prompt Engineering: Designing effective prompts, controlling model behavior, and improving output quality, Fine-tuning language models for creative writing and chatbot development

UNIT 4

Multi-Agent Systems and Generative AI Applications

Introduction to Multi-Agent Systems (MAS),Types of agents: reactive, deliberative, hybrid, and learning agents, Multi-agent collaboration and orchestration for generative tasks, Use cases: autonomous research assistants, cooperative creative generation, distributed problem-solving, Frameworks and tools: AutoGen, CrewAI, Hugging GPT for LLM-powered multi-agent systems, Generative AI applications: Art, Creativity, Image/Video generation, Music composition, Healthcare, Finance, Real-world case studies and deployment challenges

UNIT 5

Frameworks, Multimodal Applications, and Ethics

LangChain framework: components and LLM application development, Retrieval-Augmented Generation (RAG), Embeddings, Indexing networks, and Vector databases, Generative AI across modalities: Text, Code, Image, and Video generation, Image and Video generation using GANs and VAEs, Multimodal Generative AI: integration and training strategies, Ethical considerations: bias, fairness, trust, and responsible AI deployment, Social and legal implications of Generative AI, Risk mitigation strategies and real-world ethical case studies

TEXT BOOKS

1. Altaf Rehmani, Generative AI for Everyone: Understanding the Essentials and Applications of This Breakthrough Technology.
2. Charu C. Aggarwal, Neural Networks and Deep Learning: A Textbook. Joseph Babcock, Raghav Bali, Generative AI with Python and TensorFlow 2, 2024.

REFERENCE BOOKS

1. Josh Kalin, Generative Adversarial Networks Cookbook.
2. Jesse Sprinter, Generative AI in Software Development: Beyond the Limitations of Traditional Coding, 2024.

ONLINE REFERENCES

1. Fabian Gloeckle et al., Better & Faster Large Language Models via Multi-token Prediction, arXiv:2404.19737v1, 2024.Vaswani et al., Attention Is All You Need, NeurIPS 2017.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED ALGORITHMS LAB

(LAB - III)

Course Code:GR25D5046 **L/T/P/C: 0/0/4/2**

I Year II Semester

Course Outcomes:

1. Apply algorithmic techniques such as brute force, divide and conquer, greedy, dynamic programming, and string matching to solve classical computational problems.
2. Implement numerical algorithms including Gaussian elimination and LU decomposition for solving systems of linear equations with efficiency.
3. Analyze graph algorithms such as Warshall's algorithm for transitive closure and Max-Flow for network optimization.
4. Compare and evaluate string matching algorithms (Rabin-Karp, KMP, Horspool) in terms of time complexity, efficiency, and practical applications.
5. Design and test algorithmic solutions for optimization problems (e.g., assignment, knapsack, max-flow) and validate their correctness and performance through experimental analysis.

TASKS:

1. Implement assignment problem using Brute Force method
2. Perform multiplication of long integers using divide and conquer method.
3. Implement a solution for the knapsack problem using the Greedy method.
4. Implement Gaussian elimination method.
5. Implement LU decomposition
6. Implement Warshall algorithm
7. Implement the Rabin Karp algorithm.
8. Implement the KMP algorithm.
9. Implement Harspool algorithm
10. Implement max-flow problem.

TEXT BOOK:

1. Design and Analysis of Algorithms, S.Sridhar, OXFORD University Press

REFERENCES:

1. Introduction to Algorithms, second edition, T.H. Cormen, C.E. Leiserson, R.L. Rivest and C.Stein,PHI Pvt. Ltd./ Pearson Education.
2. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Universities Press.
3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA ANALYTICS AND VISUALIZATION LAB

(PROFESSIONAL ELECTIVE-III LAB)

Course Code:GR25D5033 **L/T/P/C: 0/0/4/2**

I YEAR II SEMESTER

Course Outcomes:

1. Demonstrate proficiency with statistical analysis of data.
2. Apply data modeling techniques to large data sets.
3. Design applications for data analytics using R programming.
4. Apply data visualization tools proficiently to present data insights.
5. Create and interpret effective data visualizations.

TASKS

TASK 1. Load data sets into the R statistical package and perform summary statistics on the data.

TASK 2. Plot the data using R using lattice and ggplot.

TASK 3. Load the data from an excel sheet and remove outliers from the data.

TASK 4. Test a hypothesis about the data using R studio.

TASK 5. Use the R -Studio environment to code OLS models and review the methodology to validate the model and predict the dependent variable for a set of given independent variables. Use R graphics functions to visualize the results generated with the model.

TASK 6. Use R -Studio environment to code Logistic Regression models and review the methodology to validate the model and predict the dependent variable for a set of given independent variables. Use R graphics functions to visualize the results generated with the model.

Note: Use Tableau for the following Tasks:

TASK 7. Data Representation: chart types: categorical, hierarchical, relational, temporal & spatial.

TASK 8. 2D: Bar charts, Clustered bar charts, dot plots, connected dot plots.

TASK 9. 2D: pictograms, proportional shape charts, bubble charts, radar charts, polar charts.

TASK 10. 2 D: Range chart, Box-and- whisker plots, univariate scatter plots, histograms word cloud.

TASK 11. 2 D: Pie chart, waffle chart, stacked bar chart, back-to-back bar chart, tree map.

TASK 12. 3-D: Surfaces, contours, hidden surfaces, pm3d coloring, 3Dmapping.

TEXT BOOKS:

1. Grolemund, G., 2014. Hands-on programming with R: Write your own functions and simulations. " O'Reilly Media, Inc.".

2. Andy Kirk, Data Visualization – A hand book for data driven design, Sage publications 2016.

3. Joshua N. Milligan, Learning Tableau 2019 Tools for Business Intelligence, data prep and visual analytics Third Edition.

REFERENCE BOOKS:

1. Philipp K. Janert, Gnuplot in Action, Understanding Data with Graphs, Manning Publications, 2010.

2. Sinan ozdemmir , “Principles of Data Science”, Packet Publishers-2016

3. Andy Kirk, Data Visualization A Handbook for Data Driven Design, Sage Publications,2016

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CYBER SECURITY LAB

(PROFESSIONAL ELECTIVE-III LAB)

Course Code:GR25D5061 **L/T/P/C: 0/0/4/2**

I YEAR II SEMESTER

Course Outcomes:

1. Apply ethical hacking tools and techniques (e.g., NMAP, Dmitry, UA Tester) to perform port scanning, footprinting, and target information gathering.
2. Design and implement secure systems by deploying honeypots, monitoring network traffic with sniffers (Wireshark), and analyzing logs using Snort.
3. Demonstrate the working of cryptographic mechanisms (symmetric, asymmetric, hashing, and digital signatures) using tools such as Cryptool/Jcrypt and OpenSSL for secure communication.
4. Analyze digital evidence by performing forensic techniques including email analysis, registry analysis, file type detection, memory capture, and network traffic monitoring using Autopsy, FTK Imager, and Network Miner.
5. Evaluate the effectiveness of various cybersecurity tools and techniques in detecting threats, monitoring suspicious activity, and preserving digital evidence in real-world scenarios.

TASKS:

1. Perform an Experiment for port scanning with NMAP.

2. Setup a honeypot and monitor the honeypot on the network

3. Install Jcrpt /Cryptool tool (or any other equivalent) and demonstrate Asymmetric, Symmetric crypto algorithm, Hash and Digital/PKI signatures.

4. Generate minimum 10 passwords of length 12 characters using open SSL command

5. Perform practical approach to implement Foot printing-Gathering target information using Dmitry-Dmagic, UAtester.

6. Working with sniffers for monitoring network communication (Wireshark).

7. Use Snort to perform real time traffic analysis and packet logging.

8. Perform email analysis using Autopsy tool.

9. Perform Registry analysis and get boot time logging using process monitor tool

10. Perform File type detection using Autopsy tool

11. Perform Memory capture and analysis using FTK imager tool

12. Perform Network analysis using the Network Miner tool

TEXT BOOKS

1. Real Digital Forensics for Handheld Devices, E. P. Dorothy, Auerback Publications, 2013.

2. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010

REFERENCES:

1. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J. Sammons, Syngress Publishing, 2012.
2. Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides, C. H. Malin, E. Casey and J. M. Aquilina, Syngress, 2012
3. The Best Damn Cybercrime and Digital Forensics Book Period, J. Wiles and A.Reyes, Syngress, 2007.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCE UNIX PROGRAMMING LAB

(PROFESSIONAL ELECTIVE-III LAB)

Course Code:GR25D5062 **L/T/P/C: 0/0/4/2**

I YEAR II SEMESTER

COURSE OUTCOMES

1. Demonstrate proficiency in using fundamental Linux commands (e.g., file management, process management, and system utilities) to effectively interact with the Unix/Linux operating system.
2. Apply advanced text processing and file handling commands (such as `grep`, `awk`, `sort`, `diff`, `tar`, etc.) to manage, filter, and manipulate data in Linux environments.
3. Design and implement shell scripts to automate tasks including file handling, user interaction, system information retrieval, and time-based activities.
4. Simulate core Unix/Linux commands through C programs to understand their underlying system calls and enhance low-level programming skills.
5. Implement inter-process communication (IPC) and socket programming (using FIFO, PIPE, message queues, shared memory, and TCP/IP sockets) to enable data exchange and process synchronization in distributed and networked environments.

TASKS

1. Study and Practice on various commands like man, passwd, tty, script, clear, date, cal, cp, mv, ln, rm, unlink, mkdir, rmdir, du, df, mount, umount, find, unmask, ulimit, ps, who, w.

2. Study and Practice on various commands like cat, tail, head , sort, nl, uniq, grep, egrep,fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, tar, cpio.

3. a) Write a Shell Program to print all .txt files and .c files.

b) Write a Shell program to move a set of files to a specified directory.

c) Write a Shell program to display all the users who are currently logged in after a specified time.

d) Write a Shell Program to wish the user based on the login time.

4. a) Simulate **cat** command. b) Simulate **cp** command.

5. a) Simulate **head** command. b) Simulate **tail** command.

6. a) Simulate **mv** command. b) Simulate **nl** command.

7. Write a program to handle the signals like **SIGINT, SIGQUIT, SIGFPE**.

8. Implement the following IPC forms

a) **FIFO** b) **PIPE**

9. Implement **message queue** form of IPC.

10. Implement **shared memory** form of IPC.

11. Write a Socket program to print system date and time (Using TCP/IP).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDIAN CONSTITUTION

Course Code:GR25D5057 **L/T/P/C:2/0/0/2**
I Year II Semester

Course Outcomes: Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of1956.
5. Discuss the significance of Election Commission of India.

Unit 1: History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

Unit 2: Philosophy of the Indian Constitution: Preamble Salient Features

Unit 3: Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Unit 4: Organs of Governance and composition of judiciary: Parliament- Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, composition of judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit 5: Local Administration and Election Commission: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning

REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PEDAGOGY STUDIES

Course Code:GR25D50458 **L/T/P/C:2/0/0/2**
I Year II Semester

Course Outcomes: Students will be able to understand

1. What pedagogical practices are being used by teachers in formal classrooms in developing countries?
2. What pedagogical practices are being used by teachers in informal classrooms in developing countries?
3. Synergy from the work force.
4. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
5. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Unit 1: Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and searching.

Unit 2: Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit 3: Evidence on the effectiveness of pedagogical practices, Methodology for the in-depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

Unit 4: Professional development: alignment with classroom practices and follow- up support, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes

Unit 5: Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
STRESS MANAGEMENT AND YOGA

Course Code:GR25D5059 **L/T/P/C:2/0/0/2**
I Year II sem

Course Outcomes: Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also improve efficiently.
2. Develop body awareness. Learn how to use their bodies in a healthy way. Perform well in sports and academics.
3. Will balance, flexibility, and stamina, strengthen muscles and connective tissues enabling good posture.
4. Manage stress through breathing, awareness, meditation and healthy movement.
5. Build concentration, confidence and positive self-image

Unit 1: Definitions of Eight parts of yoga. (Ashtanga)

Ashtanga, the eight limbs of yoga, is Patanjali's classification of classical yoga, as set out in his Yoga Sutras. He defined the eight limbs as yama (abstinences), niyama (observances), asana (postures), pranayama (breathing), pratyahara (withdrawal), dharana (concentration), dhyana (meditation) and Samadhi (absorption).

Unit-2. **Orientation to Patanjala Yoga sutra**:

Introduction to Yoga sutra - Nature of Yoga science, Definition of yoga, the nature of seer in pure and modified state, Vrittis - Nature, classification, definition, method to control of chitta vrittis. Samprajnata Samadhi and its classification, Iswarapranidhana - a means to attain Samadhi, definition and quality of Iswara. Astanga yoga-Vama, Niyama, Asana, Pranayama, Ratyahara-Bahiranga Yoga, Dharana, Dhyana, Samadhi-Antaranga Yoga, Powers Introduction.

Unit-3. **Orientation of Hath yoga pradipika** :

Hath yoga - Introduction, relationship of Hath yoga and Raja yoga, greatness of Hath yoga, Hath yogi parampara, importance of Hath and its secrecy, place of Hath yoga Practice, Destructives and constructive of yoga, Yama and Niyama, Asana, methods of Hath yoga Practice, Mitahara, Pathya and Apathya. Rules in food taking, Hath yoga achievements. Paranayama - Benefits of Pranayama, Nadishuddi and Pranayama. Duration and time for pranayama practice, Gradation of Pranayama, Sweat and Pranayama, Food during pranayama practice, Yukta and Ayukta pranayama, Nadishuddi, Satkriya-Neti, Dhouti, Basti, Nauli, Trataka, Kapalbhati, Gajakarani, Importance of Pranayama practice. Symtoms of Nadishuddhi, Manonnani, Varieties of Kumbhaka-Methods of practice, Classification of their benefits, Hathayogasiddhilakshanam. Kundalini as base for all yoga, Results of Kundalini prabyodha, Synonyms for Susumna, Mudras Bandhas-classification, benefits and methods of practice, Nadanusandhana.

Unit 4: Yam and Niyam. Do`s and Don'ts in life. Ahinsa, satya, astheya, bramhacharya & aparigrahaShaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit 5: Asan and Pranayam - Various yoga poses and their benefits for mind & body. Regularization of breathing techniques and its effects-Types of pranayam

REFERENCES:

1. 'Yogic Asanas for Group Training - Part-I" : Janardan Swami Yogabhyasi Mandal,Nagpur
2. "Rajayoga or conquering the Internal Nature" by SwamiVivekananda, AdvaitaAshrama (Publication Department),Kolkata
3. Rajayoga - Swami Vivekananda - Ramakrishna Ashrama Publications.
4. Hathayoga Pradipika of Swatmarama - Kaivalyadhama, Lonavala
5. The Science of Yoga - Taimini - Theosophical Publishing House, Adyar, Madras.
6. Yogasutras of Patanjali - Hariharananda Aranya, University of Calcutta Press, Calcutta.
7. Patanjal Yoga Pradeepa Omananda Tirtha- Geeta Press, Gorakhpur.
8. Gherandasamhita - Bihar School of Yoga, Munger, Bihar.
9. Shivayogadipika - Sadashivabrahmendra, Ananda Ashramagranthavali, Choukhamba Press
10. Yoga Darshan : Swami Niranjanananda-Sri Panchadashanam Paramahamsa Alakh Bara, Deoghar.
11. Four chapters on Freedom (commentary on the Yoga sutras of Patanjali), Swami Satyananda (1983), Bihar School of Yoga, Munger.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Code:GR25D5060 **L/T/P/C:2/0/0/2**
I Year II Semester

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:

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

TEXTBOOKS / REFERENCES:

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

II YEAR

I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIGITAL FORENSICS

(PROFESSIONAL ELECTIVE - V)

Course Code: GR25D5047 **L/T/P/C: 3/0/0/3**

II Year I Semester

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

1. Understand the fundamental principles of forensic science, computer forensics, and digital forensics.
2. Assess the importance of proper documentation and court requirements in criminal investigations.
3. Apply the forensic mindset in managing and presenting digital evidence effectively.
4. Apply forensic methodologies to investigate and critique digital crime cases.
5. Analyze recent trends in mobile forensic techniques and electronic evidence handling.

UNIT - I

Digital Forensics Science: Forensics science, computer forensics, and digital forensics.

Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber criminalistics area, holistic approach to cyber-forensics

UNIT - II

Cyber Crime Scene Analysis:

Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

UNIT - III

Evidence Management & Presentation:

Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

UNIT - IV

Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case, **Network Forensics:** open-source security tools for network forensic analysis, requirements for preservation of network data.

UNIT - V

Mobile Forensics: mobile forensics techniques, mobile forensics tools.

Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008.

Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

TEXT BOOKS:

1. John Sammons, The Basics of Digital Forensics, Elsevier
2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications

REFERENCES:

1. William Oettinger, Learn Computer Forensics: A beginner's guide to searching, analyzing, and securing digital evidence, Packt Publishing; 1st edition (30 April 2020), ISBN : 1838648178.
2. Thomas J. Holt , Adam M. Bossler, Kathryn C. Seigfried-Spellar , Cybercrime and Digital Forensics: An Introduction, Routledge.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

QUANTUM COMPUTING

(PROFESSIONAL ELECTIVE - V)

Course Code:GR25D5063 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Outcomes

1. Analyze the role of transcendental numbers and their significance in advanced quantum mechanics.
2. Interpret quantum entanglement, quantum key distribution (QKD), and their role in secure communication.
3. Understand the principles of qubits, quantum gates, circuits, and their role in quantum computation.
4. Apply Shor's algorithm for integer factorization and understand its impact on cryptography.
5. Analyze the potential threats quantum computing poses to existing cryptographic systems.

Unit I
Introduction to Essential Linear Algebra

Some Basic Algebra, Matrix Math, Vectors and Vector Spaces, Set Theory
Complex Numbers
Definition of Complex Numbers, Algebra of Complex Numbers, Complex Numbers Graphically, Vector Representations of Complex Numbers, Pauli Matrice, Transcendental Numbers

Unit II
Basic Physics for Quantum Computing

The Journey to Quantum, Quantum Physics Essentials, Basic Atomic Structure, Hilbert Spaces, Uncertainty, Quantum States, Entanglement
Basic Quantum Theory
Further with Quantum Mechanics, Quantum Decoherence, Quantum Electrodynamics, Quantum Chromodynamics, Feynman Diagram Quantum Entanglement and QKD, Quantum Entanglement, Interpretation, QKE

Unit III
Quantum Architecture

Further with Qubits, Quantum Gates, More with Gates, Quantum Circuits, The D-Wave Quantum Architecture
Quantum Hardware
Qubits, How Many Qubits Are Needed? Addressing Decoherence, Topological Quantum Computing, Quantum Essentials

Unit IV
Quantum Algorithms

What Is an Algorithm? Deutsch's Algorithm, Deutsch-Jozsa Algorithm, Bernstein-Vazirani Algorithm, Simon's Algorithm, Shor's Algorithm, Grover's Algorithm

Unit V
Current Asymmetric Algorithms: RSA, Diffie-Hellman, Elliptic Curve

The Impact of Quantum Computing on Cryptography: Asymmetric Cryptography, Specific Algorithms, Specific Applications.

TEXT BOOKS:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press
2. Dr. Chuck Easttom, Quantum Computing Fundamentals, Pearson

REFERENCES:

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. Basic Concepts, Vol
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROMPT ENGINEERING

(PROFESSIONAL ELECTIVE - V)

Course Code: GR25D5064 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Outcomes:

1. Explain and apply the core principles of prompt engineering for guiding generative AI outputs effectively.
2. Describe the underlying architecture and functionality of state-of-the-art large language models (LLMs).
3. Generate and manipulate structured outputs (JSON, YAML, CSV) using ChatGPT with advanced prompting techniques.
4. Implement text chunking, tokenization, and format control using tools like SpaCy, Tiktoken, and Python.
5. Utilize vector databases such as FAISS and Pinecone in Retrieval-Augmented Generation (RAG) pipelines for efficient information retrieval.

UNIT – I

Fundamentals and Principles of Prompting

Overview of the Five Principles of Prompting: Give Direction, Specify Format, Provide Examples, Evaluate Quality, Divide Labor.

UNIT – II

Introduction to Large Language Models for Text Generation

What Are Text Generation Models, Vector Representations: The Numerical Essence of Language, Transformer Architecture: Orchestrating Contextual Relationships, Probabilistic Text Generation: The Decision Mechanism, Historical Underpinnings: The Rise of Transformer Architectures, OpenAI's Generative Pretrained Transformers, GPT-3.5-turbo and ChatGPT, GPT-4, Google's Gemini, Meta's Llama and Open Source.

UNIT – III

Standard Practices for Text Generation with ChatGPT- Part-A

Generating Lists, Hierarchical List Generation, When to Avoid Using Regular Expressions, Generating JSON, YAML Filtering YAML Payloads, Handling Invalid Payloads in YAML, Diverse Format Generation with ChatGPT, Mock CSV Data, Universal Translation Through LLMs, Ask for Context, Text Style Unbundling, Identifying the Desired Textual Features, Generating New Content with the Extracted Features, Extracting Specific Textual Features with LLMs.

UNIT – IV

Standard Practices for Text Generation with ChatGPT- Part-B

Chunking Text, Benefits of Chunking Text, Scenarios for Chunking Text, Poor Chunking Example, Chunking Strategies, Sentence Detection Using SpaCy, building a Simple Chunking Algorithm in Python, Sliding Window Chunking, Text Chunking Packages, Text Chunking with Tiktoken, Encodings, Understanding the Tokenization of Strings.

UNIT – V

Vector Databases with FAISS and Pinecone

Retrieval Augmented Generation (RAG), Introducing Embeddings, Document Loading

Memory Retrieval with FAISS, RAG with Lang Chain, Hosted Vector Databases with Pinecone, Self- Querying, Alternative Retrieval Mechanisms.

TEXTBOOK:

1. Phoenix J, Taylor M. Prompt engineering for generative AI. " O'Reilly Media, Inc."; 2024 May 16.

REFERENCES:

1. Tunstall L, Von Werra L, Wolf T. Natural language processing with transformers. " O'Reilly Media, Inc."; 2022 Jan 26.
2. Foster D. Generative deep learning. " O'Reilly Media, Inc."; 2022 Jun 28.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTRUSION DETECTION SYSTEMS

(OPEN ELECTIVE)

Course Code: GR25D5052 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Outcomes:

1. Understand the state of threats against computers and networked systems in the modern era.
2. Analyze attack methods such as scans, denial-of-service, penetration attempts, and software exploits.
3. Understand the general model and taxonomy of Intrusion Detection Systems.
4. Understand anomaly detection techniques and algorithms for intrusion identification.
5. Understand worm and botnet behaviors through forensic autopsies and case studies.

UNIT-I

The state of threats against computers, and networked systems-Overview of computer security solutions and why they fail-Vulnerability assessment, firewalls, VPN's-Overview of Intrusion Detection and Intrusion Prevention, Network and Host-based IDS

UNIT-II

Classes of attacks - Network layer: scans, denial of service, penetration Application layer: software exploits, code injection-Human layer: identity theft, root access-Classes of attackers-Kids/hackers/sop Hesitated groups-Automated: Drones, Worms, Viruses

UNIT-III

A General IDS model and taxonomy, Signature-based Solutions, Snort, Snort rules, Evaluation of IDS, Cost sensitive IDS

UNIT-IV

Anomaly Detection Systems and Algorithms-Network Behavior Based Anomaly Detectors (rate based)-Host-based Anomaly Detectors-Software Vulnerabilities-State transition, Immunology, Payload Anomaly Detection

UNIT-V

Attack trees and Correlation of alerts- Autopsy of Worms and Botnets-Malware detection - Obfuscation, polymorphism- Document vectors.

Email/IM security issues-Viruses/Spam-From signatures to thumbprints to zero day detection-Insider Threat issues-Taxonomy-Masquerade and Impersonation Traitors, Decoys and Deception-Future: Collaborative Security

TEXT BOOKS:

1. Peter Szor, The Art of Computer Virus Research and Defense, Symantec Press ISBN 0-321- 30545-3.
2. Markus Jakobsson and Zulfikar Ramzan, Crimeware, Understanding New Attacks and Defenses.

REFERENCE BOOKS:

1. Saiful Hasan, Intrusion Detection System, Kindle Edition.
2. AnkitFadia, Intrusion Alert : An Ethical Hacking Guide to Intrusion Detection.

Online Websites/Materials:

https://www.intechopen.com/books/intrusion-detection systems/Online Courses:

1. https://www.sans.org/course/intrusion-detection-in-depth
2. https://www.cybrary.it/skill-certification-course/ids-ips-certification-training-course

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COST MANAGEMENT OF ENGINEERING PROJECTS

Course Code: GR25D5051 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Outcomes:

1. Discuss various construction costs to manage a construction project.
2. Summarize different construction activities and its application related to cost based on the field requirements.
3. Identify Cost Behaviour of various types of cost and Quality Management
4. Identifying various construction Budgets involved Cost Management process.
5. Discussing various types of Techniques and Problem-solving techniques involved in Construction

UNIT I

Introduction: Overview of the Strategic Cost Management Process, Cost concepts in decision- making; relevant cost, Differential cost, Incremental cost, Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

UNIT II

Project: Meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning; Project execution as conglomeration of technical and non- technical activities; Detailed Engineering activities; Pre project execution main clearances and documents; Project team - Role of each member; Project contracts; Bar charts and Network diagram; Project commissioning - mechanical and process.

UNIT III

Cost Behaviour and Profit Planning: Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis and Cost-Volume-Profit Analysis (theory only). Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis (theory only).

UNIT IV

Budgetary Control: Flexible Budgets; Performance budgets; Zero-based budgets;
Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT V

Qualitative and Quantitative Techniques: Quantitative techniques for cost management, Linear Programming, PERT / CPM, Transportation and Assignment, problems (theory only), Simulation, Learning Curve theory.

Text Books:

1. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting, Pearson publications,3rd edition,1998.
2. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd, 6th edition,2021.
3. Srikant Datar, Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi, 16th edition, 2017.

Reference Books:

1. Charles T. Horngren and George Foster, Advanced Management Accounting, prentice Hall, 13th edition, 2008.
2. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher, 3rd edition, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HUMAN RESOURCE MANAGEMENT
(OPEN ELECTIVE)

Course Code: GR25D5065 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. The students understand the significance of human resource management concepts and challenges, practices in their profession of HR.
2. The students will be 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 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.