Academic Regulations
Program Structure
and
Detailed Syllabus

Master of Technology
in
Data Science

(Two Year Regular Programme)
(Applicable for Batches admitted from 2020)

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

Academic Regulations

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
For all Post Graduate Programmes (M.Tech)
GR20 REGULATIONS

Gokaraju Rangaraju Institute of Engineering & Technology - GR20 Regulations are given here under. These regulations govern all the Post Graduate programmes offered by various departments of Engineering with effect from the students admitted to the programmes in 2020-21 academic year.

1. **Programme Offered:** The Post Graduate programme offered by the department is M.Tech in Data Science, a two-year regular programme in that discipline.
2. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.

3. **Admissions:** 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 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.

4. **Programme Pattern:**
    a) A student is introduced to "Choice Based Credit System (CBCS)" for which he/she has to register for the courses at the beginning of each semester as per the procedure.
    b) Each Academic year of study is divided into two semesters.
    c) Minimum number of instruction days in each semester is 90.
    d) The total credits for the Programme is 68.
    e) 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).
    f) A student has a choice of registering for credits from the courses offered in the programme.
    g) All the registered credits will be considered for the calculation of final CGPA.

5. **Award of M.Tech Degree:** A student will be declared eligible for the award of the M. Tech Degreeif 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 course.
    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 fulfill all the requirements for the award of the degree.

6. **Attendance Requirements**
    a) A student shall be eligible to appear for the semester end examinations if he/she puts in a minimum of 75% of attendance in 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 examinations 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.

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

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

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

Particulars	Internal Evaluation	External Evaluation	Total
Theory	**30**	**70**	**100**
Practical	**30**	**70**	**100**
Mini Project	**30**	**70**	**100**
Dissertation	**30**	**70**	**100**

c) The marks for internal evaluation per semester per theory course are divided as follows:

i.	**Mid Examinations:**	**20 Marks**
ii.	**Tutorials/Assignment:**	**5 Marks**
iii.	**Continuous Assessment:**	**5 Marks**
	Total:	**30 arks**

d) **Mid Examination:** There shall be two mid examinations during a semester. The first mid examination shall be conducted from the first 50 per cent of the syllabus and the second mid examination shall be conducted from the remaining 50 per cent of the syllabus. The mid examinations shall be evaluated for **20 marks** and average of the marks scored in the two mid examinations shall be taken as the marks scored by each student in the mid examination for that semester.

e) **Assignment:** Assignments are to be given to the students and marks not exceeding 5 (5%) per semester per paper are to be awarded by the teacher concerned.

f) **For Internal Evaluation in Practical/Lab Subjects:** The marks for internal evaluation are 30. Internal Evaluation is done by the teacher concerned with the help of the other staff members nominated by Head of the Department. Marks Distribution is as follows:

i.	Internal Exam:	10 Marks
ii.	Record:	05 Marks
iii.	Continuous Assessment:	15 Marks
	Total:	30 Marks

g) **For External Evaluation in Practical/Lab Subjects:** The semester end examination shall be conducted by an external examiner and a staff member of the department nominated by Head of the Department.

h) 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.

i) **Mini Project:** The Mini Project is to be taken up with relevance to Industry and is evaluated for 100 marks. Out of 100 marks, 30 marks are for internal evaluation and 70 marks are for external evaluation.

Internal Evaluation: For internal evaluation,10 Marks are given by PRC based on project reviews and 5 marks for the quality of report and abstract submitted. The supervisor continuously assesses the student performance for 15 marks. Tentative presentation dates and marks distribution of the mini project.

S.No	Date	Review	Marks
Internal Marks (30)			
1	First week of the semester	Abstract submission*	5
2	Mid of the semester	Second review	10
3	Last week of the semester	Last review	15

*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: (70 Marks)

The mini project report is presented before PRC along with the supervisor and the same is evaluated for 70 marks. At the end of the semester the mini project report is evaluated by PRC.

Guidelines to award 70 marks:

S.No	Date	Review/ PRC report	Marks
External Evaluation Marks (70)			
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	20
3	Project Deliverables • Hardware prototype • Simulation in any authorized software • Submission of research articles in any Scopus Indexed conference /Journal	Verified by PRC	30
4	Results and Discussion	Verified by PRC	10

j) **Dissertation (Phase I & Phase II):**

Internships/Seminars/Dissertation :

i. Dissertation Phase I:

The Dissertation Phase I, the department help the students to do the projects supported by the industry and is evaluated for 100 marks. Out of 100 marks, 30 marks are for internal evaluation and 70 marks are for external evaluation.

Internal Evaluation: For internal evaluation,10 Marks are given by the PRC based on project reviews and 5 marks for the quality of report and abstract submitted. The supervisor continuously assesses the student performance for 15 marks. Tentative presentation dates and marks distribution of the Dissertation Phase I.

S.No	Date	Review	Marks
Internal Marks (30)			
1	lst week of the semester	Abstract submission*	5
2	Mid of the semester	Second review	10
3	Last week of the semester	Last review	15

*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 the literature review.
2. Schematic/Block diagram which gives the broad idea of the entire project.
3. Time line or mile stone of the project. It should clearly indicate deliverables/outcomes of the project.
4. Components required with approximate cost.
5. Possibility to develop Product.
6. Plagiarism check is compulsory for Dissertation Phase I and Phase II as per the plagiarism policy of GRIET.

External Evaluation: (70 Marks)

The Dissertation Phase I report is presented before PRC along with the supervisor and the same is evaluated for 70 marks. At the end of the semester the Dissertation Phase I report is evaluated by PRC.

Guidelines to award 70 marks:

S.No	Date	Review/ PRC report	Marks
External Evaluation Marks (70)			
1	Last week of the semester	Final Presentation and report Submission	10
2	Project report submission- Project report should be written as per IEEE guidelines.	Verified by PRC	20
3	Project Deliverables • Hardware prototype • Simulations in any authorized software • Submission of research articles in any Scopus indexed conference /Journal • Product development • Industry Support	Verified by PRC	30
4	Results and Discussion	Verified by PRC	10

ii. Dissertation Phase II:

The Dissertation Phase II, the department help the students to do the project a industry and is evaluated for 100marks.Outof100marks, 30 marks are for internal evaluation and 70 marks are for external evaluation. It is expected that along with the project he will be placed in the company.

Internal Evaluation: For internal evaluation, 10 Marks are given by the PRC based on project reviews and 5 marks for the quality of report and abstract submitted. The supervisor continuously

assesses the student performance for 15marks.Tentative presentation dates and marks distribution of the Dissertation Phase II.

S.No	Date	Review	Marks
Internal Marks (30)			
1	1st week of the semester	Abstract submission*	5
2	Mid of the semester	Second review	10
3	Last week of the semester	Last review	15

*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 the 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. Possibility to develop Product and IPR.
6. Plagiarism check is compulsory for Dissertation Phase I and Phase II as per the plagiarism policy of GRIET.

External Evaluation: (70 Marks)

The Dissertation Phase II report is presented before PRC along with the supervisor and the same is evaluated for 70 marks. At the end of the semester the Dissertation Phase II report is evaluated by PRC.

Guidelines to award 70 marks:

S.No	Date	Review/ PRC report	Marks
External Evaluation Marks (70)			
1	Last week of the semester	Final Presentation and report Submission	10
2	Project report submission- Project report should be written as per IEEE guidelines.	Verified by PRC and External Examiner	20
3	Project Deliverables • Hardware prototype • Simulations in any authorized software • Submission of research articles in any Scopus indexed conference /Journal • Product development • Industry Support	Verified by PRC and External Examiner	30
4	Results and Discussion	Verified by PRC and External Examiner	10

Rules and regulations related to Internships/Seminars/Mini Project/Dissertation Phase I and II:

The student must work under the guidance of both internal guide (one faculty member of the department) and external guide (from Industry not below the rank of an officer). Internal guide is allotted by the Head of the Department or Program Coordinator, where as external guide is allotted by the industrial organization in which the project is undertaken.

- After approval from the PRC, the final thesis is to be submitted along with ANTI- PLAGIARISM report from the approved agency with a similarity index not more than 24%.
- Two hardcopies and one soft copy of the project work (dissertation) certified by the research supervisors shall be submitted to the College/Institute.
- The thesis shall be adjudicated by one external examiner selected by the Institute out of 3-member panel, submitted by the department.
- In external evaluation, the student shall score at least 40% marks and an aggregate of 50% marks to pass in the project work. If the project report is satisfactory, Viva-voce examination shall be conducted by a Board consisting of the Supervisor, Head and the External Examiner who adjudicated the project work. The Board shall jointly evaluate the student's performance in the project work.
- In case the student doesn't pass through the project work, he/she must reappear for the viva-voce examination, as per the recommendations of the Board. If he fails succeed at the second Viva-voce examination also, he will not be eligible for the award of the degree, unless he is asked to revise and resubmit the Project by the Board. Head of the Department and program coordinator shall coordinate and make arrangements for the conduct of viva-voce examination. When one does get the required minimum marks both in internal and external evaluations the candidate has to revise and resubmit the dissertation in the time frame prescribed by the PRC. If the report of the examiner is unfavorable again, the project shall be summarily rejected.
- If a student gets a chance to work in industry for one year (placement through internship) then he/she should take permission from Principal, Dean of examinations, Dean of Placements, Dean Academics, Department HOD and program coordinator. He/she should complete the credits in 3^{rd}semester in consultation with course instructor and program coordinator.

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 malpractices 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 in the Semester-end Examination and a minimum aggregate of 50% of the total marks in the Semester-end examination and Internal Evaluation taken together.

    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 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-C. 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) 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.,

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

Where C_i is the number of credits of the i^{th} course and 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 S_k, where $k \geq 2$.

$$\mathbf{CGPA} = \sum_{i=1}^{m}(\mathbf{Ci} * \mathbf{Gi}) / \sum_{i=1}^{m} \mathbf{Ci}$$

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:

	Class Awarded	CGPA Secured
13.1	**First Class With Distinction**	**CGPA ≥ 7.75**
13.2	**First Class**	**CGPA ≥ 6.75 and CGPA < 7.75**
13.3	**Second Class**	**CGPA ≥ 6.00 and CGPA < 6.75**

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. **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.

16. **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.

17. **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

INFORMATION TECHNOLOGY

M.Tech (DS) – GR20 Course Structure

I M. Tech (DS) - I Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	IT	PC	GR20D5116	Statistical Methods for Data Science	3	0	0	3	3	0	0	3	30	70	100
2	IT	PC	GR20D5117	Data Science	3	0	0	3	3	0	0	3	30	70	100
3	IT	PE I		Professional Elective I	3	0	0	3	3	0	0	3	30	70	100
4	IT	PE II		Professional Elective II	3	0	0	3	3	0	0	3	30	70	100
5	ENG	BS	GR20D5011	Research Methodology and IPR	2	0	0	2	2	0	0	2	30	70	100
6	IT	PC	GR20D5124	Advanced Data Structures and Algorithms Lab	0	0	2	2	0	0	4	4	30	70	100
			GR20D5125	Informational Retrieval Systems Lab											
			GR20D5126	Data Preparation and Analysis Lab											
7	IT	PC	GR20D5127	Data Science Lab	0	0	2	2	0	0	4	4	30	70	100
	Total							**18**	**14**	**0**	**8**	**22**	**210**	**490**	**700**
8		AC		Audit Course I	2	0	0	2	2	0	0	2	30	70	100

PROFESSIONAL ELECTIVE – I				
S. No.	**BOS**	**Group**	**Course Code**	**Course**
1	IT	PE	GR20D5118	Advanced Data Structures and Algorithms
2	IT	PE	GR20D5119	Informational Retrieval Systems
3	IT	PE	GR20D5120	Data Preparation and Analysis
PROFESSIONAL ELECTIVE – II				
S. No.	**BOS**	**Group**	**Course Code**	**Course**
1	IT	PE	GR20D5121	Artificial Intelligence
2	IT	PE	GR20D5122	Data Security and Access Control
3	IT	PE	GR20D5123	Principles of Distributed Computing

I M. Tech (DS) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	IT	PC	GR20D5128	Big Data Analytics	3	0	0	3	3	0	0	3	30	70	100
2	IT	PC	GR20D5129	Machine Learning	3	0	0	3	3	0	0	3	30	70	100
3	IT	PE III		Professional Elective III	3	0	0	3	3	0	0	3	30	70	100
4	IT	PE IV		Professional Elective IV	3	0	0	3	3	0	0	3	30	70	100
5	IT	PC	GR20D5136	Soft Computing Lab	0	0	2	2	0	0	4	4	30	70	100
			GR20D5137	Web Analytics and Development Lab											
			GR20D5138	Natural Language Processing Lab											
6	IT	PC	GR20D5139	Machine Learning and Big Data Analytics Lab	0	0	2	2	0	0	4	4	30	70	100
7	IT	PW	GR20D5143	Mini Project	0	0	2	2	0	0	4	4	30	70	100
	Total							**18**	**14**	**0**	**12**	**24**	**210**	**490**	**700**
8		AC		Audit course II	2	0	0	2	2	0	0	2	30	70	100

PROFESSIONAL ELECTIVE – III				
S. No.	**BOS**	**Group**	**Course Code**	**Course**
1	IT	PE	GR20D5130	Distributed Database Systems
2	IT	PE	GR20D5131	Data Storage Technologies and Networks
3	IT	PE	GR20D5132	Recommender Systems

PROFESSIONAL ELECTIVE – IV				
S. No.	**BOS**	**Group**	**Course Code**	**Course**
1	IT	PE	GR20D5133	Soft Computing
2	IT	PE	GR20D5134	Web Analytics and Development
3	IT	PE	GR20D5160	Natural Language Processing and Linguistic Techniques

II M. Tech (DS) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	IT	PE V		Professional Elective -V	3	0	0	3	3	0	0	3	30	70	100
2		OE	GR20D5146	1. Cost Management of Engineering Projects	3	0	0	3	3	0	0	3	30	70	100
			GR20D5147	2. Industrial Safety											
			GR20D5148	3. Operations Research											
			GR20D5149	4. Artificial Neural Networks and Fuzzy Systems											
			GR20D5150	5. Cyber Security											
			GR20D5151	6. Internet of Things Architecture and Design Principles											
3	IT	PW	GR20D5144	Dissertation Phase - I	0	0	10	10	0	0	20	20	30	70	100
	Total							**16**	**6**	**0**	**20**	**26**	**90**	**210**	**300**

PROFESSIONAL ELECTIVE – V				
S. No.	**BOS**	**Group**	**Course Code**	**Course**
1	IT	PE	GR20D5140	Cloud Computing
2	IT	PE	GR20D5141	Deep Learning and Applications
3	IT	PE	GR20D5142	Digital Image Processing

OPEN ELECTIVE				
S. No.	**BOS**	**Group**	**Course Code**	**Course**
1	CE	OE	GR20D5146	Cost Management of Engineering Projects
2	EEE	OE	GR20D5147	Industrial Safety
3	ME	OE	GR20D5148	Operations Research
4	ECE	OE	GR20D5149	Artificial Neural Networks and Fuzzy Systems
5	CS	OE	GR20D5150	Cyber Security
6	IT	OE	GR20D5151	Internet of Things Architecture and Design Principles

II M. Tech (DS) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	IT	PW	GR20D5145	Dissertation Phase - II	0	0	16	16	0	0	32	32	30	70	100
	Total							**16**	**0**	**0**	**32**	**32**	**30**	**70**	**100**

Audit Courses I & II

1	GR20D5152	English for Research Paper Writing
2	GR20D5153	Disaster Management
3	GR20D5154	Sanskrit for Technical Knowledge
4	GR20D5155	Value Education
5	GR20D5156	Indian Constitution
6	GR20D5157	Pedagogy Studies
7	GR20D5158	Stress Management by Yoga
8	GR20D5159	Personality Development through Life Enlightenment Skills

I YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STATISTICAL METHODS FOR DATA SCIENCE

Course Code: GR20D5116 **L/T/P/C: 3/0/0/3**

I Year I Semester

Course Objectives:

1. To understand the mathematical fundamentals that is prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.
2. To develop the understanding of the mathematical and logical basis to many modern techniques in information technology like machine learning, programming language design, and concurrency.
3. Developing an appreciation for the use of to multivariate statistical models like regression and classification problems, principal components analysis, problem of over fitting model.
4. To study various sampling and classification problems.
5. Designing and Developing planar Graphs, Euler circuits, Graph Coloring, Hamiltonian graphs and their applications

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

1. Understand the basic notions of distribution functions, discrete and continuous probability.
2. Formulate the methods of statistical inference and the role that sampling distributions play in those methods.
3. Perform correct and meaningful statistical analysis of simple to moderate complexity.
4. Solve mathematical as well as graphical problems in systematic and logical manner.
5. To be familiar in calculating number of possible outcomes of elementary combinatorial processes such as permutations and combinations.

UNIT I

Probability mass, density, and cumulative distribution functions, parametric families of distributions, Expected value, variance, conditional expectation.

UNIT II

Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood

UNIT III

Statistical inference, Introduction to multivariate statistical models: Statistics in data mining for business insights, Prediction, Classification,

Clustering. regression and classification problems, principal components analysis, The problem of over fitting model assessment.

UNIT IV

Graph Theory: distance metrics like- Euclidean, Pearson, Geodesic and Mahalanob is Isomorphism, Planar graphs, graph Coloring, Hamilton circuits and Euler cycles Permutations and Combinations with and without repetition.

Unit V

Computer science and engineering applications: Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning. Recent Trends in various distribution functions in mathematical field of computer science for varying fields like bioinformatics, soft computing, and computer vision.

Reference Books:

1. John Vince, Foundation Mathematics for Computer Science, Springer.

2. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science Applications.
Wiley.

3. M. Mitzenmacher and E. Upfal. Probability and Computing: Randomized Algorithms and Probabilistic
Analysis.

4. Alan Tucker, Applied Combinatorics, Wiley

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA SCIENCE

Course Code: GR20D5117 **L/T/P/C: 3/0/0/3**

I Year I Semester

Prerequisites:

Students should have knowledge of one Programming Language.
Students Should have Analytical Ability.

Course Objectives:

1. Provide with the knowledge and expertise to become a proficient data scientist.
2. Demonstrate an understanding of Data Collection and Management techniques.
3. Demonstrate statistics and machine learning concepts that are vital for data science.
4. Critically evaluate data visualizations based on their design and use, for communicating stories from data.
5. Explore Applications and Latest Technologies of Data Science.

Course Outcomes:

1. Understand the key concepts in data science, including their real-world application and the toolkit used by data scientists.
2. Explain how data is collected, managed and stored for data science
3. Implement data collection and management scripts.
4. Explore Visual Analysis techniques
5. Explore latest trends in Data Science techniques

UNIT-I:Introduction to Data Science: Introduction to Data Science, Data Science Terminology, Data Science Process, Data Science Project Roles, Data Science Projects in Industry.

UNIT-II: Data Collection and Management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources.

UNIT-III: Data analysis: Data – Matrix, Attributes, algebraic, geometric view, probabilistic view of data. Data Analysis : Univariate, Bivariate, Muti-variate Analysis of Numerical and Categorical Attributes Graph Data Concepts, Topological attributes and Centrality analysis. Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT.

UNIT-IV: Data visualization: Introduction of visual perception, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

UNIT-V:Applications and Recent Trends: Applications of Data Science, Technologies for visualization, Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods used in data science.

Text Books:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from the Frontline. O'Reilly.
2. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.

Reference Books:

1. Joel Grus, Data Science from Scratch, O'Reilly Publications.
2. Davy Ceilen, Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, DreamTech Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED DATA STRUCTURES AND ALGORITHMS

(Professional Elective-1)

Course Code: GR20D5118 **L/T/P/C: 3/0/0/3**

I Year I Semester

Prerequisites:

- Abstract data types: lists, stacks, queues, trees, search trees
- Priority queues: heaps. Sorting and searching. Graphs: representation and algorithms.

Course Objectives:

1. The fundamental design, analysis, and implementation of basic data structures.
2. Basic concepts in the specification and analysis of programs.
3. Principles for good program design, especially the uses of data abstraction.
4. Significance of algorithms in the computer field
5. Various aspects of algorithm development

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

1. Understand performance evaluation of various algorithms.
2. Illustrate various Data Structures operations.
3. Implement various Hashing Techniques.
4. Develop and analyze algorithms for various Tree structures such as red-black trees, B- trees and Splay trees.
5. Develop algorithms for text processing applications.

.

UNIT I

Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation- Big Oh, Omega and Theta notations, Complexity Analysis Examples.

Data structures-Linear and non linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation, Vector representation, singly linked lists -insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists. Representation of single, two dimensional arrays, Sparse matrices and their representation.

UNIT II

Stack and Queue ADTs, array and linked list representations, infix to postfix conversion using stack, implementation of recursion, Circular queue-insertion and deletion, Dequeue ADT, array and linked list representations, Priority queue ADT, implementation using Heaps, Insertion into a Max Heap, Deletion from a Max Heap, java.util package-ArrayList, Linked List, Vector classes, Stacks and Queues in java.util, Iterators in java.util.

UNIT III

Searching–Linear and binary search methods, Hashing-Hash functions, Collision Resolution methods-Open Addressing, Chaining, Hashing in java.util-HashMap, HashSet, Hashtable.
Sorting –Bubble sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort, comparison of sorting methods.

UNIT IV

Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT, representations, recursive and non recursive traversals, Java code for traversals, Threaded binary trees. Graphs- Graphs terminology, Graph ADT, representations, graph traversals/search methods- dfs and bfs, Java code for graph traversals, Applications of Graphs- Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm for Single Source Shortest Path Problem

UNIT V

Search trees- Binary search tree-Binary search tree ADT, insertion, deletion and searching operations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees – Definition and examples only, B-Trees-definition, insertion and searching operations, Trees in java.util- TreeSet, Tree Map Classes, Tries(examples only),Comparison of Search trees.
Text compression-Huffman coding and decoding, Pattern matching-KMP algorithm.

TEXT BOOKS:

1. Data structures, Algorithms and Applications in Java, S.Sahni, Universities Press.
2. Data structures and Algorithms in Java, Adam Drozdek, 3rd edition, Cengage Learning.
3. Data structures and Algorithm Analysis in Java, M.A.Weiss, 2nd edition, Addison-Wesley (Pearson Education).

REFERENCES:

1. Java for Programmers, Deitel and Deitel, Pearson education.
2. Data structures and Algorithms in Java, R.Lafore, Pearson education.
3. Java: The Complete Reference, 8th editon, Herbert Schildt, TMH.
4. Data structures and Algorithms in Java, M.T.Goodrich, R.Tomassia, 3rd edition, Wiley.
5. Data structures and the Java Collection Frame work,W.J.Collins, McGraw Hill.
6. Classic Data structures in Java, T.Budd, Addison-Wesley (Pearson Education).
7. Data structures with Java, Ford and Topp, Pearson Education.
8. Data structures using Java, D.S.Malik and P.S.Nair, Cengage learning.
9. Data structures with Java, J.R.Hubbard and A.Huray, PHI Pvt. Ltd.
10. Data structures and Software Development in an Object-Oriented Domain, J.P.Tremblay and G.A.Cheston, Java edition, Pearson Education.
11. A Practical Guide to Data Structures and Algorithms using Java, S.Goldman&K.Goldman, Chapman & Hall/CRC, Taylor & Francis Group.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INFORMATIONAL RETRIEVAL SYSTEMS

(Professional Elective-1)

Course Code: GR20D5119 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Objective:

1. Introduce information retrieval models.
2. Introduce information retrieval models query languages.
3. Application of web search and information retrieval in social networks.
4. To minimize the overhead of a user locating needed information.
5. Measures associates with IR systems.

Course Outcomes:

1. To identify basic theories and analysis tools as they apply to information retrieval.
2. To develop understanding of problems and potentials of current IR systems.
3. To learn and appreciate different retrieval algorithms and data structures used in information retrieval systems.
4. To apply various indexing, matching, organizing, and evaluating methods to IR problem.
5. To become aware of current experimental and theoretical IR research.

UNIT I

Information retrieval model, Information retrieval evaluation, Searching the Web Document Representation, Query languages and query operation, Meta-data search

UNIT II

Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Hypertext data structure.

UNIT III

Indexing and searching, Scoring and ranking feature vectors, Similarity measures, Relevance feedback

UNIT IV

Ontology, domain specific search, parallel and distributed information retrieval

UNIT V

Text and multimedia languages, Social networks, Recent trends in Web search and Information retrieval techniques

References:

1. C. D. Manning, P. Raghavan and H. Schütze, Introduction to Information Retrieval, Cambridge University Press, 2008 (available at http://nlp.stanford.edu/IR-book).

2. Chakrabarti, S. (2002). Mining the web: Mining the Web: Discovering knowledge from hyper text data. Morgan-kaufman.

3. B. Croft, D. Metzler, T. Strohman, Search Engines: Information Retrieval in Practice, Addison-Wesley, 2009 (available at http://ciir.cs.umass.edu/irbook/).

4. R. Baeza-Yates, B. Ribeiro-Neto, Modern Information Retrieval, Addison-Wesley, 2011 (2^{nd}Edition).

5. Information Storage and Retrieval Systems: Theory and Implementation By Kowalski, Gerald, Mark T Maybury Kluwer Academic Press, 2000.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA PREPARATION AND ANALYSIS

(Professional Elective-1)

Course Code: GR20D5120 **L/T/P/C: 3/0/0/3**

I Year I Semester

Prerequisites:

Students should have knowledge of one Programming Language.
Students Should have Analytical Ability.

Course Objectives:

1. To Introduce to Data Collection Techniques.
2. To make understand the need of data pre-processing
3. To understand Statistical Hypothesis tests and Data Transformation
4. To prepare the data for analysis and develop meaningful Data Visualizations.
5. To explore Properties and Techniques of Data Evaluation.

Course Outcomes:

After completion of the course, students would be able to:

1. Understand scalability and real-time issues in different forms of data.
2. Explore different techniques to clean up the data
3. Interpret different kinds of statistical techniques
4. Explore the Visualization techniques for Data Preparation
5. Demonstrate the Techniques of Evaluating the datasets.

UNIT–I: **Data Gathering and Preparation:** Data formats, parsing and transformation, Scalability and real-time issues.

UNIT–II: Data Cleaning/Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT–III: Exploratory Analysis: Descriptive and comparative statistics, Clustering and association, Hypothesis generation.

UNIT-IV: Visualization: Designing visualizations, Time series, Geo located data, Correlations and connections, Hierarchies and networks, interactivity.

UNIT–V:Introduction, General properties of evaluation research, Evaluation designs: Accuracy, Coverage, confidence, novelty, diversity, scalability, serendipity, Evaluation on historical datasets, Offline evaluations.

Text Books:

1. Cathy O'Neil and Rachel Schutt, Doing Data Science, Straight Talk from The Frontline, O'Reilly.
2. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, Mining of Massive Datasets. v2.1, Cambridge University Press.
3. Jiawei Han and Micheline Kamber, Morgan Kaufmann , Data Mining-Concepts and Techniques, Publishers, Elsevier, Second Edition, 2006.

Reference Books:

1. Joel Grus, Data Science from Scratch, O'Reilly Publications
2. Davy Ceilen, Introducing Data Science: Big Data, Machine Learning and More, Using Python Tools, DreamTech Publications
3. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ARTIFICIAL INTELLIGENCE

(Professional Elective-2)

Course Code: GR20D5121 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Objectives:

1. To learn the difference between optimal reasoning Vs human like reasoning.
2. To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities.
3. To learn different knowledge representation techniques.
4. To understand Game Playing, Theorem Proving, Expert Systems and Natural Language Processing.
5. To understand the applications of AI.

Course Outcomes:

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

1. Understand the major areas and challenges of AI.
2. Understand and apply different knowledge representation in AI.
3. Understand the process of learning with knowledge.
4. Able to learn the natural language processing.
5. Apply the knowledge of AI in real world problems**.**

UNIT I

Introduction: What is AI? Foundations of AI, History of AI, Agents and environments, The nature of the Environment, Problem solving Agents, Problem Formulation, Search Strategies, Web APIs, Data APIs and Web Scrapping

UNIT II

Knowledge and Reasoning: Knowledge-based Agents, Representation, Reasoning and Logic, Prepositional logic, First-order logic, Using First-order logic, Inference in First-order logic, forward and Backward Chaining

UNIT III

Learning: Learning from observations, Forms of Learning, Inductive Learning, Learning decision trees, why learning works, Learning in Neural and Belief networks

UNIT IV

Practical Natural Language Processing: Practical applications, Efficient parsing, Scaling up the lexicon, Scaling up the Grammar, Ambiguity, Perception, Image formation, Image processing operations for Early vision, Speech recognition and Speech Synthesis , Deep Learning: Auto-encoders, Voice Assistant, Building a Speech Recognizer, Characterization of Audio Signals, Deep Learning-

UNIT V

Robotics: Introduction, Tasks, parts, effectors, Sensors, Architectures, Configuration spaces, Navigation and motion planning, Introduction to AI based programming Tools

Text Books

1. Stuart Russell, Peter Norvig: "Artificial Intelligence: A Modern Approach",2nd Edition, Pearson Education, 2007

References

1. Artificial Neural Networks B. YagnaNarayana, PHI
2. Artificial Intelligence , 2nd Edition, E.Rich and K.Knight (TMH).
3. Artificial Intelligence and Expert Systems – Patterson PHI.
4. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson.
5. PROLOG Programming for Artificial Intelligence. Ivan Bratka- Third Edition – Pearson Education.
6. Neural Networks Simon Haykin PHI

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA SECURITY AND ACCESS CONTROL

(Professional Elective-2)

Course Code: GR20D5122 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Objectives:

1. Fundamentals of database security.
2. Various access control techniques
3. Design models for different access control
4. Security management system issues for smart cards.
5. Recent trends in database security

Course Outcomes:

After completion of the course, students would be able to:

1. Understand and implement classical models and Algorithms.
2. Analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
3. Assess the strengths and weaknesses of various access control models and to analyze their behavior.
4. Assess the strengths and weaknesses of smart card system and their usage.
5. Understanding of recent trends in database security.

UNIT I

INTRODUCTION: Introduction to Access Control, Purpose and fundamentals of access control, brief history, Policies of Access Control, Models of Access Control, and Mechanisms, Discretionary Access Control (DAC), Non- Discretionary Access Control, Mandatory Access Control (MAC). Capabilities and Limitations of Access Control Mechanisms: Access Control List (ACL) and Limitations, Capability List and Limitations.

UNIT II

ROLE BASED ACCESS CONTROL: Role-Based Access Control (RBAC) and Limitations, Core RBAC, Hierarchical RBAC, Statically Constrained RBAC, Dynamically Constrained RBAC, Limitations of RBAC. Comparing RBAC to DAC and MAC Access control policy.

UNIT III

MODELS: Biba's integrity model, Clark-Wilson model, Domain type enforcement model, mapping the enterprise view to the system view, Role hierarchies- inheritance schemes, hierarchy structures and inheritance forms, using SoD in real system Temporal Constraints in RBAC, MAC AND DAC. Case study: Multi line Insurance Company.

UNIT IV

SMART CARD BASED INFORMATION SECURITY: Smart Card based Information Security, Smart card operating system fundamentals, design and implementation principles, memory organization, smart card files, file management, atomic operation, smart card data transmission ATR, PPS Security techniques- user identification, smart card security, quality assurance and testing, smart card life cycle-5 phases, smart card terminals.

UNIT V

RECENT TRENDS: Recent trends in Database security and access control mechanisms. Recent Trends related to data security management, vulnerabilities in different DBMS.

Text Books:

1. David F. Ferraiolo, D. Richard Kuhn, RamaswamyChandramouli, Role Based Access Control.
2. HosseinBidgoli, Handbook of Information Security, Threats, Vulnerabilities, Prevention, Detection and Management Vol -3, Wiley, 2006.

References Books:

1. http://www.smartcard.co.uk/tutorials/sct-itsc.pdf: Smart Card Tutorial.
2. MessaoudBenantar, Access Control Systems: Security, Identity management and Trust models, Springer, 2006.

References:

1. R.S. Sandhu, E.J. Coyne, H.L. Feinstein, C.E. Youman (1996), **Role-Based Access Control Models**, *IEEE Computer* 29(2), (February 1996)
2. http://www.smartcardbasics.com/smart-card-security.html
3. http://www.fit.vutbr.cz/~cvrcek/confers98/datasem/datasem.html.cz
4. http://www.softpanorama.org/Access_control/Security_models/biba_model.shtml
5. https://en.wikipedia.org/wiki/Clark%E2%80%93Wilson_model

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF DISTRIBUTED COMPUTING

Course Code: GR20D5123 **L/T/P/C: 3/0/0/3**

I Year I Semester

Prerequisites:

- Basic understanding of Computer Networks
- Basic Understanding of Object Oriented concepts

Course Objectives:

The objective of the course is to provide the student:

1. Ability to understand the distributed and remote computing environment.
2. Ability to different distributed computing paradigms.
3. Understanding of distributed document based systems and distributed multimedia systems.
4. Ability to understand basic concept of Grid Computing
5. Ability to understand basic concept of Cluster Computing

Course Outcomes:

At the end of the course the student will be able to:

1. Compare and differentiate between different computing techniques
2. Understand the different computing paradigms
3. Demonstrate of the remote method invocation and its comparison with CORBA
4. Define and study the Distributed Document Based systems and distributed multimedia systems.
5. Understand the outline of the Grid computing and cluster computing concept.

UNIT I

Introduction: Evolution of Distributed Computing Systems, System models, issues in design of Distributed Systems, Distributed computing environment, web based distributed model. The different forms of computing, monolithical, distributed, parallel and cooperative computing, meaning of distributed computing, the architecture of distributed applications.computer networks and operating system concepts related to distributed systems and web based protocols.

UNIT II

IPC and Distributed Computing Paradigms: Interprocess Communication: Message Passing and its features, IPC message format, IPC synchronization, distributed applications- message passing paradigm, the client-server paradigm, the peer to peer paradigm, the message passing (MOM) paradigm- point to point message model and the publisher- subscriber message model.

The distributed Object Paradigms- RMI, ORB, the object space paradigm, the mobile agent paradigm, the network service paradigm, the collaborative application, choosing a paradigm for an application.

Remote Communication: Introduction, RPC basics, RPC implementation, RPC Communication.

UNIT III

Distributed Object Space Paradigm: Message passing verses distributed objects, an archetypal distributed object architecture, distributed object system, RMI, the RMI java architecture, java RMI API, a simple RMI application, steps for building an RMI application, testing and debugging, comparison of RMI and socket API.

Introduction to CORBA distributed architectures, The CORBA object interface, Inter-ORB protocols, object servers and object clients, CORBA object references, CORBA Naming Service, CORBA object services, object Adapters, Java IDL, An example CORBA application. Steps and methods used in implementing a CORBA object-based application.

UNIT IV

Distributed Document-based System: WWW and Lotus Notes, Distributed Coordination based System- Introduction to coordination system models, TIB, JINI, comparison of TIB and JINI, Software agents, agents technology, mobile agents.

Distributed Multimedia Systems: Characteristics of Multimedia data, QOS of services management, Resource management, stream adaptation.

UNIT V

Grid Computing: Definition of Grid, grid types – computational grid, data grid, grid benefits and applications drawbacks of grid computing, grid components, grid architecture and standards and its relation with various distributed technologies. Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI

Cluster and cloud Computing: Parallel computing overview, cluster computing – Introduction, Cluster architecture, parallel programming models and paradigms, applications of clusters. An introduction to Cloud computing- General benefits and architecture.

Text Books:

1. Distributed computing principles and applications, M.L.Liu, Pearson Edition.
2. Distributed computing principles and applications A.S Tanenbaum.
3. Client/ Server programming with java and CORBA, second edition, R.Orfali and Dan Harkey, john white and sons.
4. Grid Computing, J.Joseph&C.Fellenstein, Pearson education.
5. High Performance Cluster Computing, RajkumarBuyya, Pearson education.

Reference Books:

1.A networking approach to grid computing, D.Minoli, wiley.
2.Java programming with CORBA 3 rd edition.
3.Java Network Programming:E.R.Harold,2nd edition, O'Reilly,SPD
4.Distributed Systems, Concepts and Design, 3rd Edition G.Colouris, J.Dollimore, Pearson .Education
5.Java Programming with CORBA,3rd edition , Brose, Vogel,Duddy, Wiley DreamTech

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

RESEARCH METHODOLOGY AND IPR

Course Code: GR20D5011 **L/T/P/C: 2/0/0/2**

I Year I Semester

Course objectives:

1. To familiarize students with the different aspects of research.
2. To provide an idea of good scientific writing and proper presentation skills.
3. To provide an understanding of philosophical questions behind scientific research.
4. To provide a brief background on the historical legacy of science.
5. To provide an insight of nature of Intellectual Property and new developments in IPR.

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

1. Understand research problem formulation.
2. Analyze research related information and follow research ethics
3. Understand that today‘s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
4. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering.
5. Understand the nature of Intellectual Property and IPR in International scenario.

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.

Unit II

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations, 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.

Reference Books:

1. Stuart Melville and Wayne Goddard, ‒Research methodology: an introduction for science & engineering students'‖
2. Wayne Goddard and Stuart Melville, ‒Research Methodology: An Introduction‖
3. Ranjit Kumar, 2 ndEdition , ‒Research Methodology: A Step by Step Guide for beginners‖
4. Halbert, ―Resisting Intellectual Property‖, Taylor & Francis Ltd ,2007.
5. Mayall , ‒Industrial Design‖, McGraw Hill,1992.
6. Niebel , ‒Product Design‖, McGraw Hill,1974.
7. Asimov , ‒Introduction to Design‖, Prentice Hall,1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, ― Intellectual Property in New Technological Age‖,2016. T. Ramappa, ‒Intellectual Property Rights Under WTO‖, S. Chand,2008

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

Course Code: GR20D5124 **L/T/P/C: 0/0/4/2**

I Year I Semester

Course Objectives:

1. The fundamental design, analysis, and implementation of advanced data structures.
2. Basic concepts in the specification and analysis of programs.
3. Principles for good program design, especially the uses of data abstraction.
4. To familiarize students with advanced paradigms and data structures used to solve algorithmic problems.
5. Students should be able to come up with analysis of efficiency and proofs of correctness.

Course Outcomes:

After completion of the course, students would be able to:

1. Demonstrate various Searching and Sorting algorithms.
2. Implement various operations on different Data Structures.
3. Design all the functions of a Dictionary(ADT) using different Hashing techniques.
4. Develop Binary Search and B-Trees operations.
5. Implement the algorithms for Text processing and Computational geometry problems.

The following exercises are to be done.

1. Write Java programs that use both recursive and non-recursive functions
for implementing the following searching methods:
a) Linear search b) Binary search
2. Write Java programs to implement the following using linked lists
a) List ADT
3. Write Java programs to implement the following using an array.
a) Stack ADT b) Queue ADT
4. Write a Java program that reads an infix expression and converts the expression
to postfix form. (use stack ADT).
5. Write a Java program to implement circular queue ADT using an array.
6. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.
7. Write Java programs to implement the following using a singly linked list.
a) Stack ADT
8. Write Java programs to implement the following using a singly linked list.
a) Queue ADT
9. Write a Java program to implement priority queue ADT.
10. Write a Java program to perform the following operations:
a) Construct a binary search tree of elements.
b) Search for a key element in the above binary search tree.
c) Delete an element from the above binary search tree.

11. Write a Java program to create a dictionary in Java and the usage of a few of the class's methods
12. Write a Javaprogram to implement Dijkstra's algorithm for Single source shortest
path problem.
13. Write Java programs that use recursive functions to traverse the
given binary tree in

a) Preorder b) Inorder and c) Postorder.
14. Write Java programs for the implementation of bfs and dfs for a given graph.
15. Write Java programs for implementing the following sorting methods:
a) Bubble sort
b) Insertion sort
c) Quick sort
d) Merge sort
16. Write a Java program to perform the following operations:
a) Insertion into a B-tree b) Searching in a B-tree
17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
18. Write a Java program that implements KMP algorithm for pattern matching.

Text Books:

1. A.Drozdek, Data Structures and Algorithms in java, 3rd Edition, Cengage Learning.
2. J.R. Hubbard, Data Structures with Java, 2nd Edition, Schaum's Outlines, TMH.

Reference Books:

1. R. Lafore, Data Structures and algorithms in Java, 2nd Edition, Pearson Education.
2. D.S. Malik and P.S. Nair, Data Structures using Java, Cengage Learning.
3. S. Sahani, Data structures, Algorithms and Applications in java, 2ndEdition, Universities Press.
4. P.H. Dave and H.B. Dave, Design and Analysis of Algorithms, Pearson Education.
5. W.J. Collins, Data Structures and java collections frame work, McGraw-Hill.
6. Herbert Schildt, Java: the complete reference, 7th Edition, TMH.
7. P.J. Deitel and H.M. Deitel, Java for Programmers, Pearson education / Java: How to Program P.J. Deitel and H.M. Deitel, 8th Edition, PHI.
8. D.S. Malik, Java Programming, Cengage Learning.
9. S. Goldman & K. Goldman, A Practical Guide to Data Structures and Algorithms using Java, Chapman & Hall/CRC, Taylor & Francis Group.
10. Mark de Berg, Otfried Cheong, Merc Van Kreveld, Computational Geometry: Algorithms and Applications, 3rd edition, Springer India.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INFORMATIONAL RETRIEVAL SYSTEMS LAB

Course Code: GR20D5125 **L/T/P/C: 0/0/4/2**

I Year I Semester

Course Objective:

1. Understand of algorithms and data structures, including theoretical analysis of runtime complexity, with a particular focus on look-up data structures such as inverted indexes, postings lists, and trees.
2. Understand machine learning algorithms and probabilistic models, with a focus on vector space models, multinomial distributions and Bayes rule, classification, clustering, and discriminative learning-to-rank algorithms.
3. Understand Natural language processing of input documents and user queries, including spelling correction.
4. Understand Random walk algorithms on graphs, such as Google's PageRank.
5 Understand integration of abstract models into one end-to-end retrieval system that is capable of crawling Web pages for indexing for efficient document retrieval with a user-provided keyword query.

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

1.Learn algorithms and data structures with a focus on look-up data structures such as inverted indexes, postings lists, and trees.

2.Learn Machine learning algorithms and probabilistic models, with a focus on vector space models, Bayes rule, classification, clustering, and discriminating learning-to-rank algorithms.

3.Learn Natural language processing of input documents and user queries

4.Learn Random walk algorithms on graphs, such as Google's PageRank.
5. Learn capable of crawling Web pages for indexing for efficient document retrieval with a user-provided keyword query.

Experiments

1. Write a program implement various distance similarity measures between documents.

a) Euclidean distance

b) Cosine similarity

c) Jaccard similarity

2. Write a Program to represent data using N-Gram data structure?

a) Uni-gram

b) Bi-gram

c) Tri-gram using overlapping and non overlapping character/word sequences

3) Write a program to represent text documents using Vector Space Model and implement various weight mechanism to get into normalized format?

4) Write a program for pre-processing of a Text Document: stop word removal and show content words from high frequency to low frequency? Display top N words.

5) Write a program to represent data as Inverted File structure format and Retrieve efficiently based on query vector?

6) Write a program to apply Porter Stemming algorithm on the given documents?

7) Write a program to create a web crawler to retrieve documents from web and analyze them?

8) Write a program to implement Latent Semantic Indexing using SVD to reduce dimensionality of the Vector Space Model and display the reduced components?

9) Write a program to implement Chat Bot / Question Answering System.

Note: The above experiments can be implemented using Java/Python

References:

1. C. D. Manning, P. Raghavan and H. Schütze, Introduction to Information Retrieval, CambridgeUniversity Press, 2008 (available at http://nlp.stanford.edu/IR-book).

2. Chakrabarti, S. (2002). Mining the web: Mining the Web: Discovering knowledge from hypertextdata. Morgan-kaufman.

3. B. Croft, D. Metzler, T. Strohman, Search Engines: Information Retrieval in Practice, Addison-Wesley, 2009 (available at http://ciir.cs.umass.edu/irbook/).

4. R. Baeza-Yates, B. Ribeiro-Neto, Modern Information Retrieval, Addison-Wesley, 2011 (2nd Edition).

5. Information Storage and Retrieval Systems: Theory and Implementation By Kowalski, Gerald, Mark T Maybury Kluwer Academic Press, 2000.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA PREPARATION AND ANALYSIS LAB

Course Code: GR20D5126 **L/T/P/C: 0/0/4/2**

I Year I Semester

Prerequisites:

Students should have knowledge of a Programming Language (Python Preferably).
Students should have Analytical Ability and Visualization of Real – time applications.

Course Objective:

1. To familiarize Python Libraries for Data Collection
2. To Apply different Data Cleaning methods for Data Preparation
3. To Apply appropriate statistical methods for Data Preparation
4. To Understand characteristics of Data by Data Visualization techniques
5. To Identify and apply appropriate Libraries for Data Analysis

Course Outcomes :

1. Apply appropriate tools for Data Collection and Manipulation
2. Will be able to identify and apply appropriate Data Cleaning techniques for Data Preparation
3. Elucidate statistical measures to Analyze the nature of Data.
4. Implement Data Visualization Methods for getting insights of Data.
5. Will be able to Analyze Data by implementing Concepts of Data Preparation.

Lab Experiments:

1. Write a Program in Python to Manipulate, Aggregate and Analyze data using Numpy
2. Write a Program in Python to Handle and Analyze data using Pandas
3. Write a Program in Python to Read and write different types of Files(csv, json, txt etc).
4. Write a Program in Python to handle Missing Values in Data .
5. Write a Program in Python to perform Uni-variate analysis on data.
6. Write a Program in Python to perform Bi-variate analysis on data.
7. Write a Program in Python to Perform Make sense of Data using Descriptive Analysis
8. Write a Program in Python to Make sense of Data by Visualization Methods – I
9. Write a Program in Python to Make sense of Data by Visualization Methods– II
10. Write a Program in Python to perform Regression Analysis on Data.
11. Write a Program in Python to Prepare Data from Text Documents for Text Data Analysis
12. Write a Program in Python to Prepare Data from Image for Image Data Analysis

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA SCIENCE LAB

Course Code: GR20D5127 **L/T/P/C: 0/0/4/2**

I Year I Semester

Prerequisites:

Students should have knowledge of a Programming Language (Python Prefarably).
Students should have Analytical Ability and Visualization of Real – time applications.

Course Objectives:

1. Understand the process of Importing and Exporting the data.
2. Learn how to collect, store and manage data from multiple data sources.
3. Know the insights of data using statistical methods
4. Identify different techniques for data analysis and data visualization.
5. Discuss the applications of Data Science for real world problems.

Course Outcomes:

After completion of the course, students would be able to:

1. Demonstrate import/export different types of data.
2. Apply appropriate data collection and pre-processing methods.
3. Identify different data analysis Techniques suitable for a given applications
4. Demonstrate data visualization techniques for Data Analysis.
5. Illustrate Implementations of Data Science Case studies

The following exercises are to be done.

Week 1

1. a. Write program to create a list, manipulate and slices it.
   b. Create a new list and add elements to it from another list, and creates a matrix from two lists
   c. Create same a, b steps for Tuple and Dictionary

Week 2

2. Write a program for Accessing/Importing and Exporting Data

Week 3

3. The following table gives the size of the floor area (ha) and the price ($A000), for 15 houses sold in the Canberra (Australia) suburb of Aranda in 1999.

area	sale	price
1	694	192.0
2	905	215.0
3	802	215.0
4	1366	274.0
5	716	112.7
6	963	185.0
7	821	212.0
8	714	220.0
9	1018	276.0
10	887	260.0
11	790	221.5
12	696	255.0

13	771	260.0
14	1006	293.0
15	1191	375.0

Explore with different formats of data and describe the procedure of storing of data
Type these data into a data frame with column names area, sale and Price.
(a) Plot sale. Price versus area.
(b) Use the hist () command to plot a histogram of the sale prices.
(c) Repeat (a) and (b) after taking logarithms of sale prices.
(d) The two histograms emphasize different parts of the range of sale prices. Describe the differences.

Week 4:

4. Consider the sample data
Mean velocity: 0.2474, 0.1235, 0.1737, 0.1824
Standard deviation of velocity: 0.3314, 0.2278, 0.2836, 0.2645
Write a Python program to create bar plots with error bars on the same figure. Attach a text label above each bar displaying means.

Week 5:

5. Apply basic statistical methods on Sample Datasets

Week 6:

6. Develop an application to analyze Stock Market Data using Python tools.

Week 7

7. Given the *iris dataset*:
https://archive.ics.uci.edu/ml/datasets/iris
1.How many rows does it contain? How many columns?
2.Compute the average petal length
3.Compute the average of all numerical columns
4.Extract the petal length outliers (i.e. those rows whose petal length is 50% longer than the average petal length)
5.Compute the standard deviation of all columns, for each iris species
6.Extract the petal length outliers (as above) for each iris species
7.Extract the group-wise petal length outliers, i.e. find the outliers (as above) for each iris species using `group by ()`, `aggregate ()`, and `merge ()`.
Write a python program to compute all the functionalities of the above-mentioned data.

Week 8

8.Consider the above Iris data set, write a python script to arrange the attributes in hierarchical structure and perform clustering with similar attributes

Week 9

9.**Consider the sample data**
people = ('G1','G2','G3','G4','G5','G6','G7','G8')
segments = 4
multi-dimensional data= [[3.40022085, 7.70632498, 6.4097905, 10.51648577, 7.5330039, 7.1123587, 12.77792868, 3.44773477],
[11.24811149, 5.03778215, 6.65808464, 12.32220677, 7.45964195, 6.79685302, 7.24578743, 3.69371847],
[3.94253354, 4.74763549, 11.73529246, 4.6465543, 12.9952182, 4.63832778, 11.16849999, 8.56883433],

[4.24409799, 12.71746612, 11.3772169, 9.00514257, 10.47084185, 10.97567589, 3.98287652, 8.80552122]]
Write a Python program to create stack bar plot and add label to each section.

Week 10
10 Demonstrate Object detection in an image.

Week 11
11. Develop an application to a Recommendation system using Python Tools.
Week 12
12. Develop an application to a Text Data Analysis using Python Tools.

Text Books:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly.
2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman.Mining of Massive Datasets. v2.1, Cambridge University Press.

Reference Books:

1. Joel Grus, Data Science from Scratch, O'Reilly Publications.

2. Davy Ceilen, Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, DreamTech Publications.

I YEAR

II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BIG DATA ANALYTICS

Course Code: GR20D5128 **L/T/P/C: 3/0/0/3**

I Year II Semester

Prerequisites:

- Students should have knowledge of one Programming Language(Java preferably)
- Acquaintance with SQL(Queries and sub queries)
- Exposure to Linux Environment.

Course Objectives:

1. To Describe the Big Data Platform and its Usecase.
2. Understand the storage & retrieval of data that is modeled in different ways.
3. Explain HDFS and accessing HDFS, Processing Big Data using Map Reduce
4. Inception about Hbase, Cassandra Pig and Hive Architectures.
5. Explore Machine Learning Techniques on Big Data

Course Outcomes:

After Completion of course , student would be able to:

1. Illustrate the Big Data Analytic techniques for useful Business Applications.
2. Explain NoSql Big Data Management
3. Describe working of Hadoop HDFS and Map Reduce Framework
4. Perform Store/Access data using Hadoop Eco-system HBase, Hive, Pig
5. Demonstrate Analytical techniques on Big Data.

UNIT I

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, Analytical BigData, Pitfalls of Traditional Data Processing, Characteristics of Big Data, Overview of Big Data Technologies, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics.

UNIT II

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.

UNIT III

Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures.

MapReduce: MapReduce workflows, Unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats ,Hadoop Big-Data Solutions, .Big Data Frameworks-Hadoop, Spark Hadoop's Architecture, Hadoop Ecosystem components and their functions

UNIT IV

Hbase, data model and implementations, Hbase clients, Hbase examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration.

Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.

UNIT V

Predictive Analytics for Big Data, Regression Techniques, Classification Techniques, Visual data analysis techniques and interpretation.

Text Books:

1.V.K. Jain, Big Data and Hadoop, Khanna Book Publishing, Delhi.
2.Anil Maheshwari, Data Analytics, McGraw.

References Books:

1.Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, Big Data, Big Analytics: Emerging.
2.Tom White, Hadoop: the definitive guide, 4th edition, Shorff publications.
3.Business Intelligence and Analytic Trends for Today's Businesses, Wiley,2013.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MACHINE LEARNING

Course Code: GR20D5129 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Objective

1. To understand the basic terminology and theory underlying machine learning.
2. To understand a range of machine learning algorithms along with their strengths and weaknesses.
3. To be able to apply machine learning algorithms to solve problems of moderate complexity.
4. To Explore supervised and un supervised learning paradigms of machine learning.
5. To explore Deep learning technique and various feature extraction strategies.

Course Outcomes

1. Ability to understand what is learning and why it is essential to the design of intelligent machines.
2. Ability to design and implement various machine learning algorithms in a wide range of real-world applications.
3. To compare pros and cons of various machine learning techniques and to get an insight of when to apply a machine learning approach.
4. To mathematically analyze various machine learning approaches and paradigms.
5. Acquire knowledge deep learning and be able to implement deep learning models for language, vision, speech, decision making.

Unit I

Introduction to Machine learning: Supervised learning, Unsupervised learning, Reinforcement learning. Deep learning.Terminology**:**regularization, over fitting, under fitting, bias-variance trade off, feature selection, feature normalization, confusion matrix, cross-validation, learning curves, gradient checking, computer vision

Unit II

Supervised Learning (Regression/Classification): Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes Linear models: Linear Regression, Logistic Regression, Classification and Regression Trees(CART),Linear Discriminant Analysis, Multiple Linear Regression and Polynomial Regression.

Generalized Linear Models Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

Unit III

Unsupervised Learning: Clustering: K-means/Kernel K-means, Hierarchical Clustering, Agglomerative Clustering, Density based Clustering, DBScan & Spectral Clustering, Dimensionality Reduction: PCA and kernel PCA Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models)

Unit IV

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests), Maximum Likelihood estimation, Bayesian estimation-bias and variance tradeoff, Root Mean Square Error,R2 score, Confusion Matrix, Precision and Recall scores, ROC curves, AUC, Hyperparameter optimization.

Unit V

Sparse Modelling and Estimation, Modelling Sequence/Time-Series Data, DeepLearning and Feature Representation Learning, Active Learning, Reinforcement Learning

Text Books

1. Machine Learning – Tom M. Mitchell, - MGH
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
3. R. S. Sutton and A. G. Barto. Reinforcement Learning - An Introduction. MIT Press. 1998.

Reference Books

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
3. Machine Learning Yearning, Andrew Ng.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DISTRIBUTED DATABASE SYSTEMS

(Professional Elective-3)

Course Code: GR20D5130 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Objectives

1. Understanding of the theoretical and practical aspects of the database technologies
2. Introduction to the concepts and techniques of distributed database including principles, architectures, design, implementation and major domain of application.
3. To learn the principles, architectures, algorithms and programming models used in distributed systems.
4. To understand the architecture of Distributed databases.
5. To learn Transactional aspect and query processing techniques in DDBMS.
6. Ability to understand the parallel database systems and architecture

Course Outcomes

At the end of the course the student will be able to:

1. Develop system architecture based on distributed databases.
2. Understand relational database management systems, normalization to make efficient retrieval from database and query.
3. Identify the introductory distributed database concepts and its structures.
4. Produce the transaction management and query processing techniques in DDBMS.
5. Relate the importance and application of emerging database technology.
6. Provide insight to parallel database systems along with object oriented models.

UNIT I

Introduction: Distributed Data processing, Distributed database system (DDBMS), Promises of DDBMSs, Complicating factors and Problem areas in DDBMSs, Overview Of Relational DBMS Relational Database concepts, Normalization, Integrity rules, Relational Data Languages, Relational DBMS.

UNIT II

Distributed DBMS Architecture: DBMS Standardization, Architectural models for Distributed DBMS, Distributed DBMS Architecture.

Distributed Database Design: Alternative design Strategies, Distribution design issues, Fragmentation, Allocation.

Semantic Data Control: View Management, Data security, Semantic Integrity Control

UNIT III

Overview of Query Processing: Query processing problem, Objectives of Query Processing, Complexity of Relational Algebra operations, characterization of Query processors, Layers of Query Processing.

Introduction to Transaction Management: Definition of Transaction, Properties of transaction, types of transaction.

Distributed Concurrency Control: Serializability theory, Taxonomy of concurrency control mechanisms, locking bases concurrency control algorithms.

UNIT IV

Parallel Database Systems: Database servers, Parallel architecture, Parallel DBMS techniques, Parallel execution problems, Parallel execution for hierarchical architecture.

UNIT V

Distributed Object Database Management systems: Fundamental Object concepts and Object models, Object distribution design, Architectural issues, Object management, Distributed object storage, Object query processing, Transaction management. Database Interoperability: Database Integration, Query processing.Recent approaches, models and current trends in improving the performance of Distributed Database.

Text Books

1. Principles of Distributed Database Systems, Second Edition, M. Tamer Ozsu Patrick Valduriez
2. Distributed Databases principles and systems, Stefano Ceri, Giuseppe Pelagatti, Tata McGraw
Hill.

References

1. Fundamental of Database Systems, Elmasri&Navathe, Pearson Education, Asia.
2. Database System Concepts, Korth&Sudarshan, TMH.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA STORAGE TECHNOLOGIES AND NETWORKS

(Professional Elective-3)

Course Code: GR20D5131 **L/T/P/C: 3/0/0/3**

I Year II Semester

Pre-Requisites:

Basic knowledge of Computer Architecture, Operating Systems, and Computer Networking is required.

Course Objectives:

To provide learners with a basic understanding of Enterprise Data Storage and Management Technologies

1. Introduction to Different Storage Media & Technologies.
2. Understand the usage of Hardware& Software Storage System.
3. Design the storage Architecture & Virtualization Technologies.
4. Understand the purpose of Storage Area Networks.
5. Study the different types of Storage Management systems.

Course Outcomes:

After completion of the course, students would be able to:

1. Learn different storage media and technologies
2. Learn usage and access to storage systems
3. Overview of Virtualization Technologies, Storage System Architecture
4. Learn Storage Area Network
5. Learn recent trends related to data management and software storage appliances

UNIT I

Introduction & Storage Media : Hard Disk Drive, Hybrid drive, Flash Memory and SSD **Storage Arrays:** Architectural Principles, All-Flash Arrays, Deduplication, pros and cons. **Fiber Channel SAN:** Why FC SAN, SAN Topologies, Redundancy, FC SAN.

UNIT II

Usage and Access – Positioning in the Memory Hierarchy, Hardware and Software Design for Access, Performance issues.**RAID:** What Is RAID, RAID Groups, RAID Levels, and The Future of RAID.

UNIT III

Large Storages – Hard Disks, Networked Attached Storage, Scalability issues, Networking issues.**Storage Architecture** - Storage Partitioning, Storage System Design, Caching, Legacy Systems.**Storage Virtualization:** The SNIA Shared Storage Model, Host-Based Virtualization.

UNIT IV

Storage Area Networks – Hardware and Software Components, Storage Clusters/Grids.**Storage QoS**–Performance, Reliability, and Security Issues Backup and Recovery: Backup Architecture, Backup Methods, Backup Types and Archiving.

UNIT V

Storage Management: Capacity Management, Performance Management, Alerting, Recent Trends related to Copy data management, Erasure coding, and Software- defined storage appliances.

Text Books:

1. Nigel Poulton, Data Storage Networking: Real World Skills for the CompTIA Storage, SYBEX publishers.
2. Nigel Poulton, Data Storage Networking: Real-World Skills for The Comptia Storage+ Certification and Beyond (SYBEX)– 2015.

Reference Books:

1. Ulf Troppens, Rainer Erkens, Wolfgang Muller-Friedt, Rainer Wolafka,Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS, ISCSI, INFINIB and FOCE, 2015.
2. The Complete Guide to Data Storage Technologies for Network-centric Computing Paper Back– Import, Mar 1998 by Computer Technology ResearchCorporation
3. Data Storage Networking: Real World Skills for the CompTIA Storage by Nigel Poulton

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

RECOMMENDER SYSTEMS

(Professional Elective-3)

Course Code: GR20D5132 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Objective

1. To learn techniques for making recommendations,
2. To including non-personalized, content-based, and collaborative filtering.
3. To learn non-personalized recommendation using summary statistics and product associations.
4. To automate a variety of choice-making strategies with the goal of providing affordable recommendations.
5. personal, and high-quality recommendations

Course Outcomes

After completion of course, students would be able to:

1. Design recommendation system for a particular application domain.
2. Learn concepts of content based systems and content based filtering
3. Learn collaborative filtering and different types of recommender systems.
4. Learn Hybrid approaches and design for recommender systems.
5. Evaluate recommender systems on the basis of metrics such as accuracy, rank accuracy, diversity, product coverage, and serendipity

Unit I

Introduction: Overview of Information Retrieval, Retrieval Models, Search and Filtering Techniques: Relevance Feedback, User Profiles, Recommender system functions, Matrix operations, covariance matrices, Understanding ratings, Linear Algebra notation, Applications of recommendation systems, Issues with recommender system.

Unit II

Content-based Filtering: High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, Discovering features of documents, pre- processing and feature extraction, Obtaining item features from tags, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

Unit III

Collaborative Filtering: User-based recommendation, Item-based recommendation, Model based approaches, Matrix factorization, Memory based collaborative filtering algorithms, Attacks on collaborative recommender systems.

Unit IV

Hybrid approaches: Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade Meta-level, Limitations of hybridization strategies

Unit V

Evaluating Recommender System: Introduction, Recommendation systems for web search, Social tagging and Group recommender systems, Designing and evaluating a recommendation systems for a business domainGeneral properties of evaluation research, Evaluation designs: Accuracy, Coverage, confidence, novelty, diversity, scalability, serendipity, Evaluation on historical datasets, Offline evaluations.

Text Books:

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, 1st edition, Cambridge University Press (2011).
2. Charu C. Aggarwal, Recommender Systems: The Textbook, 1st edition, Springer (2016).

Reference Books:

1. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, 1st edition, Springer (2011).
2. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems for Learning, 1st edition, Springer (2013).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SOFT COMPUTING

(Professional Elective-4)

Course Code: GR20D5133 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Objectives:

1. To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
2. To implement soft computing based solutions for real-world problems.
3. To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
4. To integrate soft Computing Techniques
5. To solve complex problems with soft computing techniques

Course Outcomes:

After completion of the course, students would be able to:

1. Implement different saturating functions
2. Implement Single layer feed forward and Multi-layer forward networks
3. Implement Different learning rules
4. Implement Fuzzy logic rules and Fuzzy membership functions
5. Implement logic gates using Fuzzy logic

UNIT I

INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS:

Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

UNIT II

FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT III

NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

UNIT IV

GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning: Machine Learning Approach to Knowledge Acquisition.

UNIT V

RECENT TRENDS: Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm, Implementation of recently proposed soft computing techniques.

Text Books:

1. Jyh: Shing Roger Jang, Chuen, Tsai Sun, EijiMizutani, Neuro: Fuzzy and Soft Computing, Prentice Hall of India, 2003.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 1995.

Reference Books:

1. Samir Roy, Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms, Pearson Publications.
2. B.K. Tripathy, Soft Computing Advances and Applications, Cambridge University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

WEB ANALYTICS AND DEVELOPMENT

(Professional Elective-4)

Course Code: GR20D5134 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Objectives:

1. The course explores use of social network analysis to understand growing connectivity and complexity in the world ranging from small groups to WWW.
2. Collecting and working with multi-channel data sources, perform quantitative and qualitative searches, and more
3. To confidently analyze and provide business solutions
4. To conduct qualitative research and deliver actionable, data-driven business insights
5. The critical elements of web, social, mobile, and content analytics to optimize organization's ability to make highly informed business decisions.

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

1. Familiarize with core research in Social and web analytics.
2. Learn and understand various web analytic tools.
3. Analyze the data, identifying various issues proposed solutions with optimization.
4. Analyze social network analysis using graph theory.
5. Identify various innovation approaches of web and social analytics.

UNIT I

Introduction Social network and Web data and methods, Web analytics at e-Business scale, Basic Segmentation and metrics, Collection of Web Data, Basic Dashboards, Graph and Matrices, Basic measures for individuals and networks, Information Visualization

UNIT II

Web Analytics tools: Click Stream Analysis, A/B testing, Online Surveys, Web Analytics Ecosystem

UNIT III

Web Search and Retrieval: Search Engine Optimization, Web Crawling and indexing, Ranking Algorithms, Web traffic models, Web Analytics Data Acquisition and Conversions, Tracking Mobile visitors, Web Analytics Reports

.

UNIT IV

Making Connection: Link Analysis, Random Graphs and Network evolution, Social Connects: Affiliation and identity.

UNIT V

Connection: Connection Search, Collapse, Robustness Social involvements and diffusion of Innovation, Geo Social Data and Cohort Analysis

Text Books:

1. Hansen, Derek, Ben Sheiderman, Marc Smith, Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann, 2011.
2. AvinashKaushik, Web Analytics 2.0: The Art of Online Accountability, 2009.

References Books:

1. David Easley & J. Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World, New York: Cambridge University Press, 2010.
2. S. Wasserman &K. Faust, Social network analysis: Methods and applications. New York: Cambridge University Press, 1994.
3. P. R. Monge& N. S. Contractor, Theories of communication networks. New York: Oxford University Press, 2003.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

NATURAL LANGUAGE PROCESSING AND LINGUISTIC TECHNIQUES

(Professional Elective-4)

Course Code: GR20D5160 **L/T/P/C: 3/0/0/3**

I Year II Semester

Course Objectives

1. Understand the basic terminology and theory underlying natural language processing
2. Understand approaches inflectional and derivational morphology and finite state transducers
3. Understand approaches to part of speech tagging, parsing syntax and semantics in NLP.
4. Understand approaches to discourse, generation, dialogue and summarization within NLP.
5. Understand current methods for statistical approaches to machine translation.

Course Outcomes

1. Apply skills of python for Simple language processing with the Natural Language Tool Kit (NLTK)
2. Develop understanding of problems and potentials of current NLP systems
3. Ability to understand morphology and finite state transducers
4. Ability to apply part of speech tagging, parsing syntax and semantics in NLP.
5. Ability to apply approaches to discourse, generation, dialogue and summarization within NLP.

UNIT I

Introduction: Need for processing of natural languages, Language processing levels, Applications of NLP, Ambiguity and uncertainty in language, Regular Expressions, NLP tasks in syntax, semantics and pragmatics, Machine Translation, Introduction to Finite State Automata and Regular expressions, Introduction to Formal languages and Context-free grammars.

UNIT II

Morphological Processing: Introduction to Corpus, Tokenization ,Stemming, Lemmatization Inflectional and Derivational morphology, Morphological parsing, Finite state transducers, N- gram language models, practical illustrations with NLTK,Python3, Textual sources, APIs, Social Media and Web Scraping, practical illustrations with NLTK,Python3, Textual sources, APIs, Social Media and Web Scraping.

UNIT III

Part-of-Speech Tagging: Corpus, Tokenization ,Stemming, Lemmatization, stopwords and Text Features, Word Classes, Part-of-speech tagging, Tagsets, Rule-based, Stochastic and Transformation based POS tagging, TF-IDF Classification, Hidden Markov Models.

UNIT IV

Parsing: Basic parsing strategies, Parsing with context-free grammars, Earley algorithm, Finite-state parsing methods, Unification of feature structures, Non-probabilistic Parsing

UNIT V

Semantic Analysis: Lexical Semantics, Lexemes, Relations among lexemes and their senses, WordNet, Word Sense Disambiguation. Pragmatics: Discourse, Discourse structure. Dialogue
- Acts, structure, conversational agents.

Text Books:

1. D. Jurafsky and J. H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education, 2008.

2. J. Allen , "Natural Language Understanding", Addison Wesley, 2007.

3. J. Handke, "The Structure of the Lexicon: Human Versus Machine (Natural Language Processing)", Mouton de Gruyter, 1995.

4. Natural Language Processing - A Paninian Perspective by AksharBharathi, VineetChaitanya, Rajeev Sangal

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SOFT COMPUTING LAB

Course Code: GR20D5136 **L/T/P/C: 0/0/4/2**

I Year II Semester

Course Objectives:

1. To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
2. To integrate soft Computing Techniques
3. To solve complex problems with soft computing techniques
4. To understand different saturating functions.
5. To analyze feed forward networks.

Course Outcomes:

After completion of the course, students would be able to:

1. Implement different saturating functions
2. Implement Single layer feed forward and Multi-layer forward networks
3. Implement Different learning rules
4. Implement Fuzzy logic rules and Fuzzy membership functions
5. Implement logic gates using Fuzzy logic

The following exercises are to be done.

1. Write A Program for Implementing Linear Saturating Function.
2. Study and Analysis of Art Model.
3. Write A Program for Error Back Propagation Algorithm (EBPA) Learning.
4. Study and Analysis Of CPN
5. Study and Analysis of Genetic Algorithm Life Cycle.
6. Study and Analysis of Fuzzy Vs Crisp Logic.
7. Write A Program of Perceptron Training Algorithm.
8. Write A Program to Implement Hebb's Rule
9. Write A Program to Implement Delta Rule
10. Write A Program for Back Propagation Algorithm
11. Write A Program to Implement Logic Gates
12. Write a program to store a pattern (1 1 1 0). Test the network using Discrete Hopfield Net by giving the input with mistakes in First and Second position.

13. To studyfuzzy control, principle of Fuzzy Control Design and rule-based Fuzzy Inference System (FIS)

Text Books:

1. Jyh: Shing Roger Jang, Chuen: Tsai Sun, EijiMizutani, Neuro: Fuzzy and Soft Computing, Prentice: Hall of India, 2003.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 1995.

Reference Books:

1. Samir Roy, Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms, Pearson Publications.
2. B.K. Tripathy, Soft Computing Advances and Applications, Cambridge University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

WEB ANALYTICS AND DEVELOPMENT LAB

Course Code: GR20D5137 **L/T/P/C: 0/0/4/2**

I Year II Semester

Course Objectives:

1. To understand the key fabric of the Web.
2. To understand and analyze the clickstream data, online surveys, usability research.
3. To understand preprocessing of data.
4. To understand Navigation analysis (funnel reports, heat maps,etc).
5. To confidently analyze and provide business solutions

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

1. Familiarize with core research in Social and web analytics.
2. Learn and understand various web analytic tools.
3. Analyze the data, identifying various issues proposed solutions with optimization.
4. Analyze social network analysis using graph theory.
5. Identify various innovation approaches of web and social analytics.

The following exercises are to be done.

1. Write a Python program to test if a given page is found or not on the server.
2. Write a Python program to download IMDB's Top 250 data (movie name, Initial release, director name and stars).
3. Demonstrate collection of Information (web Crawling) from web like twitter.
4. Write python script to pre process the data collected from twitter.
5. Write a python script for Page Ranking algorithm.
6. Consider a fraud detection use case: You have a database of clients, and would like to know how they are connected to each other. Especially, you know some clients are involved in complex fraud structure, but visualizing the data at an individual level does not bring out evidence of fraud. The fraudsters look like other usual clients.
   From the above use case perform the following

a) Create a graph from user database.
b) Custom visualization that helps us see strange patterns.
c) Risky pattern detection.

7. Create visualizations and automating analyses for the above use case.
8. Create a Python Script to demonstrate

a) Graph Plotting
b) Plotting two or more lines on same plot

9. Create a Python Script to demonstrate Customization of Plots
10. Create a Python Script to demonstrate Bar Chart

a) Histogram
b) Scatter plot
c) Pie-chart

11. Create a Python Script to demonstrate Plotting curves of given equation
12. Write a Python Script to demonstrate Cohort Analysis.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

NATURAL LANGUAGE PROCESSING LAB

Course Code: GR20D5138 **L/T/P/C: 0/0/4/2**

I Year II Semester

Course Objectives

1. Understand the basic terminology and theory underlying natural language processing
2. Understand approaches of building our own datasets using NLP
3. Understand approaches to N-gram, stemming , lemmatization and morphological parsing of NLP
4. Understand approaches part of speech tagging, parsing syntax and semantics in NLP.
5. Understand approaches to text classification, clustering, topic modelling and summarization within NLP.

Course Outcomes

1. Apply skills of python for Simple language processing with the Natural Language Tool Kit (NLTK) and Textblob modules.
2. Develop understanding transforming text to numeric vectors using Scikit learn machine learning library for building current NLP systems
3. Ability to understand morphology and wordnet concepts for building high level text based applications
4. Ability to apply part of speech tagging, parsing syntax and semantics in NLP.
5. Ability to apply approaches to build text classification / clustering / summarization/topic modeling within NLP.

Note : Use Python I/O files, TextBlob, NLTK, SK learn libraries for building the following applications.

1. Write a program to parse the given data set into words, characters and N gram using data structure?.

2. Write a program to remove stop-words and apply the concepts of Stemming, Lemmatization and POS Tagging for the given data set.

3. Write a program to convert given data into numeric format (CSV format) using Vector Space Model for text normalization?

4. Write a program to find Text Similarity between two or more documents using distance measures?

5. Write a program for Text classification on Twenty News Groups data set?

6 Write a program for Text classification on Movie review data set?

7. Write a program to classify the given mail is ham/spam using Text classification on Email data set?

8. Write a program to build a Setiment Analyser on a given data set using Supervised Learning?

9. Write a program to build a Text Summarization application on a given data set?

10. Write a program to build a Topic Modeling application on a given data set?

11. Write a program to build Text Clustering application on given data set?

12. Write a program to create our own CSV file from the given Text data set using Python file ?

13. Write a program to build an application on Sentiment Analysis on Twitter data set using CNN?

14. Write a program to build Text Sequence generation on a given data set using RNN?

Textbooks/References

1. Practical Computer Vision Applications Using Deep Learning with CNNs by Fawzy Gad
2. Natural Language Processing Recipes by Akshay Kulakarni

Online resources
1. https://www.nltk.org/
2. http://mlreference.com/spacy
3. https://textblob.readthedocs.io/en/dev/
4. https://scikit-learn.org/stable/index.html

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MACHINE LEARNING AND BIG DATA ANALYTICS LAB

Course Code: GR20D5139 **L/T/P/C: 0/0/4/2**

I Year II Semester

Course Objectives:

1. Learn, understand, and practice big data analytics.
2. Understand Machine learning techniques, and scaling up machine learning approaches.
3. Understand machine learning approaches, which include the study of modern computing big data technologies
4. Scaling up machine learning techniques focusing on industry applications.
5. Understand conceptualization and summarization of big data and machine learning trivial data versus big data, big data computing technologies

Course Outcomes:

After completion of the course, students would be able to:

1. Ability to understand what is learning and why it is essential to the design of intelligent machines.
2. Ability to design and implement various machine learning algorithms in a wide range of real-world applications.
3. Install Hadoop and perform basic file management task Implement basic data structures in Hadoop
4. Implement map reduce concept using matrix multiplication Install Pig and perform basic operations.
5. Install Hive and perform basic operations.

1. Problem Statement:

Step 1:

Create a database with 100 instances containing numeric values as per following
values as per following details given in Tables 1

Name this file as *data_employee.*

Employee_id	Age	Basic pay	No. Of clients	Years of Service	Performance Score
1					
2					
3					
..					

Range of this attributes are as follows:

1. Employee_id : 1-100
2. Age : 25-62
3. Basic pay : 15,600-67000
4. No.of clients :1-1000
5. Years of Services:0-40
6. Performance

Score:0/1 Step 2:

1. To create missing values in the data,remove the data entry from the cell asm indicated below in Table2.(This dataset will be later useful to practice preprocessing on the data)

Table 2

Instance No/ record No	Attribute values to be deleted
Instance 1	Age, Basic Pay, Years of Service
Instance 2	Basic Pay, Age
Instance 12	Age
Instance 51	Years of Service
Instance 54	Age
Instance 56	No. of Clients, Years of Service
Instance 81	Age, Years of Service
Instance 83	Years of Service ,Age
Instance 91	Years of Service ,Age
Instance 99	No. of Clients, Basic Pay ,Age

For example : Consider data example as per Table 3 having 2 instances.Table 4 illustrates the deletion of values of attributes to generate missing values.

Table 3

Employee_id	Age	Basic Pay (Monthly)	No. of Clients	Years of Services	Performance Score
1	30	32000	20	5	1
2	40	22000	1	3	1

Table 4

Employee_id	Age	Basic Pay (Monthly)	No. of Clients	Years of Services	Performance Score
1			20		1
2			1	3	1
...					

2. Dataset generated is to be named as *data_after_missing_values*

Expected Outcome:

1. A complete dataset named data_employee has been generated for further analysis

2. For further preprocessing a dataset named data_after_missing_valuesis also generated.

2.Problem Statement:

Step 1: Refer to the dataset *data_after_missing_values*and handle missing values in it. The missing values in the created dataset can be handled in following 3 ways:

1. Fill all the missing values by a default value. Default values for four attributes are given as:

a. 100 for Age
b. 1000for Basic Pay
c. 100 for No of Clients
d. 50 for Years of Service

For example : Table 5 illustrates the filling of missing values using default values of the two sample instances given in Table 4.

Table 5

Employee_id	Age	Basic Pay (Monthly)	No. of Clients	Years of Services	Performance Score
1	100	1000	20	50	1
2	100	1000	1	3	1
...					

Name this file as *PS_IB_I*

2. Fill all the missing values in the column by mean value of all the existing values of the attributes

a. Fill missing values of column Basic Pay using all the existing values of attribute Basic Pay
b. Similarly , fill missing value of column No of Clients, Years of Service and Age using all the existing values of attribute No. of Clients, Years of Service and Age

Suppose, mean value of attribute, Age, Basic Pay, No of Clients and Years of Service are 50,4500,10 and 13 respectively. (Use file*data_after_missing_values*) Table 6 illustrates the filling of missing values using mean value of the corresponding attribute for two sample instances shown in Table 4.

Employee_id	Age	Basic Pay (Monthly)	No. of Clients	Years of Services	Performance Score
1	50	45000	20	13	1
2	50	45000	1	3	1
...					

Name the generated file as PS_1B_2

c. Fill all the missing values by median value of all the existing value of the attribute.For example: Fill missing values of Basic Pay using all the existing value of attribute Basic Pay
d. Similarly fill missing value of No. of Clients, Years of Service and Age using all the existing values of attribute No. of Clients, Yearsof Service and Age
For example:
Suppose, median value of attribute Age,BasicPay,No of Clients and Years of Service are 30,15000,10 and 11 respectively .(Use file *data_after_missing_values)*
Table 7illustrates the filling of missing values using mean valueof the corresponding attribute for two sample instances shown in Table4.

Table 7

Employee_id	Age	Basic Pay (Monthly)	No. of Clients	Years of Services	Performance Score
1	50	45000	20	13	1
2	50	45000	1	3	1
...					

Name the generated file as *PS_1B_3*

Expected Outcome : Clean and completely preprocessed datasets named *PS_1B_i*, PS_1B_2 and PS_1B_3 are generated

3. Problem statement:

Clean and completely preprocessed datasets named PS_1B_1, PS_1B_2 and PS_1B_3 generated in Practical Session 1A and 1B are to be used

Refer to the dataset PS_1B_1, PS_1B_2 and PS_1B_3. To apply a Classification Model follow the steps below:

1. Use the dataset PS_1B_1and apply a classification model such as k-NN on three attributes i.eAge,Basic pay and No.of Clients for predicting the values in target class.
2. Use 'Performance Score' as target class
3. Fins out the accuracy score i.e correctness of predictions using the formula given below:

   Accuracy score=correct number of predictions / total no. of instances

   For example: Table 1 illustrates the two sample instances of the data PS_1B_1.

Table 1

Employee_id	Age	Basic pay	No. Of clients	Years of Service	Performance Score
1	100	1000	20	50	1
2	100	1000	20	3	0
..					

   On applying k-NN(on PS_1B_1.), generate new column named Predicted Performance Score as shown in Table 2.

Table 2

Age	Basic pay	No. Of clients	Performance Score	Predicted Performance Score
100	1000	20	1	1
100	1000	20	0	1

   Evaluate the accuracy i.e Accuracy =1/2=50%
4. Store the accuracy of the data in the variable named *Accuracy_1*.
5. Repeat Steps 1 to 4 for the datasets PS_1B_2 and PS_1B_3 and save the respective accuracy scores in variables *Accuracy_2*and *Accuracy_3*

   Expected Outcome :Datasets with differently resolved missing values give different accuracies. Some methods for resolving missing values perform better than the others. Observe Variables named *Accuracy_*, *Accuracy_2*and *Accuracy_3*

4. Problem statement:

Clean and completely preprocessed datasets named PS_1B_1,PS_1B_2 and PS_1B_3generated in Practical Session 1A and 1B are to be used

Refer to the dataset PS_1B_1, PS_1B_2 and PS_1B_3. To apply a Classification Model follow the steps below

1. Use the dataset PS_1B_1and apply a classification model such ask-Means on

two attributes i.e No of Clients and Years of Services for identifying the similar rows together

2. Use Euclidean Distance measure for evaluating the centroid of each cluster

The formulafor Distance between a point X(x1,x2,etc.) and a point Y(y1,y2,etc.) is given as

$$D=\sqrt{\sum_{i=1}^{2}(xi-yi)2}$$

3. Calculate Accuracy score for each of the cluster formed

Accuracy Score for each cluster= *Maximum number of instances of target class (0/1) in the cluster / Total number of instances in the cluster*

Note: Use Performance score as target class

4. Repeat step 1 to 3 for all values of k from 2 to 6

For example: Table 1 illustrates the 3 sample instances of the data PS_1B_1.

Table 1

Employee_id	Age	Basic pay	No. Of clients	Years of Service	Performance Score
1	100	1000	20	50	1
2	100	1000	1	3	0
3	80	90	31	21	1
..					

Accuracy ore for Cluster 1= 1/2 = 0.5

Accuracy ore for Cluster 2= 1/1 = 1

5. Repeat steps 1 to 4 for the datasets PS_1B_2 and PS_1B_2

Expected Outcomes:

1. Clustering is performed on the datsetPS_1B_1,PS_1B_2 and PS_1B_3
2. Accuracies for each clusters on datasets PS_1B_1,PS_1B_2 and PS_1B_3 are calculated

5. Problem Statement:

Use clean and completely preprocessed datasets named PS_1B_1, PS_1B_2 and

PS_1B_3 Perform the following exercise:

1. Use the dataset PS_1B_1and apply z-score transformation on variabes: Age, Basic Pay (Monthly), Years of Service and No. ofClients
   Formula for z-score is given as:
   $Z=(x-\mu)/\sigma$
   Where x is the input feature , z is the transformed value of x, μ is mean and

σ is standard deviation.

2. Name this new data file as *standardized*_PS_1 dataset
3. Perform feature engineering by applying a suitable a suitable dimensionality reduction method such as PCA (Principal Component Analysis) on the *standardized* PS_1B_1dataset.Perform the following steps:
    1. Identify 2 principal components out of the four transformed variables of *standardized*_PS_1 dataset , using PCA.
    2. Store the generated 2 principal components in variables *PC1* and *PC2*
4. Create a new file named reduced_PSI and store the values of PC1,PC2 along with the target variable named *Performance Score* in the file

For example: Table 1 shows 2 sample instances of file *reduced_PS1*

Table 1

PC1	PC2	Performance Score
1.8	1.04	0
2.3	1.18	1

5. Apply regressio analysis on *reduced_PS1d*ataset taking PC1 and PC2 as input variables i.e X_1 and X_2 and *performance Score* as Output variable , Y_1

$$Y_i=\beta_0+ \beta_1X_1+€_i$$

For our data we have i=2

6. Calculate the intercept € and coefficients .Also , calculate predicted Y using the calculated intercept and coefficient values and name it as *predicted_Performance_score*
7. Calculate the Mean Absolute Error for Actual and predicted Performance score Formula for MAE is given as:

$$MAE=\sum_{i=1}^{n}(Performancescore - Predictedperformance_{score})/n$$

Where n is the number of instances in the data

8. Repeat steps 1-7 for datasets PS_1B_2 and PS_1B_3

Expected Outcome:

1. Dimensionally reduction is performed using PCA on the datasets PS_1B_1, PS_1B_2, and PS_1B_3
2. Number of dimensions in each of the datasets PS_1B_1, PS_1B_2, and PS_1B_3 are reduced to 2, whereas earlier it was 4

6. Problem Statement:

Suppose a user wants to find relevant documents / article for a particular query from a given huge collection of documents. Then it becomes very difficult to search manually , as it will require a lot of efforts. So to search efficiently and automatically we require a

recommendation system that will recommend a document / article in response to a particular query

Exercise 1: Pre-processing Text Step 1: Create three records for the following text belonging to 3 different documents

No. of Documents	
Document 1	Broad to Rogers no run around the wicket Rogers back and across the off stump to block up the wicket
Document 2	Swann to Watson no run covers up on the off stump up the wicket
Document 3	Meth to ShahriarNafees , no run, on a good length on the off, drives that on the up towards extra cover

Step 2: Remove stopwors from the given set of documents as shown in Table 1.

Stop words list	A, about, above, after, again , against, all, am, an , and, any, are, aren't ,as, at, it, will, for ,me, how, off, no, the ,to ,up

Table 1 :Stopword list

Document before the stopword removal	Swann to Watson no run comes up on the off stump up the wicket
Document after the stopword removal	"Swann", "Watson", "covers", "stump", "wicket'

Table 1 : Example of removing the stopwords from document 1

Step 3: Consider the following Query Q1: how many wickets Swann Watson took while bowling around the wickets?

Step 4:Repeat 1 & 2

Tokenize the documents and remove the stopwords in similar way as we have done in first step

Exercise 2: Using the pre-Processed text for Analysis

Step 1: Provide TF-IDF score to each documents

TF: Term Frequency, which measures how frequently a term occurs in a document . Since every document is different in length , it is possible that a term would appear much more times in long documents that the shorter ones. Thus, the term frequency is often divided by the document length (aka, the total number of terms in the document) as a way of normalization

TF(t)=(Number of times term t appears in a document)/(Total number of terms in the document)

IDF: Inverse Document Frequency , which measures how important a term is. While computing TF, all terms are considered equally important . However it is known that certain terms such as “is”,”off” and “that”, may appear a lot of times but have little importance. Thus we need to weigh down the frequent terms while scale up the rare ones, by computing the following

IDF(t)=log_e (Total number of documents / number of documents with term t in it)

Document_1	Td-idf score
Swann to Watson no run covers up on the off stump up the wicket	(‘covers’,0.34112294132833015), (‘stump,0.24271178228501236’), (‘wicket,0.24271178228501236’), (‘Swann’,0.197822850123), (‘Watson’,0.1987822850123)

Table 3:Tf-idf calculation on document_1.txt

After that find the similar document out of document_1, document_2, document_3 which matches the query

Hint: (Use Euclidean distance for finding similarity)

7. **Implement the following file management tasks in Hadoop:**
    - Adding files and directories
    - Retrieving files
    - Deleting files

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copiesthem into HDFS using one of the above command line utilities.

8. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
9. Write a Map Reduce program that mines weather data and prints Maximum Temperature.
10. Write a Map Reduce Program to Find Designation wise Average Salary of Employees in an organization.
11. Run Pig, use Pig to perform sort, group, join, project, and filter data.

12. Run Hive, use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

13. Demonstrate Data Processing using Pig Script.

14. Demonstrate UDF creation and usage using Pig Script.

Text Books:

1. V.K. Jain, Big Data and Hadoop, Khanna Book Publishing, Delhi.

2. Maheshwari, Data Analytics, McGraw.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MINI PROJECT

Course Code: GR20D5143 **L/T/P/C: 0/0/4/2**

I YEAR II SEMESTER

Course Objectives:

1. To improve the technical presentation skills of the students.
2. To train the students to do literature review.
3. To impart critical thinking abilities for problem solutions.
4. To learn different implementation techniques.
5. To prepare technical reports

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

1. Choose the problem domain in the specialized area under computer science and engineering.
2. Acquire and categorize the solution paradigms with help of case studies
3. Design and code using selected hardware, software and tools.
4. Execute, Implement and demonstrate the problem statement by using the selected hardware, software and tools.
5. Document the thesis and publish the final work in a peer reviewed journal.

Syllabus Contents:

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution. Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the Departmental committee.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECCHNOLOGY

ENGLISH FOR RESEARCH PAPER WRITING

(AUDIT COURSE)

Course Code: GR20D5152 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. To understand that how to improve their writing skills and level of readability
2. To learn about what to write in each section
3. To understand the skills needed when writing a Title and ensure the good quality of paper at very first-time submission
4. To understand the process of research
5. To write quality research papers

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

1. Will have given a view of what writing is all about
2. Will be able to understand Research and its process
3. Will be able to comprehend the steps and methods involved in research process
4. Will have learned various skills necessary that are necessary for doing research
5. Will 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: Clarifying Who Did What, Highlighting Your Findings, Hedging and Critiquing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts and writing an Introduction

Unit 3: Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

Unit 4: A. Key skills that are needed when writing a Title, an Abstract, an Introduction, and Review of the Literature,

B. Skills that are needed when writing the Methods, the Results, the Discussion, an 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

DISASTER MANAGEMENT
(AUDIT COURSE)

Course Code: GR20D5153 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches,
5. Planning and programming in different countries, particularly their home country or the countries they work in.

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

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 AndCommunity 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 RiskAssessment. Strategies for Survival. Concept and Strategies of Disaster Mitigation, Emerging Trendsin Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

References:

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
SANSKRIT FOR TECHNICAL KNOWLEDGE
(AUDIT COURSE)

Course Code: GR20D5154 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects
4. Enhancing the memory power
5. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

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, NewDelhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, RashtriyaSanskrit Sansthanam, New DelhiPublication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., NewDelhi.
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
7. Content creation and E-learning in Indian languages: a model: http://eprints.rclis.org/7189/1/vijayakumarjk_01.pdf
8. HTML Tutorial - W3Schools: www.w3schools.com/html
9. The Unicode Consortium: http://unicode.org/.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

VALUE EDUCATION

(AUDIT COURSE)

Course Code: GR20D5155 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. Understand value of education and self-development
2. Imbibe good values in students
3. Let the should know about the importance of character
4. To understand the significance of human conduct and self-development
5. To enable students to imbibe and internalize the value and Ethical behaviour in personal and professional lives.

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”
3. N. Venkataiah, “ Value Education”, APH Publishing, 1998 - Education

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDIAN CONSTITUTION
(AUDIT COURSE)

Course Code: GR20D5156 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals 'constitutional
3. Role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
4. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.
5. To understand the role and functioning of Election Commission of India.

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

Suggested reading

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

(AUDIT COURSE)

Course Code: GR20D5157 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. Review existing evidence on the review topic to inform Programme design and policy making
2. Undertaken by the DFID, other agencies and researchers.
3. Identify critical evidence gaps to guide the development.
4. Establishing coordination among people in order to execute pedagogy methods.
5. To study pedagogy as a separate discipline.

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.

Suggested reading

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

(AUDIT COURSE)

Course Code: GR20D5158 **L/T/P/C: 2/0/0/2**

Course Objective:

- To achieve overall health of body and mind.
- To overcome stress.
- To lower blood pressure and improve heart health.
- Relaxation and Sleeping aid and to become non-violent and truthfulness.
- To increase the levels of happiness and to eliminate all types of body pains.

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 chittavrittis. 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 & aparigraha Shaucha, 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

Suggested reading

1. 'Yogic Asanas for Group Training - Part-I" : Janardan Swami YogabhyasiMandal,Nagpur
2. "Rajayoga or conquering the Internal Nature" by SwamiVivekananda, AdvaitaAshrama(Publication Department),Kolkata
3. Rajayoga - Swami Vivekananda - Ramakrishna Ashrama Publications.
4. HathayogaPradipika of Swatmarama - Kaivalyadhama, Lonavala
5. The Science of Yoga - Taimini - Theosophical Publishing House, Adyar, Madras.
6. Yogasutras of Patanjali - HariharanandaAranya, University of Calcutta Press, Calcutta.
7. Patanjal Yoga PradeepaOmananda 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 PanchadashanamParamahamsaAlakh 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 (AUDIT COURSE)

Course Code: GR20D5159 **L/T/P/C: 2/0/0/2**

Course Objectives

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students
- To differentiate three types of happiness (Sukham)
- To describe the character traits of a spiritual devotee

Course Outcomes

- Study of Shrimad- Bhagwad-Gita will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neethishatakam will help in developing versatile personality of students
- To develop self-developing attitude towards work without self-aggrandizement and to develop suffering free meditative mind
- 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

TEXT BOOKS/ REFERENCES:

1. “Srimad Bhagavad Gita” by Swami SwarupanandaAdvaita 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

CLOUD COMPUTING

(Professional Elective-5)

Course Code: GR20D5140 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objectives:

1. To learn how to use Cloud Services.
2. Understanding the implementation of Virtualization.
3. Implementing the Task Scheduling algorithms.
4. Apply the algorithms to build Private Cloud.
5. Broadly educate to know the impact of engineering on legal and societal issues involved.

Course Outcomes:

After completion of course, students would be able to:

1. Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.
2. Design different workflows according to requirements and apply map reduce programming model. Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
3. Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds
4. Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application
5. Broadly educate to know the impact of engineering on legal and societal issues involved in addressing the security issues of cloud computing.

UNIT I

Understanding Cloud Computing: Cloud Origins and Influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges Fundamental Concepts and Models: Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models.

UNIT II

Cloud-Enabling Technology: Data Centre Technology, Virtualization Technology, Web Technology, Multitenant Technology, Service Technology.

UNIT III

Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud Usage Monitor, Resource Replication.

UNIT IV

Fundamental Cloud Architectures: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture.

UNIT V

Cloud Security: Infrastructure Security, Data Security and storage, Identity and access management, Access Control, trust, reputation, risk,

Text Book(s)

1. Thomas Erl, Ricardo Puttini, ZaighamMahmood, Cloud Computing:Concepts, Technology & Architecture, Prentice Hall.
2. John W. Rittinghouse, James F.Ransome, Cloud Computing: Implementation, Management and Security, CRC Press, 2012.

References

1. Anthony T.Velte, Toby J Velte Robert Elsenpeter, Cloud Computing a practical approach, TMH 2010
2. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
3. Gautam Shroff, Enterprise Cloud Computing: Technology, Architecture, applications, Cambridge University Press, 2010.
4. Ronald Krutz Russell Dean Vines, Cloud Security:A comprehensive guide to Secure cloud computing, Wiley, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DEEP LEARNING AND APPLICATIONS

(Professional Elective-5)

Course Code: GR20D5141 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objectives:

1. Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.
2. Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
3. Implement deep learning algorithms and solve real-world problems.
4. Students will learn to implement, train, and validate their own neural network.
5. To improve the understanding of the on-going research in computer vision and multimedia field.

Course Outcomes:

After completion of course, students would be able to:

1. Understand the fundamental principles, theory and approaches for learning with deep neural Networks.
2. Understand the main variants of deep learning (such Convolutional and recurrent architectures), and their typical applications.
3. Analyzethe key concepts, issues and practices when training and modeling with deep architectures; as well as have hands-on experience in using deep learning.
4. Implement basic versions of some of the core deep network algorithms (such as back propagation).
5. Evaluate how deep learning fits within the context of other ML approaches and what learning tasks it is suited and not well suited to perform Vision and NLP applications

UNIT I

Introduction to Deep Neural Networks: Feed forward Neural networks. Gradient descent and the back propagation algorithm, Intuition of Neural Networks Loss functions, Optimization, Unit saturation, aka 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 and Recurrent Neural Networks: Architectures, convolution / pooling layers, LSTM, GRU, Encoder Decoder architectures, Function Approximation, Cost Function, Convolutional Neural Network, Training Neural Networks, Understanding Neural Networks Through Deep Visualization, Back Propagation, DeepFace and FaceNet

UNIT III

Deep Unsupervised Learning: Autoencoders (standard, sparse, denoising, contractive, etc.), Variational Autoencoders, Adversarial Generative Networks, Autoencoder and DBM, Attention and memory models, Dynamic memory networks, Deep Convolutional Features for Iris Recognition, Single Shot Multibox Detector

UNIT IV

Deep Belief Networks: Auto Encoders, Denoising Auto encoders, Stacked Autoencoders, Energy Based Models, Restricted Boltzmann Machines, Sampling in an RBM, Justifying Greedy-Layer Wise Pre-Training, Max Pooling, engine of neural networks-gradient-based optimization, Sequencing Processing with convents

UNIT V

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, analogy reasoning, Parsing and Sentiment Analysis using Recursive Neural Networks, Sentence Classification using Convolutional Neural Networks

.

Text Books:

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book in preparation. (2015).
2. Deep Learning for Computer Vision: Expert techniques to train advanced neural networks using TensorFlow and Keras by RajalingappaaShanmugamani,Packt Publishers

Reference Books:

1. Hochreiter, Sepp, and JargenSchmidhuber. "Long short-term memory." Neural computation 9.8 (1997).
2. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIGITAL IMAGE PROCESSING

(Professional Elective-5)

Course Code: GR20D5142 **L/T/P/C: 3/0/0/3**

II Year II Semester

Course Objectives:

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. Learn digital image fundamentals.
3. Be exposed to simple image processing techniques.
4. Be familiar with image compression and segmentation techniques.
5. Learn to represent image in form of features

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

1. Discuss digital image fundamentals.
2. Apply image enhancement and restoration techniques.
3. Use image compression and segmentation Techniques.
4. Represent features of images.
5. Interpret image segmentation and representation techniques

UNIT I

DIGITAL IMAGE FUNDAMENTALS: Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – color models.

UNIT II

IMAGE ENHANCEMENT : Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

UNIT III

IMAGE RESTORATION AND SEGMENTATION : Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation.

UNIT IV

WAVELETS AND IMAGE COMPRESSION :Wavelets – Sub band coding – Multi resolution expansions – Compression: Fundamentals – Image Compression models – Error

Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

UNIT V

IMAGE REPRESENTATION AND RECOGNITION : Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors –Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.

Text Books:

1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.

References:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata McGraw Hill Pvt. Ltd., 2011.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.
3. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
4. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.
5. http://eeweb.poly.edu/~onur/lectures/lectures.html.
6. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COST MANAGEMENT OF ENGINEERING PROJECTS

(Open Elective I)

Course Code: GR20D5146 **L/T/P/C: 3/0/0/3**

II Year I Semester

Prerequisites: Estimation & Costing, Construction Technology and Project management.

Course Objectives:

1. To attain knowledge in Cost Management process and Costing System.
2. Ability to understand the basic concepts of Project planning, execution, and cost control
3. Discuss about Various types of costs and its behaviour along with Quality Management
4. Identify various types of Budgets involved in Cost Management process
5. Broaden the career potential of available techniques and problems available in Cost Management.

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 and 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. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. 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, Cost-Volume-Profit Analysis. Various decision- making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. 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.

UNIT IV

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

UNIT V

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

REFERENCE BOOKS

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi.
2. Charles T. Horngren and George Foster, Advanced Management Accounting.
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting.
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher.
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co.Ltd

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDUSTRIAL SAFETY

(Open Elective I)

Course Code: GR20D5147 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objectives

1. To understand the importance of maintaining a safe workplace.
2. To maintain safety standards in compliance with regulatory requirements and within engineering limits understand personal safety and industrial safety.
3. To create a job safety analysis (JSA) for a given work project.
4. To follow safety recordkeeping and management, and the role of the safety manager.
5. To utilize personal proactive equipment.

Course Outcomes

1. Understanding of Safety principles.
2. Analyze different types of exposure and biological effects, exposure guidelines and basic workplace monitoring Ability to do Hazard analysis.
3. Demonstrate an understanding of workplace injury prevention, risk management, and incident investigations.
4. Understand the acute and chronic health effects of exposures to chemical, physical and biological agents in the workplace.
5. Demonstrate knowledge of the types of hazards, planning, organization and training needed to work safely with hazardous materials.

Unit I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravitylubrication,v.Wickfeedlubricationvi.Sidefeedlubrication,vii.Ringlubrication,
Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors,
iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

Reference Books

1. Maintenance Engineering Handbook, Higgins & Morrow, Da InformationServices.
2. Maintenance Engineering, H. P. Garg, S. Chand andCompany.
3. Pump-hydraulic Compressors, Audels, Mcgrew HillPublication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & HallLondon.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATIONS RESEARCH

(Open Elective I)

Course Code: GR20D5148 **L/T/P/C:3/0/0/3**

II Year I Semester

Course Objectives

1. To define and formulate linear and Non-linear programming problems and appreciate their limitations arising from a wide range of applications.
2. To perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change.
3. To distinguish various inventory models and develop proper inventory policies.
4. To solve the scheduling and sequencing models.
5. To understand how to model and solve problems using dynamic programming, Game Theory.

Course Outcomes

1. The student will formulate and solve problems as networks and graphs for optimal allocation of limited resources such as machine, material and money.
2. The student will able to carry out sensitivity analysis.
3. The student will solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
4. The student will able to distinguish various inventory models and develop proper inventory policies.
5. The student will also propose the best strategy using decision making methods under uncertainty and game theory.

Unit I

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex techniques, Sensitivity Analysis, Inventory Control Models

Unit II

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Unit III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem -CPM/PERT

Unit IV

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit V

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

Reference Books

1. H.A. Taha, Operations Research, An Introduction, PHI,2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi,1982.
3. J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi,2008
4. Hitler Libermann Operations Research: McGraw Hill Pub.2009
5. Panner selvam, Operations Research: Prentice Hall of India2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India2010

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ARTIFICIAL NEURAL NETWORKS AND FUZZY SYSTEMS

(Open Elective I)

Course Code: GR20D5149 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objective

1. To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems.
2. To know about feedback networks.
3. To learn about the concept of fuzziness involved in various systems
4. To understand the concept of adequate knowledge about fuzzy set theory.
5. To learn about comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm

Course Outcomes

1. To Expose the students to the concepts of feed forward neural networks
2. To provide adequate knowledge about feedback networks.
3. To teach about the concept of fuzziness involved in various systems.
4. To provide adequate knowledge about fuzzy set theory.
5. To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.

Unit I: INTRODUCTION TO NEURAL NETWORKS

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

Unit II: ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural

Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

FEED FORWARD NEURAL NETWORKS

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications

Unit III: MULTILAYER FEED FORWARD NEURAL NETWORKS

Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

ASSOCIATIVE MEMORIES

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

Unit IV: SELF-ORGANIZING MAPS (SOM) AND ADAPTIVE RESONANCE THEORY (ART)

Introduction, Competitive Learning, Vector Quantization, Self-Organized Learning Networks, Kohonen Networks, Training Algorithms, Linear Vector Quantization, Stability- Plasticity Dilemma, Feed forward competition, Feedback Competition, Instar, Outstar, ART1, ART2, Applications.

Classical& Fuzzy Sets Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

Unit V: FUZZY LOGIC SYSTEM COMPONENTS

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

Applications

Neural network applications: Process identification, Function Approximation, control and Process Monitoring, fault diagnosis and load forecasting.

Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

Text Books

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.

Reference Books

1. Neural and Fuzzy Systems: Foundation, Architectures and Applications, - N. Yadaiah and S. Bapi Raju, Pearson Education
2. Neural Networks – James A Freeman and Davis Skapura, Pearson, 2002.
3. Neural Networks – Simon Hykins , Pearson Education
4. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
5. Neural Networks and Fuzzy Logic System by Bork Kosko, PHI Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CYBER SECURITY

(Open Elective I)

Course Code: GR20D5150 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objectives:

1. To understand Cyber security challenges and their threats.
2. To understand Cyber attacks and their vulnerabilities.
3. To understand ethical hacking concepts and social engineering targets.
4. To understand cyber forensic investigation process
5. To recognize cyber laws and ethics

Course Outcomes: after completing this course student able to

1. Understand importance and challenges of Cyber security
2. Investigate cybercrime and collect evidences
3. Identify security risks and take preventive steps
4. Able to use knowledge of forensic tools and software
5. Knowledge about Indian IT act and International law

UNIT I:

Introduction to Cyber Security: Introduction to Cyber Security, Importance and challenges in Cyber Security, Cyberspace, Cyber threats, Cyber warfare, CIA Triad, Cyber Terrorism, Cyber Security of Critical Infrastructure, Cyber security - Organizational Implications.

UNIT II:

Hackers and Cyber Crimes: Types of Hackers, Hackers and Crackers, Cyber-Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses, Backdoors.

UNIT III:

Ethical Hacking and Social Engineering: Ethical Hacking Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modelling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration Testing, Types of Social Engineering, Insider Attack, Preventing Insider Threats, Social Engineering Targets and Defense Strategies.

UNIT IV:

Cyber Forensics and Auditing: Introduction to Cyber Forensics, Computer Equipment and associated storage media, Role of forensics Investigator, Forensics Investigation Process, and Collecting Network based Evidence, Writing Computer Forensics Reports, Auditing, Plan an audit against a set of audit criteria, Information Security Management System Management. Introduction to ISO 27001:2013

UNIT V:

Cyber Ethics and Laws: Introduction to Cyber Laws, E-Commerce and E-Governance, Certifying Authority and Controller, Offences under IT Act, Computer Offences and its penalty under IT Act 2000, Intellectual Property Rights in Cyberspace.

TEXT BOOKS:

1. Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., Enterprise Cybersecurity -How to Build a Successful Cyber defense Program Against Advanced Threats, A-press .
2. Nina Godbole, Sumit Belapure, Cyber Security, Willey
3. Hacking the Hacker, Roger Grimes, Wiley
4. Cyber Law By Bare Act, Govt Of India, It Act 2000.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTERNET OF THINGS ARCHITECTURE AND DESIGN PRINCIPLES

(Open Elective I)

Course Code: GR20D5151 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objectives:

1. To assess the vision and introduction of IoT.
2. To Understand Networking & Communication aspects of IOT.
3. To Explore the Application areas of IOT and to analyze the current needs
4. To Understand State of the Art - IoT Architecture.
5. To classify Real World IoT Design Constraints, Industrial Automation in IoT.

Course Outcomes: On successful completion of the course, the student will:

1. Understand the concepts of Internet of Things
2. Analyze basic protocols in wireless sensor network
3. Design IoT applications in different domain and be able to analyze their performance
4. Understand the Hardware concepts of Internet of Things
5. Implement basic IoT applications through python.

UNIT-1

Introduction to IoT :

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network.

UNIT-II

Network & Communication aspects

Connectivity terminologies-IOT Node, LAN,WAN, Gateway, IOT Stack vs. Web Stack, IOT Identification and Data Protocols-IPV4,IPV6,HTTP,MQTT,COAP

UNIT-III

IOT Applications

Smart Homes-Smart Home Origin, Technologies, Implementation, Smart Grids-Characteristics, Benefits, Architecture, Components, Smart Cities-Characteristics, Frameworks, Challenges,
Industrial IOT- Requirements, Design Considerations, Applications

UNIT-IV

Hardware Platforms

Programming with Arduino-Features of Arduino, Components of Arduino Board, Arduino IDE, Program Elements, Raspberry

UNIT-V

Developing IoTs

Introduction to Python, Introduction to different IoT tools, developing applications through IoT tools, developing sensor based application through embedded system platform, Implementing IoT concepts with python.

Text Books:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"

2. Internet of Things, Jeeva Jose, Khanna Publishing, 2018

3. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".

Reference Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1 st Edition, Academic Press, 2014. (ISBN-13: 978-0124076846).

2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",1st st Edition, Apress Publications, 2013. (ISBN-13: 978- 1430257.

3. Internet of Things Challenges, Advances and Applications by Quas F.Hassan, Atta Ur Rehaman Khan, and Sajiad A. Madani