Academic Regulations
Programme Structure
&
Detailed Syllabus

Bachelor of Technology
(B. Tech)
(Four Year Regular Programme)
(Applicable for Batches admitted from 2020)

Computer Science and Engineering
(Computer Science and Business System)

Department of Computer Science and Engineering
GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING & TECHNOLOGY
Bachupally, Kukatpally, Hyderabad, Telangana, India
500 090

ACADEMIC REGULATIONS

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

PROGRAMME BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND BUSINESS SYSTEM

GR20 REGULATIONS

Gokaraju Rangaraju Institute of Engineering and Technology 2020 Regulations (GR20 Regulations) are given here under. These regulations govern the programmes offered by the Department of Computer Science and Engineering with effect from the students admitted to the programmes in 2020-21 academic year.

1. **Programme Offered:** The programme offered by the Department is B. Tech in Computer Science and Business System, a four-year regular programme.
2. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.
3. **Admissions:** Admission to the B. Tech in Computer Science and Business System Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the State Government/University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the Government/University or on the basis of any other order of merit approved by the Government/University, subject to reservations as prescribed by the Government/University from time to time.
4. **Programme Pattern:**
   a) Each Academic year of study is divided in to two semesters.
   b) Minimum number of instruction days in each semester is 90.
   c) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
   d) The total credits for the Programme is160.
   e) Student is introduced to “Choice Based Credit System (CBCS)”.
   f) A student has a choice to register for all courses in a semester / one less or one additional course from other semesters provided the student satisfies prerequisites.
   g) All the registered credits will be considered for the calculation of final CGPA.
   h) Each semester has - ‘Continuous Internal Evaluation (CIE)’ and ‘Semester End Examination (SEE)’. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.
   i) **Subject / Course Classification:** All subjects/ courses offered for the under graduate programme in E & T (B.Tech. degree programmes) are broadly classified as follows.

S. No.	Broad Course Classification	Course Group/ Category	CourseDescription
1	BS	Basic Science Courses	Basic Science Courses
2	ES	Engineering Science Courses	Includes Engineering subjects
3	HS	Humanities and Social sciences	Includes Management courses
4	PC	Professional Core Courses	Includes core subjects related to the parent discipline/department/ branch of Engineering
5	PE	Professional Elective Courses	Includes elective subjects related to the parent discipline/ department/ branch of Engineering
6	OE	Open Elective Courses	Electives from other technical and/or emerging subjects
7	LC	Laboratory Courses	Laboratory Courses
8	MC	Mandatory Courses	Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge
9	PW	Project Work	Project work, seminar and internship in industry or elsewhere

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

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

b) A student has to register for all the 160 credits and secure all credits.

c) A student, who fails to fulfill all the academic requirements for the award of the degree within eight academic years from the date of admission, shall forfeit his/her seat in B. Tech course.

d) The Degree of B. Tech in Computer Science and Engineering 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 aggregate in all the courses concerned in the semester.

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

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

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

e) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. They may seek reregistration for that semester 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 from time to time.

b) **Distribution and Weightage of marks**

S. No	Components	Internal	External	Total
1	Theory	30	70	100
2	Practical	30	70	100
3	Engineering Graphics	30	70	100
4	Mini Project	30	70	100
5	Project Work	30	70	100

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

Assessment Procedure:

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Theory	30	Internal Examination & Continuous Evaluation	1) Two mid semester examination shall be conducted for 20 markseach for a durationof 2 hours. Average of the two mid exams shall be considered **i) Subjective - 15marks** **ii) Objective - 5marks** **2) Tutorials - 5marks** **3) Continuous Assessment– 5 marks**
		70	Semester end examination	The semester-end examination is for a duration of 3 hours
2	Practical	30	Internal Examination & Continuous Evaluation	**i) Internal Exam-10marks** **ii) Record - 5marks** **iii) ContinuousAssessment - 15 marks**
		70	Semester end examination	The semester-end examination is for a duration of 3 hours

d) **Mini Project with Seminar:** 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. The supervisor continuously assesses the students for 20 marks (Continuous Assessment – 15 marks, Report – 5 marks). At the end of the semester, Mini Project shall be displayed in the road show at the department level for the benefit of all students and staff and the same is to be evaluated by Mini Project Review Committee for 10 marks. The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for 70 marks. Mini Project Review Committee consists of HOD, Mini Project Coordinator and Supervisor.

e) **Summer Internship:** Summer Internship shall be done by the student in the summer break after III B. Tech II Semester and shall be evaluated in IV B. Tech I Semester along with the Project Work (PhaseI).

f) **Project Work (Phase–I and Phase-II):** The project work is evaluated for 100 marks. Out of 100, 30 marks shall be for internal evaluation and 70 marks for the external evaluation. The supervisor assesses the student for 20 marks (Continuous Assessment – 15 marks, Report –5 marks). At the end of the semester, projects shall be displayed inthe

road show at the department level for the benefit of all students and staff and the same is to be evaluated by the Project Review Committee for 10 marks. The external evaluation for Project Work is a Viva-Voce Examination which is conducted by the Project Review Committee in the presence of external examiner and is evaluated for 70 marks, Project Review Committee consists of HOD, Project Coordinator and Supervisor. These rules are applicable for both Phase I and PhaseII.

g) **EngineeringGraphics:**

- Two internal examinations, each is of 10 marks. The average of the two internal tests shall be considered for the award of marks.
- Submission of day to day work - 15marks.
- Continuous Assessment - 5marks.

8. **Recounting of Marks in the End Examination Answer Books:** A student can request for recounting of his/her answer book on payment of a prescribed fee.
9. **Re-evaluation of the End Examination Answer Books:** A student can request for re-evaluation of his/her answer book on payment of a prescribed fee.
10. **Supplementary Examinations:** A student who has failed to secure the required creditscan appear for a supplementary examination, as per the schedule announced by the College.
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 and PromotionRules:**
    a) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or laboratories if he/she secures not less than 35% of marks in the Semester-end Examination and a minimum of 40% of the sum total of the Internal Evaluation and Semester-end Examination taken together.
    b) A student shall be promoted to the next year only when he/she satisfies the requirements of all the previous semesters.

	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to second year first semester	(i) Regular course of study of first year secondsemester. (ii) Must have secured at least 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether thestudent takes those examinations or not.
3	Second year first semester to second year second semester	Regular course of study of second year first semester.
4	Second year second semester to third year first semester	(i) Regular course of study of second year secondsemester (ii) Must have secured at least 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether thestudent takes those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester.
6	Third year second semester to fourth year first semester	(i) Regular course of study of third yearsecond semester. (ii) Must have secured at least 60% credits up to third year second semester fromall the relevant regular and supplementary examinations, whether the student takes those examinations ornot.
7	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

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

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

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-P. 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 8) is the ratio of sum of the product of the number of credits and grade points to the total credits of all courses registered by a student, i.e.,

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

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 student over all the semesters of a programme, i.e., upto and inclusive of S_k, where $k \geq 2$.

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

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

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

	Class Awarded	CGPA Secured
14.1	First Class With Distinction	CGPA >= 8.00 with no F or below grade/ detention anytime during the programme
14.2	First Class	CGPA >= 8.00 with rest of the clauses of 14.1 not satisfied
14.3	First Class	CGPA ≥ 6.50 and CGPA < 8.00
14.4	Second Class	CGPA ≥ 5.50 and CGPA < 6.50
14.5	Pass Class	CGPA ≥ 5.00 and CGPA < 5.50

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

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

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

18. **General Rules**

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

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

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

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

Academic Regulations for B.Tech (Lateral Entry) under GR20

(Applicable for Batches Admitted from 2021-2022)

1. All regulations as applicable for B.Tech Four year degree programme (Regular) will hold good for B.Tech (Lateral Entry Scheme) except for the following rules

a) Pursued programme of study for not less than three academic years and not more than six academicyears.

b) A student should register for all 123 credits and secure all credits. The marks obtained in all 123 credits shall be considered for the calculation of the final CGPA.

c) Students who fail to fulfil all the academic requirements for the award of the degree within six academic years from the year of their admission, shall forfeit their seat in B.Tech programme.

2. Academic Requirements and Promotion Rules:

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

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

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

5	**Fourth year first semester to fourth year second semester.**	**Regular course of study of fourth year first semester.**

3. Award of Class: After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B. Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 123 credits.

	Class Awarded	**CGPA Secured**
3.1	**First Class With Distinction**	**CGPA >= 8.00 with no F or below grade/ detention anytime during the Programme**
3.2	**First Class**	**CGPA >= 8.00 with rest of the clauses of 3.1 not satisfied**
3.3	**First Class**	**CGPA ≥ 6.50 and CGPA < 8.00**
3.4	**Second Class**	**CGPA ≥ 5.50 and CGPA < 6.50**
3.5	**Pass Class**	**CGPA ≥ 5.00 and CGPA < 5.50**

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

Bachupally, Kukatpally, Hyderabad–500090, India. (040)65864440

COMPUTER SCIENCE AND BUSINESS SYSTEM (CSBS)

I B. Tech – CSE (CSBS) - I Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Maths	BS	GR20A1022	Discrete Mathematics for Engineers	3	1	0	4	3	1	0	4	30	70	100
2	Maths	BS	GR20A1023	Introductory Topics in Statistics, Probability and Calculus	3	0	0	3	3	0	0	3	30	70	100
3	CSE	ES	GR20A1024	Fundamentals of Computer Science	3	0	0	3	3	0	0	3	30	70	100
4	EEE	ES	GR20A1025	Principles of Electrical Engineering	2	0	0	2	2	0	0	2	30	70	100
5	Physics	BS	GR20A1026	Physics for Computing Science	2	0	0	2	2	0	0	2	30	70	100
6	CSE	ES	GR20A1027	Fundamentals of Computer Science Lab	0	0	2	2	0	0	4	4	30	70	100
7	EEE	ES	GR20A1028	Principles of Electrical Engineering Lab	0	0	1	1	0	0	2	2	30	70	100
8	Physics	BS	GR20A1029	Physics for Computing Science Lab	0	0	1	1	0	0	2	2	30	70	100
9	English	HS	GR20A1030	Business Communication and Value Science – I	2	0	0	2	2	0	0	2	30	70	100
		TOTAL			**15**	**1**	**4**	**20**	**16**	**1**	**8**	**25**	**270**	**630**	**900**
10	Mgmt	MC	GR20A1021	Life skills and Personality Development	**1**	**0**	**0**	**1**	**2**	**0**	**0**	**2**	**30**	**70**	**100**

I B. Tech – CSE (CSBS) - II Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	To Tal	L	T	P	To tal			
1	Maths	BS	GR20A1031	Linear Algebra	3	1	0	4	3	1	0	4	30	70	100
2	Maths	BS	GR20A1032	Statistical Methods	3	0	0	3	3	0	0	3	30	70	100
3	CSE	ES	GR20A1033	Data Structures and Algorithms	2	1	0	3	2	1	0	4	30	70	100
4	ECE	ES	GR20A1034	Principles of Electronics	2	0	0	2	2	0	0	2	30	70	100
5	Mgmt	HS	GR20A1035	Fundamentals of Economics	2	0	0	2	2	0	0	2	30	70	100
6	Maths	BS	GR20A1036	Statistical Methods Lab	0	0	1	1	0	0	2	2	30	70	100
7	CSE	ES	GR20A1037	Data Structures and Algorithms Lab	0	0	2	2	0	0	4	4	30	70	100
8	ECE	ES	GR20A1038	Principles of Electronics Lab	0	0	1	1	0	0	2	2	30	70	100
9	English	HS	GR20A1039	Business Communication and Value Science – II	2	0	0	2	2	0	0	2	30	70	100
				TOTAL	**14**	**2**	**04**	**20**	**15**	**2**	**8**	**25**	**270**	**630**	**900**
10	Chemistry	MC	GR20A1040	Environmental Sciences (Non-Credit)	0	0	0	0	2	0	0	2	30	70	100

II B. Tech – CSE (CSBS) - I Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	CSE	PC	GR20A2085	Theory of Computation	3	0	0	3	3	0	0	3	30	70	100
2	CSE	PC	GR20A2086	Computer Organization and Architecture	3	0	0	3	3	0	0	3	30	70	100
3	CSE	PC	GR20A2087	Object Oriented Programming	2	0	0	2	2	0	0	2	30	70	100
4	CSE	PC	GR20A2088	Computational Statistics	3	0	0	3	3	0	0	3	30	70	100
5	CSE	PC	GR20A2089	Principles of Software Engineering	3	0	0	3	3	0	0	3	30	70	100
6	CSE	PC	GR20A2090	Computer Organization and Architecture Lab	0	0	2	2	0	0	4	4	30	70	100
7	CSE	PC	GR20A2091	Object Oriented Programming Lab	0	0	2	2	0	0	4	4	30	70	100
8	CSE	PC	GR20A2092	Computational Statistics Lab	0	0	1	1	0	0	2	2	30	70	100
9	CSE	PC	GR20A2093	Software Engineering Lab	0	0	1	1	0	0	2	2	30	70	100
		TOTAL			**14**	**0**	**6**	**20**	**14**	**0**	**12**	**26**	**270**	**630**	**900**
10	Mgmt	MC	GR20A2003	Constitution of India	2	0	0	2	2	0	0	2	30	70	100

II B. Tech – CSE (CSBS) - II Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	CSE	PC	GR20A2094	Operating Systems Concepts	3	0	0	3	3	0	0	3	30	70	100
2	CSE	PC	GR20A2095	Fundamentals of Database Systems	3	0	0	3	3	0	0	3	30	70	100
3	CSE	PC	GR20A2096	Software Design with UML	2	0	0	2	2	0	0	2	30	70	100
4	Mgmt	BS	GR20A2097	Introduction to innovation, IP management and Entrepreneurship	3	0	0	3	3	0	0	3	30	70	100
5	MS	MS	GR20A2098	Operational Research	2	0	0	2	2	0	0	2	30	70	100
6	CSE	PC	GR20A2099	Operating Systems Concepts Lab	0	0	1	1	0	0	2	2	30	70	100
7	CSE	PC	GR20A2100	Databases Lab	0	0	1	1	0	0	2	2	30	70	100
8	CSE	PC	GR20A2101	Software Design with UML lab	0	0	1	1	0	0	2	2	30	70	100
9	MS	MS	GR20A2102	Operational Research Lab	0	0	1	1	0	0	2	2	30	70	100
10	Mgmt	BS	GR20A2103	Design and Critical Thinking	3	0	0	3	3	0	0	3	30	70	100
		TOTAL			**16**	**0**	**4**	**20**	**17**	**0**	**8**	**24**	**300**	**700**	**1000**
11	Mgmt	MC	GR20A2104	Essence of Indian Traditional Knowledge (Non-credit)	2	0	0	2	2	0	0	2	30	70	100

I YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DISCRETE MATHEMATICS FOR ENGINEERS

Course Code: GR20A1022 **L/T/P/C : 3/1/0/4**

I Year I Semester

Course Objectives:

1. Interpret concepts of sets and relation to understand Group and Ring theory
2. Apply theory of logic for testing validity of statements
3. Make use of Boolean expressions, operations and truth tables
4. Experiment with graphs and trees in discrete optimization problems
5. Utilize Graph theory to detect patterns in data sets

Course Outcomes:

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

1. Relate characteristics of Sets, Groups, Rings and Fields
2. Explain and exemplify tautology, contradiction and contingency
3. Identify underlying combinatorial structures
4. Analyze the design of various combinational & sequential logic circuits using the concepts of Boolean Algebra
5. Apply graph theory based tools in solving some discrete optimization problems

UNIT-I:

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

UNIT-II:

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

UNIT-III:

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

UNIT-IV:

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

UNIT-V: Graph Theory: Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Trees, Properties of trees, Spanning trees, Minimal Spanning trees using Kruskal’s and Prims Algorithms.

Graph Theory Applications: Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments, Planar graphs, Euler's formula, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem.

TEXT BOOKS:

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

REFERENCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY AND CALCULUS
Course Code: GR20A1023 **L/T/P/C : 3/0/0/3**
I Year I Semester

Pre-requisites: Combinatorics and Basic-calculus

Course Objectives:

1. Interpret the significance of statistics as an analytical tool.
2. Interpret the measures of central tendency and dispersion.
3. Apply various probability distributions in various contexts.
4. Apply mean value theorems for function approximation.
5. Interpret the significance of multivariable calculus.

Course Outcomes

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

Unit-I:

Introduction to Statistics and Descriptive Statistics

Definition of Statistics. Basic objectives, Applications in various branches of science with examples; Collection of Data: Internal and external data, Primary and secondary Data; Population and sample, Representative sample.

Classification and tabulation of univariate data; graphical representation, Frequency curves, Descriptive measures - Central tendency and Dispersion.

Unit-II:

Basic Probability and Mathematical Expectations

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

Unit-III:

Probability Distributions

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

Unit-IV:

Differential Calculus

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

Unit-V:

Integral Calculus

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

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TEXT BOOKS*:*

1. S. M. Ross, "Introduction of Probability Models", Academic Press,N.Y.
2. Sheldon M. Ross, "Introduction to probability and statistics for Engineers and scientists", third edition, Academic Press.
3. A. Goon, M. Gupta and B. Dasgupta, "Fundamentals of Statistics", vol. I & II, WorldPress.

REFERENCE BOOKS*:*

1. I. R. Miller, J.E. Freund and R. Johnson, "Probability and Statistics for Engineers". Fourth Edition,PHI.
2. A. M. Mood, F.A. Graybill and D.C. Boes, "Introduction to the Theory of Statistics", McGraw Hill Education.
3. Peter V O'Neil, "Advanced Engineering Mathematics", seventh edition, Thomson learning.
4. M.D. Greenberg, "Advanced Engineering Mathematics", second edition, Pearson Education.
5. P.N. Wartikar and J.N. Wartikar, "Applied Mathematics", Vol. I&II, Vidyarthi Prakashan.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF COMPUTER SCIENCE

Course Code: GR20A1024 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Pre-Requisites: Basic knowledge of mathematics.

Course Objectives:

1. To relate basics of programming language constructs and problem solving techniques.
2. To classify and implement control structures and derived data types.
3. To analyse and develop effective modular programming.
4. To construct mathematical problems and real time applications using C Language.
5. To learn the different interfaces in the operating system.

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

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

UNIT-I:

General problem Solving concepts: Algorithm, and Flowchart for problem solving with Sequential Logic Structure.

Imperative languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C)

Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation, Type Conversion.

UNIT-II:

Decisions and Loops: Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, goto labels, structured and un- structured programming.

Input and Output: Standard I/O, Formatted Output – printf, Formatted Input – scanf,

Arrays: One Dimensional, Two Dimensional and Multi-dimensional array and Row/column major formats.

UNIT-III:

Functions and Program Structure with discussion on standard library: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Standard Library Functions and return types.

Programming Method: Pre-processor, Debugging, Macro, User Defined Header, User Defined Library Function, make file utility

UNIT-IV:

Structures: Basic Structures, Structures and Functions, Array of structures, Table look up, typedef, unions, Bit-fields

Pointers: Pointers and address, Pointer to functions, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Initialisation of Pointer Arrays, Pointer of structures, Self-referral structures.

UNIT-V:

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

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

TEXT BOOKS:

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

REFERENCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PRINCIPLES OF ELECTRICAL ENGINEERING

Course Code: GR20A1025 **L/T/P/C: 2/0/0/2**
I Year I Semester

Course Objectives:

1. To understand the basic concepts of electrical circuits
2. To solve problems in DC & AC circuits
3. To provide foundation in theory and applications of Transformers and DC machines
4. To identify the types of sensors and measure quantities in AC and DC systems
5. To study various electrical installation components and safety measures

Course Outcomes:

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

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

UNIT-I:

Basic Circuit Concepts

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

UNIT-II:

DC Circuits

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

UNIT-III:

AC Circuits

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

UNIT-IV:

Electrostatics and Electro-Mechanics

Electrostatic field, electric field strength, concept of permittivity in dielectrics, capacitor composite, dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors, Electricity and Magnetism, magnetic field and Faraday's law, self and mutual inductance, Ampere's law, Magnetic circuit, Single phase transformer, principle of operation, EMF equation, voltage ratio, current ratio, KVA rating,

efficiency and regulation, Electromechanical energy conversion. DC generator construction, principle, EMF generated, types, DC motor principle, back EMF.

UNIT-V: Measurements and Sensors

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

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PHYSICS FOR COMPUTING SCIENCE

Course Code: GR20A1026 **L/T/P/C: 2/ 0/ 0/ 2**
I Year I Semester

Course Objectives:

1. Demonstrate competence and understanding of the concepts of Harmonic oscillations and waves.
2. Identify interaction of light with matter through interference, diffraction and polarization phenomena.
3. Examine basic concepts of electromagnetism and thermodynamics.
4. Recall the dualistic nature of radiation, basic concepts of crystallography and semiconductors.
5. Discuss the use of lasers as light sources in optical fiber applications.

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

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

UNIT I

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

UNIT II

Interference: Principle of superposition, Young's experiment, Theory of interference fringes, Types of interference, Fresnel's prism, Newton's rings, Diffraction: Two kinds of diffraction, Difference between interference and diffraction, Fresnel's half period zone and zone plate, Fraunhofer diffraction at single slit, Plane diffraction grating, Temporal and spatial coherence.

Polarization of light: Polarization, Concept of production of polarized beam of light from two SHM acting at right angle, Plane, Elliptical and Circularly polarized light, Brewster's law, Double refraction.

UNIT III

Basic Idea of Electromagnetisms: Continuity equation for current densities, Maxwell's equation in vacuum and non-conducting medium.

Thermodynamics: Zeroth law of thermodynamics, First law of thermodynamics, Brief discussion on application of 1st law, Second law of thermodynamics and concept of Engine, Entropy, Change in entropy in reversible and irreversible processes.

UNIT IV

Quantum Mechanics: Introduction, Planck's quantum theory, Matter waves, de-Broglie wavelength, Heisenberg's Uncertainty principle, Time independent and time dependent Schrödinger's wave equation, Physical significance of wave function, Particle in a one-dimensional potential box, Heisenberg Picture.

Crystallography: Basic terms, Types of crystal systems, Bravais lattices, Miller indices, Interplanar spacing, Atomic packing factor for SC, BCC, FCC and HCP structures.

Semiconductor Physics: Basic concept of Band theory: Bloch theorem, Kronig-Penny model (Qualitative), Differences between Conductors, Semiconductors and Insulators.

UNIT V

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

Teaching methodologies:

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

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FUNDAMENTALS OF COMPUTER SCIENCE LAB

Course Code : GR20A1027 **L/T/P/C: 0/0/4/2**

I Year I Semester

Course Objectives:

1. To gain a working knowledge of C programming to write modular, efficient and readable C programs by Identifying the structural elements and layout of C source code.
2. To declare and manipulate single and multi-dimensional arrays of the C data types and derived data types like structures, unions.
3. To use functions from the portable C library and to describe the techniques for creating program modules using functions and recursive functions.
4. To manipulate character strings in C programs.
5. Utilize pointers to efficiently solve problems.

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

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

LIST OF EXPERIMENTS:

Task-1 (Basic Programs):

a) Write a C program to implement operators in c?

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

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

Task-2 (Basic Programs):

a) Write a C program to find the roots of a quadratic equation using if-else.

b) The program should request the user to input two numbers and display one of the following as per the desire of user:

   i. Sum of numbers

   ii. Difference of numbers

   iii. Product of the numbers

   iv. Division of the numbers.

   Write a C program using switch statement to accomplish the above task.

c) Write a C program to find the GCD of a given number.

Task-3 (Small but tricky codes):

a) Write a C program to find Maximum and minimum of two numbers without using any loop or condition.

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

Task-4 (Proper parameter passing):

a) Write a C program to swap two numbers using call by value.

b) Write a C program to swap two numbers using call by reference

Task-5 (Command line Arguments):

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

Task-6 (Variable parameter):

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

Task-7(Pointer to functions):

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

Task-8 (User defined header):

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

Task-9 (Make file utility):

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

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

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

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

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

Task-12(Parsing related assignments):

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

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

Course Code: GR20A1028 **L/T/P/C :0/0/2/1**
I Year I Semester

Course Objectives:

1. To design electrical systems
2. To analyze a given network by applying various network theorems
3. To know the response of electrical circuits for different excitations.
4. To study various electrical measuring instruments and transducers
5. To summarize the performance characteristics of electrical machines

Course Outcomes:

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

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

Laboratory

1. Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical circuits
2. Verification of KVL and KCL
3. Verification of Thevenin's and Norton's theorems
4. Verification of superposition theorem
5. Verification of maximum power transfer theorem
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits.
7. Verification of relation between phase and line quantities in a 3-phase balanced star and delta connected systems.
8. Measurement of Active and Reactive Power in a balanced Three-phase circuit.
9. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
10. Load test on single phase transformer.
11. Demonstration of measurement of electrical quantities in DC and AC systems.

TEXT BOOKS:

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

REFERENCES:

1. Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi. 2. Circuits and Networks Analysis and Synthesis, A. Sudhakar, Shyammohan S. Palli, Tata McGraw Hill, 2010.
2. Engineering Electromagnetics, William H. Hayt, Jr. John A. Buck, 8th Revised Edition, McGraw Hill Higher Education, 2011.
3. Fundamentals of Electrical and Electronics Engineering, SmarjithGhosh, Prentice Hall (India) Pvt. Ltd., 2010.
4. Basic Electrical Engineers, P. Ramana, M. Surya Kalavathi, G. T. Chandra Sekhar, S. Chand Technical Publications, 2018.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PHYSICS FOR COMPUTING SCIENCE LAB

Course Code: GR20A1029 **L/T/P/C :0/0/2/1**

I Year I Semester

Course Objectives:

1. Identify the behavioral aspects of magnetic fields.
2. Demonstrate the quantum nature of radiation through photoelectric effect.
3. Recall the basic properties of light through hands on experience
4. Apply the theoretical concepts of Lasers and optical fibers in practical applications.
5. Infer the rigidity modulus and energy gap of a semiconductor.

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

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

LIST OF EXPERIMENTS:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BUSINESS COMMUNICATION AND VALUE SCIENCE – I

Course Code: GR20A1030 **L/T/P/C : 2/ 0/ 0/ 2**

I Year I Semester

Pre requisites:

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

Course Objectives:

1. To understand what life skills are and their importance in leading a happy and well-adjusted life
2. To motivate students to look within and create a better version of self
3. To introduce them to key concepts of values, life skills and business communication
4. To enable them to practice basic communication
5. To improve written skills of the students

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

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

UNIT-I:

Overview of Leadership Oriented Learning:

i) Self Introduction
ii) Recognize the need of life Skills and Values
iii) Overview of Business Communication
iv) Identify Strengths and Opportunities- Identity, body awareness
v) Stress- Management

UNIT-II:

A. Essential Grammar – I:

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

B. Overview of Communication Skills:

i) Importance of effective communication
ii) Types of communication- verbal and non - verbal
iii) Barriers of communication, effective communication

iv) Importance of Questioning
v) Listening Skills: Law of nature- Importance of listening skills, Difference between listening and hearing; Types of listening.

UNIT-III:

Verbal Communication and Vocabulary Enrichment:

A. Vocabulary Enrichment:

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

B. Phonetics:

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

UNIT-IV:

Written Communication:

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

UNIT-V:

Realities of Facing Life:

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

TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

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

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

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

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

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

Online Resources:

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

RESERVATIONS & SUGGESTIONS:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
LIFE SKILLS AND PERSONALITY DEVELOPMENT (LSPD)
Course Code: GR20A1021 L/T/P/C: 2/0/0/1
I Year I Semester

Course Objectives:
Students undergoing the course are expected to
1. Understand the concepts such as "Time Management", "Managing Information Overload" and "How to cope with Peer pressure".
2. Become familiar with concepts like how to master "English Language Skills" and "Communication skills".
3. Be thorough with the '"science behind personal health management and addictions" and stress management.
4. Appreciate the importance of cultivating good hobbies, need for forming good habits and discarding bad habits and how to hold difficult conversations in crisis situations.
5. Understand the importance of creative thinking, continuous and lifelong learning and cross culture sensitization. They will know what is meant by collaboration and team working.

Course Outcomes:
At the end of the course, student should be able to
1. Apply the concept of Time Management to his own day to day life. They will also learn to cope with Information Overload, which has become a serious problem for the digital generation. They will be in a position to withstand harmful peer pressure, and steer themselves towards attaining their own objectives in the four years time they spend in the college.
2. Apart from understanding the importance of English language skills in a globalized world, they will leart the methodologies as to how they can master English Language skills. They will become familiar with the communication skills and etiquette, body language, non-verbal communication and they will start applying these concepts in their day to day life. This will help them to become thorough professionals in their career.
3. Large number of students are ignorant about the need for personal health management and the need to stay away from addictions. After this course, they will get a complete understanding of the biological basis behind these concepts. This will help them to maintain a robust health trough out their life and it will also keep them away from addictions like drug addiction, alcohol addiction & video games addiction. They will learn the techniques of stress management as well.
4. They would start cultivating some good hobbies which will help them to maintain ideal work-life balance throughout their life. The students would start discarding bad habits & will start picking up good habits. Further, they will learn the techniques of holding difficult conversations and negotiations, which is an important skill set in the 21st century world.
5. They will develop the aptitude for finding creative solutions to problems and they will come to realize the importance of continuous and lifelong learning in a fast changing technological landscape. They will appreciate why collaboration and team working skills are important for success in a modern world.

UNIT I

Introduction to life skills: Why life skills are important for students. Highly competitive job market; companies test not only Engineering knowledge but also life skills; Fast paced changes in technologies; proliferation of electronic gadgets and harmful online content; Even to perform well in B.Tech, students need basic life skills.

Time management: What is meant by time management; Impulsive behaviorVs goal directive behavior; The concept of time log; What are the usual time wasters for students; How to minimize time wasters.

Information overload and how to cope with it: ICT revolution; proliferation of electronic media; Exponential growth in online content; Impact of information overload on human brain; How information overload interferes with student learning.

UNIT II

How to master English Language Skills: Importance of English in a globalized world; For any engineer, the whole world is his job market; Companies conduct exams, interviews & group discussions in English; Interdependence of communication skills & language skills; Entrance exams to foreign universities test English language skills; What are the various language skills; Practical strategies to improve one's English language skills.

Communication Skills: What is communication; Various types of communication's; Why communication skills are important in the modern world; Importance given to communication by companies during recruitment; Barriers to effective communication; Practical strategies to improve one's communication skills.

Body language, Etiquette and Non-Verbal communication: What is etiquette, grooming, attire & body language? Why these are important in the modern world; What kind of etiquette is expected by companies; How success in career & life is interlinked to etiquette, grooming, attire & body language; practical steps to improve one's etiquette, grooming, attire & body language.

UNIT III

Science behind personal health management: Widespread ignorance in society on health issues; WHO definition of Health; Human evolution; Hunting & Gathering lifestyle; Importance of physical work for human body & mind; Dangers of sedentary lifestyle; Germ diseases Vs Lifestyle diseases; How to integrate physical exercise into daily life.

Science behind Addictions: What is an addiction? Neurology and hormonal basics of addictive behavior; How addictions are formed; Harmful effects of addictions on physical health & mental health; How to recognize the addictions in oneself; How to come out of addictions.

Stress management: What is stress; Various stressors faced by a student; Fight & Flight response of humans; Harmful effects of chronic stress; Symptoms of poor coping skills of stress; Stress & Psychiatric problems; Easy coping strategies for stress.

UNIT IV

Need for cultivating good hobbies: Why hobbies are important for maintaining work-life balance; how hobbies help in maintaining good physical and mental health, what are various hobbies.

What is habit? Why it is so important. How to cultivate good habits & discard bad habits: Why habits are critical for successful life; How habits forms; How to analyze one's own habits; How to recognize useless & harmful habits; How to cultivate & Sustain useful habits; Difference between hobby & habit.

Peer pressure and how to cope with it: Human being is a social animal; Physical pain & social pain; How to be aware of harmful social pressure; Role of prefrontal cortex in judgment and decision making; why teenagers are vulnerable to peer pressure; strategies to overcome harmful peer pressure.

UNIT V

Continuous & lifelong learning: Accelerated change in technology landscape; shorter & shorter life cycles of technologies; Need for continuous learning ; Engineering knowledge alone is not enough to solve the real-life problems.

Cross culture sensitization: What is culture; why there are different cultures; How to understand culture; Today all workplaces are multi-cultural; How stereotypes develop in the mind about other cultures; Dangersof stereotypes & culture hatred prevailing society; How to overcome the culture prejudices.

Collaboration & team working skills. Why collaboration is important to succeed in one's own career, Today's workplace is all about teams, what is team working, what are various team working skills, how to be a good team member.

Textbooks:

1. The story of the human body by Daniel E Lieberman, Published by Pantheon Books, 2013
2. Spark by Dr. John J Ratey, *Publisher* Little Brown *Spark* 01-01-2013.
3. Creative thinking by Edward De Bono, Publisher: Penguin UK (25 October 2016).

Reference:

1. The power of positive confrontation by Barbara Pachter; Publisher: Da Capo Lifelong Books (November 28, 1999) ...
2. Habit by Charles Duhigg, Publisher: Random House Trade Paperbacks,2012
3. Communication skills for engineers and scientists by Sangeetha Sharma and Binod Mishra, PHI Learning, 2009.
4. Time management by Brian Tracy, Publisher: AMACOM, 2014

I YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

LINEAR ALGEBRA

Course Code: GR20A1031 **L/T/P/C : 3/ 1/ 0/ 4**

I Year II Semester

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

Course Objectives:

1. Determine relationship between coefficient matrix inevitability and solutions to a system of linear equations.
2. Solve systems of linear equations using various methods
3. Infer real vector spaces and subspaces and apply their properties.
4. Utilize concept of latent values of a matrix which is critical in many engineering applications.
5. Evaluate eigenvalues and eigenvectors and use them in applications.

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

1. Interpret real vector spaces and subspaces and apply their properties.
2. Compile the rank of a matrix to determine the existence of solutions of a linear algebraic system.
3. Apply Factorization techniques in many engineering applications.
4. Determine the eigenvalues and eigenvectors of a square matrix which arise in several engineering applications
5. Improve Principal component analysis by make use of Singular value decomposition

UNIT-I

Introduction to Matrices: Determinants, solving system of equations by Cramer's rule and Inverse of a Matrix method.

Vector definition, linear combinations, linear independence of vectors, Orthogonality

UNIT-II

Vector space definition: linear Span, Basis –Dimension**,** definition of 4 fundamental sub Spaces-(Column space *Ax*, Row space $A^T y$, null space *Ax=o,* null space $A^T y = 0$)

System of equations: Rank of a matrix - Solution of Linear Equations Homogenous and Non-Homogenous by Gaussian elimination.

UNIT-III

Matrix decomposition: Solving system of equations by LU decomposition- Scalar and vector projections, Gram-Schmidt Orthogonalization- QR decomposition- Spectral decomposition

Types of matrices: Symmetric, skew symmetric, orthogonal, Hermitian, skew Hermitian and unitary matrices;

UNIT-IV

Matrix eigenvalue problem: Eigenvalues and eigenvectors, Definiteness of a symmetric matrix- Linear transformations-for diagonalization of matrices.

UNIT-V

Singular value decomposition and Principal component analysis: Introduction to their applications in Image Processing and Machine Learning.

TEXT BOOKS:

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

REFERENCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STATISTICAL METHODS

Course Code: GR20A1032 **L/T/P/C : 3/ 0/ 0/ 3**

I Year II Semester

Pre-requisites: Elementary statistics and Linear algebra

Course Objectives:

1. Apply Estimation methods.
2. Apply Sampling techniques.
3. Apply the tests of hypothesis in large and small sampling.
4. Distinguish between explanatory and response variables and analyze data using correlation and regression.
5. Employ basic analysis of time series data.

Course Outcomes:

1. Estimate parameters.
2. Apply Sampling techniques.
3. Apply Inferential Statistics to make predictions or judgments about the population from which the sample data is drawn.
4. Forecast the models using Regression Analysis.
5. Interpret Time series data.

UNIT-I

Estimation: Point estimation, criteria for good estimates (un-biasedness, consistency), Methods of estimation - Maximum Likelihood Estimation.

Sufficient Statistic: Concept and examples, complete sufficiency, their application in estimation.

UNIT-II

Sampling Techniques: Random sampling. Sampling from finite and infinite populations. Estimates and standard error (sampling with replacement and sampling without replacement), Sampling distribution of sample mean, stratified random sampling.

Testing of hypothesis (parametric Inference): Concept and formulation, Type I and Type II errors, Neyman-Pearson lemma.

Procedures of Parametric testing of Single and two population means in small and large samplings, Single and two population Proportions in large sampling.

UNIT-III

Non-parametric Inference: Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman's and Kendall's test. Tolerance region.

UNIT-IV

Linear Statistical Models: Scatter diagram. Simple linear regression and correlation, Statements of their properties, Least squares method-simple examples, Rank correlation. Multiple correlation, Multiple Regression, Residual Analysis, Testing of Multiple Regression model, Concept of Multicollinearity and Analysis of variance - one way and two way classifications and related examples.

UNIT-V

Basics of Time Series Analysis and Forecasting: Components of Time series – Additive and Multiplicative Decompositions of Time series components, Measure of trend - Exponential smoothing, Moving averages method, Measure of seasonality – Ratio to Trend method and Ratio to Moving averages method , concept of deterministic and probabilistic time series, Stationary, ARIMA Models : Identification, Estimation and Forecasting.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA STRUCTURES AND ALGORITHMS

Course Code: GR20A1033 **L/T/P/C : 3/ 1/ 0/ 3**

I B. Tech II Semester

Course Pre-Requisites: C Language

Course Objectives:

1. To impart the basic concepts of algorithm analysis.
2. To demonstrate operations of linear and non-linear data structures.
3. To develop an application using suitable data structure.
4. To compare and contrast various data structure performances.
5. To implement various searching and sorting techniques.

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

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

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

Searching and Sorting on Various Data Structures: Sequential Search, Binary Search, Insertion Sort, Selection Sort, Shell Sort, Heap Sort , Divide and Conquer Sort :Merge Sort, Quick Sort, Comparison Trees (Decision tree),Introduction to Hashing.

File: Organisation Sequential, Direct, Indexed Sequential, Hashed and various types of accessing schemes (no implementation).

TEXT BOOKS:

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

REFERENCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF ELECTRONICS

Course Code: GR20A1034 **L/T/P/C : 2/ 0/ 0/ 2**

I Year II Semester

Course Pre-Requisite: Fundamentals of Physics

Course Objectives:

1. To understand the principle of operation and characteristics of various semiconductor devices
2. To study the applications of various semiconductor devices
3. To compare the functionalities of various electronic devices
4. To understand the concepts of feedback in amplifiers
5. To know about analog and digital IC's

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

1. Explain the principles of operation and substantiate the applications of
2. various semiconductor devices
3. Compare the functionalities of various electronic devices
4. Understand the effect of feedback in amplifiers
5. Apply the knowledge of analog IC's Use several digital IC's in various applications

UNIT-I

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

UNIT-II

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

UNIT-III

Bipolar Junction Transistors: Formation of PNP / NPN junctions; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut- off, active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors; Biasing and Bias stability: calculation of stability factor.

Field Effect Transistors: Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET structure and characteristics, MOSFET structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles.

UNIT-IV

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

UNIT-V

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

TEXT BOOKS

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

REFERENCES

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF ECONOMICS

Course Code: GR20A1035 **L/T/P/C : 2/ 0/ 0/ 2**
I Year II Semester

Course Objectives:

1. To provide a unifying theme of managerial decision making around the theory of firm by introducing tools such as demand and supply analysis
2. To analyse consumer behaviour w.r.t, select, buy, use and dispose goods, services and ideas based on the effects of price change, income change and substitutions
3. To get acquainted with various production theories, various costs and their role in cost minimization and various market structures such as perfect and imperfect competition
4. To gain knowledge on important elements of Nation's economic environment (National Income, National Product, Exports, Imports, Taxes, Subsidies, etc.)
5. To evaluate economic models describing the demand and supply of money and measure policies.

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

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

Unit I:

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

Unit II:

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

Unit III:

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

Unit IV:

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

Unit V :

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

Text Books:

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

REFERENCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
STATISTICAL METHODS LAB

Course Code: GR20A1036 **L/T/P/C : 0/ 0/ 2/ 1**
I Year II Semester

Course Objectives:

1. Identify the structural elements and layout of R source code.
2. Apply tests of significance.
3. Forecast in cross sectional and Time Series Data.
4. Compute descriptive statistics.
5. Depict data through visualization.

Course Outcomes:

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

Task1: Write an R program to create an array, passing in a vector of values and a vector of dimensions. Also provide names for each dimension.

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

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

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

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

Task 6: Write an R program to read the .csv file and perform the following:
(i) Summary statistics on the data, (ii) Remove outliers from the data.
Task 7: Plot the data using ggplot

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

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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA STRUCTURES AND ALGORITHMS LAB

Course Code: GR20A1037 **L/T/P/C : 0/ 0/ 4/ 2**

I Year II Semester

Course Objectives:

1. To read and make elementary modifications to programs that solve real-world problems.
2. To design and implement various linear and non-linear data structures.
3. To appropriately use a particular data structure and algorithm to solve a problem.
4. To implement searching and sorting techniques.
5. To use library functions, debug and run programs.

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

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

LIST OF EXPERIMENTS:

WEEK 1:

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

WEEK 2:

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

WEEK 3:

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

WEEK 4:

a) Write a C program to implement the operations – create, insert, delete, search and traversal of a Double linked list.

WEEK 5:

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

WEEK 6:

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

WEEK 7

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

WEEK 8:

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

WEEK 9 :

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

WEEK 10:

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

WEEK 11:

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

WEEK 12:

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

TEXT BOOKS:

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

REFERENCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF ELECTRONICS LAB

Course Code: GR20A1038 **L/T/P/C : 0/ 0/ 2/ 1**

I Year II Semester

Course Objectives:

1. To know the characteristics of various semiconductor devices
2. To verify the functionality and applications of analog IC's
3. To verify the functionality of digital IC's
4. To Design various circuits based on the characteristics of the components
5. To verify the theoretical concepts through laboratory and simulation

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

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

LIST OF EXPERIMENTS:

Simulation of any 3 or 4 experiments using open source software

1. Forward and Reverse Bias V-I characteristics of PN junction Diode.
2. V-I characteristics of Zener diode.
3. Full wave rectifier.
4. Characteristics of a BJT under CB configuration.
5. Characteristics of a BJT under CE configuration.
6. JFET characteristics under CS configuration.
7. MOSFET characteristics under CS configuration.
8. Hartly oscillator
9. Inverting and Non-Inverting amplifiers using IC 741 Op-Amp.
10. Adder, subtractor and comparator using IC 741 Op-Amp.
11. Integrator and Differentiator using IC 741 Op-Amp.
12. Truth table verification of Logic gates.
13. Truth table verification of Half-Adder and Full Adder.
14. Truth table verification of Multiplexer and De-multiplexer

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

Course Code: GR20A1039 **L/T/P/C : 2/ 0/ 0/ 2**
I Year II Semester

Nature of Course: Behavioral
Course Pre-Requisites: Basic Knowledge of English (verbal and written)
Course Pre-Requisites: a. Basic knowledge of English (verbal and written)
b. Completion of all units from Semester 1

Course Objectives:

1. To develop effective writing, reading, presentation and group discussion skills
2. To help students identify personality traits and evolve as a better team player
3. To introduce them to key concepts of
    a. Morality
    b. Beliefs and Behaviors
    c. Diversity & Inclusion
4. To make students understand the concepts of Morality and Diversity practically
5. To acquaint students of various personal skills like interpersonal and intrapersonal skills

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

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

COURSE CONTENTS:

1. Identification of common errors in written communication and ways of rectification
2. Understanding speed reading techniques – Skimming and Scanning
3. Application of reading and writing skills
4. Analyzing personality traits and team player style
5. Understanding the concepts of Morality, Diversity and Inclusion
6. Application of these concepts
7. Creation of communication material
8. Experiencing diversity and organizing events to support inclusion
9. Assignment – Assimilation of concepts and present them effectively

UNIT I

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

UNIT II

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

UNIT III

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

B. Group Discussion – Types - Dos – Don'ts

UNIT IV

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

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

UNIT V

Inclusion – Definition – concept of inclusion – workplace inclusion – 7 pillars of inclusion – How to promote inclusion - Examples

Morality – Definition – Purpose – Importance -Types – Examples – Morality vs. Ethics

Diversity – Definition – Different forms of diversity in our society – Examples

Discussion on TCS values, Respect for Individual and Integrity

TEXT BOOKS:

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

REFERENCES:

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

WEB REFERENCES:

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

ONLINE RESOURCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
ENVIRONMENTAL SCIENCES

Course Code:GR20A1040 **L/T/P/C:2/0/0/0**
I Year II Semester

Course Pre-Requisites: Basic knowledge of environmental issues

Course Objectives:

1. To recognize the impacts of human interventions towards environment
2. To understand how science and scientific method work to address environmental problems
3. To list out the benefits in creating a sustainable environment
4. To sketch out various activities in achieving a cleaner environment
5. To emphasize the role of an individual for a better planet to live

Course Outcomes:

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

UNIT 1: INTRODUCTION AND AWARENESS ACTIVITIES

Environmental Science: Introduction, Definition, scope and importance.

AWARENESS ACTIVITIES

Small group meetings about:

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

UNIT 2: SLOGAN AND POSTER MAKING EVENT

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

UNIT 3: EXPERT LECTURES ON ENVIRONMENTAL SCIENCE

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

UNIT 4: CLEANLINESS DRIVE

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

UNIT 5: CASE STUDIES

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

TEXT BOOKS:

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

REFERENCES:

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

II YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
THEORY OF COMPUTATION

Course Code: GR20A2085 **L/T/P/C: 3 /0/ 0/ 3**
II Year I Semester

Course Objectives:

1. Explain Regular Expressions and Finite Automata Conversions.
2. Understand Regular Grammars and properties
3. Explain Context Free Grammar Normal Forms and Push Down Automata.
4. Learn Turing machines models and types
5. Explain Computational theory and models.

Course Outcomes:
After completion of the course, the student will be able to
1. Design Regular Expressions and equivalent automata models.
2. Construct Regular Grammars and regular languages
3. Formulate Context-free languages and pushdown automata.
4. Design Turing machines models
5. Analyse Undecidability and Complexity

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

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

UNIT-III:

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

UNIT-IV:

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

UNIT-V:

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

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

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY

COMPUTER ORGANIZATION & ARCHITECHTURE

Course Code: GR20A2086 **L/T/P/C : 3/ 0/ 0/3**

II Year I Semester

Course Objectives: The Objectives of this course is to provide the student:

1. Analyze the functional blocks of a basic computer and understand the data representation, registers and Instruction sets.
2. Understand various CPU design formats and algorithms for arithmetic operations
3. Study the different ways of memory design and standard I/O interfaces.
4. Understand the design aspects of parallel processing and pipeline hazards
5. Study the hierarchical memory system including cache memory.

Course Outcomes:

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

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

UNIT-I:

Revision of basics in Boolean logic and Combinational/Sequential Circuits.

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit.

Data representation: Signed number representation, fixed and floating point representations, character representation.

Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

UNIT-II:

Introduction to x86 architecture.

CPU control unit design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU.

Computer arithmetic: Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic, IEEE 754 format.

UNIT-III:

Memory system design: Semiconductor memory technologies, memory organization.

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

UNIT-IV:

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

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

TEXT BOOKS:

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

REFERENCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
OBJECT ORIENTED PROGRAMMING

Course Code: GR20A2087 **L/T/P/C : 2/ 0/ 0/2**
II Year I Semester

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Prerequisites: A course on "Procedural programming".

Course Objectives :
The following Objectives are expected to be achieved by the students by learning thus course. Students shall.

1. Study the procedural programming language concepts through C.
2. Identify the specific Object Oriented approach in C++(Analyze)
3. Apply concepts of Data Abstraction Encapsulation , Access specifiers to realize Class concepts
4. Analyze how data can be shared through hierarchy and overloading of operators, overriding of methods/functions.
5. Create generic programs using templates, file handling and also develop design entities using UML.

Course Outcomes:

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

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

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

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

UNIT-IV

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

UNIT-V

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

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

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
COMPUTATIONAL STATISTICS

Course Code: GR20A2088 **L/T/P/C : 3/0/0/3**
II Year I Semester

Course Objectives:

1. Identify the problem of statistical inference, testing of hypothesis and interpret results.
2. Analyze the concepts of linear and multiple linear regression models.
3. Compare different types of plots such as residual plots, normal probability plots.
4. Illustrate multivariate normal distribution and principal components along with their applications.
5. Apply various kinds of regression and clustering models in real time problems.

Course Outcomes:

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

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

UNIT-I:

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

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

UNIT-II:

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

UNIT-III:

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

UNIT-IV:

Principal Component Analysis: Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

Factor Analysis: Factor analysis model, extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores.

UNIT-V:

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

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
PRINCIPLES OF SOFTWARE ENGINEERING

Course Code: GR20A2089 **L/T/P/C : 3/0/0/3**
II Year I Semester

Course Objectives:

1. To gain knowledge of basic software engineering methods and practices, and their appropriate application.
2. To describe software engineering layered technology and Process frame work.
3. To identify software measurement and software risks.
4. To describe the approaches to verification and validation using static and dynamic testing.
5. To examine the good qualities of a software.

Course Outcomes:

Upon completion of the course, students shall have ability to

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

UNIT I

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

Software Requirements Analysis: Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques.

UNIT II

Design and Construction: Techniques for requirement modeling – decision tables, event tables, state transition tables, Petri nets; requirements documentation through use cases; introduction to UML, introduction to software metrics and metrics based control methods; measures of code and design quality.

Object Oriented Analysis, Design and Construction: Concepts -- the principles of abstraction, modularity, specification, encapsulation and information hiding; concepts of abstract data type; Class Responsibility Collaborator (CRC) model; quality of design; design measurements; concepts of design patterns; Refactoring; object oriented construction principles; object oriented metrics.

UNIT III

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

UNIT IV

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

UNIT V

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

Text Books:

1. Software Engineering, Ian Sommerville

Reference Books:

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

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

Course Code : GR20A2090 **L/T/P/C: 0/0/4/2**
II Year I Semester

Course Objectives:
1. To gain a working knowledge on logic gates and combinational circuits
2. To perform operations on sequential circuits.
3. To gain knowledge on arithmetic operations using Machine language programming.
4. To understand how to access memory locations and ports using MLP.
5. To study the operations of various address modes.

Course Outcomes: After the completion of the course, the student will be able to
1. Incorporate logic gates with different combinations.
2. Develop sequential circuits for different applications.
3. Perform various operations using MLP.
4. Understand accessing communication port and memory locations.
5. Analyze the applications of different address modes.

Lab: Circuits on breadboard or simulators.

Task 1. Implementation of Boolean Circuits: Operations of Logic Gates: OR, AND, NOT, NAND and NOR gates.

Task 2. Implementation of Combinational Circuits: Adder, Subtractor, Multiplication Module, Division Module,

Task 3. Implementation of Multiplexer, De-multiplexer, Encoder, Decoder.

Task 4. Implementation of Sequential Circuits: Counters, Linear Feedback Shift Registers (LFSR)

Task 5. C/C++ programming to understand the formats of char, int, float, double, long etc.

Task 6. Machine language programming on x86 or higher version kits or simulators:

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

Task 7. Machine language programming : Accessing some specific memory locations/ports

Task 8. Counting odd and even integers from a series of memory locations

Task 9. Printing values of selected registers

Task 10. Handing interrupts

Task 11. Write a program for data transfer using different addressing modes

Task 12. Write a program to convert binary number to BCD number and vice versa.

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
OBJECT ORIENTED PROGRAMMING LAB

Course Code: GR20A2091 **L/T/P/C:0/0/4/2**
II Year I Semester

Course Objectives:

1. Reproduce basics of pointer handling, parameter passing mechanisms and also the concepts of object oriented programming as function overloading, in program.
2. Demonstrate the concepts related to class implementation
3. Construct programs for stack queue linked list considering access specifications
4. Test the concepts of operator overloading and templates using suitable programs
5. Design UML diagrams of Class, Sequence and Activity diagrams for any class concept considered.

Course Outcomes:

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

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

TASK-1

1 a) Parameter passing: passing parameter by value vs by reference, passing array as constant pointer

b) Function overloading: writing string operations like strcat and strncat, strcpy and strncpy as overloaded functions.

c) Dynamically allocating space for a pointer depending on input and doing this repeatedly, depending on different inputs and finally de-allocating the pointer.

TASK-2

2 a) Define class complex with all possible operations: constructor, destructor, copy constructor, assignment operator with the data members stored as pointer to integers.

b) Define class vector of integers with all possible operations like constructor, destructor, copy constructor and assignment operators

c) Define class matrix of integers with all possible operations like constructor, destructor, copy constructor and assignment operators

d) Define class matrix of integers using vector, with all possible operations like constructor, destructor, copy constructor and assignment operators

TASK-3

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

TASK-4

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

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

TASK-5

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

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

TASK-6

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

TASK-7

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

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

TASK-8

8. Formatted input-output examples

TASK-9

9. Input manipulators

TASK-10

10. Overriding operators <<, >>

TASK-11

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

TASK-12

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

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY

COMPUTATIONAL STATISTICS LAB

Course Code: GR20A2092 **L/T/P/C: 0/0/2/1**
II Year I Semester

Course Objectives:

1. To gain a working knowledge of Python programming to write modular, efficient and readable programs
2. Understand the concepts of plotting graphs using Matplotlib package.
3. Know how to annotate the graphs and use patches in Matplotlib package
4. Understand the concepts of Multivariate regression , Multiple regression and Cluster Analysis
5. Know the application of PCA and LDA for dimensionality reduction.

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

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

LIST OF EXPERIMENTS:

Task-1 (Control Flow)

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

Task-2 (Functions)

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

Task-3 (Data Structures)

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

Task-4 (Files)

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

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

Task-5 (Matplotlib package)

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

Task-6 (Matplotlib package)

a) Using “text” command add text to the axes of figures.
b) Using “annotate” command, label the parts of the axes in figures.
c) Using Locator and Formatter objects , set the axis properties.

Task-7 (Matplotlib package)

a) Draw a rectangle patch to a plot
b) Draw a circular patch at a given centre with a given radius in a plot.

Task-8

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

Task-9 (Multivariate Analysis).

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

Task-10 (**Classification using Principal Component Analysis**).

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

Task-11 (**Classification using Linear Discriminant Analysis**).

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

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

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

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
SOFTWARE ENGINEERING LAB

Course Code: GR20A2093 **L/T/P/C: 0/0/1/1**
II Year I Semester

Course objectives

- To impart state-of-the-art knowledge on Software Engineering and UML.
- Practice software engineering principles for real time problems.
- Design various types of diagrams for real time problems.
- Learn test case generation.
- Demonstrate software engineering methodologies for various real time problems.

Course outcomes

- Analyze and identify requirements for real time problems.
- Design and implement various software design models.
- Usage of modern engineering tools for specification, design and implementation.
- Provide appropriate solutions for the real time problems using software engineering methodology.
- Design test cases for various real time problems.

Software's Used: StarUML /Umbrello & JUNIT
Develop the following applications using software engineering methodologies.

1. Unified Library System 2. Online Railway Reservation System

Task1. Prepare the problem statement for above applications.

Task2. Develop Software Requirement Specification (SRS) for above applications.

Task3. Design the data flow diagram for the above applications.

Task4. Design the class diagrams for above applications.

Task 5: Design the Use-case diagrams for the above applications.

Task 6: Design the interaction diagrams for the above applications.

Task 7: Perform forward engineering for the above application and generate a report of the same.

Task 8: Perform reverse engineering for the above application and generate a report of the same.

Task 9: Write a C++ program to demonstrate the working of the fallowing constructs:

i) while ii) if …else iii) Switch iv) for Loops in C++ language

Task 10: Create a test plan document for any application (e.g. Unified Library System)

Task 11: Implement a Junit Test program and design test cases to find the maximum of an array of numbers.

Task 12: Implement a Junit Test program and design test cases to count the number of elements in array of numbers.

TEXT BOOKS:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CONSTITUTION OF INDIA

Course Code: GR20A2003 **L/T/P/C: 2/0/0/2**

II Year I Semester

Course Objectives:

1. Create an awareness about the Constitution of India, Fundamental Rights and Duties, Directive Principles.
2. Learn the role of Prime Minister, President and the Council of Ministers and the State Legislature.
3. Learn the divisions of executive, legislative and judiciary and so on.
4. Know how a municipal office, panchayat office etc. works.
5. Understand the importance and role of Election Commission Functions.

Course Outcomes:

1. Know the importance of Constitution and Government.
2. Become Good Citizens and know their fundamental rights, duties and principles.
3. Learn about the role of PM, President, Council of Ministers and Local Administration.
4. Understand the importance of Election Commission.
5. Know about Secularism, Federalism, Democracy, Liberty, Freedom of Expression, Special Status of States etc.,

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

Text/Reference Books:

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

II YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
OPERATING SYSTEMS CONCEPTS

Course Code: GR20A2094 **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Objectives:
The Objectives of this course is to provide the student to

1. Understand main concepts of OS, Processes, and threads
2. To analyze the different CPU scheduling policies and Deadlock management strategies
3. Understand inter process communication and process synchronization
4. Understand memory management and virtual memory techniques
5. Appreciate the concepts of storage and file management

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

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

UNIT-1

Introduction: Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS.

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.

UNIT-2

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.

Scheduling algorithms: Pre-emptive and non-pre-emptive, FCFS, SJF, RR; Multi processor scheduling: Real Time scheduling: RM and EDF.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT-3

Inter-process Communication: Concurrent processes, precedence graphs, Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Strict Alternation, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem, Barber's shop problem.

Concurrent Programming: Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection and recovery.

UNIT 4

Memory Management: Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction.

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

UNIT-5

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

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

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

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

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
FUNDAMENTALS OF DATABASE SYSTEMS

Course Code: GR20A2095 **L/T/P/C : 3/0/0/3**
II Year II Semester

Course Objectives:

1. Summarize the concepts of data modelling and architecture of DBMS
2. Construct the query statements with the available relational query languages
3. Paraphrase the importance of normalization and indexing techniques
4. Identify the mechanisms to perform concurrency control on transactions
5. Describe the authorization and authentication models for database security

Course Outcomes:

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

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

UNIT-I:

Introduction: Introduction to Database, Hierarchical, Network and Relational Models, Database System Architecture, Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

Data Models: Entity-Relationship Model, Network Model, Relational and Object oriented Data Models, Integrity Constraints, and Data Manipulation Operations.

UNIT-II:

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

UNIT-III:

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

UNIT-IV:

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

UNIT-V:

Database Security: Authentication, Authorization and Access Control, DAC, MAC and RBAC Models,

Intrusion Detection, SQL Injection.

Advanced Topics: Object oriented Databases, Object Relational Databases, Logical Databases, Web Databases, Distributed Databases, Data Warehousing and Data Mining.

TEXT BOOKS:

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

REFERENCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
SOFTWARE DESIGN WITH UML

Course Code: GR20A2096 **L/T/P/C : 3/0/0/3**
II Year II Semester

Course Objectives:

1. To know the importance of modeling techniques in the SDLC.
2. To design for students to analyze and design a problem domain in terms of objects by introducing and clarifying the fundamental ideas and basic concepts associated with object orientation.
3. To understand the object-oriented approach to analyzing and designing systems and software solutions.
4. Employ the UML notation and symbols to create effective and efficient system designs.
5. This course strongly focus on helping the learner master OOAD through case studies that demonstrate key OO principles and patterns, while also applying the UML.

Course Outcomes:

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

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

UNIT-1

Introduction to on Object Oriented Technologies and the UML Method.

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

UNIT-II

Introduction to the UML Language.

Standards, Elements of the language, General description of various models, The process of Object-Oriented software development. Description of Design Patterns. Technological Description of Distributed Systems.

Requirements Analysis Using Case Modeling

Analysis of system requirements. Actor definitions, writing a case goal, Use Case Diagrams, Use Case Relationships.

UNIT-III

Transfer from Analysis to Design in the Characterization Stage: Interaction Diagrams.

Description of goal, Defining UML Method, Operation, Object Interface, Class. Sequence Diagram.

Finding objects from Flow of Events. Describing the process of finding objects using a Sequence Diagram.

Describing the process of finding objects using a Collaboration Diagram.

Dynamic Model: State Diagram / Activity Diagram.

Description of the State Diagram, Events, Handling, Description of the Activity Diagram, Exercise in State Machines.

UNIT IV

The Logical View Design Stage: The Static Structure Diagrams.

The Class Diagram Model, Attributes descriptions, Operations descriptions, Connections descriptions in the Static Model, Association, Generalization, Aggregation, Dependency, Interfacing, Multiplicity.

Package Diagram Model.

Description of the model, White box, black box, Connections between packagers, Interfaces., Create Package Diagram, Drill Down.

UNIT - V

Component Diagram Model.

Physical Aspect. Logical Aspect, Connections and Dependencies, User face Initial DB design in a UML environment.

Deployment Model.

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

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTRODUCTION TO INNOVATION, IP MANAGEMENT AND ENTREPRENEURSHIP

Course Code: GR20A2097 **L/T/P/C: 2/ 0/ 0/ 2**

II Year II Semester

Course Objectives:

1. The major emphasis of the course will be on creating, enhancing the learning system through their innovation and creative thinking skills for effective business process.
2. Acquaint themselves with the special challenges of starting new ventures
3. Impart the entrepreneur skills in recognizing the new opportunities and styles required in maintaining competitive advantages
4. Provide the insights of financial aspects in planning and executing the market opportunities into a business plan
5. Emphasis on the role of IPR as an effective tool to protect their innovations and intangible assets from exploitation.

Course Outcomes:

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

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

UNIT – I:

Introduction to Innovation (What and Why) - Innovation as a core business process, Sources of innovation, Knowledge push vs. need pull innovations.

Class Discussion- Is innovation manageable or just a random gambling activity?

UNIT – II:

Building an Innovative Organization: Creating new products and services, exploiting open innovation and collaboration, Use of innovation for starting a new venture

Class Discussion- Innovation: Co-operating across networks vs. ‘go-it-alone’ approach

UNIT – III

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

UNIT – IV

Entrepreneurship- Financial Planning: Financial Projections and Valuation, Stages of financing, Debt,

Venture Capital and other forms of Financing

UNIT – V

Intellectual Property Rights (IPR): Introduction and the economics behind development of IPR: Business Perspective, IPR in India – Genesis and Development, International Context, Concept of IP Management, Use in marketing.

Types of Intellectual Property: Patent- Procedure, Licensing and Assignment, Infringement and Penalty, Trademark- Use in marketing, example of trademarks- Domain name, Geographical Indications- What is GI, Why protect them?, Copyright- What is copyright, Industrial Designs- What is design? How to protect?,

Class Discussion- Major Court battles regarding violation of patents between corporate companies

Home Assignment:

Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.

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

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

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

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

Textbooks:

1. Joe Tidd, John Bessant. Managing Innovation: Integrating Technological, Market and Organizational Change
2. Case Study Materials: To be distributed for class discussion.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OPERATIONAL RESEARCH

Course Code: GR20A2098 **L/T/P/C: 2/ 0/ 0/ 2**
II Year II Semester

Course Objectives

1. To understand familiarizes students to use quantitative methods and techniques for business planning and effective decisions making in the current business era.
2. To develop and find optimal solutions to transportation and assignment problems.
3. To understand the importance of network analysis and solve problems involved in planning, scheduling and controlling projects using PERT and CPM
4. To familiarize and realize the importance of network analysis and project management & scheduling techniques.
5. Being able to implement various inventory models, queuing, and simulation models in the real-world scenario.

Course Outcomes:

After completion of the course, the student will be able

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

UNIT I

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

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

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

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

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

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

UNIT II

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

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

UNIT III

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

UNIT IV

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

UNIT V

Queuing Theory:

Definitions – queue (waiting line), waiting costs, characteristics (arrival, queue, service discipline) of queuing system, queue types (channel vs. phase).

Kendall's notation, Little's law, steady state behaviour, Poisson's Process & queue, Models with examples - M/M/1 and its performance measures; M/M/m and its performance measures; brief description about some special models.

Simulation Methodology:

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

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
OPERATING SYSTEMS CONCEPTS LAB

Course Code: GR20A2099 **L/T/P/C : 0/0/2/1**
II Year II Semester

Course Objectives:
The Objectives of this course is to provide the student to

1. Learn basic commands and Shell programming in UNIX
2. Learn different types of CPU scheduling algorithms and demonstrate the usage of semaphores for solving synchronization problems.
3. Understand deadlock avoidance and management.
4. Understand memory management techniques and various page replacement policies.
5. Learn indexing and hashing

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

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

Laboratory

Task 1 Experiment Unix commands (files directory, data manipulation, network communication etc)

Task 2 Write programs using shell programming and use of vi editor

Task 3 Simulate the following Scheduling algorithms using C program

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

Task 4 To write a C program to implement concept of Shared memory

Task 5 Simulate Thread and Multi Thread using a C program

Task 6 To write a C program to implement concept of Inter Process Communication

Task 7 Implement an Algorithm for Dead Lock Detection in C.

Task 8 Simulate Bankers Algorithm for Deadlock Avoidance in C.

Task 9 Simulate the Readers – Writers problem using semaphores.

Task 10 To write C program to implement concepts of Memory Management:

a) Simulate First Fit b) Best Fit algorithm

Task 11 To write C program to Simulate page replacement Algorithms for memory management:

a) FIFO b) LRU

Task 12 To write a C program to implement the concept of Indexing and Hashing

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
DATABASES LAB

Course Code : GR20A2100 **L/T/P/C:0/0/2/1**
II Year II Semester

Course Objectives:

1. Develop the logical design of the database using data modeling concepts such as Relational model
2. Infer the commands for retrieving the data.
3. Create a relational database using SQLite
4. Manipulate the data in the tables using SQL.
5. Render the Procedural concepts with SQL

Course Outcomes:

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

1. Construct the schema of the database and modify it.
2. Compile a query to obtain the aggregated result from the database.
3. Speculate the concepts of database objects.
4. Compare the use of procedure and function in database.
5. Use SQLite to connect to database from C programs.

LIST OF EXPERIMENTS:

Task-1 (DDL and DML Commands):

a) Practice queries on DDL Commands
b) Practise queries on DML Commands

Task-2 (SQL Functions):

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

Task-3 (Aggregate Operators):

a) Perform aggregate operations and generate queries using them.
b) Implement the group by and having clauses with aggregate operators.

Task-4 (Nested Queries):

a) Write queries to illustrate the use of pair wise sub queries.
b) Practice the single row and multiple row sub queries.
c) Use sub queries in Create, Insert, Update and delete commands

Task-5 (Joins and Set Operators):

a) Practice queries on various kinds of joins.
b) Practice queries on set operators.

Task-6 (Views):

a) Create a simple view and try modifications through it.
b) Create a complex view and understand the restrictions for modifications through it.
c) Practice the creation of sequence and synonym.

Task-7(Indexes, Sequences and Synonyms):

a) Practice the creation of sequence and synonym.
b) Practice creation of function based indexes.
c) Create an index on attribute of a table.

Task-8 (DCL Commands):

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

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

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

Task-10(Cursor and Trigger):

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

Task-11(C Implementation for DB):

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

Task-12(Case Study):

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

Text Books:

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

Reference Books:

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

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

Course Code: GR20A2101 **L/ T/ P/ C:-0/0/2/1**
II Year II Semester

Course Objectives:

1. Compare the design based on the different diagrams drawn to find any missing requirements.
2. To study various UML tools with team work
3. Analyze the object-oriented analysis and design concepts.
4. Learn fundamental principle of object-oriented programming.
5. Understand UML diagrams for real time problems.

Course Outcomes:

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

Laboratory Experiments

Task1: Draw Class Diagram for ATM System.
Task2: Draw Object Diagram for ATM System.
Task3: Draw Use Case Diagram for ATM System.
Task4: Draw Sequence Diagram for ATM System.
Task5: Draw Collaboration Diagram for ATM System
Task6: Draw State Chart Diagram for ATM System.
Task7: Draw Activity Diagram for ATM System.
Task8: Draw Component Diagram for ATM System.
Task9: Draw Deployment Diagram for ATM System.
Task10: Draw UML Behavioural diagrams for Remote Procedure Call Implementation.
Task11: Draw UML Structural Diagrams for Remote Procedure Call Implementation.
Task12: Draw All UML Diagrams for Stock Maintenance System.

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OPERATIONAL RESEARCH LAB

Course Code: GR20A2102 **L/T/P/C: 0 / 0/ 2 / 1**
II Year II Semester

Course Objectives

1. Formulate and solve the linear programming problem.
2. Recognize and formulate transportation &assignment problems.
3. Develop network diagrams with activities and events.
4. Apply the basic inventory model to inventory control situations.
5. Solve queuing problems using M/M/1 and M/M/m models and understand the basic techniques used in a simulation analysis.

Course Outcomes

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

Task 1

Formulation of linear programming problems.

Task 2

Solution of linear programming problem using graphical method with:

i. Multiple constraints
ii. Unbounded solution
iii. Infeasible solution
iv. Alternative or multiple solution

Task 3

Enumeration of all basic solutions for linear programming problem.

Task 4

Solution of linear programming problem with simplex method.

Task 5

Problem solving using Big M method.

Task 6

Problem solving using two phase method.

Task 7

Solution on primal problem as well as dual problem.

Task 8

Solution based on dual simplex method.

Task 9

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

Task 10

Solution of transportation problem.

Task 11

Solution of assignment problem.

Task 12

ABC analysis.

Task 13

Inventory model.

Task 14

Performance measures for M/M/1 queuing model.

Task 15

Monte Carlo method.

Task 16

Simulation: Random number generation.

Task 17

Solution of integer programming problem using Branch and Bound method.

Task 18

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

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DESIGN AND CRITICAL THINKING

Code: GR20A2103 **L/T/P/C:3/0/0/3**

II Year II Semester

Course Objectives:

1) Recognize the importance of Design Thinking in engineering and business applications.
2) To understand the steps to create personas in the define phase of DT.
3) To familiarize the steps in the ideate phase of DT
4) Being able to understand the importance of the prototype phase in DT.
5) Recognize the importance of service value proposition.

Course Outcomes:

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

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

UNIT I

Introduction to Design Thinking. What is Design Thinking. Importance of Design Thinking for business. Examples from Industrial cases will be used to introduce Design Thinking to the participants. Steps in the DT process. Empathy, Steps in the empathize phase of DT. Introduction to Immersion Activity. Use of relevant stories and the videos to explain the importance of application of Design Thinking.

1. YouTube video: The Design Thinking Process – Sprouts (3.57 mins)
1. business environment. Can be a video. (2 mins)

Activities:

1. Why is Design Thinking important for you?

Products that you loved and hated: In this activity, learners will have to share about a product they like or disliked based on their experience. What would they need in a bad product to make it good?

1. **What is DT?**

Introduce the 5-Step Stanford Model using YouTube videos:
The video will give a brief idea about the five steps:

1. Empathize (search for rich stories and find some love)

2. Define (user need and insights – their POV)
3. Ideate (ideas, ideas, ideas)
4. Prototype (build to learn)
5. Test

1. **Introduction to immersion activity** through flowcharts and handouts and examples (to be provided by TCS DT Team) (steps and the question template:
1. We met;
2. We were amazed to realize that;
3. We wonder if this means It would change the world if)

Immersion activity-Participants will be divided into four groups. Each group will need to visit any one of the following places to conduct an immersion activity. They need to interview people and fill up the DT question template (explained in the last class)

1. College cafeteria
2. College library
3. College sports facility
4. Transport facility near college

UNIT II

i) **Creating personas. What is a persona and how to create a persona.**

Material: YouTube videos explaining the process of persona creation

1. **Reference:** https://www.interaction-design.org/literature/article/personas-why-and-how-you-should-use-them

https://www.youtube.com/watch?v=GNvLpfXCge8

Activity: Each group will create at least one persona based on the immersion study they conducted in the empathize stage (refer to the four question templates). Lecturer to guide participants on getting the personas right

ii) Steps to create problem statements in the define phase of DT

Material- YouTube videos on how to define problem statements in the Define phase

Activity: Group activity, in which each group will define the key problem statements (max three) for their lead personas. Each group will present while the remaining groups will do a peer review. Finally, lecturer will moderate/validate the problem statements

UNIT III

i) Ideate phase of DT- How to Ideate, The session will start with YouTube videos. Steps in the ideate phase of DT

1. FHIL | Stages of Design Thinking | IDEATE (1:54 secs)
2. What Is Six Thinking Hats? (Litmos Heroes) (1:58 secs)

Lecturer to briefly tell them about the guidelines of ideating

Activity: **Ideation games**

Game 1: Six Thinking Hats

Game 2: Million-dollar idea

ii) Ideate to find solutions -

Activity: Participants will work in their assigned groups to ideate solutions for the problem statements they
identified (as continuation of immersion activity) applying ideation methods discussed in the previous session. They will get scores based on how well they can apply the ideation methods.
Lecturers will observe the groups separately and assign them scores based on specific rubric (provided by the TCS DT Team).

iii) Let's doodle!
Material-Participants will first watch a video on doodling
Doodling – how it can help in presenting ideas during ideate and prototype phases
iv) Importance of storytelling in presenting ideas and prototypes.What is Storytelling in DT
Activity- Research to find out about people who have used DT in providing solutions. Present their findings in forms of stories. (Recap from Unit- Sem-)

UNIT IV
Importance of the prototype phase in DT. Why is a Prototype important in Design Thinking importance of creating a prototype in the design thinking process.
YouTube videos:
1. FHIL | Stages of Design Thinking | PROTOTYPE
2. Prototyping Phase - Design Thinking | Coursera
https://www.coursera.org/lecture/patient-safety-project-planning/prototyping-phase-jVuQn
Activity:
Prototype your idea
This is a group activity in which the participants will work in groups (created at the beginning of the course, in which they did immersion, persona creation, defining problem statement and ideating) to create prototypes based on the solutions they had identified. Lecturer to share feedback

UNIT V
i) Value Proposition Statement
You Tube: What is Value Proposition (by Venture Well) (3:51 mins)?
Lecturer to discuss the guidelines for creating a value proposition statement (to be provided by the TCS DT Team)
Activity: Each group now needs to create value proposition statement for the solution they have suggested.

ii) Testing in Design Thinking. Importance of Testing the prototype through stories
Participants will first watch a YouTube video:
FHIL | Stages of Design Thinking | TESTING

iii) Test the Prototype
Each group needs to test their prototype created earlier and:
1. Document user feedback
2. Write down their inference from the feedback

iv) Role of DT in your work
Lecturer conducts a group/open house discussion on:"How DT can help me to become a better coder?"
Lecturer needs to capture the key learning points in these discussions.

Project

Option 1: Each group needs to present a Prototype of how they can apply DT in their functional work or coding. Examples will be provided to explain what exactly they need to do.
Option 2: Each group will apply DT to create a prototype to improve any existing product or service.
For both options, groups need to complete all phases of the

Stanford DT model and include the outputs of each phase in their presentation.
Lecturers will evaluate the project based on the rubric provided by the TCS DT Team.

Reference Books:

1. Hooked by Nir Eyal
2. The Art of Creative Thinking by Rod Judkins
3. Start Up nation by Dan Senor and Saul singer
4. Start with Why by Simon Sinek

Web References:

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

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

Course Code: GR20A2104 **L/T/P/C: 2/0/0/2**

II Year II Semester

Course Objective:

1. The course aims at imparting basic principles of thought process, reasoning, inferencing, and sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
2. Holistic lifestyle of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
3. The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific worldview.
4. Provide basic principles of Yoga and holistic health care system.
5. Being able to instrument various approaches for the enhancement living ideals based on the Indian traditional knowledge.

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

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

UNIT – I:

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

UNIT – II:

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

UNIT – III:

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

UNIT – IV:

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

UNIT – V:

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

REFERENCES:

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

2. Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan.

3. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

4. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016

E-Resources:

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