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

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

Where C_i is the number of credits of the ith course and G_i is the grade point scored by the student in the ith course and n is the number of courses registered in that semester. ii) The CGPA is calculated in the same manner taking into account all the courses m, registered by student over all the semesters of a programme, i.e., 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	Total	L	T	P	Total			
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. N o	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. N O	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

III 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	GR20A3069	Algorithm Design and Analysis	3	0	0	3	3	0	0	3	30	70	100
2	CSE	PC	GR20A3070	Compiler Construction	3	0	0	3	3	0	0	3	30	70	100
3	Mgmt	HS	GR20A3071	Fundamentals of Management	2	0	0	2	2	0	0	2	30	70	100
4	Mgmt	HS	GR20A3072	Business Strategy	2	0	0	2	2	0	0	2	30	70	100
5	English	HS	GR20A3073	Business Communication and Value Science – III	2	0	0	2	2	0	0	2	30	70	100
6	CSE	PE		Professional Elective-I	2	1	0	3	2	1	0	3	30	70	100
7	CSE	PC	GR20A3077	Algorithm Design and Analysis Lab	0	0	2	2	0	0	4	4	30	70	100
8	CSE	PC	GR20A3078	Compiler Construction Lab	0	0	2	2	0	0	4	4	30	70	100
9	CSE	PC	GR20A3079	Machine Learning with R Programming Lab	0	0	1	1	0	0	2	2	30	70	100
10	CSE	PW	GR20A3080	Mini Project	0	0	1	1	0	0	2	2	30	70	100
				TOTAL	14	1	6	21	14	1	12	27	300	700	1000

PROFESSIONAL ELECTIVE – I				
S. No.	BOS	Group	Course Code	COURSE
1	CSE	PE	GR20A3074	Conversational Systems
2	CSE	PE	GR20A3075	Cloud, Microservices and Application
3	CSE	PE	GR20A3076	Machine Learning with R Programming

III 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	GR20A3142	Computer Communications	3	0	0	3	3	0	0	3	30	70	100
2	CSE	PC	GR20A3143	Information Security	3	0	0	3	3	0	0	3	30	70	100
3	CSE	PC	GR20A3144	Fundamentals of Artificial Intelligence	3	0	0	3	3	0	0	3	30	70	100
4	Mgmt	HS	GR20A3145	Financial and Cost Accounting	3	0	0	3	3	0	0	3	30	70	100
5	English	HS	GR20A3146	Business Communication and Value Science – IV	3	0	0	3	4	0	0	4	30	70	100
6	CSE	PE		Professional Elective-II	3	0	0	3	3	0	0	3	30	70	100
7	CSE	PC	GR20A3150	Computer Networks and Security Lab	0	0	1	1	0	0	2	2	30	70	100
8	CSE	PC	GR20A3151	Fundamentals of Artificial Intelligence Lab	0	0	1	1	0	0	2	2	30	70	100
9	CSE	PC	GR20A3152	Data Mining and Analytics Lab	0	0	1	1	0	0	2	2	30	70	100
			TOTAL		18	0	3	21	23	0	6	29	270	630	900
				Industrial Project (6-8 weeks)											

PROFESSIONAL ELECTIVE – II				
S. No.	BOS	Group	Course Code	COURSE
1	CSE	PE	GR20A3147	Modern Day Robotics and its Industrial Applications
2	CSE	PE	GR20A3148	Modern Web Applications
3	CSE	PE	GR20A3149	Data Mining and Analytics

IV B. Tech – CSE (CSBS) - I Semester

S. No	BOS	Group	Course Code	Course Name	Credits L	T	P	Total	Hours L	T	P	Total	Int.	Ext	Total Marks
1	CSE	PC	GR20A4072	Usability Design of Software Applications	2	1	0	3	2	1	0	3	30	70	100
2	Mgmt	HS	GR20A4073	Financial Management	3	0	0	3	3	0	0	3	30	70	100
3	Mgmt	HS	GR20A4074	Human Resource Management	3	0	0	3	3	0	0	3	30	70	100
4	CSE	PE		Professional Elective-III	2	1	0	3	2	1	0	3	30	70	100
5	CSE	PE		Professional Elective-IV	2	1	0	3	2	1	0	3	30	70	100
6	CSE	PC	GR20A4081	Usability Design of Software Applications Lab	0	0	1	1	0	0	2	2	30	70	100
7	CSE	PC	GR20A4082	Mobile Computing Lab	0	0	1	1	0	0	2	2	30	70	100
8	CSE	PW	GR20A4129	Project Work - Phase I	0	0	6	6	0	0	12	12	30	70	100
				TOTAL	12	3	8	23	12	3	14	29	240	560	800

PROFESSIONAL ELECTIVE – III				
S. No.	BOS	Group	Course Code	COURSE
1	CSE	PE	GR20A4075	Cognitive Science and Analytics
2	CSE	PE	GR20A4076	Introduction to IoT
3	CSE	PE	GR20A4077	Cryptology

PROFESSIONAL ELECTIVE – IV				
S. No.	BOS	Group	Course Code	COURSE
1	CSE	PE	GR20A4078	Quantum Computation and Quantum Information
2	CSE	PE	GR20A4079	Advanced Social, Text and Media Analytics
3	CSE	PE	GR20A4080	Mobile Computing

IV 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	Mgmt / CSE / Mgmt	OE		Open Elective -I	3	0	0	3	3	0	0	3	30	70	100
2	Mgmt	PE		Professional Elective-V	3	0	0	3	3	0	0	3	30	70	100
3	Mgmt / Mgmt / CSE	PE		Professional Elective-VI	3	0	0	3	3	0	0	3	30	70	100
4	CSE	PW	GR20A4130	Project Work-Phase II	0	0	6	6	0	0	12	12	30	70	100
				TOTAL	9	0	6	15	9	0	12	21	120	280	400

PROFESSIONAL ELECTIVE – V				
S. No.	BOS	Group	Course Code	COURSE
1	Mgmt	PE	GR20A4131	Behavioral Economics
2	Mgmt	PE	GR20A4132	Computational Finance & Modeling
3	Mgmt	PE	GR20A4133	Psychology

PROFESSIONAL ELECTIVE – VI				
S. No.	BOS	Group	Course Code	COURSE
1	Mgmt	PE	GR20A4134	Enterprise Systems
2	Mgmt	PE	GR20A4135	Advance Finance
3	CSE	PE	GR20A4136	Image Processing and Pattern Recognition

OPEN ELECTIVE – I				
S. No.	BOS	Group	Course Code	COURSE
1	Mgmt	OE	GR20A4137	Services Science and Service Operational Management
2	CSE	OE	GR20A4138	IT Project Management
3	Mgmt	OE	GR20A4139	Marketing Research and Marketing Management

PROFESSIONAL ELECTIVES – 4 THREADS

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

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:
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,5^{th}Edition,RdphP.Grimaldo(Pearson Education)
2. Discrete Mathematics with graph Thoery,3^{rd}Edition,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.
.

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:
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:
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 (⋏-Δ&⋏-⋏).

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:
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:
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:
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:
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:
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:
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:
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:
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:
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:
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:
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 solves 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:
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:
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:
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 AND 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 AND 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:
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. Computeus and Intractability: A Guide to the Theory of NP Completeness, M. R. Garey and D. S. Johnson.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER ORGANIZATION AND ARCHITECHTURE
Course Code: GR20A2086   **L/T/P/C : 3/ 0/ 0/3**
II Year I Semester

Course Objectives:

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:
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 AND TECHNOLOGY
OBJECT ORIENTED PROGRAMMING
Course Code: GR20A2087   **L/T/P/C : 2/ 0/ 0/2**
II Year I Semester

.

Prerequisites: A course on "Procedural programming".

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

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

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

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

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

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

UNIT V

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

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 AND 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 AND 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 AND 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:
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 AND TECHNOLOGY
SOFTWARE ENGINEERING LAB

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

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

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

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

1. Unified Library System 2. Online Railway Reservation System

Task1. Prepare the problem statement for 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 AND 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 I

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

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

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

UNIT II

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

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

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

UNIT III

Inter-process Communication: Concurrent processes, precedence graphs, Critical Section,

Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Strict Alternation, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem, Barber's shop problem.

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

UNIT IV

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

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

UNIT V

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

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

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

Case study: UNIX OS file system, shell, filters, shell programming, programming with the 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 AND 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 AND 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 AND 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 AND 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 Wellbeing Definition of Ayurveda, the principles of Ayurvedic healing, treating diseases to restore health, Astanga Ayurveda.

REFERENCES:
1. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014.
2. Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan.
3. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino
4. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016

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

III YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ALGORITHM DESIGN AND ANALYSIS

Course Code: GR20A3069   **L/T/P/C :3/0/0/3**
III Year I Semester

COURSE OBJECTIVES:

1. To analyze the asymptotic performance of algorithms.
2. To differentiate various algorithm design strategies.
3. To solve problems using algorithmic design paradigms and analyze the complexities.
4. To demonstrate the tree traversal algorithms and find its complexities.
5. To understand the concepts NP-complete, NP-hard problems and Cook's theorem.

COURSE OUTCOMES:

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

Unit 1
Introduction: Characteristics of Algorithm. Analysis of Algorithm: Asymptotic analysis of Complexity Bounds – Best, Average and Worst-Case behavior; Performance Measurements of Algorithm, Time and Space Trade-Offs, Analysis of Recursive Algorithms through Recurrence Relations: Substitution Method, Recursion Tree Method and Masters' Theorem.

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

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

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

Unit V

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

Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPILER CONSTRUCTION
Course Code: GR20A3070   **L/T/P/C: 3/0/0/3**
III Year I Semester

Course Pre-Requisites: Basic knowledge of computers and programming.

   Course Objectives:
   1. To learn the various phases of compiler.
   2. To learn the various parsing techniques.
   3. To understand intermediate code generation and run-time environment.
   4. To learn to implement code generator.
   5. To Learn code optimization.

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

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

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

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

Unit IV
Intermediate Code Generation: Translation of different language features, different types of intermediate forms.

Code Improvement (optimization): control-flow, data-flow dependence etc.; local optimization, global optimization, loop optimization, peep-hole optimization etc

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

TEXTBOOKS:

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

REFERENCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF MANAGEMENT

Course Code:GR20A3071   **L/T/P/C: 2/0/0/2**
III Year I Semester

Course Objective:

1. To provide engineering and science students with an accelerated introduction to the basics of management and organization behavior
2. The course provides learning on the framework of management functions
3. The course support to learn the management concepts related to organizational behavior and culture.
4. To provide an insight of organizational design approaches and leadership practices
5. To deliver the fundamental ethics to be practices in a business allied areas and importance of corporate ethical practices.

Course Outcomes:

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

UNIT I

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

UNIT II

Functions of Management- Planning, Organizing, Staffing, Directing, Controlling

UNIT III

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

UNIT IV

Organizational Design: Classical, Neoclassical and Contingency approaches to organizational design;

Organizational theory and design, Organizational structure (Simple Structure, Functional Structure, Divisional Structure, Matrix Structure) **Leadership:** Concept, Nature, Importance, Attributes of a leader, developing leaders across the organization, Leadership Grid

UNIT V

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

Home Assignment:

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

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

Text Books:
1. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
2. Principles and Practice of Management, L. M. Prasad, Sultan Chand & Sons, 2012
3. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, Organizational Behavior
4. Organizational Behavior - An Evidence-Based Approach- by Fred Luthans, Published by McGraw-Hill

Reference Books:
1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Richard L. Daft, Understanding the Theory and Design of Organizations
3. Intellectual Property- Deborah E. Bouchoux, Cengage, 2012

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BUSINESS STRATEGY

Course Code: GR20A3072   **L/T/P/C: 2/0/0/2**
III Year I Semester

Course Objectives:

1. To provide the students a clear understanding on strategic Management to analyze business situation and to apply the concepts to solve business problems.
2. To provide the students in understanding the business functionality in R&D, production, marketing, finance, HR, and information technology.
3. To make the students understand the inter-relationship of business with business environment.
4. To familiarize and analyze complex, qualitative, and quantitative problems solving with appropriate tools.
5. To give insights on strategic implementation and corporate Governance.

 Course Outcomes:

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

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

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

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

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

and Mergers & Acquisitions

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

Home Assignment

- Latest business events would be discussed in class and students should be ready to discuss these events (in groups). The topic will be mentioned beforehand. Students are required to meet in groups before coming to class and prepare on the topic.
- There will be periodic homework assignments relating to the course concepts or mini-cases. Specific instructions will be given separately.

Textbooks:

1. Robert M. Grant (2012). Contemporary Strategic Management, Blackwell, 7th Edition.
2. Strategic Management by Thompson and Strickland ,17th Edition, Tata McGraw-Hill Education Private Limited,

Reference Books:

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

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

Course Code: GR20A3073   **L/T/P/C: 2/0/0/2**

III Year I Semester

COURSE OBJECTIVES:

1. Develop technical writing skills
2. Introduce students to Self-analysis techniques like SWOT & TOWS
3. Leverage motivation in real-life scenarios
4. Introduce students to key concepts of Pluralism & cultural spaces ,Cross-cultural communication and Science of Nation building
5. To understand the importance of science for Nation building

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

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

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

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

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

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

UNIT IV
A) Technical Writing
- Introduction to technical writing
- Basic rules of technical writing
- Applying technical writing in profession
- Scenario-based technical writing
- Best practices of Technical writing

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

UNIT –V
Community Oriented Learning (Through Projects)

- Introduction to Community Oriented Project Work
- Visit rural area / underprivileged parts of city to address some of the local issues.
  Suggest solutions to the issues.

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

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

REFERENCES:

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

Online Resources

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

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

Course Code:GR20A3074   **L/T/P/C:** 2**/ 1/ 0/3**
III Year I Semester

COURSE OBJECTIVES

1. To understand aspects of conversational systems
2. To enable attendees to acquire knowledge on chat bots and its terminologies
3. To work with ML Concepts and different algorithms to build custom ML Model
4. To better understand on Conversational experiences and provide better customer experiences
5. To explore conversational analytics

COURSE OUTCOMES:

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

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

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

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

UNIT IV:
Role of ML/AI in Conversational Technologies –Brief Understanding on how Conversational Systems uses ML technologies in ASR, NLP, Advanced Dialog management, Language Translation, Emotion/Sentiment Analysis, Information extraction, etc. to effectively converse

UNIT V
Contact Centers: Introduction to Contact centers – Impact & Terminologies.
Conversation Analytics: The need of it, Introduction to Conversational Metrics.

Future – Where are we headed? Summary, Robots and Sensory Applications overview, XR Technologies in Conversational Systems, XR-Commerce, What to expect next? – Future technologies and market innovations overview.

TEXT BOOKS:
1. Designing Voice User Interfaces: Principles of Conversational Experiences 1st Edition by Cathy Pearl, O'Reilly
2. Conversational Interfaces: Principles of Successful Bots, Chatbots & Messaging Apps By Mariya Yao

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CLOUD, MICROSERVICES AND APPLICATIONS
(Professional Elective –I)

Course Code:GR20A3075   **L/T/P/C:** 2/ 1/ 0/3
III Year I Semester

COURSE OBJECTIVES
The course intends to introduce students to the fundamentals of developing application on Cloud, specifically public clouds such as AWS, AZURE and Google Students would be able to appreciate
1. Design applications for Cloud service components and security issues
2. Develop applications using various services
3. Deploy applications on Cloud by using cloud native services
4. Introduction to Devops, Security and Monitoring Tools
5. Visualize & Develop the use cases for Cloud Applications.

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

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

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

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

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

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

TEXT BOOKS:

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

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

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

Course Code:GR20A3076   **L/T/P/C:** 2/ 1/ 0/3
III Year I Semester

COURSE OBJECTIVES:
1. To understand the basic concepts and techniques of Machine Learning
2. To explore thorough understanding of supervised and unsupervised learning techniques
3. To study the advanced machine learning techniques and its applications
4. To explore the advance regression techniques and association rule mining
5. To study the unsupervised learning technique and outlier analysis

COURSE OUTCOMES:
1. Distinguish between, supervised, unsupervised and semi-supervised learning
2. Apply machine learning strategy for given supervised leaning based problem
3. Ability to get the skill to use advance machine learning techniques in real time applications
4. Implement the prediction models in various real time application areas
5. Understand the unsupervised machine learning techniques for clustering the given data

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

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

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

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

Course Code:GR20A3077   **L/T/P/C:** 0/ 0/ 2/2
III Year I Semester

Course Objectives:
1. Learn how to analyze a problem and design the solution for the problem.
2. Design and implement efficient algorithms for a specified application.
3. Strengthen the ability to identify and apply the suitable algorithm for the given real world problem.
4. Design and implement various algorithms in C.
5. Employ various design strategies for problem solving.

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

List of Programs:

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

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

3. Implement and analyze time complexity of Greedy Application Problems.

4. Implement and analyze time complexity of Dynamic Programming Application Problems.

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

6. Implement and analyze time complexity of Backtracking Application Problems.

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

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

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

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

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

12. Implement and analyze time complexity of Randomized Quick Sort.

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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPILER CONSTRUCTION LAB

Course Code: GR20A3078   **L/T/P/C :0/ 0/ 2/ 2**
III Year I Semester

Course Objectives:
1. To learn the knowledge of Lex & Yaac
2. To use lex and yaac for implementing basic programs
3. To learn code generation techniques.
4. To gain the knowledge of parsing.
5. To learn the knowledge of address codes.

Course Outcomes:

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

LIST OF EXPERIMENTS:

TASK 1:

Introduction to lex tools.

TASK 2:
Lex program to count the number of words, characters, blank spaces and lines

TASK 3:
LEX program to identify REAL PRECISION of the given number

TASK 4:
LEX Program to recognize tokens

TASK 5:
Implement a program to Elimination of Left Recursion in a grammar.
TASK 6:

Program to implement Predictive Parsing.

TASK 7:

Design LALR bottom up parser for the above language.

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

TASK 9:

Introduction to YACC.

TASK 10:

Convert the BNF rules into Yacc form and Write code to generate abstract syntax tree.

TASK 11:

YACC Program of an advanced desk calculator.

TASK 12:

Program to Implement 3 Address Code.

TEXT BOOKS:

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

REFERENCES:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MACHINE LEARNING WITH R PROGRAMMING LAB

Course Code:GR20A3079   **L/T/P/C: 0/ 0/ 1/1**

III Year I Semester

COURSE OBJECTIVES:
1. To used R and Weka tools for experimenting machine learning techniques
2. To introduce basic concepts of data preprocessing techniques
3. To understand the Supervised and Unsupervised learning techniques
4. To study the various statistical techniques
5. To understand the performance of the various machine learning techniques

COURSE OUTCOMES:

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

Programs

TASK-1
 (a) : Introduction to WEKA
 (b) : Reading ARFF, CSV files and apply preprocessing techniques in Weka (UCI datasets)

TASK-2
(a) : Introduction to R Programming
(b) : Read dataset and practice basic programming concepts

TASK-3
(a): Perform Data exploration and pre-processing in R (use any UCI dataset)
(b): Perform Feature Engineering and Feature Selection Methods in R

TASK-4
(a) : Implement regularized Linear regression in R (use any UCI dataset)
(b): Implement regularized logistic regression in R

TASK-5:
Implement Apriori association rule mining algorithm in R and Weka

TASK-6:
Implement K- means clustering algorithm in R and Weka
TASK-7:
Implement Decision Tree classification algorithm in R and Weka

TASK-8:
Implement Distance and density-based anomaly detection (K-NN) algorithm

TASK-9:
Implement Normal distribution in R programming for any dataset.

TASK-10:
Implement Expectation Maximization in R programming to solve exponential distribution

TASK-11:
Apply EM algorithm to cluster a set of data stored in a .CSV file and use the same data set for clustering using k-Means algorithm in R. Compare the results of these two algorithms and comment on the quality of clustering

TASK-12:
Write R program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Beyond Spreadsheets with R: A beginner's guide to R and RStudio 1st Edition by Dr Jonathan Carroll (Author)
2. Data Science and Machine Learning with R Paperback – 30 July 2021
3. by Reema Thareja (Author)
4. R.O. Duda, P.E. Hart, D.G. Stork, Pattern Classification, 2/e, Wiley, 2001.

5. C. Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
6. E. Alpaydin, Introduction to Machine Learning, 3/e, Prentice-Hall, 2014.
7. A. Rostamizadeh, A. Talwalkar, M. Mohri, Foundations of Machine Learning, MIT Press.
8. A. Webb, Statistical Pattern Recognition, 3/e, Wiley, 2011.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MINI PROJECT

Course Code: GR20A3080   **L/T/P/C: 0/0/2/1**
III Year I Semester

Course Objectives:

1. Demonstrate a wide range of skills learned to deliver a project.

2. Encourage multidisciplinary research through the integration learned.

3. Develop problem solving, analysis, synthesis and evaluation skills.

4. Encourage teamwork.

5. Improve communication and presentation skills during project work.

Course Outcomes:

1. Formulate hypothesis for the problem statement with sound technical knowledge from selected project domain.

2. Design Engineering Solution to the problem statement with systematic approach.

3. Analyse and develop an efficient solution for implementation of the project.

4. Apply the theoretical concepts while providing solution to the problem statement with teamwork and multidisciplinary approach.

5. Demonstrate professionalism with ethics while preparing and presenting the project work.

III YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER COMMUNICATIONS
Course Code: GR20A3142   L/T/P/C: 3/0/0/3
III Year II Semester

Course Pre-Requisites: Basic knowledge of components of a computer.
Course Objectives:
1. To understand the protocol layering and physical level communication.
2. To Learn principles involved in Data Link Layer
3. To Learn principles involved in Network and transport Layers
4. To gain knowledge of Application Layer functionalities and importance of Security in the Network
5. To Learn the importance of Security in the Network

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

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

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

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

UNIT IV

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP,RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP),Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service (QoS), QoS improving techniques - Leaky Bucket and Token Bucket algorithms.

UNIT V

Application Layer: DNS, DDNS, TELNET, EMAIL, FTP, WWW, HTTP, SNMP, Bluetooth, Firewalls.

Network Security: Electronic mail, directory services and network management,Basic concepts of Cryptography.

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

REFERENCES:
3. Network Security, Kaufman, R. Perlman and M. Speciner.

4. UNIX Network Programming, Vol. 1,2 & 3, W. Richard Stevens

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INFORMATION SECURITY

Course Code:GR20A3143   **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Objective:
1. To understand the basics of Information Security
2. To know the legal, ethical and professional issues in Information Security
3. To know the aspects of risk management
4. To become aware of various standards in this area
5. To know the technological aspects of Information Security

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

UNIT I

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

UNIT II

Access Control Models: Discretionary, mandatory, roll-based and task-based models, unified models, access control algebra, temporal and spatio-temporal models.

Security Policies: Confidentiality policies, integrity policies, hybrid policies, non-interference and policy composition, international standards.

UNIT III

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

UNIT IV

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

UNIT V

Operating Systems Security: Security Architecture, Analysis of Security in Linux/Windows.

Database Security: Security Architecture, Enterprise security, Database auditing.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FUNDAMENTTALS OF ARTIFICIAL INTELLIGENCE
Course Code:GR20A3144   **L/T/P/C:** 3**/ 0/ 0/3**
III Year II Semester

COURSE OBJECTIVES:
1. To understand the Applications AI and its importance
2. To introduce basic AI algorithms to solve problems for a given case study
3. To describe various knowledge representation techniques
4. To understand the concepts of planning techniques
5. To explore probabilistic reasoning and expert system techniques

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

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

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

UNIT III
Search techniques: Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.

Constraint satisfaction problems: Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

UNIT IV

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

UNIT V

Probabilistic reasoning: Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Planning Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.

Expert Systems: Representing and using domain knowledge, expert system shells, and knowledge acquisition.

TEXTBOOKS:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach

2. Artificial Intelligence, Russel, Pearson

REFERENCES:

1. Artificial Intelligence, Ritch & Knight, TMH

2. Logic &Prolog Programming, Saroj Kaushik, New Age International

3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI

4. Expert Systems, Giarranto, VIKAS

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FINANCIAL AND COST ACCOUNTING

Course Code:GR20A3145   **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Objectives:
1. To understand the accounting concepts & conventions.
2. To acquaint with the accounting process.
3. To understand the financial statements, accounting standards, cash flow and funds flow techniques.
4. To acquaint with the different types of costing and cost management
5. To explain about company accounts and audit reports

Course Outcomes:

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

UNIT I

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

UNIT II

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

UNIT III

Financial Statements: Form and Contents of Financial Statements, Analyzing and Interpreting Financial Statements, Accounting Standards.

Cash Flow and Fund Flow Techniques: Introduction, how to prepare, difference between them.

Class Discussion: Corporate Accounting Fraud- A Case Study of Satyam

UNIT IV

Costing Systems: Elements of Cost**,** Cost Behavior, Cost Allocation, OH Allocation**,** Unit Costing, Process Costing, Job Costing**,** Absorption Costing, Marginal Costing, Cost Volume Profit Analysis**,** Budgets**,** ABC Analysis.

Class Discussion: Application of costing concepts in the Service Sector

UNIT V

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

Home Assignment:

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

Further, the topic for class discussion will be mentioned beforehand and students should be prepared to discuss these topics in class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Corporate Accounting Fraud: A Case Study of Satyam
2. Topic: Application of costing concepts in the Service Sector

Textbooks:

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

Case Study Materials: To be distributed for class discussion

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

Course Code: GR20A3146   **L/T/P/C:** 4/ 0/ 0/3
III Year II Semester

Course Objectives:
1. Use the best practices of writing and public speaking in real life scenarios
2. Recognize the importance of diversity in workplace
3. Recognize the attributes needed to function and grow in a corporate environment
4. Understand the importance of emotional intelligence in personal and professional lives
5. Understand the importance of corporate social responsibility (CSR)

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

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

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

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

UNIT IV
  A) Corporate Social Responsibility (CSR)
  i)   Importance of corporate social responsibility (CSR)

ii)   The Need to conduct CSR activities
iii) Stories of corporate social responsibility

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

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

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

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

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

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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MODERN DAY ROBOTICS AND ITS INDUSTRIAL APPLICATIONS
(Professional Elective –II)

Course Code:GR20A3147   **L/T/P/C:** 3/ 0/ 0/3
III Year II Semester

Course Objectives:
1. To understand knowledge about the modern-day robotics
2. To understand the computer vision in robotics
3. To learn the basic knowledge of Artificial Intelligence
4. To acquire knowledge on cloud computing and its applications in robotics.
5. To acquire knowledge on big data, data science and python

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

UNIT I
Introduction to Modern Day Robotics and their industrial applications: Industry 4.0 Concept: Background and Overview-Industry 4.0 technologies: implementation patterns in manufacturing companies-Evolution of Industrial Robots and their Applications-Advancements in Robotics and Its Future Uses-Types of robotics in various fields for applications.
Technologies essential for Cognitive Robotics: Computer systems and Technologies relevant to modern day robotics-Robotic Process Automation: Overview of RPA and its applications- RPA, AI, and Cognitive Technologies for Leaders-Introduction to Robotics: Analysis, Control, Applications

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

Build advanced computer vision applications using machine learning and deep learning techniques- Machine Vision Applications-
Application areas for vision systems-Robot inspection case study-Autonomous driving using 3D imaging case study.

UNIT III
AI in the context of Cognitive Robotics and Role of AI in Robotics: Foundation for Advanced Robotics and AI- A Concept for a Practical Robot Design Process- Demo to train A Robot Using AI - Deep learning core applications-Deep learning business applications
Data Science and Big Data in the context of Cognitive Robotics: Cognitive Technologies: The Next Step Up for Data and Analytics in robotics-Cognitive Deep Learning Technology for Big Data Cognitive Assistant Robots for Reducing Variability in Industrial Human-Robot Activities
Artificial Intelligence and Robotics - The Review of Reliability Factors Related to Industrial Robots -Failure analysis of mature robots in automated production- Data Analytics for Predictive Maintenance of Industrial Robots - Failure Is an Option: How the Severity of Robot Errors Affects Human-Robot Interaction

UNIT IV
Concepts of Cloud computing, cloud platforms and it applications in Robotics: Learning Cloud Computing: Core Concepts - Cloud Computing: Private Cloud Platforms -Robot as a Service in Cloud Computing -Cloud Computing Technology and Its Application in Robot Control - A Comprehensive Survey of Recent Trends in Cloud
Robotics Architectures and Applications - Google's cloud robotics and high computing needs of industrial automation and systems-The role of cloud and opensource software in the future of robotics-The Power of Cloud Robotics by Robotics Industry Association

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MODERN WEB APPLICATIONS

(Professional Elective-II)

Course Code:GR20A3148 **L/T/P/C:** 3/ 0/ 0/3
III Year II Semester

Course Objectives:
1. Enable students to develop modern web application by leveraging latest technologies.
2. Build strong foundation in students making them job ready as per industry requirements.
3. Enable them to learn new technologies by applying foundation paradigms.
4. Building strong expertise to develop end to end application - web frontend and backend development.
5. Understand the notions of Web servers and Web Application Servers, Design Methodologies with concentration on Object-Oriented concepts, Client-Side.

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

UNIT I

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

UNIT II

Hyper Text Mark Up Language: - Languages used for website development, HTML5: basic tags, formatting tags, Adding images, Lists, Embedding multimedia in Web pages, Inserting tables, Internal and External Linking, Frames, Forms

Cascading Style Sheets (CSS3): Basics of Cascading Style sheets, Advantages of CSS, External Style sheet, Internal style sheet, Inline style sheet, CSS Syntax, color, background, Font, images

UNIT III

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

UNIT IV

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

UNIT V

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

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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA MINING AND ANALYTICS
(Professional Elective –II)
Course Code:GR20A3149   **L/T/P/C:** 3/ 0/ 0/3
III Year II Semester

Course objectives:
1. Acquire knowledge on various data mining functionalities and pre-processing techniques.
2. Identify appropriate data mining algorithms for solving practical problems.
3. Develop skills of using data mining software for solving practical problems
4. Understand and apply several statistical analysis techniques: regression, ANOVA, data reduction
5. Explore the recent trends in data analytics.

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

UNIT I

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

UNIT II

Data preprocessing: Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies, Installing Weka 3 Data Mining System, Experiments with Weka - filters, discretization

Data mining knowledge representation: Task relevant data, Background knowledge, Representing input data and output knowledge, Visualization techniques

Attribute-oriented analysis: Attribute generalization, Attribute relevance, Class comparison, Statistical measures

UNIT III

Data mining algorithms - **Association rules:** Motivation and terminology, Example: mining weather data, Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis

Data mining algorithms - Classification: Basic learning/mining tasks, Inferring rudimentary rules: 1R, algorithm, Decision trees, covering rules

Data mining algorithms – Prediction: The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbor), linear models

UNIT IV

Descriptive analytics: Data Modeling, Trend Analysis, Simple Linear Regression Analysis

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

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

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

UNIT V

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

CourseCode:GR20A3150   **L/T/P/C :0/ 0/ 1/ 1**
III Year II Semester

Course Objectives:
1. To learn various networking technologies
2. To appropriately use network configuration commands
3. To learn the routing techniques
4. To learn different encryption techniques
5. To learn client/server models using sockets

Course Outcomes:

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

LIST OF EXPERIMENTS:

TASK 1:

Study of Different types of cables and network IP

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

TASK 3:
Study and practice the basic network configuration commands
TASK 4:
Implement on a data set of characters the three CRC polynomials

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

TASK 6:

Implement Dijkstra 's algorithm to compute the Shortest path through a graph.
TASK 7:
Implement DES Encryption and Decryption

TASK 8:

Implement the AES Encryption and decryption

TASK 9:

Implement RSA Encryption Algorithm

TASK 10:

Study of Socket Programming and Client – Server model.

TASK 11:

Write a socket program (using c) for interaction between server and client processes using

Unix Domain sockets.

TASK 12:

Write a socket program (using c) for interaction between server and client processes using

Internet Domain sockets.

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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE LAB

Course Code:GR20A3151   **L/T/P/C: 0/ 0/ 1/1**
III Year II Semester

Course Objectives:
1. To understand the basic concepts in AI
2. To apply basic principles of various AI search techniques
3. To explore various knowledge representation techniques in AI
4. To explore on expert systems
5. To explore AI classification algorithms

Course Outcomes:
1. Implement practical approach to solve and apply various search strategies
2. Demonstrate the adversial search techniques
3. Design the use cases for knowledge representation techniques and predicate logic
4. Demonstrate expert systems by using domain knowledge
5. Apply AI classification techniques for classifying the data

TASK-1:
(a) Write a program to solve any problem using depth first search.
 (b) Write a program to solve any problem using best first search algorithm.

TASK-2:
(a) Write a program to implement depth limit search.
(b) Write a program to solve 4-Queen's problem.

TASK-3:
Write a program to solve travelling salesman problem.

TASK-4:
Write a program to implement A*algorithm.

TASK-5:
Write a program to implement heuristic approach.

TASK-6:
Write a program to implement tic_tac_toe with min_max algorithm.

TASK-7:
Solve the logic programming for the mathematical expression using necessary libraries
Hint: pip install kanren, sympy.

TASK-8:
Demonstrate knowledge representation for the following using open source tools:
a. Ram likes mango. b. Seema is a girl. c. Bill likes Cindy. d. Rose is red. e. John owns gold

TASK-9:

Simulate use cases in predicate logic by using open source tools.

TASK-10:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

TASK-11:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

TASK-12:
Write a program to implement Bayesian network.

TEXT BOOKS:

1. Artificial Intelligence-A modern approach, Staurt Russel and peter Norvig, 1998, PHI
2. Artificial Intelligence, Elaine Rich & Kevin Knight, TMH Publication.

REFERENCE BOOKS:
1. Introduction to AI & Expert Systems, Dan W. Patterson, PHI Publication

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA MINING AND ANALYTICS LAB

Course Code:GR20A3152   **L/T/P/C**: 0/ 0/ 1/1
III Year II Semester

Course Objectives:
1. To demonstrate the basic concepts and techniques of Data Mining using WEKA machine learning toolkit
2. Identify the use of attribute relation file format table for data analysis.
3. Acquire knowledge on various pre-processing techniques.
4. Obtain the skill in implementing various data mining functionalities.
5. Implement appropriate mining algorithm using Weka tool to solve real time problems.

Course Outcomes:
1. Learn the concept of creating database tables in attribute relation file format(.arff).
2. Evaluate and implement the methods to to facilitate the knowledge discovery
3. Apply pre-processing statistical methods for any given rawdata.
4. Assess raw input data and process it to provide suitable input for a range of data mining algorithms
5. Acquire skills to effectively apply data mining techniques to solve real business problems

Implement the following Tasks using Weka Tool:

Task-1: Loading dataset in WEKA
Load the Weather dataset in weka tool and answer the following questions
a. How many instances are there in the dataset?
b. State the names of the attributes along with their types and values. What is the class attribute?
c. How will you view the instances in the dataset? How will you save the changes?
d. What happens with the Visualize All button is pressed?
e. Press the Visualize tab to view the Visualizer panel. Select one panel in the Visualizer and experiment with the buttons on the panel and report the findings.

Task-2: Using filters and statistics
a. Create a data set Student.arff with required data.
b. Apply the below unsupervised attribute filter
   i)Add
   ii) Remove
   iii) Discretize and
   iv) normalize for student dataset.
c) report the usage of filters and Undo the effect of the filter.

Task-3: Using Weka to determine Association rules
Perform the following tasks:
   a) Create a data set Employee.arff by adding required data fields.
   b) Apply Association rule mining on dataset Employee.arff (Use Apriori Algorithm)
   c) List the rules that were generated.
   d) How are their support and confidence values related?

Task-4: Perform classification and Build a Decision Tree using the Weka toolkit
Load the Credit dataset and perform the following tasks:
   a) Create the Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.
   b) Train a Decision Tree again using cross-validation and report your results. Does your accuracy increase/decrease? Why?
   c) Try reduced error pruning for training your Decision Trees using cross-validation and report the Decision Tree you obtain?
   d) How can you convert a Decision Trees into "if-then-else rules". Report the rule obtained by training PART and one R classifier. Rank the performance of j48, PART and one R.

Task-5: perform classification and make predictive analysis using naïve bayes in WEKA
Perform the following tasks:
   a) Create a data set student.arff by adding required data fields.
   b) Demonstrate Naïve Bayes classifier on Student.arff
   c) Using Naïve Bayes classifier make a prediction of the class Buy_computer (YES,NO) to which the below cases belongs to:
      X1 = (age='31..40', income='high', student = 'yes', status='single')
      X2 = (age='<=30', income='high', student = 'yes', status='married')
      X3 = (age='>40, income='medium', student = 'no', status='married')

Task-6: Performing clustering using the data mining toolkit
Perform the following tasks:
   a) Load the 'iris.arff' data set in Weka.
   b) Run the Simple K-Means clustering algorithm on the dataset and answer the following
      i)   How many clusters are created?
      ii)   What are the number of instances and percentage figures in each cluster?
      iii)   Tabulate the characteristics of the centroid of each cluster.
   c) Visualize the results of this clustering (let the X-axis represent the cluster name, and the Y-axis represent the instance number)

Task-7: Classification by logistic regression
Investigate two-class classification by regression
   a) Open file diabetes.arff
   b) Apply logistic regression for the given data set and report the classifier output
   c) Visualize classifier errors for this model

Task-8: Classification by linear regression
Perform the following tasks:
   a) Open file diabetes.arff

b) Use the NominalToBinary attribute filter to convert to numeric
   – but first set Class: class (Nom) to No class, because attribute filters do not operate on the   class value
c) Choose functions>LinearRegression and Run
d) Visualize classifier errors for this model

Task-9: Pre-processing the dataset using knowledge flow
Perform the following tasks:
a) Create a data set Weather.arff with required fields.
b) Using knowledge flow interface apply preprocessing techniques and attribute selection on dataset Weather.arff
c) Normalize Weather Table data using Knowledge Flow.
d) report the result using arff saver component in knowledge flow

Task-10: Mining Association Rule with WEKA Explorer on the real-world dataset.
Perform the following tasks:
   a) Load the Supermarket Dataset for market-basket analysis
   b) Run Apriori on this data with default settings.
   c) Interpret the rules that are generated.
   d) Comment and prepare brief report on the rules

Task-11: perform multi-class classification using j48 classifier
Perform the following tasks:
   a) Load the hypothyroid Dataset from weka datasets
   b) Apply j48 classifier and report classifier output
   c) Visualize the decision tree model

Task-12: Making predictions on new data using Weka
perform Model fitting using weka toolkit
   a) Create animal.arff dataset with required data fields and class label as mammal
   b) Train the dataset using j48 classifier model and report the result
   c) Create a test dataset and make output predictions by applying the trained model

TEXT BOOKS:

1. Data Mining– Concepts and Techniques - Jiawei Han & MichelineKamber, Morgan Kaufmann Publishers, Elsevier, Second Edition,2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

REFERENCE BOOKS:

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

IV YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
USABILITY DESIGN OF SOFTWARE APPLICATIONS

Course Code: GR20A4072   **L/T/P/C: 2/1/0/3**

IV Year I Semester

Course Objectives:

1. To sensitize the students to the fundamentals of User Centered Design

2. To learn the knowledge of heuristic evaluation.

3. To learn User Experiences and their relevance and contribution to businesses

4. To Familiarize them to the facets of User Experience (UX) Design, particularly as applied to the digital artefacts

5. To understand the development of prototypes for their project.

Course Outcomes:

1. Understand the fundamentals of User Centered Design

2. Use heuristic evaluation practically with examples.

3. Understand the User Experiences and their relevance and contribution to businesses

4. Analyze the facets of User Experience (UX) Design, particularly as applied to the digital artefacts

5. Understand the development of prototypes for their project

UNIT I

Introduction to User Centered Design, Aspects of User Centered Design **Product Appreciation Assignment** – Evaluating the product from user centered design aspects such as functionality, ease of use, ergonomics, aesthetics.

UNIT II

Heuristic Evaluation: 10 Heuristic Principles, Examples, Heuristic Evaluation: Group Assignment initiation (Website and App), Evaluation for key tasks of the app or website for heuristic principles, severity, recommendations.

UNIT III

UX Research: Understanding users, their goals, context of use, environment of use.

Research Techniques: Contextual Enquiry, User Interviews, Competitive Analysis for UX,

Scenarios and Persona Technique, Presentation of Personas for the group project

UNIT IV

Design Thinking Technique, Discovery and brainstorming, Concept Development, Task flow

detailing for the Project

UNIT V

Prototyping Techniques, Paper, Electronic, Prototyping Tools, Review and feedback

TEXTBOOKS:

1. Interaction Design: Beyond Human-Computer Interaction, 4th Edition, Jenny Preece, Helen Sharp and Yvonne Rogers

2. About Face, 4th Edition, Alan Cooper and Robert Reimann

REFERENCES:

1. Observing the User Experience, Second Edition: A Practitioner's Guide to User Research. Elizabeth Goodman, Mike Kuniavsky, Andrea Moed

2. The Elements of User Experience: User-Centered Design for the Web and Beyond. 2nd Edition, Jesse James Garrett

3. Understanding Design Thinking, Lean, and Agile - Jonny Schneider

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FINANCIAL MANAGEMENT

Course Code:GR20A4073   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Course Objectives

1. To understand the goals of financial management and time value of money.
2. To describe the risk, return and valuation of securities.
3. To comprehend operating, financial leverage and cost of capital.
4. To acquaint with capital budgeting techniques.
5. To describe the role of short-term financial management.

Course Outcomes:
1. Apply future value and present value concepts to single sums, mixed streams, and annuities.
2. Apply the concept of risk, its measurement for single assets and portfolios and bond valuation.
3. Apply techniques for estimating the cost of each component of the cost of capital and the concepts of financial and operating leverage.
4. Identify relevant cash flows for capital budgeting projects and apply various methods to analyze projects.
5. Apply strategies and techniques used to manage cash, accounts receivable and working capital.

UNIT I
Introduction: Introduction to Financial Management - Goals of the firm - Financial Environments.

Time Value of Money: Simple and Compound Interest Rates, Amortization, Computing more than once a year, Annuity Factor.

UNIT II
Risk & Return: Defining Risk and Return, Using Probability Distributions to Measure Risk, Attitudes Toward Risk, Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model (CAPM)

Valuation of Securities: Bond Valuation, Preferred Stock Valuation, Common Stock Valuation, Concept of Yield and YTM.

UNIT III
Operating & Financial Leverage: Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study

Cost of Capital: Concept, Computation of Specific Cost of Capital for Equity - Preference – Debt, Weighted Average Cost of Capital – Factors affecting Cost of Capital

UNIT IV
Capital Budgeting: The Capital Budgeting Concept & Process - An Overview, Generating Investment Project Proposals, Estimating Project, After Tax Incremental Operating Cash Flows, Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods

UNIT V

Working Capital Management: Overview, Working Capital Issues, Financing Current Assets (Short Term and Long Term- Mix), Combining Liability Structures and Current Asset Decisions, Estimation of Working Capital.

Cash Management: Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring.

Accounts Receivable Management: Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period.

Text Book

1. Chandra, Prasanna - Financial Management - Theory & Practice, Tata McGraw Hill.
2. Khan and Jain, Financial Management - Tata McGraw Hill

References Books :

1. Srivastava, Misra: Financial Management, OUP
2. Van Horne and Wachowicz: Fundamentals of Financial Management, Prentice Hall/ Pearson Education.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HUMAN RESOURCE MANAGEMENT

Course Code: GR20A4074   **L/T/P/C: 3/0/0/3**
IV Year I Semester

Course Objectives
1. To provide students the insights of human resource management concepts, challenges, and practices.

2. The student will be able to understand human resource system design like HR profession, HR department and bring awareness on human resource information systems.

3. To provide the student with a clear understanding on various functional areas of HRM

4. To provide the student with a clear understanding of human resource planning
5. This course provides the inputs related to strategic management of human resources and human resource management in service sector.

Course Outcomes:
1. The students understand the significance of human resource management concepts and challenges, practices in their profession of HR.
2. The students will be acquainting with the human resource system design and provide awareness on human resource information systems.
3. The student will be able to understand various functional areas of HRM and acquire knowledge related to compensation, employee relations, training and development and payroll system.
4. The student will obtain expertise in designing the human resource planning and related to succession planning.
5. The student will be able to realize the concepts related to strategic management of human resources and human resource management in service sector.

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

UNIT II
Human Resource System Design: HR Profession, and HR Department, Line Management Responsibility in HRM, Measuring HR, Human resources accounting and audit; Human resource information system

UNIT III
Functional Areas of HRM: recruitment and staffing, benefits, compensation, employee relations, HR compliance, organizational design, training and development, human resource information systems (H.R.I.S.) and payroll.

UNIT IV
Human Resource Planning: Demand Forecasting, Action Plans– Retention, Training, Redeployment & Staffing, Succession Planning

UNIT V
Strategic Management of Human Resources: SHRM, relationship between HR strategy and overall corporate strategy, HR as a Factor of Competitive Advantage, Managing Diversity in the Workplace

Human Resource Management in Service Sector- Special considerations for Service Sector including

- Managing the Customer – Employee Interaction
- Employee Empowerment and Customer Satisfaction
- Service Failure and Customer Recovery – the Role of Communication and Training
- Similarities and Differences in Nature of Work for the Frontline Workers and the Backend
- Support Services - Impact on HR Practices Stressing Mainly on Performance
- Flexible Working Practices – Implications for HR

Home Assignment:

Further, the topic for class discussion will be mentioned beforehand. Students are required to meet in groups before coming to class and prepare for the topic to be discussed. Instructor may ask the student groups to present their analysis and findings to the class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Understanding the issues and challenges involved in managing a diverse workforce
2. Topic: Is The Only Purpose of a Corporation to Maximize Profit?
3. Topic: Similarities and Differences in Manufacturing and Service Sector - Impact on HR Practices

Text Books:

1. Gary Dessler: Human Resource Management, 10/e, Pearson, 2009
2. K. Aswathappa: Human Resource and Personnel Management, TMH, 2009.
3. Subbarao: Human Resource Management, HPIL2009
4. David A. Decenzo & Stephen P. Robbins: Fundamentals of Human Resource Management, 8/e, Wiley, 2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COGNITIVE SCIENCE AND ANALYTICS
(Professional Elective-III)

Course Code:GR20A4075   **L/T/P/C:2/1/0/3**

IV Year I Semester

Course Objectives:

1. To Learn Foundational areas of analytics and cognitive science.
2. To Understand the Data theory and taxonomy of data
3. To learn the Multivariate data analytics and cognitive analytics
4. To relate the concepts of Artificial intelligence and machine learning with cognitive science
5. To understand the Approach and methodology of analytics.

Course Outcomes:

1. Understand the Foundational areas of analytics and cognitive science.
2. Interpret the Data theory and taxonomy of data
3. Analyse the Multivariate data analytics and cognitive analytics
4. Relate cognitive analytics with Artificial intelligence and machine learning
5. Apply the Approach and methodology of analytics.

UNIT I

Introduction to Analytics: Definition, Description & Evolution of Analytics, History of Analytics, and Applicability of Analytics with development of Technology and Computer, How Analytics entered mainstream.

Concepts of Analytics: Various overlapping concepts and fields of Analytics such as Data Mining, Machine Learning, Artificial Intelligence and Simulation.

Emerging Areas in Analytics: Understanding of emerging research areas of Analytics: Mathematical programming, Evolutionary computation, Simulation, Machine learning/data mining, Logic-based models, and, Combinations of categories

Overview of Analytics: Descriptive Analytics Covering Exploratory Data Analysis & Basic of Statistics, Diagnostics Analytics: BI/Analysis, Trend, Pattern, Simultaneous Relationship, Predictive Analytics: Cause-Effect Relationship and Futuristic prediction in terms of probabilities, Continuous & Categorical Predictions, Simulation, Optimization, Multi-faceted Intelligent Technology driven Analytics combining Machine Intelligence with

Human Brain Processing Abilities

Introduction & Evolution of Cognitive Science: Introduction to the study of cognitive sciences, Brief history of cognitive science development and Methodological concerns in philosophy

UNIT II

Understand Brain and Sensory Motor Information: Fundamentals of Neuro Science, Processing of sensory information in the brain, and Brain Imaging Elements.

Language & Linguistic Knowledge: Background and details of Syntax & Semantics, Understanding of Generative Linguistic.

Memory & Processing: Theory of Information Processing, Fundamentals of Short term Memory.

Data as a whole: Understanding of Data as a whole for distinguishing and relating various types of data and Categorization of Data: Structured, Unstructured Data, Quantitative & Qualitative Data.

Views of Data: Understanding Data as an interdisciplinary framework for learning methodologies: covering statistics, neural networks, and fuzzy logic

UNIT III

Measurement & Scaling Concepts: Measurement of variables and commonly used statistical tools: Number of procedures for measurement of the variables,

Categorization procedures, Scale construction procedures and Techniques of data processing for qualitative as well as quantitative data;

Various types of Scales: Nominal, Ordinal, Interval & Ratio Scales

Overview: High level overview of Categorization of Techniques: Inter-dependence Relationship Techniques and Dependence Relationship Techniques

Overview of Commonly Used Inter-dependence Techniques: Factor Analysis, Principal Component Analysis (PCA), Cluster Analysis

Overview of Commonly Used Dependence Techniques: Regression, Logistic Regression.

UNIT IV

Analytics Value Chain &Application of Analytics across Value Chain:

Basic statistical concepts such as Descriptive & Diagnostics statistics, concept of random

variables, discrete and continuous random variables, confidence interval, hypothesis testing, analysis of variance and correlation.

Predictive analytics techniques such as multiple linear regression, logistic regression, decision tree learning Clustering and forecasting techniques.

Prescriptive analytics Concepts: linear programming, integer programming, goal programming & stochastic models

Cognitive analytics Concepts: Text Analytics, Learning Analytics, Data Mining, Cognitive Systems, Cognitive Computing, Learning Data Science, Machine Learning, Big data Analytics and Business analytics

Fundamentals of Artificial Intelligence: Various areas of AI:

Knowledge: Text Analytics, Topic Modelling, Natural Language Processing (NLP), Natural Language Generation (NLG), Natural Language Understanding (NLU), Named-entity recognition (NER)

Perception: Image Analytics, Video Analytics & Audio Analytics

Memory: Cognitive Engagement: BOTs, Virtual & Digital Assistants, Augmented Reality, Virtual Reality, Mixed Reality

Learning: Intelligent Automation

UNIT V

Spectrum of AI

Reactive Machine: Low memory, works on Known rules, such as Object Detection/Games/Recommendations specific to known Rules

Limited Memory: Memory used to learn and improve continuously such as Most ML Models, Automated Vehicles

Theory of Mind: Machine Understands and responds such as BoTs/Virtual/Digital Assistants

Self-Aware: Human like intelligence such as Super Robots in Space etc.

World Standard Methodology: CRISP-DM Methodology, SEMMA Methodology

Real Life Work around Multi-Variate Analytics: A few Selected Commonly used Techniques: Predictive & Classification Models, Regression, Clustering

Real Life Work around Artificial Intelligence, Machine Learning and Deep Learning: A few Selected Commonly used Techniques & Algorithms: ANN (Artificial Neural Network), CNN (Convolutional Neural Network), RNN (Recurrent Neural Network);

RN Architecture: LSTM, Bidirectional LSTM, Gated Recurrent Unit (GRU), CTRNN (Continuous Time RNN) CNN Architectures: VGG16, Alexnet, InceptionNet, RestNet, Googlenet.

Object Detection models: R-CNN, Fast R-CNN, Faster R-CNN, cascade R-CNN. Mask RCNN, Single Shot MultiBox Detector (SSD), You Only Look Once (YOLO), Single-Shot Refinement Neural Network for Object Detection (RefineDet), Retina-Net, **Autoencoders:** Denoising Autoencoder, GAN. **Transformers:** Attention based Encoder and Decoder: Eg-BERT(Bidirectional Encoder Representations from Transformers), Generative Pretrained Transformers GPT-3, GPT-2, BERT, XLNet, and RoBERTa

TEXTBOOKS:

1. Hall, P., Phan, W., & Whitson, K. (2016). Evolution of Analytics. O'Reilly Media Incorporated.
2. Cognitive Science: An Introduction to the Science of the Mind by José Luis Bermúdez
3. Cognitive Computing and Big Data Analytics by Judith S. Hurwitz (Author), Marcia Kaufman (Author), Adrian Bowles (Author)
4. Cognitive Science and Artificial Intelligence Advances and Applications: Authors: Gurumoorthy, Sasikumar, Rao, B Narendrakumar, Gao, Xiao-Zhi
5. Cherkassky, V., & Mulier, F. M. (2007). Learning from data: concepts, theory, and methods. John Wiley & Sons.
6. The visual display of Quantitative Information: Edward Tufte, Graphics Press, 2001.
7. Scaling Measurement and Statistical Tools for Extension Workers by Krunal D. Gulkari, Hemant V. Borate , Mayur S. Shitap , 2016.
8. Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). Multivariate data analysis. Englewood Cliff. New Jersey, USA, 5(3), 207-2019.
9. Kumar, U. D. (2017). Business analytics: The science of data-driven decision making. Wiley.
10. Özköse, H., Arı, E. S., & Gencer, C. (2015). Yesterday, today and tomorrow of big data. Procedia-Social and Behavioral Sciences, 195, 1042-1050.
11. Gudivada, Venkat N., M. T. Irfan, E. Fathi, and D. L. Rao. "Cognitive analytics: Going beyond big data analytics and machine learning." In Handbook of statistics, vol. 35, pp. 169-205. Elsevier, 2016.

12. . Kao, A., & Poteet, S. R. (Eds.). (2007). Natural language processing and text mining. Springer Science & Business Media.

13. Demystifying Artificial intelligence: Simplified AI and Machine Learning concepts for Everyone (English Edition) Paperback – Import, 5 January 2021by Prashant Kikani

14. Kelleher, J. D., Mac Namee, B., & D'arcy, A. (2020). Fundamentals of machine learning for predictive data analytics: algorithms, worked examples, and case studies. MIT press.

15. Goodfellow, Ian, Yoshua Bengio, Aaron Courville, and Yoshua Bengio. Deep learning. Vol. 1, no. 2. Cambridge: MIT press, 2016.

16. Practical Deep Learning for Cloud, Mobile, and Edge: Real-World AI & Computer-Vision Projects Using Python, Keras & TensorFlow 1st Edition,

17. Conversational Chatbots for Analytics Third Edition by Gerardus Blokdyk

18. BORNET, P. B. (2020). Intelligent automation: Welcome to the world of hyperautomation. World Scientific Publishing Company.

19. Maimon, O., & Rokach, L. (Eds.). (2005). Data mining and knowledge discovery handbook.

20. Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). Multivariate data analysis. Englewood Cliff. New Jersey, USA, 5(3), 207-2019.

21. Zhang, C., & Ma, Y. (Eds.). (2012). Ensemble machine learning: methods and applications. Springer Science & Business Media.

REFERENCES:

1. **Seminal Paper:** The evolution of analytics and implications for industry and academic programs MR Bowers, JD Camm, G Chakraborty - Interfaces, 2018 - pubsonline.informs.org.

2. **Cognitive Analytics:** Concepts, Methodologies, Tools, and Applications (4 Volumes) Information Resources Management Association (USA)A first course in Probability, S. M. Ross, Prentice Hall.

3. **Seminal paper:** Shneiderman, B. (2003). The eyes have it: A task by data type taxonomy for information visualizations. In The craft of information visualization (pp. 364-371).

4. **Morgan Kaufmann.C:** The Complete Reference, (Fourth Edition), Herbert Schildt, McGraw Hill.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTRODUCTION TO IOT

(Professional Elective-III)

Course Code:GR20A4076   **L/T/P/C:2/1/0/3**

IV Year I Semester

Course Objectives:

1. Expose the basics of IoT and its applications in various domains.

2. Explore to IoT reference architecture and edge computing.

3. Learn about sensors, Transducers and industrial IoT systems.

4. Learn about various networking technologies and protocols.

5. Impart the knowledge of Data Processing and Storage.

Course Outcomes:

1. Understand building blocks of IoT and application areas of IoT.

2. Explore to IoT architectures and Iot system encompassing the edge.

3. Familiarize with sensors, Transducers for IoT.

4. Identify the IoT networking components with respect to OSI layer.

5. Familiarize the data processing techniques of IoT.

UNIT I

Introduction to IoT and Use cases: Understanding basic concepts of IoT, Consumer IoT vs Industrial Internet, Fundamental building blocks, Use Cases of IoT in various industry domains,

UNIT II

Architecture: IoT reference architectures, Industrial Internet Reference Architecture, Edge Computing, IoT Gateways, Data Ingestion and Data Processing Pipelines, Data Stream Processing

UNIT III

Sensors and Industrial Systems: Introduction to sensors and transducers, integrating sensors to sensor processing boards, introduction to industrial data acquisition systems, industrial control systems and their functions

UNIT IV

Networking and Communication for IoT: Recap of OSI 7 layer architecture and mapping to IoT architecture, Introduction to proximity networking technologies (ZigBee, Bluetooth, Serial Communication), Industrial network protocols (Modbus, CANbus), Communicating with cloud applications (web services, REST, TCP/IP and UDP/IP sockets, MQTT, WebSockets, protocols. Message encoding (JSON, Protocol Buffers)

UNIT V

IoT Data Processing and Storage: Time Series Data and their characteristics, time series databases, basic time series analytics, data summarization and sketching, dealing with noisy and missing data, anomaly and outlier detection,

TEXTBOOKS:

1. The Internet of Things, Samuel Greengard, MIT Press Essential Knowledge Series,

REFERENCE BOOKS / LINKS:

1. Industrial Internet Reference Architecture - http://www.iiconsortium.org/IIRA.htm
2. World Economic Forum Report on Industrial Internet of Things - https://www.weforum.org/reports/industrial-internet-things
3. 50 Sensor Applications for a Smarter World - http://www.libelium.com/resources/top_50_iot_sensor_applications_ranking/
4. Visualizing Data-Exploring and Explaining Data with the Processing Environment, By Ben Fry, Publisher: O'Reilly Media
5. Raspberry Pi Computer Architecture Essentials, by Andrew K Dennis
6. Getting Started with Arduino, M. Banzi, O Reilly Media
7. GSMA IoT Security Guidelines & Assessment - https://www.gsma.com/iot/future-iot-networks/iot-security-guidelines/

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CRYPTOLOGY
(Professional Elective-III)

Course Code: GR20A4077   **L/T/P/C: 2/1/0/3**
IV Year I Semester

Course Objectives:
1. Emphasizes on how to apply and implement cryptography in practice;
2. Learning the fundamental principles and theories underlying cryptographic algorithms including the mathematical foundations of cryptography;
3. Learning to apply cryptography to solving data security problems;
4. Introduce the concepts how cryptographic algorithms and protocols work and how to use them;
5. Provides a broad view of security with practical applications of cryptography to data security.

Course Outcomes:

1. Understand various Cryptographic Techniques
2. Apply various public key cryptography techniques
3. Implement Hashing and Digital Signature techniques
4. Understand the various Security Applications
5. Implement system level security applications

UNIT I
Introduction to Cryptography: Elementary number theory, Pseudo-random bit generation, Elementary cryptosystems.
Basic security services: confidentiality, integrity, availability, non-repudiation, privacy

UNIT II
Symmetric key cryptosystems: Stream Cipher: Basic Ideas, Hardware and Software Implementations, Examples with some prominent ciphers: A5/1, Grain family, RC4, Salsa and ChaCha, HC128, SNOW family, ZUC; Block Ciphers: DES, AES, Modes of Operation; Hash Functions; Authentication

UNIT III
Public Key Cryptosystems: RSA, ECC; Digital signatures

UNIT IV
Security Applications (Selected Topics): Electronic commerce (anonymous cash, micro-payments), Key management, Zero-knowledge protocols, Cryptology in Contact Tracing Applications, Issues related to Quantum Cryptanalysis

UNIT V

Introductory topics in Post-Quantum Cryptography, Cyber Supply Chain Risk Management, C-SCRM, Federal Cyber security and Privacy Professionals Forum.

TEXTBOOKS:
1. Cryptography, Theory and Practice. D. R. Stinson, CRC Press.
2. Handbook of Applied Cryptography. A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone, CRC Press

REFERENCE BOOKS:

1. Refer to https://csrc.nist.gov/projects/post-quantum-cryptography unit 5
2. https://csrc.nist.gov/Projects/cyber-supply-chain-risk-management unit 5
3. (https://csrc.nist.gov/Projects/forum) unit 5
4. A course in number theory and cryptography. N. Koblitz:, GTM, Springer.
5. Cryptography and Network Security. W. Stallings, Prentice Hall.
6. Security Engineering, R. Anderson, Wiley
7. RC4 Stream Cipher and Its Variants. G. Paul and S. Maitra: CRC Press, Taylor
8. & Francis Group, A Chapman & Hall Book, 2012
9. Design & Cryptanalysis of ZUC - A Stream Cipher in Mobile Telephony. C. S. Mukherjee, D. Roy, S. Maitra, Springer 2020
10. Contact Tracing in Post-Covid World - A Cryptologic Approach. P. Chakraborty, S. Maitra, M. Nandi, S. Talnikar, Springer 2020
11. Presskil Lecture notes: Available online: http://www.theory.caltech.edu/~preskill/ph229/

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

Course Code:GR20A4078   **L/T/P/C: 2/1/0/3**

IV Year I Semester

Course Objectives:

1. To introduce basic concepts of Quantum Information
2. To explore thorough understanding Quantum Algorithms
3. To introduce Quantum Random Number Generation
4. To study the fundamentals of key distribution techniques in Quantum Computing
5. To study the concepts of post quantum cyber techniques

Course Outcomes:

1. Understand the fundamentals of Quantum Computing and Quantum Information Principles.
2. Apply various quantum algorithms in different cryptosystems
3. Explore the design issues of quantumness and its applications
4. Perform Quantum key distribution techniques in Cryptosystems
5. Understand the fame work of post quantum cryptosystem.

UNIT I

Introduction to Quantum Information: States, Operators, Measurements, Quantum Entanglement: Quantum Teleportation, Super-dense coding, CHSH Game, Quantum gates and circuits.

UNIT II

Quantum Algorithms: Deutsch-Jozsa, Simon, Grover, Shor, Implication of Grover's and Simon's algorithms towards classical symmetric key cryptosystems, Implication of Shor's algorithm towards factorization and Discrete Logarithm based classical public key cryptosystems.

UNIT III

Quantum True Random Number Generators (QTRNG): Detailed design and issues of quantumness, Commercial products and applications.

UNIT IV

Quantum key distribution (QKD): BB84, Ekert, Semi-Quantum QKD protocols and their variations, Issues of Device Independence, Commercial products.

UNIT V

Introductory topics in Post-Quantum Cryptography:

Cyber Security Framework: Framework, Getting Started: back ground, framework basics, Online Learning: Components of the Framework, Uses and Benefits of the Framework, History and creations of the framework, The five functions, Introduction to the Framework Roadmap, update process. **Block Cipher Techniques:** Overview Data Encryption Standard DES. **Cryptographic Standards and Guidelines:** Cryptographic Standards and Guidelines.

TEXT BOOKS:

1. Quantum Computation and Quantum Information. M. A. Nielsen and I. L. Chuang, Cambridge University Press

2. Presskil Lecture notes: Available online: http://www.theory.caltech.edu/~preskill/ph229/

REFERENCE BOOKS:

1. https://www.nist.gov/cyberframework/online-learning/informative-references. Unit 5

2. https://csrc.nist.gov/Projects/block-cipher-techniques. Unit 5

3. https://csrc.nist.gov/projects/cryptographic-standards-and-guidelines/example-values. Unit 5

4. https://csrc.nist.gov/projects/post-quantum-cryptography. Unit 5

5. An Introduction to Quantum Computing. P. Kaye, R. Laflamme, and M. Mosca, Oxford University Press, New York

6. Quantum Computer Science. N. David Mermin:, Cambridge University Press

7. Quantum Cryptography. D. Unruh:, Available online: https://courses.cs.ut.ee/all/MTAT.07.024/2017_fall/uploads/

8. NIST Post Quantum Cryptography, Available online: https://csrc.nist.gov/projects/post-quantum-cryptography/round-2-submissions

9. Quantum Algorithms for Cryptographically Significant Boolean Functions - An IBMQ Experience. SAPV Tharrmashastha, D. Bera, A. Maitra and S. Maitra, Springer 2020.

10. Quantum Algorithm Zoo. https://quantumalgorithmzoo.org/

11. Handbook of Applied Cryptography. A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone. CRC Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ADVANCED SOCIAL, TEXT AND MEDIA ANALYTICS
(Professional Elective -IV)

Course Code: GR20A4079   **L/T/P/C: 2/1/0/ 3**

IV Year I Semester

Course Objectives:
1. To introduce basic concepts of text mining and pre-processing techniques

2. To explore thorough understanding content analysis and NLP techniques

3. To introduce fundamentals of web analytics and its concepts

4. To study the fundamentals of social media analytics and information visualization techniques
5. To study the concepts of random graphs and social contexts

Course Outcomes:

1. Understand the text mining techniques and its application areas

2. Apply various tools for Text Mining and carry out Pattern Discovery, Predictive Modelling
3. Explore the use of web analytics to understand the growing connectivity and complexity in the world around us on different scales – ranging from small groups to the World Wide Web
4. Perform social network analysis to identify important social actors, subgroups (i.e., clusters), and network properties in social media sites such as Twitter, Facebook, and YouTube
5. To distinguish the affiliations and identities in social networks context

UNIT I

Text Mining: Introduction, Core text mining operations, Pre-processing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications

UNIT II

Methods & Approaches: Content Analysis; Natural Language Processing; Clustering & Topic Detection; Simple Predictive Modeling; Sentiment Analysis; Sentiment Predict

UNIT III

Web Analytics: Web analytics tools, Clickstream analysis, A/B testing, online surveys; Web search and retrieval, Search engine optimization, Web crawling and Indexing, Ranking algorithms, Web traffic models

UNIT IV

Social Media Analytics: Social network and web data and methods. Graphs and Matrices. Basic measures for individuals and networks. Information visualization; Making connections: Link analysis.

UNIT V

Random graphs and network evolution. Social contexts: Affiliation and identity; Social network analysis, Case studies.

TEXT BOOKS:

1. Ronen Feldman and James Sanger, "The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data", Cambridge University Press, 2006.

2. Hansen, Derek, Ben Sheiderman, Marc Smith. 2011 Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann, 304

3. Avinash Kaushik. 2009. Web Analytics 2.0: The Art of Online Accountability.

4. Hanneman, Robert and Mark Riddle. 2005. Introduction to Social Network Method

REFERENCE BOOKS:

1. Wasserman, S. & Faust, K. (1994). Social network analysis: Methods and applications. New York: Cambridge University Press.

2. Monge, P. R. & Contractor, N. S. (2003). Theories of communication networks. New York: Oxford University Press. http://nosh.northwestern.edu/vita.html

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MOBILE COMPUTING

(Professional Elective-IV)

Course Code: GR20A4080   **L/T/P/C: 2/1/0/ 3**

IV Year I Semester

Course Objectives:

1. To understand system requirements for mobile applications

2. To generate suitable design using specific mobile development frameworks

3. To implement the design using specific mobile development frameworks

4. To deploy the mobile applications in marketplace for distribution

5. To understand the basics of Mobile Computing

Course Outcomes:

1. Describe the requirements for mobile applications

2. Develop design for mobile applications for specific requirements

3. Implement the design using Android SDK, Objective C and iOS

4. Deploy mobile applications in Android and iPhone marketplace for distribution

5. Demonstrate the ad hoc network concepts and its routing protocols

UNIT I

Introduction: Overview of wireless and mobile infrastructure; Preliminary concepts on cellular architecture; Design objectives and performance issues; Radio resource management and interface; Propagation and path loss models; Channel interference and frequency reuse; Cell splitting; Channel assignment strategies; Overview of generations:- 1G to 5G.

UNIT II

Location and handoff management: Introduction to location management (HLR and VLR); Mobility models characterizing individual node movement (Random walk, Fluid flow, Markovian, Activity based); Mobility models characterizing the movement of groups of nodes (Reference point based group mobility model, Community based group mobility model); Static (Always vs. Never update, Reporting Cells, Location Areas) and Dynamic location management schemes (Time, Movement, Distance, Profile Based); Terminal Paging (Simultaneous paging, Sequential paging); Location management and Mobile IP; Overview

of handoff process; Factors affecting handoffs and performance evaluation metrics; Handoff strategies; Different types of handoffs (soft, hard, horizontal, vertical).

UNIT III

Wireless transmission fundamentals: Introduction to narrow and wideband systems; Spread spectrum; Frequency hopping; Introduction to MIMO; MIMO Channel Capacity and diversity gain; Introduction to OFDM; MIMO-OFDM system; Multiple access control (FDMA, TDMA, CDMA, SDMA); Wireless local area network; Wireless personal area network (Bluetooth and zigbee).

UNIT IV

Mobile Ad-hoc networks: Characteristics and applications; Coverage and connectivity problems; Routing in MANETs.

Wireless sensor networks: Concepts, basic architecture, design objectives and applications; Sensing and communication range; Coverage and connectivity; Sensor placement; Data relaying and aggregation; Energy consumption; Clustering of sensors; Energy efficient Routing (LEACH).

UNIT V

Cognitive radio networks: Fixed and dynamic spectrum access; Direct and indirect spectrum sensing; Spectrum sharing; Interoperability and co-existence issues; Applications of cognitive radio networks.

D2D communications in 5G cellular networks: Introduction to D2D communications; High level requirements for 5G architecture; Introduction to the radio resource management, power control and mode selection problems; Millimeter wave communication in 5G.

TEXTBOOKS:

1. Mobile Communications. Jochen Schiller, Pearson Education.
2. *Wireless Communications.* Andrea Goldsmith, Cambridge University Press.

REFERENCE BOOKS:

1. Wireless Communications: Principles and Practice. Theodore Rappaport, Pearson Education.
2. Wireless Communications. Ezio Biglieri, MIMO, Cambridge University Press.
3. Handbook of Wireless Networking and Mobile Computing. Ivan Stojmenovic, Wiley.
4. Dynamic Location Management in Heterogeneous Cellular Networks. James Cowling,
5. MIT Thesis. http://people.csail.mit.edu/cowling/hons/jcowling-dynamic-Nov04.pdf

6. Location Management in Wireless Cellular Networks. Travis Keshav, https://www.cse.wustl.edu/~jain/cse574-06/ftp/cellular_location.pdf

7. Location Management in Wireless Data Networks. Fahd A. Batayneh, https://www.cse. wustl.edu/~jain/cse574-06/ftp/wireless_location.pdf

8. Principles of Mobile Communication. Gordon L. Stber, Springer.

9. Wireless Device-to- DeviceCommunications and Networks. Lingyang Song, Dusit Niyato, Zhu Han, and Ekram Hossain, Cambridge University Press.

10. Principles of Cognitive Radio. Ezio Biglieri, Andrea J. Goldsmith, Larry J. Greenstein, Narayan Mandayam and H. Vincent Poor, Cambridge University Press.

11. Wireless Sensor Networks: Architecturesand Protocols. Edgar H. Callaway, Jr. and Edgar H. Callaway, CRC Press.

12. A Discrete-Event Network Simulator. https://www.nsnam.org/docs/manual/html/index.html

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

USABILITY DESIGN OF SOFTWARE APPLICATIONS LAB

Course Code: GR20A4081   **L/T/P/C: 0/ 0/ 2/ 1**

IV Year I Semester

Course Objectives:

1. To learn how to do Appreciation of user research, solution conceptualization and validation as interwoven activities in the design and development lifecycle

2. To identify a project such as a website or mobile app to redesign

3. To redesign the existing project through the design lifecycle.

4. To learn how to make prototype for the project.

5. To Acquire the ability to constructively engage with the Design professionals they would work with in the future

Course Outcomes:

1. Identify a project such as a website or mobile app to redesign

2. Analyze the existing project using Discovery and brain storming

3. Implement the project using design life cycle such as define, design, implement and testing.

4. Understand the use of prototypes while designing the project

5. Understand the way of testing and presenting the project.

LIST OF EXPERIMENTS:

TASK 1:

Group Project identification: Design Thinking Technique

TASK 2:

Group Project identification: Discovery

TASK 3:

Group Project identification: brainstorming

TASK 4:

Redesign project: Discovery

TASK 5:

Redesign project: Define

TASK 6:

Redesign project: Design

TASK 7:

Project Prototyping Iteration 1

TASK 8:

Project Prototyping Iteration 2

TASK 9:

Implement (Design Prototype)

TASK 10:

Usability Testing

TASK 11:

 Presentation of project:

TASK 12:

 Review and feedback

TEXTBOOKS:

1. Observing the User Experience, Second Edition: A Practitioner's Guide to User Research. Elizabeth Goodman, Mike Kuniavsky, Andrea Moed

2. Interaction Design: Beyond Human-Computer Interaction, 4th Edition, Jenny Preece, Helen Sharp and Yvonne Rogers

REFERENCES:

1. The Elements of User Experience: User-Centered Design for the Web and Beyond. 2nd Edition, Jesse James Garrett

2. Understanding Design Thinking, Lean, and Agile - Jonny Schneider

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MOBILE COMPUTING LAB

Course Code: GR20A4082   **L/T/P/C:** 0/0/ 2/1

IV Year I Semester

Course Objective:

1. To study about the fundamentals of networking and protocols.
2. To study about different categories of network technology.
3. To simulate and analysis the conditions of data flow in TCP/IP and UDP.
4. To simulate and analysis the conditions of data flow in MANET and WSN.
5. To simulate and analysis the WSN cluster using LEACH algorithm

Course Outcome:

1. Recall the fundamentals of networking and protocols
2. Summarize the different categories of network technology
3. Experiment and evaluate the data flow using TCP/IP and UDP.
4. Experiment and evaluate the data flow in MANET and WSN.
5. Experiment and evaluate the WSN cluster using LEACH algorithm.

TASKS

PART - 1: STUDY EXPERIMENTS

1. Study of wired network, wireless network and protocols.
2. Study of MANET and protocols.
3. Study of Wireless Sensor Nodes and protocols.
4. Study of 3G, 4G and 5G network and comparison.
5. Study of Ns3 simulator and installation.
6. Study of OMNET++ simulator and installation.

PART-2: SIMULATION

Instructions:

- Students may use any simulators of their choice. (NS-3 and OMNET++ only)
- Simulation should contain appropriate network devices as per the experiment / environment specified.
- Analysis should be in graphical view.

1. Simulate a wired network and analyse the traffic flow with 10 nodes using TCP/IP.
2. Simulate two wired network and analyse the traffic flow with other network using TCP/IP.
3. Simulate a wired network and a wireless network, record the traffic pattern between this networks.
4. Simulate a wireless network with 50 nodes and analysis the traffic using UDP.
5. Simulate two wireless networks with 50 nodes each and analysis the traffic with other using UDP.
6. Simulate a MANET and check the traffic effect. Record the packet loss when in motion.
7. Simulate a WSN network with 100 nodes. Analysis the Cluster using LEACH algorithm.

TEXT BOOKS:

1. Mobile Communications. Jochen Schiller, Pearson Education.
2. *Wireless Communications.* Andrea Goldsmith, Cambridge University Press.

REFERENCE BOOKS:

1. *Wireless Communications: Principles and Practice.* Theodore Rappaport, Pearson Education.
2. *Wireless Communications.* Ezio Biglieri, MIMO, Cambridge University Press.
3. *Handbook of Wireless Networking and Mobile Computing.* Ivan Stojmenovic, Wiley.
4. *Dynamic Location Management in Heterogeneous Cellular Networks.* James Cowling,
5. MIT Thesis. http://people.csail.mit.edu/cowling/hons/jcowling-dynamic-Nov04.pdf
6. *Location Management in Wireless Cellular Networks.* Travis Keshav, https://www.cse.wustl.edu/~jain/cse574-06/ftp/cellular_location.pdf

7. *Location Management in Wireless Data Networks.* Fahd A. Batayneh, https://www.cse. wustl.edu/~jain/cse574-06/ftp/wireless_location.pdf

8. *Principles of Mobile Communication.* Gordon L. Stber, Springer.

9. *Wireless Device-to- DeviceCommunications and Networks.* Lingyang Song, Dusit Niyato, Zhu Han, and Ekram Hossain, Cambridge University Press.

10. *Principles of Cognitive Radio.* Ezio Biglieri, Andrea J. Goldsmith, Larry J. Greenstein, Narayan Mandayam and H. Vincent Poor, Cambridge University Press.

11. *Wireless Sensor Networks: Architecturesand Protocols.* Edgar H. Callaway, Jr. and Edgar H. Callaway, CRC Press.

12. *A Discrete-Event Network Simulator.* https://www.nsnam.org/docs/manual/html/index.html

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROJECT WORK - PHASE I

Course Code:GR20A4129   **L/T/P/C: 0/0/12/6**
IV Year I Semester

Course Objectives:

1. Demonstrate a wide range of skills learned to deliver a project.

2. Encourage multidisciplinary research through the integration learned.

3. Develop problem solving, analysis, synthesis and evaluation skills.

4. Encourage teamwork.

5. Improve communication and presentation skills during project work.

Course Outcomes:

1. Formulate hypothesis for the problem statement with sound technical knowledge from selected project domain.

2. Design Engineering Solution to the problem statement with systematic approach.

3. Analyse and develop an efficient solution for implementation of the project.

4. Apply the theoretical concepts while providing solution to the problem statement with teamwork and multidisciplinary approach.

5. Demonstrate professionalism with ethics while preparing and presenting the project work.

IV YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BEHAVIORAL ECONOMICS
(Professional Elective-V)

Course Code: GR20A4131   **L/T/P/C: 3/0/0/3**

IV Year II Semester

Course Objectives:
1. To impart knowledge on current ideas and concepts in Economics
2. To Provide the insight on current ideas and concepts regarding decision making in Economics
3. To Describe different types of theories and models related to Economics
4. To Make the students understand various theories that help in making a choice under uncertainty
5. To acquaint students with the techniques of discounting which will help on proper decision making

Course Outcomes:
1. Students will be able to understand and apply various concepts in traditional and modern Microeconomics
2. Students will be able to focus on decision making based on heuristics are efficient mental processes that help humans solve problems or learn a new concept.
3. Students will be able to develop a holistic understanding of these concepts of utility theory and their interconnections
4. They will be able to Outline decision and probability weighting. Apply the concepts in the fields of ownership and trade, income and consumption.
5. Students will be able to make a Strategic choice with the help of game theory and Nash equilibrium

Unit I
Introduction

The neoclassical/standard model and behavioral economics in contrast; historical background; behavioral economics and other social sciences; theory and evidence in the social sciences and in behavioral economics; applications – gains and losses, money illusion, charitable donation.

Basics of choice theory -Revisiting the neoclassical model; utility in economics and psychology; models of rationality; connections with evolutionary biology and cognitive neuroscience; policy analysis – consumption and addiction, environmental protection, retail therapy; applications – pricing, valuation, public goods, choice anomalies

Unit II

Beliefs, heuristics, and biases

Revisiting rationality; causal aspects of irrationality; different kinds of biases and beliefs; self-evaluation and self-projection; inconsistent and biased beliefs; probability estimation; trading applications – trade in counterfeit goods, financial trading behavior, trade in memorabilia

Unit III

Choice under uncertainty

Background and expected utility theory; prospect theory and other theories; reference points; loss aversion; marginal utility; decision and probability weighting; applications – ownership and trade, income and consumption, performance in sports.

Unit IV

Intertemporal choice

Geometric discounting; preferences over time; anomalies of inter-temporal decisions; hyperbolic discounting; instantaneous utility; alternative concepts – future projection, mental accounts, heterogeneous selves, procedural choice; policy analysis – mobile calls, credit cards, organization of government; applications – consumption and savings, clubs and membership, consumption planning

Unit V

1. Review of game theory and Nash equilibrium – strategies, information, equilibrium in pure and mixed strategies, iterated games, bargaining, signaling, learning; applications – competitive sports, bargaining and negotiation, monopoly and market entry

2. Individual preferences; choice anomalies and inconsistencies; social preferences; altruism; fairness; reciprocity; trust; learning; communication; intention; demographic and cultural aspects; social norms; compliance and punishment; inequity aversion; policy analysis – norms and markets, labor markets, market clearing, public goods; applications – logic and knowledge, voluntary contribution, compensation design

Text Book:

1. An Introduction to Behavioral Economics, by N. Wilkinson and M. Klaes

References
1. P.L. Mehta : Managerial Economics
2. Yogesh Maheswari: Managerial Economics

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

Course Code:GR20A4132   **L/T/P/C: 3/0/0/3**

IV Year II Semester

Course Objective:
1. To impart knowledge on Numerical methods relevant for mathematical finance
2. To Provide insights on Puts, calls and Black-Scholes framework
3. To make the students understand Simulation and solving applied problems on derivative pricing
4. To describe Financial Products and Markets
5. To acquaint students with Statistical Analysis of Financial Returns

Course Outcome:

1. Students will understand existing financial models in a quantitative and mathematical way.
2. Students will be able apply these quantitative tools to solve complex problems in the areas of portfolio management, risk management and financial engineering.
3. Students will be able to apply the approaches required to calculate the price of options.
4. Students will be able to identify the methods required to analyse information from financial data and trading systems.
5. Students will be able to do statistical analysis of financial returns

UNIT I

Numerical methods relevant to integration, differentiation and solving the partial differential equations of mathematical finance: examples of exact solutions including Black Scholes and its relatives, finite difference methods including algorithms and question of stability and convergence, treatment of near and far boundary conditions, the connection with binomial models, interest rate models, early exercise, and the corresponding free boundary problems, and a brief introduction to numerical methods for solving multi-factor models.

UNIT –II

Black-Scholes framework: Black-Scholes PDE: simple European calls and puts; put-call parity. The PDE for pricing commodity and currency options. Discontinuous payoffs - Binary and Digital options. The Greeks: theta, delta, gamma, Vega & rho, and their role in hedging. The mathematics of early exercise - American options: perpetual calls and puts; optimal exercise strategy and the smooth pasting condition. Volatility considerations - actual, historical, and implied volatility; local vol and volatility surfaces.

UNIT III

Simulation including random variable generation, variance reduction methods and statistical analysis of simulation output. Pseudo random numbers, Linear congruential generator, Mersenne twister RNG.

The use of Monte Carlo simulation in solving applied problems on derivative pricing discussed in the current finance literature. The technical topics addressed include importance sampling, Monte Carlo integration, Simulation of Random walk and approximations to diffusion processes, martingale control variables, stratification, and the estimation of the "Greeks."

UNIT IV

Financial Products and Markets: Introduction to the financial markets and the products which are traded in them: Equities, indices, foreign exchange, and commodities. Options contracts and strategies for speculation and hedging. Application areas include the pricing of American options, pricing interest rate dependent claims, and credit risk. The use of importance sampling for Monte Carlo simulation of VaR for portfolios of options.

UNIT V

Statistical Analysis of Financial Returns: Fat-tailed and skewed distributions, outliers, stylized facts of volatility, implied volatility surface, and volatility estimation using high frequency data. Copulas, hedging in incomplete markets, American Options, Exotic options, Electronic trading, Jump Diffusion Processes, High-dimensional covariance matrices, Extreme value theory, Statistical Arbitrage.

Text Books:

1. R. Seydel: Tools for Computational Finance, 2nd edition, Springer-Verlag, New York, 2004.
2. P. Glasserman: Monte Carlo Methods in Financial Engineering, Springer-Verlag, New York, 2004.

References:

1. W. Press, S. Teukolsky, W. Vetterling and B. Flannery, Numerical Recipes in C: The Art of Scientific Computing, 1997. Cambridge University Press, Cambridge, UK. Available on-line at: http://www.nr.com/
2. A. Lewis: Option Valuation under Stochastic Volatility, Finance Press, Newport Beach, California, 2000.
3. A. Pelsser: Efficient Methods for Valuing Interest Rate Derivatives, Springer-Verlag, New York, 2000.
4. D. Ruppert, Statistics and Data Analysis for Financial Engineering
5. R. Carmona: Statistical Analysis of Financial Data in S-Plus
6. N. H. Chan, Time Series: Applications to Finance
7. R. S. Tsay, Analysis of Financial Time Series
8. J. Franke, W. K. Härdle and C. M. Hafner, Statistics of Financial Markets: An Introduction

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PSYCHOLOGY
(Professional Elective-V)

Course Code:GR20A4133   **L/T/P/C: 3/0/0/3**

 IV Year II Semester

Course Objectives

1. To provide the students to the legal context of the industrial psychology and human resource practices.
2. To provide the students the application of statistical test, psychological tools to organizational issues.
3. To give insights on employment law, job analysis, recruitment and selection, training, performance appraisal and discipline.
4. The students will understand employee motivation, Satisfaction and Commitment.
5. Using an applied approach, this course will help to prepare students for their roles as employees and managers.

Course Outcomes:
1. Become conversant about the major content areas of Industrial Psychology (i.e., job analysis, recruitment, selection, employment law, training, performance management, and health/well-being issues in the workplace).
2. Gain further comfort with statistical concepts in the context of making personnel decisions.

3. Understand a series of elements such as performance evaluation and importance of coaching, feedback, and role of psychology in these human resource components.

4. Deepen the understanding of role of psychology in employee motivation, satisfaction and fairness and diversity in decision making.

5. Understand the importance of organizational psychology or human resource management in organizing the climate, culture, teams, work behavior, stress and leadership practices in a firm.

UNIT I

What is I/O Psychology? Research Methods, Statistics, and Evidence-based Practice, Introduction & Legal Context of Industrial Psychology, Job Analysis & Competency Modeling, Job Evaluation & Compensation, Job Design & Employee Well-Being, Recruitment.

UNIT II

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

UNIT – III

Performance Goals and Feedback, Performance Coaching and Evaluation, Evaluating Employee Performance,

UNIT IV

Employee Motivation, Satisfaction and Commitment, Fairness and Diversity

UNIT V

Leadership, Organizational Climate, Culture, and Development, Teams in Organizations, The Organization of Work Behavior, Stress Management: Demands of Life and Work

Text Book:

1. Landy, F. J. and Conte, J. M. (2013). Work in the 21st Century (4th Edition). Oxford: Blackwell Publishing

Reference Books:

1. Industrial and Organizational Psychology: Linking Theory With Practice by Edwin A. Locke (Editor) and Cary L. Cooper (Editor)

2. Psychology Applied to Work: An Introduction to Industrial and Organizational Psychology by Paul M. Muchinsky.

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

Course Code: GR20A4134   **L/T/P/C: 3/0/0/3**

IV Year II Semester
Course Objectives:

1. To acquire the knowledge on enterprise systems.

2. To demonstrate the various architectures of the enterprise systems.

3. To acquire the knowledge on enterprise system applications.

4. To illustrate the cloud computing technology in enterprise systems.

5. To acquire the knowledge on enterprise architecture.

Course Outcomes:

1. To summarize about basic elements of enterprise systems.

2. To analyse the key characteristics and features of enterprise systems.

3. To integrate enterprise system applications.

4. To develop skills in understanding architecture and non-functional requirements in developing
   enterprise system development and their deployment.

5. To summarize the future trends in Enterprise architectures.

UNIT I
Introduction to Modern Enterprise Systems: Introduction to enterprise systems. Elements of
enterprise systems – Business Information system, Decision support systems, Knowledge management
systems, Financial and human resource systems. Kinds of Enterprise systems- B2C and B2B models.
Components of Enterprise systems: Channels (Mobile, web, desktop, partner integration), Data
management, workflow, Controlling and Auditing, Accounting etc.
Sample Enterprise systems: ERP, SCM, CRM, Product Life cycle management (PLM), HR Systems
(HRM), GL systems.
(See relevant chapters in Text book -1 and 2)

UNIT II
Key characteristics Enterprise systems: Distributivity, Managed redundancy, Exception processing,
Collaboration, Data transformation. (See relevant chapters in Textbook 2)
Enterprise System architectures: Batch processing, Monolithic, client server, ecommerce, service
oriented, microservice, and cloud architectures.
Introduction to Enterprise Application architectures: Layer Architecture, Event driven
Architecture, Service oriented Architecture, Microservice architecture, Plug-in architecture.

UNIT III
Application architecture Patterns: Layering, Organizing domain logic, Mapping to database, Web
Presentation, Concurrency. (See Text book 2)
Enterprise Application Integration: Introduction to Enterprise Integration, different integration
styles. Elements of messaging-based Integration.

(Chapter 2, Chapter 3 from Greogor Hope's book on Enterprise Integration patterns)

Enterprise Integration patterns: Modern service integration techniques. Introduction to WSDL, SOAP. Introduction RESTFul webservices integration. Differences between SOAP and REST.

UNIT IV
Deployment of Enterprise applications: Key requirements in deployment - Stability, capacity, Security, availability, Network, Availability, and Transparency (Basic Introduction only).

(Chapters Introducing stability, capacity, Networking, security, Availability, Transparency)
Concepts of Cloud computing, cloud platforms and their role in Enterprise systems: Core Concepts – Types of Cloud: Private, public, and Hybrid clouds. Advantage of cloud computing – Scaling, Availability, and cost. Disadvantages – Technology overload, Security, Monitoring and troubleshooting, Testing, Latency etc. Cloud service models: - Infrastructure, platform, Software as a Service in Cloud Computing. Major public clouds: Google cloud, AWS, Azure.

UNIT V
Application development and deployment in cloud – Dockers, micro services, Kubernetes, Serverless. Continuous Integration/Continuous Delivery
Introduction to Enterprise Architecture: Importance of Enterprise Architecture. Enterprise architecture models. Zachman Framework, TOGAF Framework.

Textbooks:
1. Ralph Stair, George Reynold, "Principle of Information Systems", 10 ed.
2. Martin Fowler et al, "Pattern of Enterprise Application Architecture", Addison-Wesley, 2012
3. Gregor Hohpe, Bobby Woolf, Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions,
4. Mark Richards, Software Architecture patterns, 2015, O'Reilly.
5. Sam Newman, "Building Microservices", 2015, O'Reilly.
6. David Farley, Jez Humble, "Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation", Jan 2016

Reference Books:
1. Brendan Burns, Designing Distributed Systems, O'Reilly, 2016
2. Enterprise Integration Patterns - Messaging Patterns Overview
3. Software architecture in Practice 3rd Edition- 2014

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ADVANCE FINANCE

(Professional Elective-VI)

Course Code: GR20A4135   **L/T/P/C: 3/0/0/3**

IV Year II Semester

Course Objectives:

1. To understand sources of funds and its regulatory framework.

2. To comprehend dividend decisions and evaluation of lease contracts.

3. To understand the corporate and financial restructuring.

4. To acquaint the working capital, cash, receivables, and inventory management.

5. To study forward, futures, options, and swaps.

Course Outcomes:

1. Create an awareness about sources and its regulatory framework.

2. Ability to make dividend decisions and evaluate the lease contracts.

3. Create an awareness about corporate and financial restructuring.

4. Ability to management of working capital, cash, receivables, and inventory.

5. Familiarizing the students with the corporate and financial derivatives.

UNIT I

Sources of Funds (including regulatory framework): Types of securities, Issuing the capital in market, Pricing of issue, Valuation of Stocks and bonds.

UNIT II

Dividend Decisions: Traditional Approach, Dividend Relevance Model, Miller and Modigliani Model, Stability of Dividends, Forms of Dividends, Issue of bonus shares, Stock Split.
Evaluation of Lease Contracts

UNIT III

Corporate Restructuring: Mergers and Acquisitions- Types of Mergers, Evaluation of Merger Proposal, Take-over, Amalgamation, Leverage buy-out, Management buy-out, Corporate Failure and Liquidation

Financial Restructuring: Share Split, Consolidation, Cancellation of Paid-up Capital, Other Mechanisms.

UNIT IV

Working Capital Management: Working Capital Planning, Monitoring and Control of Working

Capital, Working Capital Financing, Managing the Components of Working Capital-Cash Management, Receivable Management, Inventory Management.

UNIT V

Introduction to derivatives: Basics of Futures, Forwards, Options, Swaps, Interest rate Payoff Diagrams, Pricing of Futures, Put Call Parity, Option Pricing using Binomial Model and Black Scholes Model, Use of Derivatives for Risk-Return Management- Credit Default Swaps.

Home Assignment:

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

Further, the topic for class discussion will be mentioned beforehand and students should be prepared to discuss these topics in class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1.   Topic: Historical perspectives of markets like major boom and busts, bull and bear cycles, major market crashes, bubbles

2.   Topic: Major scams in the market, e.g., Satyam case

Textbooks:

1.   Brealey, Myers and Allen, *Principles of Corporate Finance*

 Case Study Materials: To be distributed for class discussion

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

IMAGE PROCESSING AND PATTERN RECOGNITION

(Professional Elective – VI)

Course Code: GR20A4136   **L/T/P/C:3/ 0/ 0/3**

IV Year II Semester

Course Objectives:

1. To introduce basic concepts of text mining and pre-processing techniques

2. To explore thorough understanding content analysis and NLP techniques

3. To introduce fundamentals of web analytics and its concepts

4. To study the fundamentals of social media analytics and information visualization techniques

5. To study the concepts of random graphs and social contexts

Course Outcomes:

1. Understand the text mining techniques and its application areas

2. Apply various tools for Text Mining and carry out Pattern Discovery, Predictive Modelling

3. Explore the use of web analytics to understand the growing connectivity and complexity in the world around us on different scales – ranging from small groups to the World Wide Web

4. Perform social network analysis to identify important social actors, subgroups (i.e., clusters), and network properties in social media sites such as Twitter, Facebook, and YouTube

5. To distinguish the affiliations and identities in social networks context

UNIT I

Introduction: Image processing systems and its applications. Basic image file formats

Image formation: Geometric and photometric models; Digitization - sampling, quantization;

Image definition and its representation, neighborhood metrics.

UNIT II

Intensity transformations and spatial filtering: Enhancement, contrast stretching, histogram specification, local contrast enhancement; Smoothing, linear and order statistic filtering, sharpening, spatial convolution, Gaussian smoothing, DoG, LoG.

UNIT III

Segmentation: Pixel classification; Grey level thresholding, global/local thresholding; Optimum thresholding - Bayes analysis, Otsu method; Derivative based edge detection operators, edge detection/linking, Canny edge detector; Region growing, split/merge techniques, line detection, Hough transform.

UNIT IV

Image/Object features extraction: Textural features - gray level co-occurrence matrix; Moments; Connected component analysis; Convex hull; Distance transform, medial axis transform, skeletonization/thinning, shape properties.

Registration: Mono-modal/multimodal image registration; Global/local registration; Transform and similarity measures for registration; Intensity/pixel interpolation.

UNIT V

Colour image processing: Fundamentals of different colour models - RGB, CMY, HSI, YCbCr, Lab; False colour; Pseudo colour; Enhancement; Segmentation.

Morphological Filtering Basics: Dilation and Erosion Operators, Top Hat Filters.

TEXTBOOK:

1. Digital Image Processing. R. C. Gonzalez and R. E. Woods, Prentice Hall.

REFERENCE BOOKS:

1. Image Processing: The Fundamentals. Maria Petrou and Panagiota Bosdogianni, John Wiley & Sons, Ltd.
2. Digital Image Processing. K. R. Castleman:, Prentice Hall, Englewood Cliffs.
3. Visual Reconstruction. A. Blake and A. Zisserman, MIT Press, Cambridge.
4. Digital Pictures. A. N. Netravali and B. G. Haskell, Plenum Press.
5. Digital Images and Human Vision. A. B. Watson:, MIT Press, Cambridge.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SERVICES SCIENCE AND SERVICE OPERATIONAL MANAGEMENT
(Open Elective-I)

Course Code: GR20A4137   **L/T/P/C: 3/0/0/3**

IV Year II Semester

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

1. To know the basics about Services, its role, characteristics, and types in the industry.
2. To provide an in-depth appreciation and understanding of the unique challenges inherent in managing and delivering quality services.
3. To develop an understanding of the 'state of the art' of service management thinking.
4. The attraction, retention, and building of strong customer relationships through quality service and services is the heart of Services Marketing.
5. To learn about need to bring the innovations in Services and Services Marketing

Course Outcomes:
1. Understand concepts of services and its significance in the economy and society and distinguish it from goods.
2. Understand the service strategy, design, and development.
3. Comprehend ways to design services and able to understand service guarantee, recovery, and failures.
4. Forecast the service demand , supply and facilitate various methods to operate and manage services.
5. Understand the service productivity and how innovation can be approached from services point of view

UNIT I
Introduction: Introduction to the course, Introduction to service operations, Role of service in economy and society, Introduction to Indian service sector
Nature of Services and Service Encounters: Differences between services and operations, Service package, characteristics, various frameworks to design service operation system, Kind of service encounter, importance of encounters
Service-Dominant Logic: From Goods-Dominant logic to Service-Dominant logic, Value Co-creation

UNIT II
Service Strategy and Competitiveness: Development of Strategic Service Vision (SSV), Data Envelopment Analysis
New Service Development: NSD cycle, Service Blueprinting, Elements of service delivery system
Service Design: Customer Journey and Service Design, Design Thinking methods to aid Service Design
Locating facilities and designing their layout: models of facility locations (Huff's retail model), Role of service-scape in layout design
Service Quality: SERVQUAL, Walk through Audit, Dimensions of Service quality & other quality tools

UNIT III
Service Guarantee & Service Recovery: How to provide Service guarantee? How to recover from

Service failure?

UNIT IV
Forecasting Demand for Services: A review of different types of forecasting methods for demand forecasting.
Managing Capacity and Demand: Strategies for matching capacity and demand, Psychology of waiting, Application of various tools used in managing waiting line in services.
Managing Facilitating Goods: Review of inventory models, Role of inventory in services
Managing service supply relationship: Understanding the supply chain/hub of service, Strategies for managing suppliers of service
Vehicle Routing Problem: Managing after sales service, understanding services that involve transportation of people and vehicle, Techniques for optimizing vehicle routes

UNIT V

Service Innovation: Services Productivity, Need for Services Innovation

Student Project:
Option 1: Choose any service organization around and present it from the perspective of: nature of service, classification of service, blueprint or service design analysis, service quality, and any additional perspective you would like to add.
Option 2: Choose any latest research paper in services and explain your understanding and feedback on the same.

Text Books:
1. Fitzsimmons & Fitzsimmons, Service Management: Operations, Strategy, Information Technology, McGraw Hill publications (7th edition)

Reference Books:
1. Wilson, A., Zeithaml, V. A., Bitner, M. J., & Gremler, D. D. (2012). *Services marketing: Integrating customer focus across the firm*. McGraw Hill.
2. Lovelock, C. (2011). *Services Marketing, 7/e*. Pearson Education India
3. Reason, Ben, and Lovlie, Lavrans, (2016) Service Design for Business: A Practical Guide to Optimizing the Customer Experience, Pan Macmillan India,
4. Chesbrough, H. (2010). Open services innovation: Rethinking your business to grow and compete in a new era. John Wiley & Sons.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

IT PROJECT MANAGEMENT

(Open Elective-I)

Course Code: GR20A4138   **L/T/P/C: 3/ 0/ 0/3**

IV Year II Semester

Course Objectives:

1. To understand the project scheduling techniques.
2. To understand the techniques how to control risks.
3. To demonstrate different agile methodologies.
4. To study agile project management techniques
5. To get an idea importance of agile methodologies.

Course Outcomes:

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

UNIT I

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

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

UNIT II

Cost Control and Scheduling: Project Cost Control (PERT/Cost), Resource Scheduling & Resource Leveling

Project Management Features: Risk Analysis, Project Control, Project Audit and Project Termination.

UNIT III

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

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

UNIT IV

Scrum: Various terminologies used in Scrum (Sprint, product backlog, sprint backlog, sprint review, retro perspective), various roles (Roles in Scrum), Best practices of Scrum.

UNIT V

DevOps: Overview and its Components, Containerization Using Docker, Managing Source Code and Automating Builds, Automated Testing and Test-Driven Development, Continuous Integration, Configuration Management, Continuous Deployment, Automated Monitoring.

TEXT BOOKS:

1. Mike Cohn, *Succeeding with Agile: Software Development Using Scrum*
2. Notes to be distributed by the course instructor on various topics

REFERENCE BOOKS:

1. Roman Pichler, *Agile Product Management with Scrum*
2. Ken Schwaber, *Agile Project Management with Scrum (Microsoft Professional)*

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MARKETING RESEARCH AND MARKETING MANAGEMENT
(Open Elective-I)

Course Code: GR20A4139   **L/T/P/C: 3/0/0/3**

IV Year II Semester

Course Objectives:

1. To provide students the insights of marketing management concepts, marketing / consumer planning and strategies related to STP.
2. The course offers a detailed insights on product management strategies in the current era.
3. To provide the student with a clear understanding on various functional marketing mix elements such as pricing, distribution and promotion mix elements.
4. This course provides the inputs related to marketing research methods and use of various statistical tools in marketing research.
5. To provide the student with a clear understanding about the concepts of internet marketing and B2B, CRM strategies.

Course Outcomes:

1. The students understand the significance of marketing management concepts, marketing environment, consumer behaviour elements and strategies related to STP.

2. The student will be able to understand various product management strategies and importance of branding, packing.
3. Comprehend the dynamics of marketing mix elements such as pricing, distribution, and promotion mix elements to leverage marketing concepts for effective decision making.
4. Students will demonstrate analytical skills in identification and resolution of problems pertaining to marketing management and marketing research and uses of various statistical tools in marketing research.
5. Understanding about the concepts of internet marketing and the fundamentals of business-to-business marketing strategy, CRM strategies.

UNIT I
Marketing Concepts and Applications: Introduction to Marketing & Core Concepts, Marketing of Services, Importance of marketing in service sector.
Marketing Planning & Environment: Elements of Marketing Mix, Analyzing needs & trends in Environment - Macro, Economic, Political, Technical & Social
Understanding the consumer: Determinants of consumer behavior, Factors influencing consumer behavior
Market Segmentation: Meaning & Concept, Basis of segmentation, selection of segments, Market Segmentation strategies, Target Marketing, Product Positioning

UNIT II
Product Management: Product Life cycle concept, New Product development & strategy, Stages in New Product development, Product decision and strategies, Branding & packaging

UNIT III
Pricing, Promotion and Distribution Strategy: Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity, 5

M's of Advertising Management. Marketing Channels, Retailing, Marketing Communication, Advertising

UNIT IV
Marketing Research: Introduction, Type of Market Research, Scope, Objectives & Limitations Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, Media Research, Qualitative Research
Data Analysis: Use of various statistical tools – Descriptive & Inference Statistics, Statistical Hypothesis Testing, Multivariate Analysis - Discriminant Analysis, Cluster Analysis, Segmenting and Positioning, Factor Analysis

UNIT V
Internet Marketing: Introduction to Internet Marketing. Mapping fundamental concepts of Marketing (7Ps, STP); Strategy and Planning for Internet Marketing
Business to Business Marketing: Fundamental of business markets. Organizational buying process. Business buyer needs. Market and sales potential. Product in business markets. Price in business markets. Place in business markets. Promotion in business markets. Relationship, networks and customer relationship management. Business to Business marketing strategy

Home Assignments:
Written Analyses of Cases – Students are expected to report on their analysis and recommendations of what to do in specific business situations by applying concepts and principles learned in class (Case Studies to be shared by Faculty) e.g. "Marketing Myopia"
1. Field visit & live project covering steps involved in formulating Market Research Project
2. Measuring Internet Marketing Effectiveness: Metrics and Website Analytics

Text Books:

1. Marketing Management (Analysis, Planning, Implementation & Control) – Philip Kotler
2. Fundamentals of Marketing – William J. Stanton & Others
3. Marketing Management – V.S. Ramaswamy and S. Namakumari
4. Marketing Research – Rajendra Nargundkar
5. Market Research – G.C. Beri
6. Market Research, Concepts, & Cases – Cooper Schindler

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROJECT WORK - PHASE II

Course Code:GR20A4130   **L/T/P/C: 0/0/12/6**
IV Year II Semester

Course Objectives:

1. Demonstrate a wide range of skills learned to deliver a project.

2. Encourage multidisciplinary research through the integration learned.

3. Develop problem solving, analysis, synthesis and evaluation skills.

4. Encourage teamwork.

5. Improve communication and presentation skills during project work.

Course Outcomes:

1. Formulate hypothesis for the problem statement with sound technical knowledge from selected project domain.

2. Design Engineering Solution to the problem statement with systematic approach.

3. Analyse and develop an efficient solution for implementation of the project.

4. Apply the theoretical concepts while providing solution to the problem statement with teamwork and multidisciplinary approach.

5. Demonstrate professionalism with ethics while preparing and presenting the project work.