ACADEMIC REGULATIONS PROGRAMME STRUCTURE AND DETAILED SYLLABUS

GR22

Bachelor of Technology
(Electronics and Communication Engineering)

(Effective for the students admitted from the Academic Year 2022-23)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

Bachupally, Kukatpally, Hyderabad-500090,Telangana
Tel: +91 7207344440
URL: www.griet.ac.in, E-Mail: info@griet.ac.in

ACADEMIC REGULATIONS
PROGRAMME STRUCTURE
&
DETAILED SYLLABUS

Bachelor of Technology
Electronics And Communication Engineering

(Four Year Regular Programme)
(Applicable for Batches Admitted from 2022-23)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
Bachupally, Kukatpally, Hyderabad, Telangana, India- 500090

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HYDERABAD

Academic Regulations for B.Tech (Regular) under GR22

(Applicable for Batches Admitted from 2022-23)

Under Graduate Degree Programme in Engineering and Technology (UG)

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

S.No	Department	Programme Code	Programme
1	Civil Engineering	01	B.Tech Civil Engineering
2	Electrical and Electronics Engineering	02	B.Tech Electrical and Electronics Engineering
3	Mechanical Engineering	03	B.Tech Mechanical Engineering
4	Electronics and Communication Engineering	04	B.Tech Electronics and Communication Engineering
5	Computer Science and Engineering	05	B.Tech Computer Science and Engineering
6	Information Technology	12	B.Tech Information Technology
7	Computer Science and Business System	32	B.Tech Computer Science & Business System
8	Computer Science and Engineering (AIML)	66	B.Tech Computer Science and Engineering (AIML)
9	Computer Science and Engineering (Data Science)	67	B.Tech Computer Science and Engineering (Data Science)
10	Computer Science and Engineering (Artificial Intelligence)	61	B.Tech Computer Science and Engineering (Artificial Intelligence
11	Computer Science and Information Technology	33	B.Tech Computer Science and Information Technology

GR22 Regulations shall govern the above programmes offered by the Departments with effect from the students admitted to the programmes in 2022-23 academic year is given below.

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

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

3. **Programme Pattern:**

a) Each Academic Year of study is divided into two semesters.
b) Minimum number of instruction days in each semester is 90.
c) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
d) The total credits for the Programme are 160.
e) A student has a choice to register for all courses in a semester / one less or one additional course from other semesters provided the student satisfies prerequisites.
f) All the registered credits except Mandatory and Value Added Courses will be considered for the calculation of final CGPA.
g) Each semester has 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC, and course structure as suggested by AICTE are followed. The terms 'subject' and 'course' imply the same meaning.
h) Course Classification: All courses offered for all undergraduate programmes in B.Tech degree programmes are broadly classified as follows.

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

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

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

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

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

5. Attendance Requirements:

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

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

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

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

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

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

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

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

b) Distribution and Weightage of marks

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

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

Assessment Procedure:

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

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

d) Mini Project:

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Mini Project	40	Continuous Evaluation & Internal Evaluation	1) The supervisor continuously assesses the students for 20 marks **i) Continuous Assessment – 15 marks** • Abstract Presentation - 3 marks • Architectural Design Presentation - 3 marks • Modules Presentation - 3 marks • Execution Cycle 1 Presentation - 3 marks • Execution Cycle 2 Presentation - 3 marks **ii) Report – 5 marks** 2) At the end of the semester, Mini Project shall be displayed in the road show at the department level. Mini Project is evaluated by Mini Project Review Committee for **10 marks**. 3) Technical Event Participation in project area/MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/ Book Publication – **10 marks**
		60	External Evaluation	The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for **60 marks**.

Note:

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

ii) Plagiarism check is compulsory for mini project report as per the plagiarism policy of GRIET.

e) Internship/Skill Development Course/ Industrial Training: Internship/Skill Development Course/Industrial Training shall be done by the student immediately after II-Year II Semester Examinations and pursue it during summer vacation/semester break & during III Year without effecting regular course work. Internship/Skill Development Course/Industrial Training at reputed organization shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination.

f) Project Work (Phase–I and Phase-II):

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Project Work (Phase- I and Phase -II)	40	Continuous Evaluation & Internal Evaluation	1) The supervisor continuously assesses the students for 20 marks **i) Continuous Assessment – 15 marks** • Abstract Presentation - 3 marks • Architectural Design Presentation- 3 marks • Modules Presentation - 3 marks • Execution Cycle 1 Presentation - 3 marks • Execution Cycle 2 Presentation – 3 marks **ii) Report – 5 marks** 2) At the end of the semester, Project work shall be displayed in the road show at the department level. Project work is evaluated by Project Review Committee for **10 marks**. 3) Technical Event Participation in project area/ MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/Book Publication – **10 marks.**
		60	External Evaluation	The Project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for **60 marks**.

Note:

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

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

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

g) The evaluation of courses having ONLY internal marks in I-Year I Semester and II Semester is as follows:

• I Year courses: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if

he/she (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

- II Year II Semester Real-Time/Field-based Research Project/Societal Related Project course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he/she (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.

7. **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.

8. **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.

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

10. **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.

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

    A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork when the course is offered next, it could be semester for first years and a year for others.

    In the event of the student taking this chance, his/her Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

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

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

    The student is eligible to write Semester End Examination of the concerned subject/course if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

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

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

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

c) Provision of opting 2 OE courses through online mode.
d) Choice of placement-oriented value-added courses in every semester from II year till IV year
e) Students can take a year break after second or third year to work on R&D
f) Under Mandatory Courses

i) Co-Curricular activities -- 0.5 credit for publishing paper, publishing patent, attend seminar, technical competition and taking part in hackathon

ii) Extra-Curricular activities -- 0.5 credit for sports represent University or part or college winning team a medal or cup in outside recognized inter collegiate or above tournaments or NSS activities or donated blood two times or 2 green campus events

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	

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

Computation of SGPA and CGPA:

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

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

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

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

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

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

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

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.

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA ≥8.00 with no F or below grade/detention anytime during the programme
2	First Class	CGPA ≥ 8.00 with rest of the clauses of S.No 1 not satisfied
3	First Class	CGPA ≥ 7.00 and CGPA < 8.00
4	Second Class	CGPA ≥ 6.00 and CGPA < 7.00
5	Pass Class	CGPA ≥ 5.00 and CGPA < 6.00

Equivalence of grade to marks

Marks % = (CGPA -0.5)*10

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

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

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

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

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

16. 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.

17. Transitory Regulations

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of GR20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of GR22 Regulations and he is required to complete the study of B.Tech programme within the stipulated period of eight academic years from the date of first admission in I Year.

2. A student who has been detained in any semester of II, III and IV years of GR20 regulations for want of attendance, shall be permitted to join the corresponding semester of GR22 Regulations and

is required to complete the study of B.Tech within the stipulated period of eight academic years from the date of first admission in I Year. The GR22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

3. A student of GR20 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of GR22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both GR20 & GR22 regulations. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission. The GR22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in GR22 Regulations:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.

5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including GR22 Regulations. There is NO exemption of credits in any case.

6. If a student is readmitted to GR22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in GR22 Regulations will be substituted by another subject to be suggested by the college academic administration.

Note:

If a student readmitted to GR22 Regulations and has not studied any courses/topics in his/her earlier regulations of study which is prerequisite for further subjects in GR22 Regulations, then the college shall conduct remedial classes to cover those courses/topics for the benefit of the students.

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

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

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

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

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

19. 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 GR22

(Applicable for Batches Admitted from 2022-23)

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

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

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

S. No.	Promotion	Conditions to be fulfilled
1	Second year first semester toSecond 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 semesterfrom all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester toThird year second semester.	Regular course of study of Third year first semester.
4	Third year second semester toFourth year first semester.	(i) Regular course of study of Thirdyear 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 120 credits.

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA ≥8.00 with no F or below grade/detention anytime during the programme
2	First Class	CGPA ≥ 8.00 with rest of the clauses of S.No 1 not satisfied
3	First Class	CGPA ≥ 7.00 and CGPA < 8.00
4	Second Class	CGPA ≥ 6.00 and CGPA < 7.00
5	Pass Class	CGPA ≥ 5.00 and CGPA < 6.00

Academic Regulations for B.Tech with Minors Programme under GR22

(Applicable for Batches Admitted from 2022-23)

1. Objectives

The key objectives of offering B. Tech. with Minor program are:

- To expand the domain knowledge of the students in one of the other programmes of engineering.
- To increase the employability of undergraduate students keeping in view of better opportunity in interdisciplinary areas of engineering & technology.
- To provide an opportunity to students to pursue their higher studies in the inter-disciplinary areas in addition to their own programme of study.
- To offer the knowledge in the areas which are identified as emerging technologies/thrust areas of Engineering.

2. Academic Regulations for B.Tech Degree with Minor programmes

a) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4 -Years B.Tech programme.

b) For B.Tech with Minor, a student needs to earn additional 18 credits (over and above the required 160 credits for B.Tech degree). All these 18 credits need to be completed in III year and IV year only.

c) After registering for the Minor programme, if a student is unable to earn all the required 18 credits in a specified duration (twice the duration of the course), he/she shall not be awarded Minor degree. However, if the student earns all the required 160 credits of B.Tech, he/she will be awarded only B.Tech degree in the concerned programme.

d) There is no transfer of credits from Minor programme courses to regular B.Tech degree course and vice versa.

e) These 18 credits are to be earned from the additional Courses offered by the host department in the college as well as from the MOOCS platform.

f) For the course selected under MOOCS platform following guidelines may be followed:

- **i)** Prior to registration of MOOCS courses, formal approval of the courses, by the University is essential. University before the issue of approval considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.
- **ii)** Minimum credits for MOOCS course must be equal to or more than the credits specified in the Minor course structure provided by the University.
- **iii)** Only Pass-grade/marks or above shall be considered for inclusion of grades in minor grade memo.
- **iv)** Any expenses incurred for the MOOCS courses are to be met by the students only.

g) The option to take a Minor programme is purely the choice of the student.
The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Minor programme at any time; and in that case

h) student will be awarded only B.Tech degree in the concerned programme on earning the required credits of 160.

i) The student can choose only one Minor programme along with his/her basic engineering degree. A student who chooses an Honors programme is not eligible to choose a Minor programme and vice-versa.

j) A student can graduate with a Minor if he/she fulfils the requirements for his/her regular B.Tech programme as well as fulfils the requirements for Minor programme.

k) The institute shall maintain a record of students registered and pursuing their Minor programmes, minor programme-wise and parent programme -wise. The same report needs to be sent to the University once the enrolment process is complete.

l) The institute / department shall prepare the time-tables for each Minor course offered at their respective institutes without any overlap/clash with other courses of study in the respective semesters.

3. Eligibility conditions for the student to register for Minor programme

a) A student can opt for B.Tech programme with Minor programme if she/he has no active backlogs till II Year I Semester (III semester) at the time of entering into III year I semester.

b) Prior approval of mentor and Head of the Department for the enrolment into Minor programme, before commencement of III year I Semester (V Semester), is mandatory

c) If more than 50% of the students in a programme fulfil the eligibility criteria (as stated above), the number of students given eligibility should be limited to 50%.

4. Registration for the courses in Minor Programme

a) At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in that semester.

b) The students should choose a course from the list against each semester (from Minors course structure) other than the courses they have studied/registered for regular B.Tech programme. No course should be identical to that of the regular B.Tech course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

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

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

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

5. Minor courses and the offering departments

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

GOKARAJU RANGARAJU INSTITUTE OF ENINEERING AND TECHNOLOGY
(Autonomous)

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

ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech (ECE)–GR22 Course Structure

I B. Tech (ECE) - 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	GR22A1001	Linear Algebraand Function Approximation	3	1	0	4	3	1	0	4	40	60	100
2	Chemistry	BS	GR22A1005	Engineering Chemistry	3	1	0	4	3	1	0	4	40	60	100
3	EEE	ES	GR22A1008	Fundamentalsof Electrical Engineering	2	1	0	3	2	1	0	3	40	60	100
4	CSE	ES	GR22A1007	Programmingfor Problem Solving	2	1	0	3	2	1	0	3	40	60	100
5	EEE	ES	GR22A1019	Fundamentalsof Electrical EngineeringLab	0	0	1	1	0	0	2	2	40	60	100
6	Chemistry	BS	GR22A1015	Engineering Chemistry Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	CSE	ES	GR22A1017	Programmingfor Problem Solving Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	ME	ES	GR22A1021	Engineering Workshop	1	0	1.5	2.5	1	0	3	4	40	60	100
TOTAL					**11**	**4**	**6**	**20.5**	**11**	**4**	**11**	**26**	**320**	**480**	**800**
9	Mgmt	MC	GR22A1022	Design Thinking	0	0	0	0	2	0	0	2	40	60	100

I B. Tech (ECE) - 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	GR22A1002	Differential equationsand Vector Calculus	3	1	0	4	3	1	0	4	40	60	100
2	Physics	BS	GR22A1003	Applied Physics	3	1	0	4	3	1	0	4	40	60	100
3	English	HS	GR22A1006	English	2	0	0	2	2	0	0	2	40	60	100
4	CSE	ES	GR22A1012	Data structures	2	1	0	3	2	1	0	3	40	60	100
5	Physics	BS	GR22A1013	Applied Physics Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
6	ME	ES	GR22A1011	Graphics for Engineers	1	0	2	3	1	0	4	5	40	60	100
7	CSE	ES	GR22A1020	Data Structures Lab	0	0	1	1	0	0	2	2	40	60	100
8	English	HS	GR22A1016	English Language and Communication Skills Lab	0	0	1	1	0	0	2	2	40	60	100
TOTAL					**11**	**3**	**5.5**	**19.5**	**11**	**3**	**11**	**25**	**320**	**480**	**800**

II B. Tech (ECE) - 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	ECE	PC	GR22A2052	Electronic Devices and Circuits	3	0	0	3	3	0	0	3	40	60	100
2	ECE	PC	GR22A2053	Digital Electronics	3	0	0	3	3	0	0	3	40	60	100
3	ECE	PC	GR22A2054	Signals and Systems	2	1	0	3	2	1	0	3	40	60	100
4	ECE	PC	GR22A2055	Probability Theory and StochasticProcesses	2	1	0	3	2	1	0	3	40	60	100
5	ECE	PC	GR22A2056	Network Analysis	3	1	0	4	3	1	0	4	40	60	100
6	ECE	PC	GR22A2057	Electronic Devices and Circuits Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	ECE	PC	GR22A2058	Digital ElectronicsLab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	ECE	PC	GR22A2059	Signals and SystemsLab	0	0	1	1	0	0	2	2	40	60	100
TOTAL					**13**	**3**	**4**	**20**	**13**	**3**	**8**	**24**	**320**	**480**	**800**
9	CHEM	MC	GR22A2001	Environmental Science	0	0	0	0	2	0	0	2	40	60	100

II B. Tech (ECE) - 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	PC	GR22A2009	Computational Mathematics for Engineers	3	0	0	3	3	0	0	3	40	60	100
2	ECE	PC	GR22A2060	Microcontrollers	3	0	0	3	3	0	0	3	40	60	100
3	ECE	PC	GR22A2061	Electromagnetic Fields and Transmission Lines	3	1	0	4	3	1	0	4	40	60	100
4	ECE	PC	GR22A2062	Analog Electronics	3	0	0	3	3	0	0	3	40	60	100
5	ECE	PC	GR22A2063	Analog and Digital Communications	3	0	0	3	3	0	0	3	40	60	100
6	ECE	PC	GR22A2064	Microcontrollers Lab	0	0	1	1	0	0	2	2	40	60	100
7	ECE	PC	GR22A2065	Analog Electronics Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	ECE	PC	GR22A2066	Analog and Digital Communications Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
TOTAL					**14**	**2**	**4**	**20**	**14**	**2**	**8**	**24**	**320**	**480**	**800**
9	English	MC	GR22A2108	Effective Technical Communication	0	0	0	0	2	0	0	2	40	60	100
10	ECE	MC	GR22A2109	Real-time Research Project/ Societal Related Project	0	0	2	2	0	0	4	4	50	--	50

III B. Tech (ECE) - 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	ECE	PC	GR22A3033	Introduction to Computer Organization	3	0	0	3	3	0	0	3	40	60	100
2	ECE	PC	GR22A3034	Linear Control Systems	2	1	0	3	2	1	0	3	40	60	100
3	ECE	PC	GR22A3035	Digital Signal Processing	3	1	0	4	3	1	0	4	40	60	100
4		PE- I		Professional Elective-I	3	0	0	3	3	0	0	3	40	60	100
5		OE-1		Open Elective-1	3	0	0	3	3	0	0	3	40	60	100
6	ECE	PC	GR22A3041	IOT Sensors Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	ECE	PC	GR22A3042	Digital Signal Processing Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	CSE	PC	GR22A3043	OOPS through Java Lab	0	0	1	1	0	0	2	2	40	60	100
TOTAL					**14**	**2**	**4**	**20**	**14**	**2**	**8**	**24**	**320**	**480**	**800**
9	Mgmt	MC	GR22A2003	Constitution of India	0	0	0	0	2	0	0	2	40	60	100

Professional Elective-I			
S.No	**BOS**	**Course Code**	**Course Name**
1	ECE	GR22A3036	Digital System Design using Verilog HDL
2	IT	GR22A3037	Soft Computing
3	ECE	GR22A3038	Optical Communications
4	ECE	GR22A3039	Actuators and Sensors

Open Elective-I			
S.No	**BOS**	**Course Code**	**Course Name**
1	ECE	GR22A3040	Principles of Communications

III B. Tech (ECE) - 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	ECE	PC	GR22A3108	VLSI Design	3	0	0	3	3	0	0	3	40	60	100
2	ECE	PC	GR22A3109	Antennas and Wave Propagation	3	0	0	3	3	0	0	3	40	60	100
3	CSE	PC	GR22A3044	Computer Networks	3	0	0	3	3	0	0	3	40	60	100
4		PE-II		Professional Elective-II	3	0	0	3	3	0	0	3	40	60	100
5		OE-II		Open Elective-II	3	0	0	3	3	0	0	3	40	60	100
6	CSE	PC	GR22A3050	Computer NetworksLab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	ECE	PC	GR22A3114	VLSI Design Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	ECE	PW	GR22A3089	Mini Project	0	0	2	2	0	0	4	4	40	60	100
TOTAL					**15**	**0**	**5**	**20**	**15**	**0**	**10**	**25**	**320**	**480**	**800**
9	Mgmt	MC	GR22A2002	Value Ethics and Gender Culture	0	0	0	0	2	0	0	2	40	60	100

Professional Elective-II			
S.No	BOS	Course Code	Course Name
1	ECE	GR22A3110	FPGA and CPLD Architectures
2	CSE(AIML)	GR22A3140	Machine Learning
3	ECE	GR22A3111	Wireless Communication Networks
4	ECE	GR22A3112	Embedded Systems Design

Open Elective-II			
S.No	BOS	Course Code	Course Name
1	ECE	GR22A3113	Sensor Technology

IV B. Tech (ECE) - 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	Mgmt	HS	GR22A2004	Economics and Accounting for Engineers	3	0	0	3	3	0	0	3	40	60	100
2	ECE	PC	GR22A4036	Microwave Engineering	3	0	0	3	3	0	0	3	40	60	100
3		PE -III		Professional Elective-III	3	0	0	3	3	0	0	3	40	60	100
4		PE- IV		Professional Elective-IV	3	0	0	3	3	0	0	3	40	60	100
5		OE- III		Open Elective-III	3	0	0	3	3	0	0	3	40	60	100
6	ECE	PC	GR22A4046	Microwave Engineering Lab	0	0	2	2	0	0	4	4	40	60	100
7	ECE	PC	GR22A4047	Advanced Communications Lab	0	0	2	2	0	0	4	4	40	60	100
8	ECE	PW	GR22A4082	Project Work Phase I	0	0	6	6	0	0	12	12	40	60	100
TOTAL					**15**	**0**	**10**	**25**	**15**	**0**	**20**	**35**	**320**	**480**	**800**

Professional Elective-III			
S.No	**BOS**	**Course Code**	**Course Name**
1	ECE	GR22A4037	Analog IC Design
2	ECE	GR22A4038	Digital Image Processing
3	ECE	GR22A4039	Software Defined Radio
4	ECE	GR22A4040	RTOS and System Programming

Professional Elective-IV			
S.No	**BOS**	**Course Code**	**Course Name**
1	ECE	GR22A4041	Fundamentals of Low Power VLSI Design
2	ECE	GR22A4042	Speech Signal Processing
3	ECE	GR22A4043	Cellular Mobile Communications
4	ECE	GR22A4044	Fundamentals and Applications of ARM processors

Open Elective-III			
S.No	**BOS**	**Course Code**	**Course Name**
1	ECE	GR22A4045	Communication Technologies

IV B. Tech (ECE) - 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		PE -V		Professional Elective-V	3	0	0	3	3	0	0	3	40	60	100
2		PE-VI		Professional Elective-VI	3	0	0	3	3	0	0	3	40	60	100
3	Mgmt	HS	GR22A3116	Fundamentals ofManagement and Entrepreneurship	3	0	0	3	3	0	0	3	40	60	100
4	ECE	PW	GR22A4145	Project Work Phase II	0	0	6	6	0	0	12	12	40	60	100
TOTAL					**9**	**0**	**6**	**15**	**9**	**0**	**12**	**21**	**160**	**240**	**400**

Professional Elective-V			
S.No	**BOS**	**Course Code**	**Course Name**
1	ECE	GR22A4111	VLSI Technology
2	ECE	GR22A4112	5G and beyond Communication
3	ECE	GR22A4113	Radar Systems
4	ECE	GR22A4114	Digital Signal Processors and Architectures

Professional Elective-VI			
S.No	**BOS**	**Course Code**	**Course Name**
1	ECE	GR22A4115	ASIC Design
2	ECE	GR22A4116	Biomedical Signal Processing
3	ECE	GR22A4117	Satellite Communications
4	ECE	GR22A4118	Autonomous Systems

PROFESSIONAL ELECTIVES – 4 THREADS

S. No.	Thread 1: VLSI	Thread 2: Signal Processing	Thread 3: Communications	Thread 4: Embedded Systems
1	Digital System Design using Verilog HDL	Soft Computing	Optical Communications	Actuators and Sensors
2	FPGA and CPLD Architectures	Machine Learning	Wireless Communication Networks	Embedded Systems Design
3	Analog IC Design	Digital Image Processing	Software Defined Radio	RTOS and System Programming
4	Fundamentals of LowPower VLSI Design	Speech Signal\ Processing	Cellular Mobile Communications	Fundamentals and Applications of ARMprocessors
5	VLSI Technology	5G and beyond Communication	Radar Systems	Digital Signal Processors and Architectures
6	ASIC Design	Biomedical Signal Processing	Satellite Communications	Autonomous Systems

OPEN ELECTIVES FOR GR22 REGULATIONS

THREAD 1	THREAD 2	OFFERED BY
Soft Skills and Interpersonal Skills (GR22A3145)	Data Science for Engineers (GR22A3049)	CSE
	Data Analytics using Open-Source Tools (GR22A3120)	
Human Resource Development and Organizational Behavior (GR22A4049)	Augmented Reality and Virtual Reality (GR22A4054)	
	Basics of Java Programming (GR22A3072)	CSE (AIML)
	Introduction to DBMS (GR22A3141)	
	Introduction to Data Mining (GR22A4080)	
Cyber Law and Ethics (GR22A4077)	Programming in Python (GR22A3077)	CSE (DS)
	Internet of Things (GR22A3147)	
	Scripting Languages (GR22A4085)	
Economic Policies in India (GR22A4147)	Services Science and Service Operational Management (GR22A4134)	CSBS
	IT Project Management (GR22A4135)	
	Marketing Research and Marketing Management (GR22A4136)	
	Introduction to Data Science (GR22A3056)	IT
	User Centric Human Computer Interaction (GR22A3127)	
	Design Patterns (GR22A4063)	
	Non-Conventional Energy Sources (GR22A3019)	EEE
	Concepts of Control Systems (GR22A3095)	
	Artificial Neural Networks and Fuzzy Logic (GR22A4022)	
	Principles of Communications (GR22A3040)	ECE
	Sensor Technology (GR22A3113)	
	Communication Technologies (GR22A4045)	
	Industrial Automation and Control (GR22A3030)	ME
	Composite Materials (GR22A3105)	
	Operations Research (GR22A3018)	
	Engineering Materials for Sustainability (GR22A3009)	CE
	Construction Project Planning and Systems (GR22A4090)	
	Environmental Impact Assessment (GR22A4011)	
	Basics of Java Programming (GR22A3072)	CSE (AI)
	Introduction to DBMS (GR22A3141)	
	Introduction to Data Mining (GR22A4080)	
	Introduction to Data Science (GR22A3056)	CSIT
	User Centric Human Computer Interaction (GR22A3127)	
	Design Patterns (GR22A4063)	

I YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
LINEAR ALGEBRA AND FUNCTION APPROXIMATION

Course Code: GR22A1001 **L/T/P/C: 3/1/0/4**

I Year I Semester

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

Course Outcomes

1. Work with the essential tools of vector and matrix algebra
2. Compute eigenvalues and vectors for engineering applications
3. Illustrate matrix decomposition techniques to determine the exact or approximate solutions of a linearalgebraic system.
4. Develop the skill of finding multivariable function optima
5. Illustrate the concepts of function approximation with measurement of error

UNIT I

Fundamentals of Vector and Matrix algebra Operations on vectors and matrices- Orthogonal projection of vectors- Exact and generalized inverse of a matrix- Rank of a matrix- Linear independence of vectors- Structured square matrices (Symmetric, Hermitian, skew-symmetric, skew-Hermitian, orthogonal, and unitary matrices)- Vector and matrix norms Solution of a linear algebraic system of equations (homogeneous and non-homogeneous) using Gausselimination.

UNIT II

Matrix eigenvalue problem and Quadratic forms Determination of eigenvalues and eigenvectors of a matrix, properties of eigenvalues and eigenvectors (without proof)- Similarity of matrices- Diagonalization of a matrix- Orthogonal diagonalization of a symmetric matrix- Definiteness of a symmetric matrix

Quadratic Forms- Definiteness and nature of a quadratic form- Reduction of a quadratic form to the canonicalform using an orthogonal transformation.

UNIT III

Matrix decomposition and Least squares solution of algebraic systems LU decomposition- Cholesky decomposition- Gram-Schmidt orthonormalization process- QR factorization- Eigen decomposition of a symmetric matrix- Singular value decomposition Least squares solution of an over determined system of equations using QR factorization and the generalizedinverse- Estimation of the least squares error

UNIT IV

Multivariable differential calculus and Function Optimization Partial Differentiation- Chain rule- Total differentiation- Jacobian- Functional dependence Multivariable function Optimization- Taylor's theorem for multivariable functions- Unconstrained optimization of functions using the Hessian matrix- Constrained optimization using the Lagrange multiplier method

UNIT V

Function approximation tools in engineering Function approximation using Taylor's polynomials- Properties of Chebyshev polynomials- Uniform approximation using Chebyshev polynomials

The principle of least squares- Function approximation using polynomial, exponential and power curves

using matrix notation- Estimating the Mean squared error

Text Books

1. Advanced Engineering Mathematics, 5th Edition, R.K.Jain and S.R.K.Iyengar, Narosa publishing house
2. Higher Engineering Mathematics- B.S.Grewal- Khanna publications

REFERENCES BOOKS

1. Introduction to Linear Algebra, Gilbert Strang, 5th Edition, Wellesley, 2017.
2. Numerical methods for scientific and engineering computation, M.K.Jain, S.R.K.Iyengar, R.K.Jain- 3rd Edition- New Age publishers
3. Applied Mathematics, Vol. I & II, P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, 2010

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING CHEMISTRY

Course Code: GR22A1005 **L/T/P/C: 3/1/0/4**
I Year I Semester

Course Outcomes
1. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Relate electromagnetic spectra used for exciting different molecular energy levels in various spectroscopic techniques and their application in medicine and other fields.
3. Recognize various problems related to electrochemistry and corrosion in industry and is able to explain different prevention techniques and apply concepts of chemistry in engineering.
4. Know the origin of different types of engineering materials used in modern technology and interpret different problems involved in industrial utilization of water.
5. Understand the processing of fossil fuels for the effective utilization of chemical energy.

UNIT I

Atomic and Molecular Structure Atomic and Molecular orbitals - Definition, examples and comparison, Molecular orbital theory- postulates and MO energy diagrams of N_2 and O_2.

Theories of Metallic bonding – Free electron theory, Resonance theory, Molecular orbital theory, Valence Bond Theory – Postulates and Limitations, Bonding in $[Ni(CO)4]$, $[Ni(Cl)4]^{2-}$, $[Ni(CN)4]^{2-}$, $[Co(NH3)6]^{3+}$, and $[CoF6]^{3-}$. Crystal Field Theory, Crystal Field Splitting of transition metal ion d-orbitals in octahedral, tetrahedral and square planar geometries.

UNIT II

Spectroscopic Techniques and Applications Regions of Electromagnetic spectrum. Molecular spectroscopy: Rotational Spectroscopy: Rotation of molecules, Rotational spectra of rigid diatomic molecules, Selection rules. Vibrational Spectroscopy: The vibrating diatomic molecule, Simple and anharmonic oscillators of a diatomic molecule, Selection rules, Applications of IR spectroscopy.NMR Spectroscopy: Criteria for NMR activity (Magnetic and non-magnetic nuclei), Basic concepts and Principle of ^1H NMR spectroscopy, Chemical shift- Shielding and Deshielding. Magnetic Resonance Imaging.

UNIT III

Batteries and Corrosion Batteries: Primary and Secondary types, Lithium ion and Lead acid batteries. Fuel cells: Definition, Hydrogen-Oxygen fuel cell and Microbial Fuel cell – working principle and applications. Corrosion: Definition, causes and effects of corrosion, Theories of chemical and electro chemical corrosion with mechanism, Differential metal corrosion - Galvanic corrosion, Differential aeration corrosion - pitting corrosion, Factors affecting corrosion – Nature of metal (Position of metal, Relative areas, Purity and Passivity), Nature of Environment (pH, Temperature and Humidity), Corrosion control methods: Cathodic protection (sacrificial anodic and impressed current cathodic protection), Metallic coatings: Hot dipping- galvanization and tinning.

UNIT IV

Engineering Materials and Water Technology Semiconductors: Si and Ge - preparation, purification and crystal growth by zone refining and Czochralskipulling methods, Doping – Epitaxy, Diffusion, and Ion implantation. Plastics: Comparison between thermoplastics and thermosets, Fabrication of plastics - compression moulding and injection moulding. Conducting polymers – Definition, classification, and applications. Water: Hardness - Causes, types and units. Boiler troubles-scales and sludges, caustic

embrittlement. Water purification: Demineralization by Ion-exchange process, Desalination by reverse osmosis method.

UNIT V

Stereochemistry and Energy Resources Stereochemistry: Elements of symmetry-plane of symmetry, centre of symmetry, alternating axis of symmetry. Chirality, Enantiomers – tartaric acid, Diastereomers-2,3-dichloropentane, Conformational analysis of n-butane. Structure, synthesis and pharmaceutical applications of aspirin and ibuprofen. Energy sources: Fossil Fuels: Coal –types, analysis of coal-proximate and ultimate analysis and their significance, Petroleum-its composition, Cracking – Definition, Fluid bed catalytic cracking, Knocking andits mechanism in Internal Combustion engine, Octane rating, Hydrogen gas generation by Electrolysis process.

Text Books

1. Engineering chemistry by P.C. Jain and M. Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. Textbook of Engineering Chemistry by A. Jayashree, Wiley Publications

Reference Books

1. Organic Chemistry by Morrison, Boyd & Bhattacharjee (Pearson Pubs)
2. Engineering Chemistry by O.G.Palanna, Tata McGraw Hills Private Ltd.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell. McGraw Hill Publication
4. A Textbook of Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF ELECTRICAL ENGINEERING

Course Code: GR22A1008 **L/T/P/C: 2/1/0/3**
I Year I Semester

Course Outcomes:

1. Summarize Understand basic electric circuits.
2. Analyze electric circuits with suitable theorems.
3. Interpret the working principle of Electrical machines.
4. Solve single phase balanced sinusoidal systems.
5. Apply sensors for real time applications

UNIT -I: BASIC COMPONENTS AND ELECTRIC CIRCUITS

Charge, Current, Voltage, Power, Passive components, Voltage and Current sources, dependent and independent sources, fundamentals of circuit Laws, Source Transformation, Passive components in series and parallel, Delta – star conversion.

UNIT- II: NETWORK ANALYSIS

Nodal and Mesh Analysis, Linearity and Superposition, Thevenin's and Norton's theorems,Maximum power transfer theorem and Reciprocity theorem.

UNIT- III: A.C CIRCUITS

Representation of sinusoidal waveforms, average and rms values, phasor representation, real power, reactive power, apparent power, power factor, analysis of RL, RC and RLC circuits. Series and Parallel Circuits, Resonance.

UNIT- IV: BASICS OF ELECTRICAL MACHINES

Transformer: Mutual Induction, construction and working principle, Types of transformers, Ideal transformer, EMF Equation, Phasor diagram on No Load. Construction and working principles of DC generator, DC motor, Synchronous generator, and Induction Motor – applications.

UNIT V: MEASURING INSTRUMENTS AND SENSORS

Transducers, Sensors, and Actuators – Physical Principles and their working, Temperature Sensors, Ultrasonic Sensor, Accelerometers Sensor, and PIR Motion Detector.

Text Books:

1. D.P. Kothari and I.J. Nagrath, Basic Electrical Engineering -, 3rd Edition 2010, Tata McGraw Hill.
2. Sensors and amp, Transducers – D. Patranabis, PHI Publications
3. Electrical Engineering Fundamentals, Vincent Deltoro, 2nd Edition, Prentice Hall India, 1989

Reference Books:

1. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education,2004.
2. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.

3. Circuit Theory (Analysis and Synthesis) by A. Chakrabarti-Dhanpat Rai & Co.
4. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
5. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
6. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROGRAMMING FOR PROBLEM SOLVING

Course Code: GR22A1007 **L/T/P/C:2/1/0/3**
I Year I Semester

Course Outcomes:
1. To design algorithms and flowcharts for problem solving and illustrate the fundamentals of C language.
2. To identify and apply control structures and arrays to solve problems.
3. To discover the need for strings and functions in problem solving and apply it.
4. To analyze the need for pointers and structures in C and implement for solutions.
5. To interpret working with files, preprocessor directives and command line arguments in C.

UNIT- I

Introduction to Programming: Introduction to Algorithms: Representation of Algorithm, Flowchart, Pseudo code with examples, compiling and executing programs, syntax, and logical errors. **Introduction to C Programming Language:** Structure of C program, keywords, variables, constants, datatypes, operators, precedence and associativity, expression evaluation, implicit and explicit type conversion, formatted and unformatted I/O.

UNIT- II

Decision Making and Arrays: Branching and Loops: Conditional branching with simple if, if- else, nested if else, else if ladder, switch-case, loops: for, while, do-while, jumping statements: go to, break, continue, exit.

Arrays: one- and two-dimensional arrays, creating, accessing and manipulating elements of arrays.

Searching: Introduction to searching, Linear search and Binary search.

UNIT- III

Strings and Functions: Functions: Introduction to structured programming, function declaration, signature of a function, parameters and return type of a function, categories of functions, parameter passing techniques, passing arrays and strings to functions, recursion, merits and demerits of recursive functions, storage classes.

Strings: Introduction to strings, operations on characters, basic string functions available in C - strlen, strcat, strcpy, strrev, strcmp, String operations without string handling functions, arrays of strings.

UNIT- IV

Pointers and Structures: Pointers: Idea of pointers, declaration and initialization ofpointers, pointer to pointer, void pointer, null pointer, pointers to arrays and structures,function pointer.

Structures and Unions: Defining structures, declaring and initializing structures, arrays within structures, arrayof structures, nested structures, passing structures to functions, unions, typedef.

UNIT- V

File handling and Preprocessor in C:

Files: Text and binary files, creating, reading, and writing text and binary files, random

access to files, error handling in files.

Preprocessor: Commonly used preprocessor commands like include, define, undef, if, ifdef, ifndef, elif, command line arguments, enumeration data type.

TEXT BOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

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

Course Code: GR22A1019 **L/T/P/C: 0/0/2/1**

I Year I Semester

Course Outcomes:

1. Get an exposure to common electrical components and their ratings.
2. Get an exposure to basic electrical laws.
3. Understandthemeasurementandrelationbetweenthebasicelectricalparameters
4. Understandtheresponseofdifferenttypesofelectricalcircuitstodifferentexcitations.
5. Compare the basic characteristics of Electrical machines.

List of Experiments:

TASK-1: Verification of Ohms Law, KVL and KCL

TASK-2: Verification of Thevenin's and Norton's Theorems

TASK-3: Verification of Superposition and Reciprocity Theorems.

TASK-4: Verification of Maximum Power Transfer Theorem

TASK-5: Resonance in series RLC circuit

TASK-6: Load Test on Single Phase Transformer (Calculate Efficiency and regulation)

TASK-7: Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)

TASK-8: Measurement of Active and Reactive Power in a balanced Three-phase Circuit

TASK-9: Torque Speed Characteristics of a Separately Excited DC Shunt Motor

TASK-10: Torque-Slip Characteristics of a Three-phase Induction Motor

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING CHEMISTRY LAB

Course Code: GR22A1015 **L/T/P/C: 0/0/3/1.5**
I Year I Semester

Course Outcomes:

1. Ability to perform experiments illustrating the principles of chemistry relevant to the study of science and engineering.
2. Determination of parameters like hardness and chloride content in water, measurement of redox potentials and conductance.
3. Understand the kinetics of a reactions from a change in concentrations of reactants or products as a function of time.
4. Synthesize a drug molecule as an example of organic synthesis methods widely used in industry.
5. Determination of physical properties like adsorption and viscosity.

List of Experiments:

1. Determination of Total Hardness of water by complexometric method using EDTA
2. Determination of Chloride content of water by Argentometry
3. Redox titration: Estimation of Ferrous ion using standard KMnO4 by Permanganometry
4. Estimation of HCl by Conductometric titrations
5. Estimation of Ferrous ion by Potentiometry using dichromate
6. Determination of Rate constant of acid catalyzed reaction of methyl acetate
7. Adsorption of Acetic acid by charcoal
8. Determination of Surface tension of liquid by using Stalagmometer
9. Determination of Viscosity of liquid by using Ostwald's Viscometer
10. Determination of Partition Coefficient of Acetic acid between n-butanol and water
11. Synthesis of Aspirin
12. Synthesis of Paracetamol

Reference Books:

1. Vogel's text book of Practical organic chemistry, 5th Edition.
2. Senior Practical Physical Chemistry, B.D. Khosala, A. Gulati and V. Garg (R. Chand & Co., Delhi)
3. Text book on experiments and Calculations in Engineering Chemistry-S.S.Dara.
4. An introduction to practical chemistry, K.K. Sharma and D.S. Sharma (Vikas Publications, New Delhi)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROGRAMMING FOR PROBLEM SOLVING LAB

Course Code: GR22A1017 **L/T/P/C: 0/0/3/1.5**

I Year I Semester

Course Outcomes:

1. Translate algorithms into a working program and analyze and debug the codes using basics of C language.
2. Develop programs by choosing appropriate control structures.
3. Select and apply the concept of arrays and strings for problem solving.
4. Demonstrate problem solving using modular programming and pointers.
5. Solve the problems using structures, files and pre-processor directives.

List of Experiments

TASK 1

a. Write a C program to convert days into years, weeks and days(Assume a year has 365 days).
b. Write a C program to find greatest and smallest among three numbers using conditional operator.
c. Write a C program to enter P, T, R and calculate Compound Interest.

TASK 2

a. Write a C program to swap two numbers using the following:
   i. Using third variable
   ii. Without using third variable
   iii. Using bitwise operators
b. Write a C program to do the following using implicit and explicit type conversion
   i. Convert Celsius temperature to Fahrenheit
   ii. Convert Fahrenheit temperature to Celsius
   iii. Find area of a triangle given sides a,b,c

TASK 3

a. Write a C program to add two numbers without using arithmetic operators in C.
b. Write a C program to determine whether a number is a power of 2 or not using bitwise operator and ternary operator.
c. Write a C program to check whether a number is even or odd using bitwise operator and ternary operator

TASK 4

a. Write a C program to find the roots of a quadratic equation using if-else.
b. Write a C program to input electricity unit charges and calculate total electricity bill according to the given condition:
   i. For first 50 units Rs. 0.50/unit for next 100 units Rs. 0.75/unit for next 100 units Rs. 1.20/unit For unit above 250 Rs. 1.50/unit
   ii. An additional surcharge of 20% is added to the bill
c. Write a menu driven C program to implement a simple arithmetic calculator.
d. Write a C program to display number of days in month using switch case (The input is month number 1 -12).

TASK 5

a. Write a C program check whether a given number is Perfect number or not.
b. Write a C program check whether a given number is Palindrome number or not.
c. Write a C program check whether a given number is Armstrong number or not.
d. Write a C program check whether a given number is Strong number or not.

TASK 6

a. Write a C program to generate the prime numbers between x and y where x and y are starting and ending values to be supplied by the user.
b. Write a C program to calculate the sum of following series:
   (i)S1=1+x/1!-x2/2!+x3/3!- x4/4!+…..xn/n!
   (ii)S2= x1/1+x3/3+x5/5+….+xn/n
c. Write a C program to display the following patterns:

```
(i)                (ii)                (iii)
* * * *                1                  1
*       *            2   3                2 2
*       *        4   5 6                  3 33
* * *   *        7   8   9   10           4  44  4
```

TASK 7

a. Write a C program to find sum, average and minimum and maximum in a list of numbers.
b. Write a C program to implement Linear search.
c. Write a C program to implement Binary search.

TASK 8

a. Write a C program to implement matrix addition.
b. Write a C program to implement matrix multiplication

TASK 9

a. Write a C program to display binary equivalent of a given decimal number using functions.
b. Write a C program to implement transpose of a matrix using functions
c. Write a C program using functions that compares two strings to see whether they are identical or not. The function returns 1 if they are identical, 0 otherwise.

TASK 10

a. Write a C program to implement factorial of a given integer using recursive and non- recursive functions.
b. Write a C program to find the GCD (greatest common divisor) of two given integers using recursive and non-recursive functions.
c. Write a C program to print first ‘n’ terms of Fibonacci series using recursive and non-recursive functions.

TASK 11

a. Write a C program to implement the following with and without string functions:
   i. Reverse a string ii. Concatenate 2 strings
b. Write a C program to read a string and determine whether it is palindrome or not.
c. Write a C program to sort the 'n' strings in the alphabetical order.

TASK 12

a. Write a C program to implement function pointer to find sum and product of two numbers.
b. Write a C program to sort list of numbers using pointers.

TASK 13

a. Define a structure Student, to store the following data about a student: roll no (int), name (string) and marks. Suppose that the class has 'n' students. Use array of type Student and create a function to read the students data into the array. Your program should be menu driven that contains the following options :
b. (i) Print all student details (ii) Search student by roll no (iii) Print the names of the students having the highest test score
c. Write a C program that uses structures and functions to perform addition and product of two complex numbers? (use structures and functions)

TASK 14

a. Write a C program to merge two files into a third file.
b. Write a C program to count number of characters in a file and also convert all lower case characters to upper case and display it
c. Write a C program to append a file and display it

TASK 15

a. Write a C program to find sum of 'n' numbers using command line arguments.
b. Write a C program to implement following pre-processor directives:
   i. define ii. undef iii. ifdef iv. ifndef.
c. Write a C program to create a user defined header file to find sum, product and greatest of two numbers

TEXT BOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education
4. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4th Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING WORKSHOP

Course Code: GR22A1021 **L/T/P/C: 1/0/ 3/2.5**

I Year I Semester

Course Outcomes:

1. Develop various trades applicable to industries / Manufacturing practices.
2. Create Hands on experience for common trades.
3. Improve to fabricate components with their own hands.
4. Develop practical knowledge on the dimensional accuracies and dimensional tolerances possible with various manufacturing processes.
5. To build the requirement of quality of work life on safety and organizational needs.

TRADES FOR EXERCISES: At least two exercises from each trade

1. Carpentry
2. Fitting Shop
3. Tin-Smithy
4. Casting
5. Welding Practice
6. House-wiring
7. Black Smithy
8. **VIDEO LECTURES:** Carpentry, Fitting operations, Tin-Smithy, Casting, Welding, Electrical and Electronics, Black Smithy, Plumbing, Power tools in construction and Wood Working, Manufacturing Methods,

Text/ Reference Books:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal /Anuradha.

Reference Books:

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/SciTech
2. Workshop Manual / Venkat Reddy/BSP
3. Workshop Manual/K. Venugopal/Dr.V. Prabhu Raja/G.Sreekanjan

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DESIGN THINKING

Course Code: GR22A1022 **L/T/P/C: 2/0/0/0**

I Year I Semester

Course Outcomes:

1. To find various DT mindsets
2. Students will be able to extend DT methodology towards defining the problem
3. Students will be able to Identify Tools for Innovation
4. Students will be able to develop Empathy Maps
5. Students will be able to build Prototypes

UNIT-I

Introduction to Design Thinking: LRI Assessment, Introduction to Design Thinking, Understanding the Mindsets-Empathy, Optimism, Embrace Ambiguity, Make it, Learn from Failure, Iterate, Create Confidence, Creativity Convergent & Divergent Thinking

UNIT-II

Design Thinking Methodology: The 5 Stages of the Design Thinking Process-Empathize, Define (the problem), Ideate, Prototype, and Test

UNIT-III

Ideation tools & exercises. Sample Design Challenge, Design Challenge Themes, Storytelling and Tools for Innovation and creativity.

UNIT-IV

Empathize-Understand customers, Empathy Maps, Empathize-Step into customer's shoes-Customer Journey Maps, Define- Analysis & Drawing Inferences from Research

UNIT-V

The Design Challenge: Define the Design Challenge, Prototyping & Iteration- Feasibility Study, Testing-Documentation, and the Pitching

TEXT BOOKS

1. Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School - Idris Mootee.

REFERENCE BOOKS

1. Zero to One: Note on Start-Ups, or How to Build the Future
2. The Lean Startup: How Constant Innovation Creates Radically Successful Businesses
3. Start with Why: How Great Leaders Inspire Everyone to Take Action

I YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Code: GR22A1002 **L/T/P/C: 3/1/0/4**

I Year II Semester

Course Outcomes:

1. Classify the differential equations of first order and solve them analytically
2. Solve linear differential equations of higher order under various forcing functions
3. Evaluate double and triple integrals and apply them to some problems in geometry
4. Apply principles of vector differentiation and line integration for some field related problems
5. Apply classical vector integral theorems for fast evaluation of work done around closed curves and flux across closed surfaces

UNIT I: ORDINARY DIFFERENTIAL EQUATIONS OF THE FIRST ORDER

Linear Differential Equations of the first order: Solution of Exact, Linear and Bernoulli equations, modelling Newton's law of cooling, growth and decay models, modelling of R-L circuit

UNIT II: ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Solution of homogeneous and non-homogeneous linear differential equations with constant coefficients, complimentary functions, particular integrals and the method of variation of parameters Solution of Linear Differential Equations with variable coefficients: Cauchy's and Legendre's homogeneous equations

UNIT III: MULTIPLE INTEGRALS

Double integrals: Evaluation of Double Integrals, change of order of integration (only Cartesian form), change of variables (Cartesian and polar coordinates) Triple Integrals: Evaluation of triple integrals, change of variables (Cartesian to Spherical and Cylindrical polar coordinates) Application of double integral to find the area of a lamina and volume of a solid, application of the triple integral to find the volume of a solid

UNIT IV: VECTOR DIFFERENTIATION AND LINE INTEGRATION

Vector differentiation: Scalar and vector point functions, Concepts of gradient, divergence and curl of functions in Cartesian framework, solenoidal field, irrotational field, scalar potential Vector line integration: Evaluation of the line integral, concept of work done by a force field, Conservative fields

UNIT V: SURFACE INTEGRATION AND VECTOR INTEGRAL THEOREMS

Surface integration: Evaluation of surface and volume integrals, flux across a surface Vector integral theorem: Green's, Gauss and Stokes theorems (without proof) and their applications

TEXT BOOKS

1. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa publishing house, 4th Edition 2014
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley &Sons, 2006
4. G.B. Thomas and R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint, 2002.

REFERENCES

1. GRIET reference manual
2. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. Calculus Early Transcendental 9E by James Steward, Daniel Clegg, Saleem Watson, CENGAGE Publications

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
APPLIED PHYSICS

Course Code: GR22A1003 **L/T/P/C: 3/1/0/4**

I Year II Semester

Course Outcomes:

1. Solve engineering problems involving quantum nature of radiation and matter waves.
2. Describe the characteristics of semiconductor devices such as transistors and diodes.
3. Illustrate the operation of optoelectronic devices and its applications.
4. Analyze the properties of Laser and its propagation in different types of optical fibers.
5. Identify dielectric, magnetic, and superconducting materials based on their properties for specific applications.

UNIT I

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

UNIT II

Semiconductor Physics: Intrinsic and extrinsic semiconductors, Estimation of carrier concentration in intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier concentration and variation with temperature, Carrier transport: diffusion and drift, p-n junction diode: I-V Characteristics, Zener diode: I-V Characteristics, Hall Effect, and its applications.

UNIT III

Optoelectronic Devices: Radiative transitions: Absorption, Spontaneous and Stimulated emissions, Non-radiative transitions: Auger recombination, Surface recombination and recombination at defects, Generation and recombination mechanism in semiconductors, Principle, Construction, Working, Characteristics and Applications: LED, PIN photo detector, Avalanche photo detector and Solar cell.

UNIT IV

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

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

UNIT V

Dielectric Materials: Introduction, Types of polarizations: Electronic, Ionic and Orientation, Calculation of Electronic and Ionic polarizability, Internal fields in solids, Clausius-Mossotti equation, Applications of dielectric materials.

Magnetic Materials: Introduction, Bohr magneton, classification of magnetic materials: Ferro, Para, Dia, Antiferro and Ferri, Hysteresis curve based on domain theory, Soft and hard magnetic materials, Applications of magnetic materials

Text Books:

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

References:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGLISH

Course Code: GR22A1006 **L/T/P/C: 2/0/0/2**

I Year II Semester

Course Outcomes:

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. Acquire proficiency in English including reading and listening comprehension, writing and speaking skills.
5. Listen and respond appropriately.

UNIT I

Where the Mind is without Fear poem by Rabindranath Tagore

Vocabulary: The Concept of Word Formation-- The Use of Prefixes and Suffixes.

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading

Writing: Sentence Structures -Use of Phrases and Clauses in Sentences-Importance of Proper Punctuation - Techniques for writing precisely - Paragraph writing - Do's and Don'ts of Paragraph Writing - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT II

The Last Leaf by O. Henry Vocabulary: Synonyms and Antonyms.

Grammar: Modal Auxiliaries- Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Précis Writing, Describing Objects, Places and Events – Classifying - Providing Examples or Evidence

UNIT III

'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press. Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses. **Reading:** Improving Comprehension Skills – Techniques for Good Comprehension **Writing**: Format of a Formal Letter-Writing Formal Letters E.g. Letter of Complaint, Letter of Requisition and Letter of permission, Use of phrases for formal and informal letter writing and Email etiquette

UNIT IV

'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Standard Abbreviations in English and Phrasal Verbs **Grammar:** Redundancies and Clichés in Oral and Written Communication. **Reading**: Comprehension- Intensive Reading and Extensive Reading

Writing: Writing Introduction and Conclusion -Essay Writing- Argumentative and Discursive essay – Picture Composition

UNIT V

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.
Vocabulary: One Word Substitutes, Technical vocabulary and their usage
Grammar: Common Errors in English
Reading: Reading Comprehension-Exercises for Practice
Writing: What is Report Writing - Technical Reports vs General Reports – Importance of Report Writing – Structure and characteristics of Report Writing - Relevance of Reports to Engineers

Text Books:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

References:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006). Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA STRUCTURES

Course Code: GR22A1012 **L/T/P/C:2/1/0/3**
I Year II Semester

Course Outcomes:
1. Implement various sorting techniques and analyze the computational complexity of algorithms.
2. Analyze the basics of data structures and its types and translate to programs the operations on stack and queue and their applications.
3. Develop algorithms for various operations on linked lists and convert them to programs.
4. Interpret operations on non-linear data structure binary tree and BST.
5. Summarize the operations on graphs and apply graph traversals techniques and outline hashing techniques.

UNIT- I

Algorithms and Complexities: Analysis of algorithms, Basic concept of order of complexity, Asymptotic Notations: Big Oh notation, Omega notation, Theta notation, little oh notation and little omega notation. **Sorting:** Bubble sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Radix Sort, Counting sort.

UNIT- II

Stacks: Introduction to Data Structures and types, Stack – Operations: pop, push, display, peek, Representation and implementation of stack operations using arrays,stack applications, recursion, infix to postfix transformation, evaluating postfix expressions.
Queues: Queue – Operations: enqueue, dequeue, display, representation andimplementation of queue operations using array, applications of queues, circular queues - representation and implementation.

UNIT- III

List: Introduction, dynamic memory allocation, self-referential structures, single linked list, advantages and disadvantages of single linked list, single linked list vs arrays, representation of a linked list in memory, operations-insertion, deletion, display, search.
Types and applications: Circular linked list, double linked list, implementation ofstack, queue using linked list.

UNIT-IV

Trees: Basic tree concepts, Binary trees**:** properties, types, representation of binarytrees using arrays and linked lists, traversals of binary tree.

Binary Search Tree –Representation and implementation of operations, Binary Search Tree Traversals (recursive), creation of binary tree and BST from given traversals.

UNIT -V

Graphs: Definition, basic terminology, representation of graphs, graph traversal techniques –Breadth First Traversal, Depth First Traversal.
Hashing - Introduction to hashing, hash function and types, hash table, implementation, collision resolution techniques–separate chaining, linear probing, quadratic probing, double hashing (only examples – no implementation).

TEXT BOOKS:

1. Data Structures, 2/e, Richard F, Gilberg, Forouzan, Cengage
2. Data Structures and Algorithms, 2008, G.A.V. Pai, TMH

REFERENCE BOOKS:

1. Data Structures with C, Seymour Lipschutz, TMH
2. Classic Data Structures, 2/e, Debasis, Samanta, PHI, 2009
3. Fundamentals of Data Structures in C, 2/e, Horowitz, Sahni, Anderson Freed, University Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
APPLIED PHYSICS LAB

Course Code: GR22A1013 **L/T/P/C:0/0/3/1.5**
I Year II Semester

Course Outcomes:
1. Compare the behavior of p-n junction diode, Solar cells and LED.
2. Analyze the behavior of magnetic and electric fields with the help of graphs.
3. Infer the work function of a material through photoelectric effect.
4. Discuss the characteristics of Lasers and infer the losses in optical fibers.
5. Estimate the time constant of RC circuit and resonance phenomenon in LCR circuit.

List of Experiments:
1. Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.
2. Solar Cell: To study the V-I Characteristics of solar cell.
3. Light emitting diode: To study V-I characteristics of light emitting diode.
4. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect: To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect: To determine work function of a given material and Planck's constant.
7. LASER: To study the V-I characteristics of LASER sources.
8. Optical fiber: To determine the bending losses of Optical fibers.
9. R-C Circuit: To determine the time constant of R-C circuit.
10. LCR Circuit: To determine the resonant frequency and Quality factor of LCR Circuit in series and parallel.

Note: Any 8 experiments are to be performed.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GRAPHICS FOR ENGINEERS

Course Code: GR22A1011 **L/T/P/C: 1/0/4/3**
I Year II Semester

Course Outcomes
1. Interpret industrial drawings and read working drawings.
2. Draw engineering objects like springs using AutoCAD.
3. Imagine and create multi-views of 2-d plane figures.
4. Construct and interpret multi-views of 3-d solid objects with proper dimensioning, scaling etc.
5. Draw and create pictorial views and model the industrial objects like gears and bearings with solid modeling commands available in AutoCAD tool.

UNIT I
Engineering Graphics with CAD– Introduction engineering graphics and significance of computer aided design CAD software, advanced commands, dimensioning and tolerancing, fundamentals of 2-D construction.

UNIT II
Orthographic projection – Introduction, definition, and classification of projections; pictorial and multi-view, significance of first and third angle methods of projections; **Projections of points** (in all quadrants) and **straight lines** (inclined to one reference plane only).

UNIT III
Projections of planes - definition and types of plane figures (triangle, square, pentagon, hexagon, and circle); projections of plane (inclined to one reference plane only).

UNIT IV
Projections of solids - definition and types of solid objects (prism, cylinder, pyramid, and cone); projections of solid (axis inclined to one reference plane only); creation of threads, washers, keys, and springs.

UNIT V
Isometric views – construction of isomeric views of planes (polygons) and solids (prism, cylinder, pyramid, and cone); fundamentals of 3-d drawings, world coordinate system, solid modelling and commands, creation of gears and bearings; conversion of 3-d to 2-d views and construction of 3-d view from 2-d views (simple objects)

TextBooks:
1. Engineering Graphics and Design by Kaushik Kumar / Apurbakumar Roy / Chikesh
2. Engineering Drawing by N.D. BHATT/CHAROTAR PUBLISHING HOUSE PVT LTD

Reference Books:
1. Engineering Graphics Essentials with AutoCAD 2018 Instruction by Kirstie Platenberg/SDC

publications.
2. Engineering Drawing by Basanth Agrawal/ C M Agrawal/ McGraw Hill Education
3. Engineering Drawing by K. Venu Gopal/New Age Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA STRCTURES LAB

Course Code: GR22A1020 **L/T/P/C: 0/0/2/1**

I Year II Semester

Course Outcomes:

1. Construct executable C programs for sorting techniques.
2. Implement stack and queue data structures and their applications.
3. Interpret various linked list operations to produce executable codes.
4. Develop working procedure for operations on BST using DMA.
5. Demonstrate graph operations and hashing techniques.

TASK 1

a. Implement Bubble sort using a C program.
b. Implement Selection sort using a C program.
c. Implement Insertion sort using a C program.

TASK 2

a. Develop a C program for Quick sort.
b. Demonstrate Merge sort using a C program.
c. Design a C program for Radix Sort.

TASK 3

a. Write a C program to implement Stack operations using arrays.
b. Write a C program to implement Queue operations using arrays.
c. Write a C program to implement Circular Queue operations using arrays

TASK 4

a. Write a C program to convert infix expression to postfix expression.
b. Write a C program to evaluate a postfix expression.

TASK 5

a. Write a C program to check for balanced parenthesis.
b. Write a C program to implement priority queue using arrays.

TASK 6

a. Implement the following operations on Single Linked List using a C program.
   i. create
   ii. insert
   iii. delete
   iv. search
   v. display

TASK 7

a. Write a C program to implement Circular Linked List operations – create, insert, delete and display.

TASK 8

a. Write a C program to implement Double Linked List operations – create, insert, delete and display.

TASK 9

a. Implement a C program for Stack using Linked list.
b. Implement a C program for Queue using Linked list.

TASK 10

a. Implement the following operations on Binary Search Tree
   i. create
   ii. insert
   iii. search
   iv. delete

TASK 11

a. Implement the following operations on Binary Search Tree
   i. count-nodes
   ii. height
   iii. minimum node
   iv. maximum node

TASK 12

a. Develop a C code for preorder, inorder and postorder traversals of a Binary Search Tree using recursion.
b. Design a C program for level order traversal of a Binary Search Tree.

TASK 13

a. Write a C program to implement Adjacency Matrix of a given graph.
b. Write a C program to implement Adjacency List of a given graph.

TASK 14

a. Implement a C program for DFS traversal on graph.
b. Implement a C program for BFS traversal on graph.

TASK 15

a. Implement a C program for the following operations on Hashing:
   i. insert
   ii. delete
   iii. search
   iv. display

Text Books:

1. Data Structures, 2/e, Richard F, Gilberg, Forouzan, Cengage
2. Data Structures and Algorithms, 2008, G.A.V. Pai, TMH

References:

1. Data Structures with C, Seymour Lipschutz, TMH

2. Classic Data Structures, 2/e, Debasis, Samanta, PHI, 2009
3. Fundamentals of Data Structures in C, 2/e, Horowitz, Sahni, Anderson Freed, University Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGLISH LANGUAGE AND COMMUNICATIONS SKILLS LAB

Course Code: GR22A1016 **L/T/P/C: 0/0/2/1**

I Year II Semester

Course Outcomes:

1. Interpret the role and importance of various forms of communication skills.
2. Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively by listening carefully and respect others point of view.
3. Utilize various media of verbal and non-verbal communication with reference to various professional contexts.
4. Recognize the need to work in teams with appropriate ethical, social and professional responsibilities.
5. Speak and pronounce English intelligibly

English Language and Communication Skills Lab (ELCS) shall have two parts:

a) Computer Assisted Language Learning (CALL) Lab
b) Interactive Communication Skills (ICS) Lab

Exercise I CALL Lab:

Understand: Introduction to Phonetics – Speech Sounds – Consonant and Vowel Sounds.
Practice: Introduction to Phonetics– Speech Sounds – Vowels and Consonants.
ICS Lab:
Understand: Ice Breaking and JAM.
Practice: Ice-Breaking Activity and JAM Session. Introducing oneself and others

Exercise II CALL Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms andStrong Forms in Context.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Formsin Context.
ICS Lab**:**
Understand: Features of Good Conversation – Non-verbal Communication.
Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions- Telephone Etiquette

Exercise III

CALL Lab: Errors in Pronunciation-the Influence of Mother Tongue (MTI).
Understand: Intonation--Errors in Pronunciation-the Influence of Mother Tongue(MTI).

Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.
ICS Lab:

Understand: Debates- argumentative vs persuasive- Public Speaking – Exposureto Structured Talks.
Practice: Debates- Making a Short Speech – Extempore.

Exercise IV CALL Lab:

Understand: Presentation Skills – Elements of Presentation – Organizing Content –Use of PowerPoint – Slides Preparation
Practice: Presentation Skills
ICS Lab:
Understand: How to make informal and Formal Presentations
Practice: Collages / Poster Presentations-Power point presentations

Exercise V CALL Lab:

Understand: Listening Skills and its importance-– Purpose- Process- Types- Barriers of Listening - Listening for General/Specific Details.
Practice: Listening Comprehension Tests.
ICS Lab:
Understand: Mind map - StoryTelling - Narrating a storyusing mind maps
Practice: Weaving Stories

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab
2. Interactive Communication Skills (ICS) Lab

II YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ELECTRONIC DEVICES AND CIRCUITS

Course Code: GR22A2052 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Outcomes:
1. Describe about different types of diodes, transistors and applying them for understanding various circuits.
2. Know the characteristics of various components.
3. Analyze the working principles of various components.
4. Ability to express functioning of diodes, BJT's, UJT's, FET's and SCR's.
5. Analyze and design various circuits for different applications in Engineering Field.

UNIT –I

Diode and Applications: Diode - Principle of working, VI characteristics, Diode Current equation, Half wave rectifier, Full wave rectifier and Bridge Rectifier, Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L-section filter, II section filter and comparisonof various filter circuits in terms of ripple factors, Zener diode as a voltage regulator, Clipper and Clamper circuits.

UNIT -II

Bipolar Junction Transistor: Transistor Construction, currents in a transistor, Input and output characteristics of transistor in common Base, Input and output characteristics of transistor in common Emitter and common collector configurations

Junction Field Effect Transistors (JFET): JFET- Construction and principle of working Drain and Transfer Characteristics, MOSFET- Construction and principle of working characteristics (Enhancement and depletion mode).

UNIT –III

Biasing and Stabilization: BJT biasing, DC Equivalent Model, Criteria for fixing operating point, fixed bias, Collector to base bias, Self bias techniques for Stabilization, Stabilization factors, Compensation techniques, Compensation against variation in V_{BE} and I_{CO}, Thermal run away, Thermal Stability.

UNIT –IV

Amplifiers: Small Signal low frequency amplifier circuits, h-parameter representation of a transistor, Analysis of Single Stage transistor amplifier using h-parameters: voltage gain, current gain, Input and Output impedance, Comparison of transistor configurations.

UNIT-V

Feedback Amplifiers and Oscillators: Concepts of feedback – Classification of feedback amplifiers – General characteristics– Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations. Condition for Oscillations, RC phase shift, Wein-bridge Oscillators, and LC type Oscillators, Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators, Frequency and amplitude stability ofOscillators.

Text Books

1. Electronic Devices and Circuit Theory - Robert L. Boylestad, Louis Nashelsky, 9th ed.,2008PE.
2. Integrated Electronics - Jacob Millman and Christos C Halkias, 1991 ed., 2008, TM

3. Electronic Devices and Circuits, S Salivahanan and N Suresh kumar, McGraw Hill Education.

Reference Books

1. Introductory Electronic Devices and Circuits– Robert T. Paynter, 7th ed., 2009, PEI.
2. Electronic Circuit Analysis – K. Lal Kishore, 2004, BSP.
3. Electronic Devices and Circuits, David A. Bell – 5th ed., Oxford University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DIGITAL ELECTRONICS

Course Code:GR22A2053 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Outcomes:

1. Aware of the theory of Boolean algebra, Logic gates & the underlying features of various number systems.
2. Use the concepts of Boolean algebra for the analysis & design of various combinational logic circuits, can be able to write Verilog program.
3. Use the concepts of Boolean algebra for the analysis & design of various sequential logic circuits, can be able to write Verilog program.
4. Apply the fundamental knowledge of analog and digital electronics to design different circuit elements like registers and counters which are very useful for real world with different changing circumstances.
5. Classify different semiconductor memories, Design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays and implement digital system using Verilog.

UNIT-I

Boolean algebra & Logic Gates: Number systems, Number- Base Conversions, Signed Binary Numbers, Binary Codes, Axiomatic Definition of Boolean Algebra, Basic Theorems, Boolean Functions, Canonical and standard Forms. Logic Gates: Digital Logic Gates, NAND and NOR Implementation, Exclusive-OR Function, Integrated Circuits, Gate-level Minimization, The K- Map Method, Four- Variable Map, Five-Variable Map, Don't-care Conditions.

UNIT-II

Combinational logic circuits: Introduction to Combinational circuits, Analysis Procedure, Design Procedure, Code conversion, Binary Adder-Subtractor, Carry Propagation, Half Subtractor, Full Subtractor, Binary Subtractor, Decimal Adder, BCD adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers with design examples. Introduction to Verilog to implement combinational circuits. Digital ICs: IC74138 3-8 Decoder, IC74151 Multiplexer, IC74155 Demultiplexer, 4-bit Parallel Binary Adder/Subtractor, IC7485 Comparator).

UNIT-III

Sequential Logic circuits: Difference between combinational and sequential logic circuits, Flip- Flops, Triggering of Flip Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Flip-Flop Excitation Tables, Design Procedure, Fundamentals of Asynchronous Sequential Logic: Introduction, Analysis procedure, Circuits with Latches, Design Procedure. Verilog code to implement sequential circuits. Digital ICs: IC7474 Flip- flops, IC7490 & IC74193.

UNIT-IV

Registers and Counters: Registers with parallel load, Shift registers, Serial Transfer, Serial Addition, Universal Shift Register, Ripple Counters, Binary Ripple Counter, BCD Ripple Counter, Synchronous Counters, Binary Counter, Up-Down Counter, BCD Counter, Binary Counter with Parallel Load, Counter with Unused States, Ring Counter, Johnson Counter, Verilogto design Registers and Counters. Digital ICs: Counters, IC74194&195 Shift Registers

.

UNIT-V

Memory and Programmable Logic: Types of Memories, Random-Access Memory, Read- Only Memory, Memory Operations, Timing waveform, Memory Decoding, Internal Construction, Address Multiplexing, Combinational Circuit Implementation, PROM, Combinational PLDs, Programmable Logic Array, Programmable Array Logic.

Text Books:

1. M Morris Mano and Michael D. Ciletti, Digital Design, Pearson 6th ed2018.
2. Charles H. Roth Jr.,Larry L. Kinney, Fundamentals of Logic Design, Cengaue learning 6th edition, 2013
3. J. Bhaskar, "A Verilog HDL Primer Hardcover"
4. Switching and Finite Automata Theory - Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge, 2010.

Reference Books:

1. Modern Digital Electronics – R. P. Jain, 3rd edition, 2007- Tata McGraw-Hill.
2. Introduction to Switching Theory and Logic Design – Fredric J. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & Sons Inc.
3. Switching Theory and Logic Design – A Anand Kumar, PHI, 2013.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SIGNALS AND SYSTEMS

Course Code: GR22A2054 **L/T/P/C: 2/1/0/3**

II Year I Semester

Course Outcomes:

1. Explain the fundamentals and detailed mathematical analysis of deterministic CTS and DTS and their spectra
2. Represent a deterministic CTS in terms of Fourier series and analyze its frequency spectra
3. Discriminate the application of Fourier, Laplace and Z-transforms appropriately on CTS and DTS
4. Analyze the effect of convolution on LTI systems and their working in time and frequency domains
5. Design basic filters for signal processing by applying the band-limited sampling theorem concepts.

UNIT-I

Introduction to Continuous-time Signals and Fourier series

Part-A: Representation of Continuous-time Signals: Introduction to typical signals; Time- domain operations; Continuous-time signal characteristics (periodicity, frequency, deterministic and random, symmetry, energy and power); Analogy between vectors and signals; Orthogonal signal space; Signal approximation using orthogonal functions; Mean squared error; Orthogonality in complex functions.

Part-B: Fourier Series: Representation of continuous-time periodic signals by Trigonometric and Exponential Fourier series; Dirichlet's conditions; Properties of Fourier series, Parseval's theorem; Complex Fourier spectrum, Power Spectrum.

UNIT-II

Fourier Transform, and Laplace Transform: Fourier transform via Fourier series; Convergence of Fourier transform; Fourier transforms of basic signals like impulse function, unit step, signum function and for various periodic and aperiodic signals; Properties of Fourier transforms, Parseval's theorem; Definition of two-& one-sided Laplace Transform (LT), Relation between LT and FT, Region of convergence (ROC) and Properties of LT.

UNIT-III

Signal Transmission through Linear Systems Continuous-time Linear Time-Invariant systems Representation by differential equations, Properties of continuous-time systems (linearity, time invariance, causality, and stability); Impulse response, Convolution; Transfer function, frequency response; Ideal vs. realizable LPF, HPF and BPF characteristics; Signal bandwidth, system bandwidth, rise-time, gain-bandwidth; Distortion; Causality and Paley- Wiener criterion for physical realization.

UNIT-IV

Discrete Time signal characteristics (periodicity, frequency, deterministic, random, symmetry, energy and power), Discrete Time (DT) signal representation using complex exponential and sinusoidal components; z-Transform of a discrete sequence; Relationship between z-Transform and Discrete Time Fourier Transform; Transfer function of a LTI system (No difference equations); Region of convergence of z-Transform, Constraints on ROC for various classes of signals; Properties of z-Transform, Inverse z-Transform by Partial Fractions (simple poles only).

UNIT-V

Sampling: Sampling theorem – Graphical and analytical proof for Band Limited Signals; Impulse-train sampling; Reconstruction of signal from its samples; Under sampling and Aliasing; Natural and Flat-top sampling, Band pass sampling.

Text/Reference Books

1. Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, "Signals and Systems", Second Edition, PHI Learning, New Delhi, 2007.
2. B. P. Lathi, Signals, Systems and Communications-B.S. Publications, 2003.
3. Simon Haykin and Barry Van Veen, "Signals and Systems", Edition, John Wiley and Sons, 2002.
4. Principles of Communication Systems by GoutamSaha, Herbert Taub& Donald Schilling, III Edition, Tata Mc graw Hill Education Private Limited
5. M J Roberts, "Signals and Systems",2e, TMH, 2012.
6. Hwei P. Hsu, "Signals and Systems", 3e, McGraw Hill Education,2014.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROBABILITY THEORY AND STOCHASTIC PROCESSES

Course Code: GR22A2055 **L/T/P/C: 2/1/0/3**
II Year I Semester

Prerequisites:
- Fundamentals of Set Theory and Probability theory
- Calculus concepts
- Basics of Fourier transforms

Course Outcomes:
1. Understand the axiomatic formulation of probability, model sample spaces and analyze random phenomena, identify situations where special distributions are applicable and use them to solve problems.
2. Characterizing probability models and functions of random variables based on single and multiple random variables.
3. Evaluate and apply moments and characteristic functions and understand the concept of inequalities and probabilistic limits.
4. Understand the concept of random processes, determine time and spectral characteristics of stationary random processes.
5. Demonstrate and classify various noise related to specific applications and model the Noise figure of cascaded networks and evaluate response of a linear system to Random Process.

UNIT-I: INTRODUCTION TO PROBABILITY

Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Bayes Theorem, Independent Events, Random Variable, Functions of random variable, Discrete and Continuous, Mixed Random Variable, Distribution and Density functions, Binomial, Poisson, Uniform, Gaussian Distribution.

UNIT-II: OPERATIONS ON SINGLE VARIABLE – EXPECTATIONS

Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

UNIT-III: OPERATIONS ON MULTIPLE RANDOM VARIABLES – EXPECTATIONS

Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (proof not included), Expected Value of a Function of Random Variables: Joint Moments of the Origin, Joint Central Moments, Joint Characteristic Functions, Gaussian Random Variables.

UNIT-IV: RANDOM PROCESSES -TEMPORAL AND SPECTRAL CHARACTERISTICS

The Random process, classification, deterministic and non-deterministic processes, distribution and density Functions, stationarity and statistical independence, first-order stationary processes, second-order and wide-sense stationarity, auto correlation function and its properties, cross- correlation function and its properties, covariance functions, Gaussian random processes.

The Power Spectrum: Properties, Relationship between Power Spectrum and Auto-correlation Function, Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

UNIT-V: RANDOM SIGNAL RESPONSE OF LINEAR SYSTEMS AND MODELLINGOF NOISE

Temporal Characteristics of System Response: Random signal response of linear systems, auto-correlation and cross-correlation functions of input and output.

Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross- Power Density Spectrums of Input and Output.

Types of Noise: Resistive (Thermal) Noise Source, Shot noise, Extra-terrestrial Noise, Arbitrary Noise Sources, White Noise, Modeling of Noise Sources, Average Noise Bandwidth, Effective Noise Temperature, Average Noise Figures, Average Noise Figure of cascaded networks.

Text Books:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001
2. Probability, Random Variables and Stochastic Processes - Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.
3. Random Processes for Engineers-Bruce Hajck, Cambridge university press, 2015

Reference Books:

1. Probability, Statistics & Random Processes-K. Murugesan, P. Guruswamy, Anuradha Agencies, 3rd Edition, 2003.
2. Digital Modulations using Matlab: Build Simulation Models from Scratch- Mathuranathan Viswanathan-ebook, 2017

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
NETWORK ANALYSIS

Course Code: GR22A2056 **L/T/P/C: 3/1/0/4**
II Year I Semester

Course Outcomes:
1. Comprehend the mathematical expression for voltages and currents in RL, RC and RLC circuits to find the transient response of inductor and capacitor in dc circuits.
2. Analyze the concept with working principles of linear constant coefficient differential equations with the help of Laplace transforms.
3. Know the basic skills of an ac circuits with independent/dependent voltage current sources by drawing impedance/admittance diagrams or using various laws/techniques like source conversion.
4. Discriminate the concepts like cut-set, tie-set, pole zero parameters and stability analysis
5. Interpolate the two-port network parameters, conversion between parameters, interconnection of two port networks.

UNIT-I

Network Elements: Review of R, L,C, RC, RL, RLC circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co- efficient of coupling, Analysis of multi-winding coupled circuits.

UNIT-II

Steady State & Transient Analysis: Steady state and transient analysis of RC, RL and RLC Circuits, Circuits with switches, step response, 2nd order series and parallel RLC Circuits, damping factor, over damped, under damped, critically damped cases.

UNIT-III

S domain analysis of circuits: Review of Laplace Transform - Transformation of a circuit intoS-domain - Transformed equivalent of inductance, capacitance and mutual inductance - Impedance and admittance in transform domain - Node analysis and Mesh analysis of the transformed circuit.

UNIT-IV

Network Topology: Network terminology - Graph of a network - Incidence and reduced incidence matrices – Cutsets - Fundamental cutsets - Cutset matrix – Tiesets, Network functions:

Poles and zeros of network functions, Restrictions on poles and zeros for driving point functionand transfer function.

UNIT-V

Two Port Network Parameters: Open circuit impedance (Z) parameters - short circuit admittance(Y) parameters - transmission (ABCD) parameters and inverse transmission parameters - Hybrid (h) parameters and inverse hybrid parameters - Conversion between parameters, Standard T, Pi Sections, Image parameters, Lattice networks.

Text Books

1. William H. Hayt Jr. and Jack E. Kemmerly, 'Engineering Circuit Analysis ', 6th Edition, McGraw Hill 2008.

2. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.
3. Networks, Lines and Fields - JD Ryder, PHI, 2nd Edition, 1999.

Reference Books

1. Electric Circuits – J. Edminister and M. Nahvi – Schaum's Outlines, MCGRAW HILL EDUCATION, 1999.
2. Network Theory – Sudhakar and Shyam Mohan, Mc-Graw Hill Education 2016

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ELECTRONIC DEVICES AND CIRCUITS LAB

Course Code: GR22A2057 **L/T/P/C: 0/0/3/1.5**
II Year I Semester

Course outcomes:

1. Analyze the characteristics of various semiconductor devices
2. Apply the knowledge of semiconductors
3. Design various circuits based on the characteristics of the components.
4. Apply concepts for the design of voltage regulator.
5. Verify the theoretical concepts through laboratory and simulation.

LIST OF EXPERIMENTS

Hardware of any 10 Experiments and Simulation of any 5 Experiments using Multisim Software.

1. Forward and Reverse Bias V-I Characteristics of PN junction Diode,
2. a. Zener Diode V-I Characteristics,
   b. Zener diode as Voltage Regulator
3. Half wave, Full Wave and Bridge Rectifiers without and with filters
4. Characteristics of a BJT under CB, CE Configuration
5. Measurement of h-parameters of transistor in CE configuration.
6. Verify Characteristics of a JFET under CS configuration.
7. Verify the V-I Characteristics of MOSFET.
8. Design and verify Voltage Series Feedback amplifier
9. Design and verify current shunt feedback amplifier
10. Design and verify RC Phase shift Oscillator
11. Design and verify Colpitt's Oscillators
12. Design and verify Wein Bridge Oscillator using Transistors

Text Books

1. Electronic Devices and Circuit Theory - Robert L. Boylestad, Louis Nashelsky, 9 ed., 2008PE.
2. Integrated Electronics - Jacob Millman and Christos C Halkias, 1991 ed., 2008, TM
3. Electronic Devices and Circuits, S Salivahanan and N Suresh kumar, McGraw Hill Education.

Reference Books

1. Introductory Electronic Devices and Circuits– Robert T. Paynter, 7 ed., 2009, PEI.
2. Electronic Circuit Analysis – K. Lal Kishore, 2004, BSP.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DIGITAL ELECTRONICS LAB

Course Code: GR22A2058 **L/T/P/C: 0/0/3/1.5**
II Year I Semester

Course Outcomes:
1. Explain theory of Boolean Algebra & the underlying features of various number systems.
2. Analyze the various coding schemes that are the part of the digital circuit design.
3. Construct basic combination circuits and verify their functionalities.
4. Apply the design procedures to design various sequential logic circuits.
5. Design of various circuits with the help of VERILOG Coding techniques.

LIST OF EXPERIMENTS

TASK-1: XILINX ISE QUICK Start Tutorial

TASK-2: Introduction to VERILOG Programming Design and Simulation of Combinational Logic Circuits Using VERILOG

TASK-3 Realization of Logic GATEs

TASK-4 Half adder and Full adder circuits

TASK-5 Magnitude comparator

TASK-6 Binary to Gray and Gray to Binary converter

TASK-7 Encoder & Decoder

TASK-8 Parity Checker Design and Simulation of sequential logic circuits using VERILOG

TASK-9 D and T Flip-Flops

TASK-10 SR and JK flipflops

TASK-11 Frequency Divider

TASK-12 Left and Right Shift Register

TASK-13 Serial to Parallel and Parallel to Serial converter

TASK-14 Binary Counter

TASK-15 Asynchronous BCD Up counter

TASK-16 Synchronous down counter

TASK-17 MOD5 and MOD 10 counters

Text Books:

1. M Morris Mano and Michael D. Ciletti, Digital Design, Pearson 6th ed2018.
2. Charles H. Roth Jr.,Larry L. Kinney, Fundamentals of Logic Design, Cengaue learning 6th Edition, 2013
3. J. Bhaskar, "A Verilog HDL Primer Hardcover"
4. Switching and Finite Automata Theory - Zvi Kohavi & Niraj K. Jha, 3rdEdition, Cambridge, 2010.

Reference Books:

1. Modern Digital Electronics – R. P. Jain, 3rd edition, 2007- Tata McGraw-Hill.
2. Introduction to Switching Theory and Logic Design – Fredric J. Hill, Gerald R. Peterson, 3rdEd, John Wiley & Sons Inc.
3. Switching Theory and Logic Design – A Anand Kumar, PHI, 2013.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SIGNALS AND SYSTEMS LAB

Course Code: GR22A2059 **L/T/P/C: 0/0/2/1**

II Year I Semester

Course Outcomes:

1. Understand basics of MATLAB syntax, functions, and programming.
2. Generate and characterize various continuous and discrete time signals.
3. Design and analyze linear time-invariant (LTI) systems and compute its response.
4. Analyze the spectral characteristics of signals using Fourier analysis, Laplace transform and Z-transform.
5. Process continuous-time signals by first sampling and then processing the sampled signal in discrete-time and employ for signal processing applications.

List of Experiments

Students will be performing experiments on MAT LAB

1. Basic Matrix Operations with the help of MATLAB program.
2. Perform Illustrate the basic periodic and aperiodic signals/ sequences with the help of MAT LAB program.
3. Write a MAT LAB Program to perform the basic operations like Addition, Multiplication, Folding, Shifting, and Flipping, evaluating Energy and Power for various periodic and a periodic signal.
4. Segregate with the help of MAT LAB program Even, Odd, Real and Imaginary parts of given signal/sequence.
5. Verify Gibb's phenomenon for the various periodic waveforms by Fourier series representation.
6. Find the Fourier Transform of (not limited to)
   a. A
   b. u(t)
   c. $A.e^{-t}u(t)$
   d. $Ate^{-t}u(t)$
   e. ACosωt
7. i. Find the Laplace transform of (not limited to)
   a. Sin(ωt)
   b. Sin(ω(t-1))
   ii. Find Inverse Laplace Transform of Y(s)= 24/s(s+8)
8. a. Prove that the given system y(t)=t*x(t) is linear in nature.
   b. Prove that the given system y(n)=n*x(n)+n2*x2(n) is Time Variant.
9. For any given LTI system, compute the Impulse Response.
10. Demonstrate Convolution of two continuous time signals and discrete time sequences with the help of MAT LAB program.
11. Evaluate the Z-Transform of
    a. n
    b. an
    c. n.an
    d. e(-a*n*t)
12. Locate the Poles and Zeros of a given Transfer function in S-Plane and Z-Plane respectively.

$$H(S) = \frac{S^2-2S+1}{s\text{^}3+6s\text{^}2+11s+6} \qquad H(Z) = \frac{1+Z^{-1}}{1+\ z^{-1}\ +0.16z^{-2}}$$

13. Verify the Sampling Theorem for various conditions prevailing between Sampling Frequency(fs) and Message Frequency (fm)
    a. fs<2 fm
    b. fs=2 fm
    c. fs>2fm
14. Perform Auto Correlation and Cross Correlation on various sequences with the help of MAT LAB program.

Text/Reference Books:

1. Alan V. Oppenheim, Alan S. Will sky and S. Hamid Nawab, "Signals and Systems", 2nd Edition, PHI Learning, New Delhi, 2007
2. B. P. Lathi, Signals, Systems and Communications-B.S. Publications, 2003.
3. Simon Haykin and Barry Van Veen, "Signals and Systems", Edition, John Wiley and Sons,2002.
4. M J Roberts, "Signals and Systems",2e, TMH, 2012.
5. Hwei P. Hsu, "Signals and Systems", 3e, McGraw Hill Education, 2014.
6. Principles of Communication Systems by Goutam Saha, Herbert Taub & Donald Schilling, 3rd Edition, Tata Mc Graw Hill Education Private Limited.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENVIRONMENTAL SCIENCE

Course Code: GR22A2001 **L/T/P/C: 2/0/0/0**
II Year I Semester

Course Pre-Requisites: Basic knowledge of environmental issues

Course Outcomes:

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

UNIT I: INTRODUCTION AND AWARENESS ACTIVITIES

Environmental Science: Introduction, Definition, scope, and importance. AWARENESSACTIVITIES
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 II: SLOGAN AND POSTER MAKING EVENT

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

UNIT III: EXPERT LECTURES ON ENVIRONMENTAL SCIENCE

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

UNIT IV: CLEANLINESS DRIVE

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

UNIT V: CASE STUDIES

- HPCL and LG Polymers disasters in Vizag
- Oleum gas leak in Delhi
- Mathura Refinery & Taj Mahal
- Conservation of Hussain Sagar Lake
- The Cleanliest cityof 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

II YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTATIONAL MATHEMATICS FOR ENGINEERS

Course code:GR22A2009 **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Outcomes:

1. Apply well known techniques to find real roots of an equation and linear algebraic systems by iterative methods.
2. Apply interpolation and numerical differentiation techniques for univariate data.
3. Solve problems related to numerical integration and least squares approximations of a function.
4. Choose appropriate numerical techniques to solve IVP and BVP in ODE
5. Distinguish between various numerical methods to solve PDE arising in the context of heat conduction.

UNIT-I: Root finding and Numerical solution of linear algebraic systems

Finding the real root of algebraic and transcendental equations by Regula-Falsi and Newton Raphson methods -Gauss Jacobi and Gauss Seidel iterative methods to solve a linear algebraic system with error analysis.

UNIT-II: Interpolation - Cubic spline- Differentiation

Interpolation with non-uniform data: Newton divided differences formula, operational calculus, Interpolation with uniform data- Newton and Gauss formulas, Fitting natural cubicspline to data Numerical differentiation for uniform and non-uniform data.

UNIT-III: Numerical integration and Curve approximations

Numerical integration by Trapezoidal rule, Simpson's 1/3rd and $3/8^{th}$ rules – The Principle of least squares, Fitting a straight line, parabola, exponential and power curve, Simple and Multiple linear regression with 2 independent variables.

UNIT-IV: Numerical solution of initial and boundary value problems in ODE

Taylor's series method, Picard's method, Euler method, Modified Euler method and R-K fourth order methods to solve initial value problems in ODE - Finite differences method to solve boundary value problems in ODE.

UNIT-V: Numerical solution initial and boundary value problems in PDE

Solution of Laplace's equation by Jacobi, Gauss-Seidel method and Successive over relaxation (SOR) methods, Solution of Heat equation by the finite difference method.

TEXT BOOKS

1. M.K. Jain, S.R.K. Iyengar, R.K. Jain-. Numerical methods for scientific and engineering Computation-New Age International publishers- 4^{th} Edition-2—3
2. Robert J. Schilling and Sandra L. Harries- Applied numerical methods for engineers using MATLABand C-Thomson Brooks/Cole-2002

REFERENCE BOOKS

1. S.S. Sastry- Introductory methods of numerical analysis- Prentice Hall (India)- 4^{th} Edition-2010

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MICRO CONTROLLERS

Course Code: GR22A2060 **L/T/P/C: 3/0/0/3**
II Year II Semester

Course Outcomes:

1. Describe the internal structure of basics of computer organization and Microprocessors.
2. Compare the architectures of microprocessors and micro controllers.
3. Analyze the functionality of 8051 microcontroller and 8086 microprocessor architectures.
4. Write assembly language programs by using the instruction set.
5. Design various programs to run several applications.

UNIT-I

Introduction to Microprocessors: Overview of 8085 and it's Comparison with 8086
8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

UNIT-II

Introduction to Microcontrollers: Differences between microprocessors and microcontrollers, Overview of 8051 Microcontroller, Pin diagram of 8051, Architecture, Programming model, I/O Ports, Memory Organization of 8051, Special function Registers**,** PSW, SCON, TCON, TMOD, PCON etc.

UNIT-III

Arithmetic and logical operations of 8051: Addressing Modes of 8051: Immediate and register addressing modes, accessing memory using various addressing modes, bit addresses for I/O and RAM Assembly language programming. Arithmetic, logical instructions and programs: Arithmetic instructions and operations, Logic and compare instructions, Rotate instructions and data serialization, BCD ASCII, and other application programs.

UNIT-IV

Jump, loop and call Operations of 8051: Loop and jump instructions, call instructions, I/O port programming: 8051 I/O Programming, I/O bit manipulation Programming,
Microcontroller design: Timer Programming: Programming 8051 timers, C o u n t e r programming, Serial Port Programming: Basics of serial communication,8051 serial port programming in Assembly, Interrupts Programming:8051 Interrupts, Programming timer interrupts, Programming external hardware interrupts, Programming the serial interrupt, Interrupt priority in the 8051.

UNIT-V

Applications and Interfacing of 8051: LCD and keyboard interfacing, ADC interfacing, DAC interfacing: Generation of sine wave, square wave, triangular wave etc., Interfacing to External Memory: 8031/51 interfacing with external ROM, 8051 data memory space.

Text Books:

1. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition 2006.
2. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Edition, 2004.

Reference Books:

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, TMH 2nd Edition 2006.
3. The 8051 Microcontroller and Embedded Systems –Muhammad Ali Mazidi,Janice GillispieMazidi, Rolin D. McKinlay.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

Course Code: GR22A2061 **L/T/P/C: 3/1/0/4**
II Year II Semester

Course Outcomes:

1. Apply Coulomb's law, Gauss's law equations for calculating electric field intensities and electric potentials in vacuum and materials due to various charge distributions.
2. Apply Biot-Savart's law, Ampere's circuital law for calculating magnetic field intensities and potentials (scalar & vector) in vacuum and materials due to steady electriccurrents.
3. Apply Faraday's law in generation of Electro Motive Force and modified Ampere's law to get finalized forms of Maxwell's equations.
4. Apply fundamentals of uniform plane waves in various electromagnetic wave propagation problems
5. Apply filed theory, circuit theory and Smith chart knowledge to transmission lines.

UNIT–I

Electrostatics: Coulomb's Law, Force on a discrete charge due to single charge and charge distributions, Electric Field Intensity – Fields due to Different Charge configurations, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V (Potential gradient), Maxwell's Equations for Electrostatic Fields (Divergence and curl of Electric field). Convection and Conduction Currents,Point form of Ohm's Law, Continuity Equation, Boundary conditions (only statements no derivation). Simulation of electrostatic fields using MAT LAB or CST Studio Suite.

UNIT–II

Magnetostatics: Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Equations for Magnetostatic Fields (Divergence and curl of Magnetic field), Magnetic Scalar Potentials, Force between current-carrying conductors, Boundary conditions (only statements). Inductance fundamental. Simulation of magnetostatic fields using MAT LAB or CST Studio Suite.

UNIT–III

Time Varying Fields, Maxwell's Equations and Wave Equations: Faraday's Law - Transformer EMF and motional EMF, Concept of Displacement Current. Maxwell's Equations in final forms, Vector wave equation (Helmholtz Equation), Solution of one- dimensional wave equation. Uniform Plane wave characteristics. Simulation of Uniform plane waves using MAT LAB or CST Studio Suite.

UNIT–IV

EM Wave Propagation in Different Media: – Loss tangent, Classification of materials into good conductors, good dielectrics, and quasi conductors. Wave propagation in good conductors, good dielectrics, and quasi conductors, Instantaneous and average Poynting vectors, Reflection, and Transmission coefficients of Normal incidence. Qualitative understanding of Oblique incidence with final expressions (no derivations). Simulation of wave movement in different media using MAT LAB or CST Studio Suite.

UNIT–V:

Transmission Lines: Transmission Line Parameters, Transmission Line Equations, Characteristic Impedance, Propagation characteristics, Lossless/ Low Loss Line Analysis, Conditions for Distortion less Transmission and Minimum Attenuation. Finite Transmission Line, Input Impedance, Short Circuit and Open Circuit Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements - λ/2, λ/4, λ/8 Lines. Impedance Transformations and Matching.
Smith Chart– Theory and Applications, Single Stub Matching. Propagation between Parallel Plates, Modes, Cut-off Frequencies, Phase and Group Velocities, Wavelengths, Wave Impedances.

Text/Reference Books:

1. Principles of Electromagnetics – Matthew N.O. Sadiku and S.V. Kulkarni, 6th Ed., Oxford University Press, Aisan Edition, 2015.
2. EM waves and radiating systems by E C Jordan and Balmain.
3. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 8th Ed.,McGrawHill, 2014.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ANALOG ELECTRONICS

Course Code: GR22A2062 **L/T/P/C: 3/0/0/3**

II Year II Semester

Course Outcomes:

1. Design the multistage amplifiers and understand the concepts of High FrequencyAnalysis of Transistors.
2. Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations.
3. Design and realize different classes of Power Amplifiers and tuned amplifiers usablefor audio and Radio applications.
4. Design multivibrators and sweep circuits for various applications.
5. Apply and analyze various amplifiers and multivibrator circuits for various applications.

UNIT-I

Multistage Amplifiers: Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Cascade, Cascode amplifier, Darlington pair, Hybrid –π-model of Common Emitter transistor at high frequency.

UNIT-II

Large Signal Amplifiers: Class A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Principle of operation of Class AB and Class –C Amplifiers. **S**ingle Tuned Amplifiers – Q-factor, frequency response, Concept of stagger tuning.

UNIT-III

Multi vibrators: Types of Triggering, Analysis and Design of Bistable, Monostable, A stable Multivibrators and Schmitt trigger using Transistors. Time Base Generators: General features of a Time base Signal, Methods of Generating Time Base Waveform, Miller, and Bootstrap.

UNIT-IV

Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non- Inverting, Differential, Instrumentation Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger Active Filters (LPF,HPF) .Classification of Integrated Circuits, LM 324.

UNIT-V

IC555 Timer – Functional Diagram, Monostable, and A stable Operations

Data Converters: Introduction, Basic DAC techniques, Different types of DACs- Weighted resistor DAC, R-2R ladder DAC, Different Types of ADCs: Flash type, Successive Approximation and Dual Slope, Counter type, Specifications of ADC and DAC.

Text/Reference Books:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education,2nd Edition 2010
2. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford, 1986.
3. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009, Pearson
4. Millman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. PrakashRao, 2nd Ed., 2008, TMH.
5. Pulse, Switching and Digital Circuits – 5th Edition, David A. Bell, Oxford, 2015
6. Linear Integrated Circuits, D. Roy and Choudhury, Shail B. Jain, 4th Edition, New Age International (P) Limited, 2010.
7. Operational Amplifiers and Linear Integrated Circuit Theory and Applications,DentonJ Dailey, McGraw-Hill, 1989.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ANALOG AND DIGITAL COMMUNICATIONS

Course Code: GR22A2063 **L/T/P/C: 3/0/0/3**

II Year II Semester

Course Outcomes:

1. Apply the knowledge for design of AMDSBFC, AMDSBSC and SSB modulation and demodulation schemes forgiven specifications.
2. Apply the knowledge for design of frequency modulation and demodulation scheme for given specifications.
3. Apply the knowledge for design of optimal baseband communication system.
4. Apply the knowledge for design of various digital modulation schemes.
5. Apply the knowledge for calculating channel capacity for various scenarios.

UNIT I

Amplitude Modulation and Demodulation: Introduction to Communication Systems and modulation, Amplitude Modulation: –Concepts and expressions of AMDSBSC, AMDSBFC, SSB modulation. Spectra of AMDSBSC, AMDSBFC, SSB modulation. System level generation and detection of AMDSBSC, AMDSBFC, SSB modulation. Noise performance analysis of AMDSBFC. Pre-envelope and complex envelope, Superheterodyne receiver, Intermediate frequency, Image frequency, FDM.

UNIT II

Angle Modulation: Concepts and expressions of , Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band and Wide band FM, Generation of FM Waves: Direct and Indirect Methods. Detection of FM Waves: Balanced Frequency discriminator, Phase locked loop. FM receiver, Noise performance analysis of FM, FM Threshold effect, Pre-emphasis, and De-emphasis.

UNIT III

Waveform coding and Baseband Communication PAM, PCM, Quantization noise, DM, DPCM and TDM, Different source codes. Matched filter, error rate in baseband communication, inter symbol interference and Nyquist criterion for distortion less binary baseband transmission.

UNIT IV

Digital Modulation Techniques Geometric representation of signals. BPSK, QPSK, FSK: Signal model, Constellation diagram Generation and Detection. Error Probabilities of BPSK and QPSK. QAM-Signal model.

UNIT V

Information Theory Discrete Memoryless source, Information, Entropy, Mutual Information - Discrete Memoryless channels – Binary Symmetric Channel, Channel Capacity - Hartley - Shannon law - Source coding theorem - Shannon - Fano & Huffman Codes.

Text Books:

1. An introduction to analog and digital communications, Haykin, SimonS. Vol.1. New York: Wiley, 1989.

2. Analog and digital communications, Sanjay Sharma
3. Principles of Communication Systems- Herbert Taub, Donald L Schiling, Goutam Saha, 3rd Edition, McGraw-Hill, 2008.
4. Communication Systems-Simon Haykin, John Wiley, 5th Ed. 2009

Reference Books:

1. Electronics Communication Systems-Fundamentals through Advanced-WayneTomasi, 5th Edition, 2009, PHI.
2. Electronic Communications – Dennis Roddy and John Coolean, 4th Edition, PEA,2004
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004
4. Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MICRO CONTROLLERS LAB

Course Code: GR22A2064 **L/T/P/C: 0/0/2/1**
II Year II Semester

Course Outcomes:

1. Acquire the knowledge of 8051and AVR microcontroller architecture & its programming.
2. Work on Arduino Uno and 8051 micro controller-based boards.
3. Interface different peripherals with Microcontroller.
4. Implement a wireless based Monitoring and appliance control System.
5. Define and design a project on the exposure with AVR/8051.

Task-1: 8051 Micro controller Programming Using Keil IDE.

1. 8051 Assembly Language Programs for Arithmetic and Logical Operations.
2. 8051 SerialCommunication.
3. Time delay Generation Using Timers of 8051.

Task-2: Embedded C/Arduino Programming Using Arduino Uno Boards and Arduino IDE

1. LEDs and Switches
2. 2*16 LCD
3. Serial Communication
4. Reading sensors using Internal ADC
5. Device control
6. DC Motor control
7. Real Time Clock
8. Wireless Communication (Bluetooth/ Zigbee)
9. Interrupts

Task-3: AVR Programming Using Arduino Uno Boards and Arduino IDE.

1. AVR Program to interface a switch and a buzzer to two different pins of a Port such that the buzzer should sound as long as the switch is pressed.
2. AVR Program for Echo.
3. AVR Program to read the LDR sensor and control the appliances based on light intensity.

NOTE

- ❖ Task1Programs have to be tested Using Keil IDE or Equivalent.
- ❖ Task 2 Programs have to be tested on Arduino Uno Boards (AVR Microcontroller Boards) or Equivalent Using Embedded C/Arduino Programming and Arduino IDE.
- ❖ Task 3 Programs have to be tested on Arduino Uno Boards (AVR Microcontroller Boards) or Equivalent Using AVR Programming and Arduino IDE

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ANALOG ELECTRONICS LAB

Course Code: GR22A2065 **L/T/P/C: 0/0/3/1.5**

II Year II Semester

Course Outcomes:

1. Design the multistage amplifiers and understand the concepts of High Frequency Analysis of Transistors.
2. Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations.
3. Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications.
4. Design multivibrators and sweep circuits for various applications.
5. Apply and analyze various amplifiers and multivibrator circuits for various applications

List of Experiments

1. Design and Verify Two Stage RC Coupled Amplifier
2. Design and verify the Darlington Pair Circuit
3. Design and verify Class A power amplifier.
4. Design and verify Class B Complementary symmetryamplifier.
5. Design and verify an Astable Multivibrator
6. Design and verify a Monostable Multivibrator
7. Design and verify Response of Schmitt Trigger circuit.
8. Design and Verify Boot strap sweep circuit.
9. Verify Op-Amp Inverting and Non-Inverting Amplifiers.
10. Verify Adder, Subtractor circuits with waveforms.
11. Design and verify Function Generator.
12. Design and verify Active Filter LPF&HPF (first order)
13. Design and verify IC 555 Timer – Monostable and A stable Multivibrator.
14. DAC-Weighted and R-2R.

Lab Methodology: -

Lab experiments with Hardware and Software: Hardware: Analog Discovery;Software: - Multisim 14.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ANALOG AND DIGITAL COMMUNICATIONS LAB

Course Code: GR22A2066 **L/T/P/C: 0/0/3/1.5**
II Year II Semester

Course Outcomes:
1. Analyze the spectrum of various analog and digital modulation techniques.
2. Understand the effect of noise present in continuous wave and angle modulationtechniques.
3. Attain the knowledge of design about analog and digital Transmitters and Receiversusing components.
4. Apply and analyze the various Modulation techniques in different environments usingMATLAB.
5. Explains spread spectrum systems to provide securityto data using MATLAB.

List of the Experiments/TASKs

(All the experiments can be done either using hardware or using MATLAB)

TASK-1: (i) Amplitude Modulation and Demodulation (ii) Spectrum analysis of AM

TASK-2: (i) DSB-SC Modulator & Demodulator (ii) Spectrum Analysis of DSBSC

TASK-3: (i) SSB-SC Modulator & Demodulator (ii) Spectrum Analysis of SSBSC

TASK-4: (i) Frequency modulation and demodulation (ii) Spectrum analysis of FM (iii) Pre emphasis and De emphasis

TASK-5: Frequency Division Multiplexing & De multiplexing

TASK-6: Pulse Amplitude Modulation & Demodulation

TASK-7: Pulse Width Modulation & Demodulation

TASK-8: Pulse Position Modulation & Demodulation

TASK-9: PCM Generation and Detection

TASK-10: Delta Modulation

TASK-11: Non-Uniform Quantization-(i) μ-Law (ii) A-law

TASK-12: Amplitude Shift Keying: Generation and Detection

TASK-13: Frequency Shift Keying: Generation and Detection

TASK-14: Binary Phase Shift Keying: Generation and Detection

TASK-15: Generation and Detection (i) DPSK (ii) QPSK

TASK-16: Time Division Multiplexing

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
EFFECTIVE TECHNICAL COMMUNICATION

Course Code: GR22A2108 **L/T/P/C:2/0/0/0**
II Year II Semester

Course Outcomes:
1. Demonstrate proficiency in producing well-structured technical documents adhering to standard writing conventions and industry-specific guidelines.
2. Develop critical analysis skills to assess and evaluate technical documents.
3. Develop a habit of lifelong learning in technical communication, recognizing itsimportance in their personal and professional growth.
4. Exhibit effective oral communication skills by delivering technical presentations with clarity, coherence, and appropriate use of visual aids.
5. Exemplify intercultural competence in technical communication.

UNIT- I
Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, Factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media, Artificial Intelligence - Voice of the future, Everyday life, Communicating with Machines.

UNIT-II
Technical Writing, Grammar, and Editing- Abstract Writing, Technical writing process, forms of discourse, Collaborative writing, creating indexes, technical writing style and language, Basics of grammar, and study of advanced grammar, Introduction to Digital Humanities, Managing technical communication projects, Time estimation, Single sourcing, Localization.

UNIT-III
Self-Development and Assessment- SWOT, Self-assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, Career planning, Self-esteem, Managing Time, Personal memory, Taking notes, Complex problem-solving, Stress Management, Working with Rhythm and Balance, Emotional Intelligence, Six Hats of Thinking.

UNIT-IV
Communication and Technical Writing- Group discussion, Oral presentation, Resume writing, Interview skills, Graphic presentation, Personality Development, Technical articles, Official notes, Memos, and Minutes of meetings.

UNIT-V
Ethics- Business ethics- Corporate Social Responsibility-importance, need, stories, Engineering Ethics, Role and responsibility of engineer, Work culture in jobs.

Text Books:

1. M Ashraf Rizvi, Effective Technical Communication, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.

Reference Books:

1. Arthur D. Rosenberg, David Hizer, The Resume Handbook, Adams Media, an F+WPublications Company, 57 Littlefield Street, Avon, MA02322, USA.
2. David F. Beer and David McMurrey, Guide to Writing as an Engineer, John Willey, NewYork, 2004
3. M. Kay DuPont, Business Etiquette & Professionalism, Viva Books private Limited,Hyd.,2005
4. Meenakshi Raman, Shalini Upadhyay, SOFT SKILLS Key to Success in Workplace andLife, Cengage Learning India Pvt. Ltd., Delhi, 2018.
5. Raman Sharma, Technical Communication, Oxford Publication, London, 2013.
6. Ron Cowan, The Teacher's Grammar of English, CAMBRIDGE UNIVERSITY PRESS, New Delhi,2008.
7. Shiv Khera, You Can Win, Macmillian Books, New York, 2003.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

REAL-TIME RESEARCH PROJECT/ SOCIETAL RELATED PROJECT

Course Code: GR22A2109 **L/T/P/C:0/0/4/2**

II Year II Semester

Course Outcomes:

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

1. Predict the Field domain in the specialized area under Engineering discipline.
2. Evaluate and obtained the category of the solution with help of Real time studies.
3. Implementing the solution of problem statement.
4. Prioritize the reports and deliver the final work with presentation.
5. Analyze and discuss the field problems using software tools /Modes/simulations and experimental investigations.

III YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTRODUCTION TO COMPUTER ORGANIZATION

Course Code: GR22A3033 **L/T/P/C: 3/0/0/3**

III Year I Semester

Course Outcomes: On completing this course, the student will be able to

1. Understand the theory and architecture of the central processing unit.
2. Design a simple CPU with applying the theory concepts.
3. Use appropriate tools to design, verify and test the CPU architecture.
4. Learn the concepts of parallel processing, pipelining and inter processor communication.
5. Exemplify in a better way the I/O and memory organization.

UNIT –I: Fundamentals of Computer Organization

Computing and Computers, Evolution of Computers, VLSI Era, System Design; Register Level, Processor Level, CPU Organization, Data Representation, Fixed Point Numbers, Floating Point Numbers, Instruction Formats, Instruction Types, addressing modes.

UNIT -II: Data Path Design

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequential ALUs, Carry look ahead adder, Robertson algorithm, booth's algorithm, non- restoring division algorithm, Floating Point Arithmetic, Co-processor, Pipeline Processing, Pipeline design, Modified booth's Algorithm.

UNIT –III: Control Design

Hardwired Control, Micro programmed Control, Multiplier Control Unit, CPU Control Unit, Pipeline Control Instruction Pipelines, Pipeline Performance, Super-scalar Processing, Nano Programming.

UNIT –IV: Memory Organization

Random Access Memories, Serial Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.

UNIT-V: System Organization

Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and systemcontrol, IO interface circuits, Hand shaking, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, operation systems, multiprocessors, fault tolerance, RISC and CISC processors, Super scalar, and vector processor.

Text Books:

1. Computer Architecture: A quantitative approach David A Patterson and John L. Hennessy
2. Computer organization and Architecture, Designing for Performance William Stallings
3. Essentials of Computer organization and Architecture Linda Null

Reference Books:

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Paraami, "Computer Architecture", BEH R002, Oxford Press.
3. P. Pal Chaudhuri, "Computer organization and design", 2nd Ed., Prentice Hall of India,2007.
4. G. Kane & J. Heinrich, "MIPS RISC Architecture", Englewood cliffs, New Jersey, PrenticeHall, 1992.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

LINEAR CONTROL SYSTEMS

Course Code: GR22A3034 **L/T/P/C: 2/1/0/3**

III Year I Semester

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

1. Determine the Transfer function using block diagram reduction technique and signal flowgraphs.
2. Evaluate steady state errors from the Transfer function.
3. Apply Routh criterion/ Root locus to determine the stability of LTI systems.
4. Evaluate Bode, Polar, inverse and Nyquist plots.
5. Apply state space analysis to control systems.

UNIT I: Introduction to Control Systems and Block Diagrams

Introduction to control systems, Classification, open-loop and closed-loop systems Transfer function of SISO and MIMO, Block Diagram of a closed-loop system, procedure for drawing a block diagram, transfer function of block diagrams, construction of Signal Flow Graphs (SFG), Signal Flow Graph analysis.

UNIT II: Time Response and Stability Analysis of Control Systems

Time response of control system, Standard test signals, Time response of first-order and second-order systems, steady state errors and error constrains, Bounded Input and Bounded Output(BIBO), Necessary conditions for stability, Routh stability criterion, applications of the Routh stability criterion, relative stability analysis.

UNIT III: Root Locus Analysis and Frequency-Domain Correlation

Root locus concepts, construction of root loci, rules for the construction of the root locus, Correlation between time and frequency response, Polar plots and inverse polar plots.

UNIT IV: Frequency Response Analysis: Bode Plots and Nyquist Stability Criterion

Bode plots, Basic factors of G(jw)H(jw), general procedure for constructing Bode plots, computation of Gain Margin and Phase margin, Nyquist plots, principle of argument, Nyquist stability criterion.

UNIT V: Introduction to State-Space Representation in Control Systems

Concepts of state, state variables and state models, state-space representation, state transition matrix and state transition equation.

Text Books:

1. Anand Kumar, “Control Systems”, Seventh printing, PHI Learning New Delhi, 2012
2. J. Nagrath, M. Gopal, “Control Systems Engineering,” Fifth Edition, New Age International, New Delhi, 2007.

Reference Books:

1. Katsuhiko Ogata, "Discrete Time Control Systems", 2nd Edition, PHI Learning NewDelhi, 2006.
2. R. Ananda Natarajan, P. Ramesh Babu, "Control Systems Engineering", 2nd E dition, Sci Tech Publications Pvt. (India) Ltd, 2008.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DIGITAL SIGNAL PROCESSING

Course Code: GR22A3035 **L/T/P/C: 3/1/0/4**
III Year I Semester

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

1. Use discrete time signals and systems, frequency response for real time applications.
2. Use different transforms and analyze the discrete time signals and systems.
3. Realization of digital filters using various structures.
4. Design analog and digital filters for various applications.
5. Design digital filters using various techniques and implement multi sampling rateconversion.

UNIT –I: Introduction to Digital Signal Processing

Discrete Time Signals and Sequences, Linear Shift Invariant Systems, Stability, and Causality, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems.

UNIT -II: Discrete Fourier series

DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT, Relation between DTFT, DFS, DFT and Z_Transform. Fast Fourier Transforms: Fast Fourier Transforms (FFT)-Radix-2, Decimation-in-Time, and Decimation- in-Frequency FFT Algorithms, Inverse FFT, and FFT with General Radix N.

UNIT –III: Realization of Digital Filters

Applications of Z-Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters - Direct, Canonical, Cascade and Parallel Forms.

UNIT –IV: IIR Digital Filters

Analog filter approximations-Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Impulse Invariant Techniques, Bi-linear Transformation Method

UNIT-V: FIR Digital Filters

Characteristics of FIR Digital Filters, Frequency Response, Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, and Comparison of IIR and FIR filters. Multi rate signal processing.

Text Books:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis,
2. Dimitris G. Manolakis, Pearson Education/PHI,2007.
3. Discrete Time Signal Processing-AV. Oppenheim and R.W. Schaffer, PHI, 2009
4. Starting Digital Signal Processing in Telecommunication Engineering A Laboratory-based Course (Tomasz P. Zieliński)

Reference Books:

1. Digital Signal Processing in Modern Communication Systems (Edition 2) (Andreas Schwarzinger)
2. Keonwook Kim, Conceptual Digital signal processing with MATLAB
3. Herbert Bernstein, Measuring Electronics & Sensors: Basics of Measurement, Technology, Sensors, Analog, and Digital Signal Processing.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DIGITAL SYSTEM DESIGN USING VERILOG HDL
(PROFESSIONAL ELECTIVE-I)

Course Code: GR22A3036 **L/T/P/C: 3/0/0/3**
III Year I Semester

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

1. Apply language constructs of Verilog hardware description languages (HDL) in design description.
2. Distinguish between gate level and data flow models of design description.
3. Describe behavioral models of design description.
4. Model designs at switch level.
5. Verify the functioning of designs by writing test benches.

UNIT –I Introduction to Verilog HDL

Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Programming Language Interface, Module. Language Constructs and Conventions: Introduction, Keywords, Identifiers, White Space, Characters, Comments, Numbers, Strings, Logic Values, Data Types, Scalars and Vectors, Operators.

UNIT -II Gate Level Modeling

Introduction, & Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tristate Gates, Array of Instances of Primitives, Design of Flip-Flops with Gate Primitives, Gate Delay, Strengths and Contention Resolution, Net Types. Modeling at Dataflow Level: Introduction, Continuous Assignment Structure, Delays and ContinuousAssignments, Assignment to Vector, Operators.

UNIT –III Behavioral Modeling

Introduction, Operations and Assignments, 'Initial' Construct, always construct, Assignments with Delays, 'Wait ‘Construct, Design at Behavioral Level, Blocking and Non-Blocking Assignments, The 'Case' Statement, 'If' and 'if-Else' Constructs, 'Assign- Deassign' Constructs,'Repeat' Construct, for loop, 'The Disable' Construct, 'While Loop', Forever Loop, sequential and Parallel Blocks.

UNIT –IV Switch Level Modelling

Basic Transistor Switches, CMOS Switch, Bi – directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Trireg Nets.

System Tasks, Functions and Compiler Directives: Parameters, Path Delays, Module Parameters, System Tasks and Functions, File – Based Tasks and Functions, Compiler Directives, Hierarchical Access, User-defined Primitives (UDP).

UNIT-V Sequential Circuit Description

Sequential Models – Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis

Component Test and Verification: Test bench – Combinational Circuit Testing, Sequential Circuit Testing, Test bench Techniques, Design Verification, Assertion Verification.

Text Books:

1. T.R. Padmanabhan, B Bala Tripura Sundari, Design Through Verilog HDL, Wiley 2009
2. Verilog HDL - Samir Palnitkar, 2nd Edition, Pearson Education, 2009.

Reference Books:

1. Fundamentals of Digital Logic with Verilog Design - Stephen Brown, Zvonkoc Vranesic, TMH, 2nd Edition.
2. Zainalabdien Navabi, Verilog Digital System Design, TMH, 2nd Edition.
3. Advanced Digital Logic Design using Verilog, State Machines & Synthesis for FPGA - Sunggu Lee, Cengage Learning, 2012.
4. Advanced Digital Design with Verilog HDL - Michel D. Ciletti, PHI, 2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOFT COMPUTING
(PROFESSIONAL ELECTIVE-I)

Course Code: GR22A3037 **L/T/P/C: 3/0/0/3**
III Year I Semester

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

1. Distinguish various soft computing techniques to solve real world problems.
2. Differentiate between Fuzzy Model with respect to Probabilistic Model.
3. Apply fuzzy inference techniques to solve problems in different domain.
4. Identify the problems, where Supervised and (Neural Networks) Unsupervised Learning Techniques can be applied.
5. Evaluate the fitness function in Genetic Algorithm.

UNIT-1

Introduction to Soft Computing: Computing System, "Soft" Computing Versus "Hard" Computing, Soft Computing Methods, Recent trends in Soft Computing, Characteristics of Soft Computing, Applications of Soft Computing Techniques.

UNIT-II

Fuzzy Logic: I(Introduction): Fuzzy Logic Basic Concepts, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversation.

UNIT-III

Fuzzy Logic: II (Fuzzy Membership, Rules): Membership Functions, Interference in Fuzzy Logic, Fuzzy if then else Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzifications and Defuzzifications, Fuzzy Controller, Industrial Applications.

UNIT IV

Neural Network: Structure and Function of a single neuron: Biological Neuron, Artificial Neuron, Definition of ANN, Taxonomy of Neural Network, Difference between ANN and human brain, Characteristics and Applications of ANN, Single Layer Network.

UNIT-V

Genetic Algorithms: Basic Operators and Terminology, Traditional Algorithms Versus Genetic Algorithm, Simple Genetic Algorithm, General Genetic Algorithm, Classification of genetic Algorithm, Genetic Programming, Applications of Genetic Algorithm. Applications of Soft Computing: Internet Search Techniques, Hybrid Fuzzy Controllers.

Text Books:

1. B.K. Tripathy, J. Anuradha," Soft Computing Advances and Applications", Cengage Learning.
2. S.Rajsekaran and G.A. VijaylakshmiPai , "Neural Networks, Fuzzy Logic and GeneticAlgorithm: Synthesis and Applications" Prentice Hall of India.

3. Introduction to Artificial Neural Systems- Jacek M. Zurada, Web Publishing Company.

Reference Books:

1. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall.
2. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley.
3. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India
4. S. N. Sivanandam , S. Sumathi and S. N. Deepa, “Introduction to Fuzzy Logic using MATLAB”, Springer.
5. N. P. Padhy, “Artificial Intelligence and Intelligent Systems” Oxford University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OPTICAL COMMUNICATIONS
(PROFESSIONAL ELECTIVE-I)

Course Code: GR22A3038 **L/T/P/C: 3/0/0/3**

III Year I Semester

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

1. Identify the basic elements of optical fiber transmission link, fiber modes configurations.
2. Explain transmission characteristics like attenuation, losses, dispersion, and polarization.
3. Differentiate different types of optical sources that includes lasers and LEDs.
4. Analyze the fiber optical network components, variety of networking aspects, detection, and reception of optics.
5. To design efficient optical communication systems, including considerations for component selection, multiplexing techniques, link budget calculations, and managing fiber dispersion.

UNIT I Introduction - Historical development, The general system, Advantages of optical fiber communications. Optical fiber waveguides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays. Cylindrical fibers- Modes, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index.

UNIT II Transmission characteristics of Optical fibers — Introduction, Attenuation, Material absorption losses- Intrinsic absorption, extrinsic absorption, Scattering losses- Linearand nonlinear, Fiber bend loss, Dispersion- Intramodal dispersion, Intermodal dispersion, Polarization.

UNIT III Optical sources- Laser- Optical emission from semiconductors, Injection laser structures- Gain-guided lasers, Index-guided lasers, Quantum well lasers, Injection laser characteristics- Threshold current temperature dependence, dynamic response, Noise, Mode hopping. LED- LED power and efficiency, LED structures- surface emitter LEDs, edgeemitter LEDs, LED characteristics- optical output power, modulation bandwidth, reliability.

UNIT IV Photodetectors - Physical principles of photodiodes, Photodetector Noise, Comparisons of photodetectors. Optical receiver operation- Fundamental receiver operation, Digital receiver performance, Burst-Mode receivers, Analog receivers.

UNIT V Optical system design- Considerations, Component choice, multiplexing. Point-to- point links, System considerations, Link power budget with examples. Overall fiber dispersion in Multi-mode and Single mode fibers, Rise time budget with examples.

Text Books:

1. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.
2. Optical Fiber Communications – Gerd Keiser, McGraw-Hill Education, 5th Edition, 2000.

Reference Books:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition, 2004.
4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ACTUATORS AND SENSORS
(PROFESSIONAL ELECTIVE-I)

Course Code: GR22A3039 **L/T/P/C: 3/0/0/3**
III Year I Semester

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

1. Comprehend, classify, and analyze the behavior of different types of sensors.
2. Analyze the characteristics and performance measures of sensors for the given applications.
3. Gain the knowledge about the types of actuators: electrical, pneumatic performance selection.
4. Design the sensor interfacing with various applications.
5. Realize the trends in sensor technology industrial network automation.

UNIT I Basics of Energy Transformation: Introduction to sensors and transducers, Principle of sensing and transduction, Classification of sensors. Performance Characteristics of Sensors, Static characteristics: accuracy, precision, resolution, sensitivity, linearity, span and range - Dynamic characteristics, Mathematical model of transducer: zero, first and second, selection criteria of sensor.

UNIT II Actuator Performance and Selection I: Electrical actuating systems: solid-state switches, solenoids and electric motors: DC motor, stepper motor, and Inertial measurement unit, Mechanical actuating systems: types of motion, kinematic chains, cams and gears, Pneumatic and hydraulic actuating systems: diaphragms, bellows and control valves.

UNIT III: Actuator Performance and Selection II: Measurement of temperature: thermistor and LM35, Measurement of pressure: strain gauge and piezoelectric type, Measurement of distance: ultrasonic, linear variable differential transformer and capacitance type, proximity sensor, Infrared sensor.

UNIT IV: Signal Conditioning: Amplification, Filtering, Multiplexing, Conversion techniques, Sensor interface design: Wheatstone bridge and operational amplifier circuits for various applications.

UNIT V: Data Acquisition System and Sensor Technology: Data Acquisition: single channel and multi-channel data acquisition, Data logging, Applications: automobile and biological systems, process of developing sensors, Trends in sensor technology and IC sensors, Sensor array and multi-sensor systems, Smart sensors.

Text Books:

1. D. Patranabis, “Sensors and Actuators”, 2nd Edition, PHI Learning, New Delhi, India,2013.
2. Ramon Pallas-Areny, John G. Webster, “Sensors and Signal Conditioning”, 2nd Edit io n,Wiley India Pvt. Ltd., India, 2012.

Reference Books:

1. D. Patranabis, “Sensors and Transducers”, 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, India, 2011.
2. Jon S. Wilson, “Sensor Technology Handbook”, Newnes Publishing Company, Boston, USA, 2005.
3. A.K. Sawhney, Puneet Sawhney, “A Course in Electrical and Electronic Measurements and Instrumentation”, Dhanpat Rai and Co. Pvt. Ltd., New Delhi, India, 2014.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
IOT SENSORS LAB

Course Code: GR22A3041 **L/T/P/C: 0/0/3/1.5**
III Year I Semester

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

1. Understand the different blocks involved in an IOT ecosystem and
2. Understand interfacing techniques to connect different sensors to a microcontroller.
3. Understand how a gateway module works as a bridge between two networks.
4. Understand different communication protocols used in IOT such as HTTP and web sockets.
5. Understand the programming of mobile applications to push and pull data from the cloud. and apply the concepts to implement a complete IOT ecosystem with different data flow scenarios.

Task-1: Microcontroller – sensor/ actuator Interfacing

Programming a Generic Sensor Board to interface the following sensors/actuators.

1. Blinking of LED
2. Buzzer Tone
3. Relay control for switching applications.
4. Ultrasonic sensor module
5. Soil Moisture Sensor Module
6. MEMS Sensor Module (INMP 441)
7. PIR Sensor Module
8. Gesture Sensor Module
9. Environment Monitoring Module (BMP 280)
10. Heart Rate Monitoring Module
11. Multi-Axis Accelerometer Sensor Module
12. Magnetic switch
13. OLED Display interface
14. IR sensor Interface

Task-2: Mobile App development

Mobile app development using MIT's App Inventor and Kodular platforms to

1. Develop apps with simple UI
2. Mobile apps to push pull data from the cloud database.
3. Mobile apps to push actuator commands to the cloud database.

Task-3: IOT projects

Integrating different blocks to do the following IOT projects.

1. Home Security System with IOT interface
2. Smart Garden with IOT interface
3. IR Remote based motor Control with IOT Interface
4. IoT based Remote Range Meter
5. Fall Detection using IOT
6. Gesture Recognition using IOT
7. Heart Rate Monitoring using IOT
8. Wake Sound Detection and Alarm Notification using IOT
9. IoT based Real Time Appliance Control
10. Environment Monitoring using IOT

Text/ Reference Books:

1. Building Arduino Projects for the Internet of Things by Adeel Javed, Apress**,** 2016

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DIGITAL SIGNAL PROCESSING LAB

Course Code: GR22A3042 **L/T/P/C: 0/0/3/1.5**

III Year I Semester

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

1. The student is able to experiment with concepts of DSP and its applications using PYTHON/ MATLAB Software.
2. The student is able to acquaint with Analyze various signals in transform domain
3. Analyze and design different signals using PYTHON/ MATLAB
4. Apply knowledge of digital filter design for various applications.
5. Demonstrate their abilities towards DSP Processor based implementation on DSP kits.

Experiments Based on PYTHON/ MATLAB/ LabView/ C Programming Equivalent

1. Generation of Sinusoidal waveform/signal based on recursive difference equations
2. Linear and circular convolutions and DFT
3. To find frequency response of a given system given in (Transfer Function/ Differential equation form) (Frequency response of analog Butterworth filter)
4. Implementation of DFT, inverse DFT and FFT of given sequence
5. Determination of Power Spectrum of a given signal (s).
6. Implementation of LP FIR filter for a given sequence (Frequency response and timedomain simulation of FIR filter (1))
7. Implementation of HP FIR filter for a given sequence
8. Implementation of LP IIR filter for a given sequence (First order IIR filter (LP): Frequency-response and time-domain simulation)
9. Implementation of HP IIR filter for a given sequence First order IIR filter (HP): Frequency response and time-domain simulation
10. Generation (Recovery) of Sinusoidal signal through filtering
11. Generation of DTMF signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of VD sampling rate converters
15. Impulse response of first order and second order systems.

Experiments Based On DSP Processor

1. Generation of Sine wave with Buffer
2. Generation of Sum of sinusoidal signals
3. Linear Convolution of Two Signal sequences
4. Circular Convolution of Two signal sequences
5. Dot Product of Two Sequences
6. Square and Sawtooth wave generation

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OOPS THROUGH JAVA LAB

Course Code: GR22A3043 **L/T/P/C: 0/0/2/1**
III Year I Semester

Course Outcomes

1. Write basic Java programs, identify classes, objects, members of a class and relationships among them needed for a specific problem.
2. Write Java application programs using OOP principles and proper program structuring.
3. Demonstrate the concepts of polymorphism and inheritance.
4. Write JAVA programs to demonstrate method overloading, overriding.
5. Explain the benefits of JAVA's Exceptional handling mechanism compared to other Programming Language.

Task 1

Write a program to print the area of a rectangle by creating a class named 'Area' having two methods. The first method named 'set Dim' takes length and breadth of rectangle as parameters and the second method named as 'get Area' returns the area of the rectangle. Length and breadth of rectangle are entered through keyboard.

Task 2: Write java programs that implement the following:

a) Constructor
b) Parameterized constructor
c) Method overloading
d) Constructor overloading

Task 3:

a) Write a Java program that checks whether a given string is a palindrome or not.
b) Write a Java program for sorting a given list of names in ascending order.
c) Write a Java program that reads a line of integers, and then displays each integer and the sum of all the integers (Use String Tokenizer class of java. util)

Task 4: Write java programs that uses the following keywords

a) this
b) super
c) static
d) final

Task 5

a) Write a java program to implement method overriding
b) Write a java program to implement dynamic method dispatch.
c) Write a Java program to implement multiple inheritance.
d) Write a java program that uses access specifiers.

Task 6

a) Write a Java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
c) Write a Java program that displays the number of characters, lines, and words in a text file.

Task 7

a) Write a Java program for handling Checked Exceptions.
b) Write a Java program for handling Unchecked Exceptions.

Task 8

Write a Java program that creates three threads. First thread displays "Good Morning" one second, the second thread displays "Hello" every two second and the third thread displays "Welcome" every three seconds.

Task 9

a) Develop an applet that displays a simple message.
b) Develop an applet that receives an integer in one text field and computes its factorial value and returns it in another text field when the button named "Compute" is clicked

Task 10

Write a Java program that works as a simple calculator. Use a grid layout to arrange button for the digits and for the +, -,*, % operations. Add a text field to display the result.

Task 11

a) Write a Java program for handling mouse events.
b) Write a Java program for handling key events.

Task 12

Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields Num1 and Num 2. The division of Num1 and. Num2 is displayed in the Result field when the Divide button is clicked. If Num1or Num2 were not an integer, the program would throw Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception and display the exception in a message dialog box.

Task 13

a) Write a java program that simulates traffic lights. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time. No light is on when the program starts.

b) Write a Java program that allows the user to draw lines, rectangles, and ovals.

Text Books:

1. Java; the complete reference, 7th Edition, Herbert Schildt, TMH.
2. Introduction to Java programming, 6th Edition, Y.Daniel Liang, Pearson Education.

Reference Books:

1. Java: How to Program, 6th Edition, H.M.Dietel and P.J.Dietel, Pearson Education.
2. Big Java, 2nd Edition, Cay Horstmann, Wiley Student Edition, Wiley India Pvt Ltd.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CONSTITUTION OF INDIA

Course Code:GR22A2003 **L/T/P/C: 2/0/0/0**
III Year I Semester

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

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

UNIT –I

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

UNIT -II

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

UNIT –III

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

UNIT –IV

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

UNIT-V

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

Text 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 Lakshmi Narain Agarwal publication

III YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
VLSI DESIGN

Course Code: GR22A3108 **L/T/P/C: 3/0/0/3**
III Year II Semester

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

1. Visualize the fabrication process of IC technology.
2. Analyze and design CMOS subsystems
3. Draw stick diagrams and layouts for CMOS circuits using design rules
4. Implement the VLSI design using programmable logic devices
5. Understand various testing schemes of ICs

UNIT –I Introduction

Introduction to IC Technology–MOS transistors, NMOS, CMOS & BiCMOS fabrication processes, Integrated Resistors and Capacitors

UNIT -II Basic Electrical Properties

Basic Electrical Properties of MOS and BiCMOS Circuits: Ids- Vds relationships, MOS transistor threshold Voltage Vt, gm, gds, Figure of merit ωo; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter-analysis and design, BiCMOS Inverters, Power Dissipation

UNIT –III VLSI Circuit Design Processes

VLSI Circuit Design Processes, Gate Level Design: VLSI Design Flow, Stick Diagrams, Layout, Lambda based Design rules for wires, contacts and Transistors, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Design using Pass transistors and transmission gates, Dynamic CMOS Logic and Domino CMOS Logic

UNIT –IV Data path Subsystems

Data path Subsystems, Array Subsystems: Subsystem Design, Shifters, Adders- Ripple Carry, Carry Look ahead Adder, Carry Select Adder, Arithmetic Logic Unit(ALU), Multipliers – Array Type, Booth, Wallace tree, Parity generators, Comparators, Zero/One Detectors, SRAM, DRAM, ROM

UNIT-V Semi Custom Integrated Circuit Design, IC Testing:

PLAs, Programmable Array Logic, FPGAs, CPLDs, Standard cells design approach, Need for Testing, Test Principles, Design Strategies for Test, Chip Level Test Techniques, System- Level Test Techniques.

Text Books:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Douglas A.Pucknell, Sholeh Eshraghian, PHI,2011.
2. CMOS VLSI Design–A circuits and systems perspective, Neil H.E Weste, David Harris, Fourth Edition, Addison Wesley, 2011.
3. VLSI Design, K. Lal Kishore and V. S. V. Prabhakar, 1st Edition, I.K. International, 2009.

Reference Books:

1. CMOS logic circuit Design- John. P. Uyemura, Springer, 2013.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rdEdition, 1997.
3. VLSI Design–A. Albert Raj, Latha, PHI, 2008
4. Introduction to VLSI–Mead & Convey, BS Publications, 2010

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ANTENNAS AND WAVE PROPAGATION

Course Code: GR22A3109 **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Outcomes: On completion of the course, the student will be able to
1. Apply basic characteristics in analyzing and designing antennas.
2. Apply Mathematical Realization to Design an array.
3. Design microstrip antenna, slot antenna for various applications
4. Design and Analyze Some practical antennas for various applications.
5. Carry out measurement of radiation pattern for given antenna and select a type of propagation forgiven application.

UNIT I-Antenna Basics

Introduction: Radiation Mechanism, Current Distribution on a Thin Wire Antenna, Fundamental Parameters of Antennas: Radiation Pattern, Radiation Power Density, Radiation Intensity, Beamwidth, Directivity, Antenna Efficiency, Gain, Beam Efficiency, Bandwidth, Polarization, Input Impedance, Antenna Radiation Efficiency, Antenna Vector Effective Length and Equivalent Areas, Maximum Directivity and Maximum Effective Area, Antenna Temperature

UNIT II–Hertzian dipole, Linear antennas, and Basics of Arrays

Fields, Power, and Impedance- Infinitesimal Dipole (Hertzian Dipole), Half-Wavelength Dipole, Monopole, Folded dipole. Arrays: Concept of point source, two sources of any phase and amplitude, uniform linear array, binomial array and Dolph-Chebyshev arrays.

UNIT III-Special Antennas

Aperture Antennas: Horn Antenna & Slot Antenna, Log Periodic Dipole Antenna (LPDA), Yagi-Uda antenna, Helical Antenna, Flat-Sheet/corner reflectors, Parabolic Reflectors, Microstrip Patch Antenna, parametric analysis of rectangular Patch Antenna Design using CST/HFSS(Case Study).
Antenna Measurements: Friis Transmission Equation, Pattern Measurement, Outdoor/Indoor.

UNIT IV - Modern Antenna Structure (No Derivations)

Reconfigurable Antennas-classification, Techniques and Applications, UWB antennas-Design considerations of UWB antennas, Metamaterials Based Antennas: Classification , Antennas based on Metamaterials.

UNIT V– Wave Propagation

Ground Wave Propagation-Plane earth reflection, Space and Surface Waves, elevated dipole antenna above plane earth, Wave tilt of surface wave, Spherical earth. propagation. Tropospheric waves: Normal refraction, abnormal refraction and reflection, modified index curves and duct propagation, tropospheric scatter. Sky Wave Propagation: Structure and Layers of Ionosphere, Electrical Properties of Ionosphere, Refraction and Reflection by Ionosphere, Critical Frequency, MUF. LUF, Skip Distance, Maximum Single- hop Distance, Virtual Height.

Text Books:

1. Antenna Theory-Analysis and Design-C.A. Balanis, John Wiley& Sons, 3rd ed. 2005.
2. Antennas and Wave Propagation-J.D.Kraus, RJ.Marhefka and Ahmad S.Khan. TMH, New Delhi, 4th ed., (Special Indian Edition), 2010.
3. Electromagnetic Waves & Radiating Systems-E.C.Jordan and K.G.Balmain. PHI, 2nd ed.,2000.
4. Modern Small Antennas Kyohei Fujimoto Hisashi Morishita, Cambridge university press, 2013.

Reference Books:

1. Antenna and Wave Propagation–Harish and Sachidananda M, Oxford University Press, 2007
2. Antenna Theory and Design-Warren L.Stutzman, GaryA. Thiele, John Wiley & Sons, 3rd edition. 2013.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER NETWORKS

Course Code:GR22A3044 **L/T/P/C: 3/0/0/3**
III Year II Semester

Pre-requisites: Students are expected to have knowledge in

- Basic computer hardware
- Multi user Operating systems
- Types of Ports and their purpose

Course Outcomes:

1. Articulate basic terminologies of Computer Networks and transmission media in building a network for an organization.
2. Interpret the error correction and detection techniques and MAC Protocols for specific networks.
3. Illustrate the purpose of routing algorithms in real time applications.
4. Mind map the protocols and mechanism used in transport layer.
5. Integrate the application layer protocols in Internet based Applications.

UNIT I

Computer Networks: Uses of Computer Networks, Network Hardware, Network Software, Types of networks, Network topologies, Layered architecture. Reference Models: OSI, TCP/IP, ARPANET, Internet, and ATM header, Reference model, QoS.

Physical Layer: Guided Transmission Media, Wireless Transmission Media, Communication Satellites. Switching and Multiplexing, Mobile Telephone Network, GSM.

UNIT II

Data link layer: Design Issues, Framing, Error Detection, Elementary Data Link Protocol, and Sliding Window Protocols.

Medium Access sub layer: Static vs. Dynamic, Multiple Access Protocols: ALOHA, CSMA and Collision Free Protocols. Ethernet (IEEE 802.3), wireless LANS (IEEE 802.11), Bluetooth (IEEE 802.15), The Network and internetwork devices.

UNIT III

Network Layer: Routing Algorithms, Flooding, Broadcasting and Multicasting. Congestion Control Algorithms: General Principles of Congestion Control, Prevention Policies, Congestion Control in Virtual and Datagram Subnets, QoS in the Internet.

The Network Layer in the Internet: IPv4 Addressing Scheme, Subnetting and Masking, CIDR, NAT, Intra and Inter domain routing protocols, Mobile IP, IPv6 Header Format and Transmission Methods.

UNIT IV

Transport Layer: Transport Services, Elements of Transport Protocols.

Transport Layer Protocols: TCP & UDP protocols, TCP Connection Establishment and Release, TCP Congestion Control, TCP Fast Re-transmit and Recovery, Slow startMechanism in TCP, Transaction Oriented TCP.

UNIT V

Application Layer: DNS, Electronic Mail, the World Wide Web, FTP, HTTP, TELNET.

Multimedia: Audio and video compression techniques, streaming audio, and video, VOIP.

Teaching Methodologies:

1. Power Point Presentations
2. Tutorial Sheets
3. Assignments

Text Books:

1. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.
2. Data Communications and Networking-Behrouz A. Forouzan, 3rd Edition TMH.

Reference Books:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks- 3rd Edition, W.A. Shay, Thomson
3. Computer Networks – Dr.G.S.Bapiraju, 2nd Edition GRIET Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FPGA & CPLD ARCHITECTURES
(PROFESSIONAL ELECTIVE-II)

Course Code: GR22A3110 **L/T/P/C: 3/0/0/3**
III Year II Semester

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

1. Classify programmable logic devices
2. Select suitable programmable logic devices for the designs
3. Study different architectures of CPLD and FPGA.
4. Compare different programming technologies in FPGAs
5. Demonstrate various applications of FPGAs

UNIT –I: INTRODUCTION TO PROGRAMMABLE LOGIC DEVICES

Introduction, Programmable Logic Devices/Generic Array Logic; Complex Programmable Logic Devices – Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLDImplementation of a Parallel Adder with Accumulation.

UNIT -II: FIELD PROGRAMMABLE GATE ARRAYS

Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs.

UNIT –III: SRAM PROGRAMMABLE FPGAS

Introduction, Programming Technology, Device Architecture, The Xilinx XC2000, XC3000 and XC4000 Architectures.

UNIT –IV: ANTI-FUSE PROGRAMMED FPGAS

Introduction, Programming Technology, Device Architecture, The Actel ACT1, ACT2 and ACT3 Architectures.

UNIT-V: DESIGN APPLICATIONS

General Design Issues, Counter Examples, A Position Tracker for a Robot Manipulator, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

Text Books:

1. Field Programmable Gate Array Technology - Stephen M. Trimberger, Springer International Edition. 2013
2. Digital Systems Design - Charles H. Roth Jr, Lizy Kurian John, Cengage Learning.

Reference Books:

1. Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.
2. Digital Design Using Field Programmable Gate Arrays - Pak K. Chan/Samiha Mourad, Pearson Low Price Edition.

3. Digital Systems Design with FPGAs and CPLDs - Ian Grout, Elsevier, Newnes.
4. FPGA based System Design - Wayne Wolf, Prentice Hall Modern Semiconductor Design Series.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MACHINE LEARNING
(PROFESSIONAL ELECTIVE-II)

Course Code:GR22A3140 **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Outcomes:

1. Explain the concepts machine learning models and able to perform feature engineering techniques.
2. Identify and apply appropriate supervised learning models.
3. Design neural network models for the given data.
4. Perform evaluation on machine learning algorithms and model selection techniques.
5. Devise unsupervised and reinforcement learning models.

UNIT-I

Introduction: Introduction to machine learning, Supervised learning, Unsupervised learning, Semi-supervised learning, Reinforcement learning, Deep learning, Concept learning using find-S algorithm.
Feature Engineering: Feature Selection using Filter, Wrapper, Embedded methods, and Feature normalization using min-max normalization, z-score normalization, and constant factor normalization,
Introduction to Dimensionality Reduction: Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) techniques.

UNIT-II

Supervised Learning – I (Regression and Classification)
Regression models: Simple linear regression, Multiple linear regression. Cost Function, Gradient Descent, Performance Metrics: Mean Absolute Error (MAE), Mean Squared Error (MSE), R-Squared error, Adjusted R Square.
Classification models: Decision Trees-ID3, CART, Naive Bayes, K-Nearest-Neighbors (KNN), Logistic regression, Multinomial logistic regression, Support Vector Machines (SVM).

UNIT-III

Supervised Learning – II (Classification with Neural Networks)
Neural Network Representation: Introduction to Artificial Neural Networks (ANN), Activation Functions, Perceptron and Back Propagation algorithms.

Convolutional Neural Networks - Convolution and Pooling layers, Recurrent NeuralNetworks(RNN).
Classification Metrics: Confusion matrix, Precision, Recall, Accuracy, F-Score, ROC curves

UNIT-IV

Model Validation in Classification: Cross Validation - Holdout Method, K-Fold, StratifiedK- Fold, Leave-One-Out Cross Validation (LOOC-V). Bias-Variance tradeoff, Regularization, Overfitting, Underfitting.

Ensemble Methods: Boosting, Bagging, Random Forest classifier

UNIT-V

Unsupervised Learning: K-means, K-Modes, K-Prototypes, Gaussian Mixture Model clustering algorithms, Expectation-Maximization, BIRCH clustering algorithms.

Reinforcement Learning: Exploration and exploitation trade-offs, non-associative learning, Markov decision processes, Q-learning.

Text Books:

1. Data Mining–Concepts and Techniques -Jiawei Han and Micheline Kamber, Morgan Kaufmann (2nd Edition).
2. Machine Learning – Tom M. Mitchell, TMGH.
3. Introduction to Data Mining - Michael Steinbach, Pang-Ning Tan, and Vipin Kumar (Second Edition).

Reference Books:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. R. S. Sutton and A. G. Barto. Reinforcement Learning - An Introduction. MIT Press,1998.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009.
4. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
5. Machine Learning Yearning, Andrew Ng.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
WIRELESS COMMUNICATION NETWORKS
(PROFESSIONAL ELECTIVE-II)

Course Code: GR22A3111 **L/T/P/C: 3/0/0/3**

III Year II Semester

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

1. Demonstrate their understanding on functioning of wireless communication systems and evolution of different wireless communication systems and standards.
2. Compare different technologies used for wireless communication systems.
3. Demonstrate an ability to explain multiple access techniques for Wireless Communication.
4. Explain the architecture, functioning, protocols, capabilities and application of various wireless communication networks.
5. Demonstrate an ability to evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks.

UNIT –I

Overview of wireless communication, cellular communication, different generations and standards in cellular communication systems, satellite communication including GPS, wireless local loop, cordless phone, paging systems, RFID.

UNIT -II

Recent wireless technologies: multicarrier modulation, OFDM, MIMO system, diversity multiplexing trade-off, MIMO-OFDM system, smart-antenna; beamforming and MIMO, cognitive radio, software defined radio, communication relays, spectrum sharing.

UNIT –III

Multiple access techniques in wireless communication: contention-free multiple access schemes (FDMA TDMA, CDMA, SDMA and Hybrid), contention-based multiple access schemes (ALOHA and CSMA).

UNIT –IV

Wireless personal area networks (Bluetooth, UWB and ZigBee), wireless local area networks (IEEE 802.11, network architecture, medium access methods, WLAN standards), wireless metropolitan area networks (WiMAX).

Wireless system protocols: mobile network layer protocol (mobile IP, IPv6, dynamic host configuration protocol), mobile transport layer protocol (traditional TCP, classical TCP improvements), support for mobility (wireless application protocol).

UNIT-V

Ad-hoc wireless networks: Design Challenges in Ad-hoc wireless networks, concept of cross layer design, security in wireless networks, energy constrained networks. MANET and WSN

Text Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005.
2. Sanjay Kumar, “Wireless Communication the Fundamental and Advanced Concepts” River Publishers, Denmark, 2015 (Indian reprint).

Reference Books:

1. Vijay K Garg, “Wireless Communications and Networks”, Morgan Kaufmann Publishers an Imprint of Elsevier, USA 2009 (Indian reprint)
2. J. Schiller, “Mobile Communication” 2/e, Pearson Education, 2012.
3. Iti Saha Misra, “Wireless Communication and Networks : 3G and Beyond”, 2/e, McGraw Hill Education (India) Private Ltd, New Delhi, 2013.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
EMBEDDED SYSTEMS DESIGN
(PROFESSIONAL ELECTIVE-II)

Course Code: GR22A3112 **L/T/P/C: 3/0/0/3**
III Year II Semester

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

1. Understand basic concepts of embedded systems.
2. Apply and analyze the applications in various processors and domains of embedded systems.
3. Analyze and develop embedded hardware and software development cycles and tools.
4. Analyze to understand what a microcomputer is, the core of the embedded system.
5. Remember the definitions of ASICs, PLDs, memory, memory interface.
6. Analyze to understand different concepts of RTOS, sensors, memory interface, communication interface.

UNIT- I: Introduction to Embedded Systems

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT- II: Typical Embedded System

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT- III: Embedded Firmware

Reset Circuit, Brown-out Protection Circuit, Oscillator UNIT-, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT- IV: RTOS Based Embedded System Design

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT- V: Task Communication

Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

Text Books:

1. Introduction to Embedded Systems - Shibu K.V, McGraw Hill.
2. Embedded Systems - Raj Kamal, TMH.

Reference Books:

1. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.

2. Embedded Systems – Lyla, Pearson, 2013
3. An Embedded Software Primer - David E. Simon, Pearson Education.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER NETWORKS LAB

Course Code:GR22A3050 **L/T/P/C:0/0/3/1.5**
III Year II Semester

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

1. Implement the Data link layer framing methods and protocols.
2. Illustrate routing, security, and congestion control algorithms,
3. Analyze how network and Internetwork devices are configured using Packet Tracer.
4. Demonstrate Virtual LANs, Network Address Translation, and routing protocols.
5. Demonstrate how to connect and monitor IOT devices.

Task-1

Implement the following Data Link Layer framing methods

a) Bit stuffing b) Character-stuffing c) Character count

Task-2

Implement the following Data Link layer protocols

a) Simplex protocol
b) Stop and Wait protocol
c) Sliding Window protocol

Task-3

Design a program to implement the following:

a) Shortest Path routing protocol
b) Distance Vector routing protocol
c) Token Bucket algorithm

Task-4

Develop a program to implement the following:

a) DES algorithm b) RSA algorithm

Task-5

a) Configure network devices, such as hubs and switches within a network topology using Packet Tracer software.
b) Construct a single LAN and understand the concepts and operation of ARP.

Task-6

a) Configure and implementation of a Switch within a Network using Packet Tracer.
b) Learn and implement basic commands of Computer network like PING, traceroute,ns lookup etc.

Task-7

a) Configure and implementation of a Router within a Network using Packet Tracer.
b) Configure and examine Network Address Translation (NAT)

Task-8

a) Configure network topology to implement VLANs using Packet Tracer software.
b) Configure network topology and implement static routing using Packet Tracer Software.

Task-9

a) Configure network topology and implement dynamic routing protocol such as RIP, OSPF etc. using Packet Tracer.

Task-10

a) Configure DHCP Server in the Network using packet tracer software.
b) Configure a remote login using SSH and Telnet.

Task-11

a) Establishing a Web Server Connection Using the PC's Web Browser
b) Install Wireshark and view
i. Network Traffic
ii. Wired and wireless NIC information.
iii. Examine Ethernet Frames

Task-12

a) Adding IoT devices to Smart Homes using Packet Tracer
b) Connect and Monitor IoT Devices using Packet Tracer

TEXT BOOKS:

1. Packet Tracer Network Simulator, Jesin A, O'REILLY, Packt Publishing
2. Introduction to Networks Companion Guide (CCNAv7), Cisco Press, Cisco Networking Academy

REFERENCE BOOKS:

1. Routing and switching Essentials Companion guide, Cisco Press, Cisco Networking Academy.
2. CISCO PACKET TRACER LABS: Best practice of configuring or troubleshooting Network Kindle Edition, Mulayam Singh.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
VLSI DESIGN LAB

Course Code: GR22A3114 **L/T/P/C: 0/0/3/1.5**
III Year II Semester

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

1. Design and analyze various combinational and sequential logic circuits.
2. Simulate and verify the design
3. Draw the layout of ICs.
4. Check design rules and compare layout with schematic
5. Extract the parasitic components

Task 1: Introduction to Layout Design Rules
Task 2: Layout of CMOS Inverter
Task 3: Layout of CMOS NAND/NOR Gates
Task 4: CMOS AND/OR Gates
Task 5: CMOS XOR/XNOR Gates
Task 6: CMOS 1-bit Full Adder T
Task 7: Static RAMTask8: Latch
Task 8: Gray to binary code converter
Task 9: Simulation of Differential amplifier
Task 10: Simulation of Common Source amplifier
Task 11: Simulation of Common Drain amplifier
Task 12: System Level Design using PLL
Task 13: Transmission Gate
Task 14: Multiplexer

NOTE:

A minimum of 12 (Twelve) experiments has to be performed and recorded by thecandidate to attain eligibility for the Practical Examination.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MINI PROJECT

Course Code: GR22A3089 **L/T/P/C: 0/0/4/2**
III Year II Semester

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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
VALUE ETHICS AND GENDER CULTURE

Course Code: GR22A2002 **L/T/P/C: 2/0/0/0**
III Year II Semester

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

1. To enable the student to understand the core values that shapes the ethical behaviour and student will be able to realize the significance of ethical human conduct and self-development
2. Students will be able to inculcate positive thinking, dignity of labour and religious tolerance.
3. The students will learn the rights and responsibilities as an employee and a team member.
4. Students will attain a finger grasp of how gender discrimination works in our society and how to counter it.
5. Students will develop a better understanding on issues related to gender and Empowering students to understand and respond to gender violence.

UNIT –I

Values and Self-Development –social values and individual attitudes, Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.

- A Case study on values and self-development

UNIT -II

Personality and Behaviour Development-positive thinking, punctuality, avoiding fault finding, Free from anger, Dignity of labor, religious tolerance, Aware of self-destructive habits.

- A Case study on Personality

UNIT –III

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

- A Case study on professional ethics

UNIT –IV

Introduction to Gender - Definition of Gender, Basic Gender Concepts and Terminology, Attitudes towards Gender, Social Construction of Gender.

- A Case study/ video discussion on attitudes towards gender

UNIT –V

Gender-based Violence -The concept of violence, Types of Gender-based violence, the relationship between gender, development and violence, Gender-based violence from a human rights perspective.

- A Case study/ video discussion on gender-based violence in view of human rights.

Text Books:

1. Professional Ethics Includes Human Values (2nd Edition) By R Subramanian, Oxford University

Press, 2017.
2. Ethics in Engineering Practice & Research, Caroline Whit beck, 2e, Cambridge University Press 2015.
3. A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by Telugu Akademi, Hyderabad, Telangana State in the year 2015.

Reference Books:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "I Fought For My Life…and Won. "Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
3. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e, Cengage learning, 2015.
4. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008

IV YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ECONOMICS AND ACCOUNTING FOR ENGINEERS

Course Code: GR22A2004 **L/T/P/C: 3/0/0/3**
IV Year I Semester

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

1. The student will be able to understand the concepts of economics and Demand concepts, elasticity, and techniques for forecast demand of products
2. The student will be able to plan the production levels in tune with maximum utilization of organizational resources and with maximum profitability.
3. To understand the types of markets, types of competition and to estimate the cost of products and decide the price of the products and services produced
4. The student will be able to analyze the profitability of various projects using capital budgeting techniques and
5. The student is able will be able prepare the financial statements and more emphasis on preparation of final accounts.

UNIT –I

Introduction & Demand Analysis: Definition and Scope: Introduction to micro, macroeconomics, Nature, and Scope of Managerial Economics. National Income and its Components - GNP, NNP, GDP, NDP **Demand Analysis**: Demand Determinants, Law of Demand, and its exceptions. **Elasticity of Demand**: Definition, Types, Measurement and Significance of Elasticity of Demand. **Demand Forecasting**, Factors governing demand forecasting, methods of demand forecasting

Unit-II

Production & Cost Analysis: Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Laws of Returns, Internal and External Economies of Scale. **Cost Analysis:** Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

Unit-III

Markets and Forms of Business organizations: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. **Pricing:** Objectives and Policies of Pricing. Methods of Pricing. Business: Features and evaluation of different forms of Business Organization: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises, and their types.

Unit-IV

Capital Budgeting: Capital and its significance, Types of Capital, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value (NPV) Method and Internal Rate of Return (IRR) (simple problems) and Profitability Index (PI)

Unit-V

Introduction to Financial Accounting: Accounting Concepts and Conventions - Double- Entry Bookkeeping. **Accounting Cycle:** Journal, Ledger, Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

Text Books:

1. Managerial Economics – International Edition, 2019, by Christopher Thomas (Author), S. Charles Maurice (Author), McGraw-Hill Education
2. Managerial Economics Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.
3. Managerial Economics: Analysis, Problems and Cases - P. L. Mehta, Edition, 13. Publisher, Sultan Chand, 2007.
4. Financial Accounting Paperback – 2016 by K.L.Narang S.P.Jain, Kalyani Publishers, 2005.

Reference Books:

1. Managerial Economics 4th Edition , W. Cris Lewis, Sudhir K. Jain, H. Craig Petersen, Pearson, 2009
2. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2009
3. Financial Accounting, 6/e, Dr S N Maheshwari, CA Sharad K Maheshwari & Dr Suneel K Maheshwari, Vikas Publishing, 2018.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MICROWAVE ENGINEERING

Course Code: GR22A4036 **L/T/P/C: 3/0/0/3**
IV Year I Semester

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

1. Apply circuit theory to analyze and design microwave circuits.
2. Implement some impedance matching networks and design microwave filters.
3. Understand operating principles and application knowledge of microwave diodes, transistors, and tubes.
4. Design microwave amplifiers and oscillators.
5. Design up converters, down converters, and frequency multipliers.

UNIT I: Microwave Network Analysis

Equivalent voltages and currents, even and odd properties of driving point impedance and input reflection coefficient. Impedance and Admittance matrices for an N-Port network. Derivation of conditions for reciprocal and lossless networks in terms of impedance and admittance parameters and matrices. Scattering Parameters and Scattering matrix: Scattering matrix in terms of impedance matrix and vice-versa. Conditions for reciprocity and losslessin terms of S-Parameters and S-matrix. Shift in reference plane. ABCD parameters of some useful two-port circuits.

UNIT-II: Three-Port and Four-Port Networks:

S matrices of general three-port networks and four-port networks. Analysis of lossless power dividers and resistive dividers. Analysis of Wilkinson power dividers, Single-hole and double- hole directional couplers, analysis of Quadrature hybrid, analysis of 180º hybrid.

UNIT-III: Impedance Matching and Filter Implementation:

Networks-analytic and smith chart solutions: Matching With Lumped Elements. Filters: process of filter design and implementation, expressions for Chebyshev and Butterworth low- pass, high-pass, band pass and band-stop filters in terms of normalization filter component values. Filter design using Richards transformation, Kuroda's identities, stepped impedance low-pass filters.

UNIT-IV: Microwave diodes, Transistors and Tubes (No derivations):

Diodes: Operating principle and applications of Schottky diodes, PIN diodes, Varactor diodes, Gunn diodes, IMPATT diodes, Tunnel diodes and BARITT diodes and their applications (No derivations) Transistors: Operating principle and applications of bipolar junction transistors, hetero junction bipolar junction transistors, Field effect transistors. Tubes: Operating principle and applications of Klystrons: Reflex klystrons and TWTs.

UNIT-V: Microwave amplifiers, Oscillators, Mixers, and Frequency Multipliers

Amplifiers: Two-port power gains, unconditional and conditional stabilities. Single -stage transistor amplifier design for maximum power. Microwave Oscillators: Transistor Oscillator, Frequency multipliers and Mixers: Reactive diode multipliers (include Manly-Rowe relations), up conversion and down conversion processes using mixers, single-ended diode mixer.

Text Books:

1. "Microwave Engineering", David M Pozar, John Wiley & Sons, 4th ed., 2012
2. "Microwave Devices and Circuits", Samuel Y Liao, Pearson Education, 3rd ed., 1990
3. "RF Circuit Design", Christopher Bowick, Elsevier Inc, 2008.

Reference Books:

1. "RF Circuit Design- Theory and Applications". Reinhold Ludwig and Pavel Bretchko, Prentice Hall Inc., 2000
2. "Foundations for Microwave Engineering", RE Collin, John Wiley & Sons Inc, 2nd ed., 2002.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ANALOG IC DESIGN
(PROFESSIONAL ELECTIVE-III)

Course Code: GR22A4037 **L/T/P/C: 3/0/0/3**

IV Year I Semester

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

1. Build a foundational under Gain a fundamental understanding of analog electronic circuits, including passive and active components
2. Understand the applications of operational amplifiers in amplifier circuits, including inverting and non-inverting amplifier configurations.
3. Understand and consider op-amp specifications and parameters when selecting and using operational amplifiers in circuit designs.
4. Understand the basic principles of digital signal processing and its advantages in signal filtering and manipulation.
5. Understand and evaluate advanced IC fabrication processes and their impact on analog IC performance.

Unit I: Introduction to Analog IC Design

CMOS Technology Fundamentals, MOS Transistor Operation, Small-Signal Models, DC Biasing, Current Mirrors

Unit II: Amplifier Design

Single-Stage Amplifiers (Common-Source, Common-Drain, Common-Gate), Differential Amplifiers, Frequency Response and Gain-Bandwidth Product, Noise Analysis, Feedback Amplifiers

Unit III: Operational Amplifiers (Op-Amps)

Op-Amp Fundamentals, Op-Amp Configurations (Inverting, Non-Inverting, Difference Amplifiers), Frequency Response and Compensation, Stability Analysis, Noise Analysis

Unit IV: Filters and Signal Processing Circuits

Active and Passive Filters, Second-Order Filters, Butterworth, Chebyshev, and Elliptic Filter Design, Voltage and Current Reference Books, Voltage Regulators

Unit V: Advanced Topics in Analog IC Design

Phase-Locked Loops (PLLs), Voltage-Controlled Oscillators (VCOs), Data Converters (ADCs and DACs), High-Frequency IC Design, Low-Noise Amplifiers.

Text Books:

1. "CMOS Analog Circuit Design" by Phillip E. Allen and Douglas R. Holberg (Edition: 3rd, Publication Year: 2012).
2. "CMOS VLSI Design: A Circuits and Systems Perspective" by Neil H.E. Weste and David Money

Harris (Edition: 4th , Publication Year: 2010).

Reference Books:

1. "Design with Operational Amplifiers and Analog Integrated Circuits" by Sergio Franco (Edition: 4th , Publication Year: 2016).
2. "Analog Filter Design" by M.E. Van Valkenburg (Edition: 2nd , Publication Year: 1982).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DIGITAL IMAGE PROCESSING
(PROFESSIONAL ELECTIVE-III)

Course Code: GR22A4038 **L/T/P/C: 3/0/0/3**

IV Year I Semester

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

1. Interpret the effect of sampling and quantizing the 2-D continuous-Image signals and analyze, implement fundamental algorithms and different types of image transforms.
2. Analyze and apply enhancement and restoration techniques suitable for specific applications.
3. Design simple systems for realizing some multimedia applications with image segmentation techniques.
4. Use color image processing techniques to classify objects.
5. Apply the acquired knowledge to solve practical multimedia related problems and projects on work.

UNIT-I: Digital image fundamentals and Image Transforms

Digital Image through scanner, Concept of gray levels, Gray level to binary image conversion. Sampling and quantization. Relationship between pixels. 2D FFT and its Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, Slant transform, SVD and Hoteling transform.

UNIT-II: Image enhancement in spatial domain and Frequency domain

Point processing, Histogram processing, Spatial filtering, Enhancement in frequency domain, Image smoothing, Image sharpening, Image enhancement using Fuzzy logic.

UNIT-III: Color image processing and Restoration

Pseudo color image processing, full color image processing. Image Restoration Degradation model, Algebraic approach to restoration, Inverse filtering, least mean square filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT-IV: Segmentation and Thresholding

Image segmentation, Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region oriented segmentation, edge detection using Fuzzy logic.

UNIT-V: Image Compression Techniques

Image compression Redundancies and their removal methods, Fidelity criteria, Image compression models, Source encoder and decoder, Error free compression, Lossy compression, Case study in Image watermarking.

Text Books:

1. Digital Image processing – R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education, 2nd Education, 2002

2. Fundamentals of Digital Image processing – A.K.Jain , PHI

Reference Books:

1. Digital Image processing using MAT LAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Edition, PEA, 2004.
2. Digital Image Processing – William K. Pratt, John Wilely, 3rd Edition, 2004. 3. Fundamentals of Electronic Image Processing – Weeks Jr., SPIC/IEEE Series, PHI

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOFTWARE DEFINED RADIO
(PROFESSIONAL ELECTIVE-III)

Course Code: GR22A4039 **L/T/P/C: 3/0/0/3**

IV Year I Semester

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

1. Distinguish different architectures of SDR
2. Quantify noise and distortion in RF chain, ADC and DAC
3. Apply techniques for improving data converter performance
4. Apply different techniques for spectrum sensing
5. Work in different hardware platforms of cognitive radio

UNIT- I

Introduction to Software-Defined Radio: Brief History, What is a Software-Defined Radio?, Networking and SDR, RF architectures for SDR, Processing architectures for SDR, Software Environments for SDR.

UNIT- II

Radio frequency implementation issues: The purpose of the RF Front-End, Dynamic range: The principal challenge of receiver design. RF receiver front-end topologies, Enhanced flexibility of the RF Chain with Software Radios, Importance of the components to overall performance, Transmitter architectures and their Issues, noise and distortion in the RF Chain, ADC and DAC distortion.

UNIT- III

Analog to digital and digital to analog conversion: Parameters of ideal data converters, Parameters of practical data converters, Techniques to improve data converter performance, Sigma-Delta Structures: ADC and DAC.

Digital Hardware Choices: DSP processors, Field programmable gate arrays, power management issues.

UNIT- IV

Cognitive Radio: Techniques and signal processing: History and background, Communication policy and Spectrum Management, Cognitive radio cycle, Cognitive radio architecture, SDR architecture for cognitive radio, Spectrum sensing Single node sensing: energy detection, cyclo stationary and wavelet-based sensing- problem formulation and performance analysis based on probability of detection versus SNR. Cooperative sensing: different fusion rules, wideband spectrum sensing- problem formulation and performance analysis based on probability of detection vs SNR.

UNIT- V

Cognitive Radio: Hardware and Applications: Hardware platforms for Cognitive radio (USRP and WARP), Details of USRP board, Cognitive wireless communication applications.

Text Books:

1. Software-Defined Radio - A Modern Approach to Radio Engineering, J.H. Reed, ,Prentice-Hall, 2002
2. Software-Defined Radio for Engineers - Travis F. Collins, Robin Getz, Di Pu, Alexander M. Wyglinski , Artech House, 2018.
3. Hüseyin Arslan "Cognitive Radio, Software Defined Radio and Adaptive Wireless Systems", Springer, ISBN 978-1-4020-5541-6 (HB), 2007.

Reference Books:

1. RF and Baseband Techniques for Software Defined Radio, Peter B. Kenington, Artech House, 2005.
2. Implementing Software Defined Radio- Eugene Grayver Springer, 2013. 3. Cognitive Radio Technology - Bruce A. Fette, Elsevier, 2006.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
RTOS AND SYSTEM PROGRAMMING
(PROFESSIONAL ELECTIVE-III)

Course Code: GR22A4040 **L/T/P/C: 3/0/0/3**

IV Year I Semester

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

1. Operate on a Unix/Linux operating system for embedded system application code development
2. Perform some basic level system programming
3. Acquainted with the coding techniques to establish synchronization in embedded systems involving multiprocessing.
4. Recommend about an operating system/real time operating system for the decided embedded application.
5. Compare the different Real Time Operating Systems and can choose the best one for the underlined embedded application

UNIT –I: Introduction

Introduction to UNIX/LINUX, Overview of Commands, File I/O(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT -II: Real Time Operating Systems

Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, Task States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

UNIT –III: Objects, Services, and I/O

Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem.

UNIT –IV: Exceptions, Interrupts and Timers

Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

UNIT-V: Case Studies of RTOS

RT Linux, Micro C/OS-II, VxWorks, Embedded Linux, Tiny OS, and Basic Concepts of Android OS.

Text Books:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011
2. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.

Reference Books:

1. Advanced UNIX Programming, Richard Stevens
2. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF LOW POWER VLSI DESIGN
(PROFESSIONAL ELECTIVE-IV)

Course Code: GR22A4041 **L/T/P/C: 3/0/0/3**
IV Year I Semester

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

1. Explain the fundamentals of low-power VLSI circuit design.
2. Apply various approaches to low-power VLSI design.
3. Distinguish between various low-power logic styles.
4. Analyze a wide range of low-power design techniques.
5. Design low-power data path subsystems, such as adders and multipliers.

UNIT -I: Introduction to Low Power VLSI Design

Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT -II: Low-Power Design Approaches

Low-Power Design through Voltage Scaling – VT CMOS circuits, MT CMOS circuits,Architectural Level Approach –Pipelining and Parallel Processing Approaches.

Switched Capacitance Minimization Approaches:

System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT –III: Low-Voltage Low- Power Adders

Introduction, CMOS Adders' Architectures – Ripple Carry Adders, Carry Look-Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low- Power Design Techniques –Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

UNIT –IV: Low-Voltage Low- Power Multipliers

Overview of Multiplication, Braun Multiplier, Baugh-Wooley Multiplier, Booth Multiplier, Wallace Tree Multiplier.

UNIT-V: Low-Voltage Low- Power Memories

Basics of ROM, Low-Power ROM Technology, Future Trends , Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

Text Books:

1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

Reference Books:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International, 1998.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SPEECH SIGNAL PROCESSING
(PROFESSIONAL ELECTIVE-IV)

Course Code: GR22A4042 **L/T/P/C: 3/0/0/3**
IV Year I Semester
Course Outcomes: On completion of the course, the student will be able to

1. Understand the process of human speech production and its relation to basic speech signal characteristics
2. Get familiar with time and frequency-domain methods of speech signal processing.
3. Understand basic algorithms applied to many common applications of speech processing
4. Extract speech features for applications like voice activity detector, pitch detection and many more
5. Understand the concepts pattern recognition system and different statistical modeling approaches

UNIT –I

Speech production and perception, information sources in speech signal, linguistic aspect of speech, acoustic and articulatory phonetics, nature of speech, models for speech analysis and perception, short-term processing of speech, time, frequency and time-frequency analysis, development of short- term Fourier transform (STFT), transform and filter-bank views of STFT

UNIT -II

Basis and development cepstrum analysis of speech, real and complex cepstrum, pitch detection, formant estimation, Mel-frequency cepstral coefficient (MFCC), delta and delta- delta MFCC, Linear Prediction (LP) analysis, LP analysis of speech, solution of LP equation using Levinson-Durbin's method, normalized error, LP spectrum, LP cepstrum, LP residual

UNIT –III

Speech enhancement: objective, issues, enhancement of noisy speech, reverberant speech and multi-speaker speech using time, frequency and time-frequency approaches

UNIT –IV

Basic concepts of pattern recognition: feature extraction, modeling, testing, Objective, issues, block diagram description of automatic speech recognition (ASR) system, development of ASR system using vector quantization (VQ), dynamic time warping (DTW), Hidden Markov Model (HMM) and Neural networks (NN)

UNIT-V

Objective, issues, block diagram description of speaker recognition system, classification of speaker recognition systems, development of speaker recognition system using VQ, Gaussian mixture model (GMM), Adapted-GMM and I-vector.

Text Books:

1. L.R. Rabiner and R.W. Schafer, Digital Processing of Speech Signals Pearson Education, Delhi, India, 2004
2. L. R. Rabiner, B. H. Jhuang and B. Yegnanarayana, "Fundamentals of speech recognition",

Pearson Education, 2009

Reference Books:

1. J. R. Deller, Jr., J. H. L. Hansen and J. G. Proakis Discrete-Time Processing of Speech Signals, Wiley-IEEE Press, NY, USA, 1999
2. T. F. Quatieri, "Discrete time processing of speech signals", Pearson Education, 2005.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CELLULAR MOBILE COMMUNICATIONS
(PROFESSIONAL ELECTIVE-IV)

Course Code: GR22A4043 **L/T/P/C: 3/0/0/3**

IV Year I Semester

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

1. Quantify interference with regard to cellular communication
2. Quantify signal strength under various propagation conditions
3. Apply GSM fundamental concepts while working in the GSM system.
4. Apply CDMA, WCDMA and IS-95 fundamental concepts while working in CDMA, WDMA and IS-95 systems
5. Apply 4G fundamental concepts. while working in 4G system

Unit-I: Introduction to Cellular Communications

The History of Wireless Communications and the Birth of a Cellular System, Concepts of a Cellular System, Concepts of Duplexing and Multiple Access, Types of Interference, Evolution of Cellular Standards, Ecosystem of Cellular Systems, Phases of a Cellular System, Performance of Cellular Systems

Unit-II: Radio Frequency Propagation

Radio Frequency Waves, Free-Space Propagation, Cellular Propagation Mechanisms, Prediction of Received Signal Strength

Unit-III

Overview of GSM: Introduction, GSM System Architecture, Air-Interface Protocol Stack between MS and BSS, Radio Interface: Frame Structure and Channels, Network Acquisition, Voice Call Setup, Mobility Management in Idle Mode, Mobility Management in Active or Connected Mode, Power Control, Deployment Considerations

GPRS and EDGE: Introduction, System Architecture, MS-BSS Air-Interface Communications, Radio Interface: Frame Structure and Channels

Unit-IV: Fundamentals of CDMA, WCDMA, and IS-95

A Brief Introduction to CDMA, WCDMA, and IS-95, Characteristics of CDMA, IS-95 System Architecture, IS-95 MS-Radio-Network Communications: An Overview, IS-95 Call Setup, IS-95 Mobility Management, IS-95 Power Control, A Brief Overview of CDMA2000, CDMA2000 lx Network Architecture, Mobility Management, Power Control

Unit-V: Fourth-Generation Technologies

Essential Elements of 4G Technologies, Fundamentals of OFDM and OFDMA, Multiple Antenna Techniques, WiMAX Overview, Overview of LTE

Text Books:

1. Cellular Communications A Comprehensive and Practical Guide, Nishith D. Tripathi, Jeffrey H.

Reed, John Wiley &Sons Inc.
2. T. S. Rappaport, "Wireless communication principles and practice," New Jersey: Prentice Hall, 1996

Reference Books:

1. Wireless and Cellular Communications, Thomas Schwengler, Lulu.com; First Edition (October 29, 2018)
2. Cellular Mobile Systems Engineering, Saleh Faruque, Artech House; 0 Edition (January 1, 1997)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS AND APPLICATIONS OF ARM PROCESSORS
(PROFESSIONAL ELECTIVE-IV)

Course Code: GR22A4044 **L/T/P/C: 3/0/0/3**

IV Year I Semester

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

1. Understand ARM7TDMI assembly instructions and their formats and usage.
2. Write ARM7 based assembly level programs.
3. Associate various coprocessors and their interfacing in an SoC.
4. Connect the various principles in cache design, virtual memory and memory protection concepts and understand their implementation details in typical SoC designs.
5. Understanding the Design principles of AMBA bus architecture and being acquainted with various hardware peripherals in SoCs.

UNIT –I

ARM Introduction and Pipeline Structure Types of computer Architectures, ISA's and ARM History. Embedded System Software and Hardware, stack implementation in ARM, Endianness, condition codes. Processor core VS CPU core, ARM7TDMI Interface signals, Memory Interface, Bus Cycle types, Register set, Operational Modes. Instruction Format, ARM Core Data Flow Model, ARM 3 stage Pipeline, ARM family attribute comparison. ARM 5 stage Pipeline, Pipeline Hazards, Data forwarding - a hardware solution.

UNIT -II

ARM ISA and Processor Variants, Different Types of Instructions, ARM Instruction set, data processing instructions. Shift Operations, shift Operations using RS lower byte, Immediate value encoding. Data Processing Instructions. AddressingMode-1, Addressing Mode -2. Addressing Mode - 2, LDR/STR, Addressing mode -3 with examples. Instruction Timing, Addressing Mode - 4 with Examples. Swap Instructions, Swap Register related Instructions, Loading Constants. Program Control Flow, Control Flow Instructions, B & BL instructions, BX instruction. Interrupts and Exceptions, Exception Handlers, Reset Handling. Aborts, software Interrupt Instruction, undefined instruction exception. Interrupt Latency, Multiply Instructions, Instruction set examples. Thumb state, Thumb Programmers model, Thumb Implementation, Thumb Applications. Thumb Instructions, Interrupt processing. InterruptHandling schemes, Examples of Interrupt Handlers.

UNIT –III

ARM coprocessor interface and Instructions, Coprocessor Instructions, data Processing Instruction, data transfers, register transfers. Number representations, floating point representation (IEEE754). Flynn's Taxonomy, SIMD and Vector Processors, Vector Floating Point Processor (VFP), VFP and ARM interactions, An example vector operation.

UNIT –IV

Memory Technologies, Need for memory Hierarchy, Hierarchical Memory Organization, Virtual Memory. Cache Memory, Mapping Functions. Cache Design, Unified or split cache, multiple level of caches, ARM cache features, coprocessor 15 for system control. Processes, Memory Map, Protected

Systems, ARM systems with MPU, memory Protection Unit (MPU). Physical Vs Virtual Memory, Paging, Segmentation. MMU Advantage, virtual memory translation, Multitasking with MMU, MMU organization, tightly coupled Memory (TCM).

UNIT-V

ARM Development Environment, Arm Procedure Call Standard (APCS), Example C program. Embedded software Development, Image structure, linker inputs and outputs, memory map, application startup. AMBA Overview, Typical AMAB Based Microcontroller, AHB bus features, AHB Bus transfers, APB bus transfers, APB bridge. DMA, Peripherals, Programming Peripherals in ARM. ARM ISAs, ARMv5, ARMv6, ARM v7, big. Little technology, ARMv8. ARM ISAs, ARMv5, ARMv6, ARM v7, big. Little technology, ARMv8.

Text Books:

1. ARM System Developer's Guide, Designing and Optimizing System Software, by Andrew N. SLOSS, Dominic SYMES and Chris WRIGHT, ELSEVIER, 2004
2. ARM System-On-Chip Architecture, 2nd Edition, by Steve Furber, PEARSON, 2013
3. Operating Systems, 5th Edition, by William Stallings
4. Manuals and Technical Documents from the ARM Inc, web site.

Reference Books:

1. Rene Beuchat, Florian Depraz, Andrea Guerrieri, Sahand Kashani Fundamentals of System-on-chip Design on ARM Cortex-M Microcontrollers
2. Alan Clements, Practical Computer Architecture with python and Arm: An introductory guide for enthusiasts and Student.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MICROWAVE ENGINEERING LAB

Course Code: GR22A4046 **L/T/P/C: 0/0/4/2**
IV Year I Semester

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

1. Apply working concepts of reflex klystron well and do practical experiment involving reflex klystron
2. Apply working concepts of directional coupler and circulator well and do practical experiment involving directional coupler and circulator
3. Apply working concepts of wave guide well and do practical experiment involving wave guide
4. Apply working concepts of wave guide power dividers well and do practical experiment involving wave guide power dividers
5. Apply antenna parameter concept well and measure radiation pattern of a given antenna

Task1: Reflex Klystron Characteristics.

Task2: Gunn Diode Characteristics.

Task3: Attenuation Measurement.

Task4: Parameters of Directional Coupler.

Task5: VSWR Measurement.

Task6: Impedance and Frequency Measurement.

Task7: Waveguide parameters measurement.

Task8: Scattering parameters of Circulator.

Task9: Scattering matrices of Tees: E plane, H plane.

Task10: Scattering parameters of Magic Tee.

Task11: Radiation patterns for basic microwave antennas.

Task12: Study of various microwave antennas.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ADVANCED COMMUNICATIONS LAB

Course Code: GR22A4047 **L/T/P/C: 0/0/4/2**
IV Year I Semester

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

1. Measurement of Bit Error Rate, Output of Convolution Encoder and Decoder
2. Obtain the efficiency of DSSST, FHSS through simulations
3. Implement AWGN, Measurement of ISI and Design of FSK Signals
4. Simulation and Verification of Modulation and Demodulations of BPSK, DQPSK, 8-QAM Techniques
5. Design and Performance evaluations of OFDM, CDMA, Rayleigh Fading and AWGN channel

List of Experiments:

(Minimum of 12 Experiments have to be conducted / All Experiments may be Simulatedusing MATLAB and to be verified using related training kits.)

1. Measurement of Bit Error Rate using Binary Data
2. Determination of output of convolution Encoder for a given sequence
3. Determination of output of convolution Decoder for a given sequence
4. Efficiency of Direct Sequence Spread Spectrum Technique
5. Simulation of Frequency Hopping (FH) Spread- Spectrum
6. Implementation of an optimum receiver for the AWGN channel.
7. Measurement of the effect of Inter-Symbol Interference.
8. Design of FSK system
9. BPSK Modulation and Demodulation Techniques
10. DQPSK Modulation and Demodulation Techniques
11. 8-QAM Modulation and Demodulation Techniques
12. OFDM Transceiver design
13. Performance evaluation of CDMA system
14. Implementation of QPSK Modulation with Rayleigh Fading and AWGN channe

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROJECT WORK PHASE I

Course Code: GR22A4082 **L/T/P/C: 0/0/12/6**
IV Year I Semester

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

1. Practice and acquire knowledge within the chosen area of technology for project development.
2. Identify, discuss, and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
3. Design and develop engineering projects by implementing technical aspects.
4. Work as an individual or in a team in development of technical projects.
5. Compile and report effectively the project related activities and findings.

IV YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
VLSI TECHNOLOGY
(PROFESSIONAL ELECTIVE-V)

Course Code: GR22A4111 **L/T/P/C: 3/0/0/3**

IV Year II Semester

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

1. Explain the steps of VLSI fabrication processes.
2. Model oxidation process.
3. Illustrate lithography techniques
4. Compare different doping processes.
5. Select from different deposition methods

UNIT-I: Overview of Semiconductor Processing

Electronic grade silicon preparation, Crystal growth, Czochralski process, wafer-preparation, slicing, Marking, polishing, evaluation. Basic wafer fabrication operations, wafer sort, clean room construction and maintenance.

UNIT-II: Oxidation

Objectives, Silicon dioxide layer uses, Thermal oxidation mechanism and methods, Kinetics of oxidation, Deal Grove model, Oxidation processes, post oxidation evaluation.

UNIT –III: Basic Patterning

Overview of Photo-making process, Ten step process, Basic photoresist chemistry, comparison of positive and negative photoresists, X-ray lithography, Electron beam exposure system.

UNIT –IV: Doping

Definition of a junction, Formation of doped region and junction by diffusion, diffusion process steps, deposition, drive-in-oxidation, Ion implantation- concept and system, implant damage, Comparison of diffusion and ion-implantation techniques.

UNIT-V: Deposition

Chemical Vapor Deposition (CVD), CVD Process Steps, CVD System types, Low- Pressure CVD (LPCVD), Plasma-enhanced CVD (PECVD), Vapor Phase Epitaxy (VPE), Molecular Beam Epitaxy (MBE), Metalorganic CVD (MOCVD), SOS (Silicon on Sapphire) and SOI (silicon on Insulator). Brief Introduction to Metallization.

Text Books:

1. S.M. Sze, VLSI Technology, McGraw-Hill, 2nd Ed.
2. S. K. Gandhi, VLSI Fabrication Principles, Wiley.

Reference Books:

1. W. R. Runyan, Silicon Semiconductor Technology, McGraw-Hill.
2. Plummer, J.D., Deal, M.D., and Griffin, P.B., "Silicon VLSI Technology: Fundamentals, Practice and Modeling", 3rd Ed., Prentice-Hall. 2000

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
5G AND BEYOND COMMUNICATION
(PROFESSIONAL ELECTIVE-V)

Course Code: GR22A4112 **L/T/P/C: 3/0/0/3**

IV Year II Semester

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

1. Explain 1G/2G/3G/4G/5G/6G systems and wireless communications networks.
2. Understand the 5G techniques e.g. massive MIMO. mm Wave etc. for the design of communication systems.
3. Characterize and analyze various modulation and multiplexing techniques e.g. OFDM, NOMA etc.
4. Applications of Machine Learning in 5G Wireless Communications.
5. Familiarize Terahertz communication

UNIT –I

Introduction to wireless communication Fading, Review of Small Scale and Large Scale Fading, Doppler Spread, Path loss, Multipath fading, diversity, SINR, capacity, BER

UNIT -II

Orthogonal frequency division multiplexing (OFDM), Orthogonal time frequency Space (OTFS), Non-orthogonal multiple access, filter bank multiple access MIMO basics, Diversity and multiplexing, multiuser MIMO, Massive MIMO Adaptive modulation and coding, Low density parity check codes (LDPC), Polar Coding

UNIT –III

Overview 5G NR Transceiver Processing: Notion of transport block, Code block segmentation, Rate matching, Scrambling, Modulation, Resource Mapping,
5G-NR Reference Signals: Channel state information reference signal, Demodulation reference signal, Sounding reference signal

UNIT –IV

Review of Carrier Sense Multiple Access (CSMA), mm Wave communication, Cognitive, CSMA, Spectrum Sharing and Licensing.

UNIT-V

Detailed performance analysis of 6G wireless technologies, Tools to analyze and characterize the performance of digital communication systems, THz communication.

Text Books:

1. Jonathan Rodriguez, Fundamentals of 5G Mobile Networks, 2015, 1st Edition, Wiley Publications, United States.
2. Mohammed Abdul Matin , A Glimpse Beyond 5G in Wireless Networks
3. Bogucha, Hanna, Kliks, Adrian, Kryszkiewicz, Pawel, Advanced multi carrier technologies for future Radio communication:5G & beyond.

Reference Books:

1. R. Vannithamby and S. Talwar, Towards 5G: Applications, Requirements and Candidate Technologies., John Willey & Sons, West Sussex, 2017.
2. Manish, M., Devendra, G., Pattanayak, P., Ha, N., 5G and Beyond Wireless Systems PHY Layer Perspective, Springer Series in Wireless Technology.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
RADAR SYSTEMS
(PROFESSIONAL ELECTIVE-V)

Course Code: GR22A4113 **L/T/P/C: 3/0/0/3**
IV Year II Semester

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

1. Apply Radar equations to calculate maximum Radar range
2. Use MTI principles and deal with range and velocity ambiguity while working with Radars
3. To analyze problems involving matched filters.
4. Select right kind of Radar for a given application
5. Understand systems involving tracking Radars.

UNIT- I

Radar Fundamentals: Fundamental Radar principles, types of Radar systems, basic Radarblock diagram and description, detection, range, velocity and target location measurements and signature reflectivity and imaging.

Radar Equations and CW Radars: Radar equations: an introduction, the pulse Radarequation, the search Radar equation, the bistatic Radar equation, the Radar equation with pulse compression, the beacon Radar equation.

CW Radars: Unmodulated continuous wave (CW) Radar, frequency modulated CW Radars

UNIT- II

MTI and Pulse Doppler Radars: Introduction, single delay-line canceler, double delay-line canceler, MTI recursive filter, MTI non- recursive filter, pulse Doppler Radar, range and Doppler ambiguities.

UNIT- III

Pulse Compression Radar and Synthetic Aperture Radar: The matched filter, the Radar ambiguity function, pulse compression in Radars, Synthetic aperture Radars (SAR), SAR general description, SAR signal processing, Radar equation of the SAR system.

UNIT- IV

Radar Receivers: Block diagram of super heterodyne receiver- Detection of Radar signals in noise – Matched filter criterion- detection criterion – Extraction of information and waveform design.

Special Purpose Radars: Height finder- 3D Radars –Radar Beacons- Radar Jamming

UNIT- V

Tracking Radars, Range tracking, Angle Tracking: Sequential lobing, conical-scan tracking, mono pulse tracking Radar, range tracking

Text Books:

1. Introduction to Radar Systems – Merrill I. Skolnik, 2nd Edition, McGraw-Hill,1981.
2. Introduction to Radar with Python and MAT LAB, Lee Andrew Harrison, Artech House, 2019

Reference Books

1. Radar Handbook, Merrill I. Skolnik, McGraw-Hill Education 3rd edition 2008
2. Introduction to Synthetic Aperture Radar Concepts and Practice, E. David Jansing, McGraw Hill, 1st Edition, 2021.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES
(PROFESSIONAL ELECTIVE-V)

Course Code: GR22A4114 **L/T/P/C: 3/0/0/3**
IV Year II Semester

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

1. Explain the basic concepts of DSP, including discrete-time signals and systems, sampling, and the Z-transform.
2. Analyze and compare different DSP processor architectures, such as fixed-point and floating-point processors, and understand their advantages and limitations.
3. Write and optimize DSP algorithms in assembly language or high-level programming languages like C/C++ for specific DSP processor platforms.
4. Design, implement, and analyze digital filters, as well as understand the application of common DSP transformations like the Fast Fourier Transform (FFT) and Discrete Cosine Transform (DCT).
5. Apply their knowledge of DSP processors and architectures to solve real-world problems in various fields, such as audio processing, image processing, communications, and control systems.

UNIT –I

DSP theory for hardware designers, theory, applications, and implementations, DSP applications, DSP implementations, review of processors and systems, design flow.

UNIT -II

Fixed-point numerical representation, data quality measure, floating-point numericalrepresentation, block floating-point, DSP based on finite precision, examples of corner cases

UNIT –III

DSP subsystem architecture, processor architecture, inside a DSP core, the difference betweenGPP and ASIP DSP, advanced DSP architecture

UNIT –IV

Introduction to ASIP, DSP ASIP design flow, understanding applications through profiling, architecture selection, quantitative approach, designing instruction sets, designing the toolchain, microarchitecture design, firmware design

UNIT-V

A simple DSP processor, instruction set and operations, assembly coding, assembly benchmarking and analysis.

Text Books:

1. Dake LIU, Embedded DSP Processor Design
2. Khaled Salah Mohammed, Wireless Communication Systems: Transceiver Design and DSP towards 6G

3. Dejan Markovic, Robert W. Broderson DSP Architecture Design Essentials

Reference Books:

1. Digital Signal Processors, Architecture, Programming and Applications–B. Venkataramani and M. Bhaskar, 2002, TMH.
2. Digital Signal Processing – Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications
5. Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
6. The Scientist and Engineer's Guide to Digital Signal Processing by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997
7. Embedded Media Processing by David J. Katz and Rick Gentile of Analog Devices, Newnes, ISBN 0750679123, 2005.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ASIC DESIGN
(PROFESSIONAL ELECTIVE-VI)

Course Code: GR22A4115 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Course outcomes: On Completion of the Course, the student will be able to

1. Build a foundational understanding of ASICs, including their purpose, advantages, and applications.
2. Design complex digital logic circuits using CMOS gates and components.
3. Apply formal verification techniques to mathematically prove the correctness of specific design properties.
4. Understand the fundamentals principles of FPGA, including architecture and programming methods.
5. Understand the ASIC Design flow, from RTL (Register-Transfer level) description to the physical design and layout stages.

UNIT –I: INTRODUCTION TO ASIC DESIGN

Introduction of ASIC, Types of ASICs. Design Flow, Case Study, Economics of ASICs, ASIC cell Libraries.

UNIT -II: CMOS LOGIC

CMOS Transistor, The CMOS process, CMOS Design Rules, Combinational Logic cells, Sequential Logic cells, I/O cells, cell compilers

UNIT –III: ASIC VERIFICATION

The Verification Process, The Verification Methodology Manual, Basic Testbench Functionality, Methodology Basics, Constrained-Random Stimulus, Functional Coverage, Testbench Components, Building a Layered Testbench, Simulation Environment Phases, Maximum Code Reuse, Test bench Performance

UNIT –IV: PROGRAMMABLE ASICs

Anti-fuse, Static RAM, EPROM and EEPROM Technology, Specifications , PREP Bench marks, FPGA Economics.

UNIT-V: PHYSICAL DESIGN

Physical design flow, System partition -Partitioning methods - Floor planning - Placement -– Global routing - Detailed routing - Circuit extraction – DRC.

Text Books:

1. M.J.S .Smith, "Application Specific Integrated Circuits", Pearson Education, 2010.
2. Farzad Nekoogar and Faranak Nekoogar, "From ASICs to SOCs: A Practical Approach" Prentice Hall PTR, 2003.
3. D. Papa, I. Markov. "Multi-Objective Optimization in Physical Synthesis of Integrated Circuits"

Springer; 2012.
4. V.Taraate, “Digital Logic Design Using Verilog: Coding and RTL Synthesis”, Springer; 2016.

Reference Books:

1. G.Hachtel, F. Somenzi. Logic Synthesis and Verification Algorithms. Springer; 2013
2. Digital Design Using Field Programmable Gate Arrays - Pak K. Chan/Samiha, Pearson Low Price Edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BIOMEDICAL SIGNAL PROCESSING
(PROFESSIONAL ELECTIVE-VI)

Course Code: GR22A4116 **L/T/P/C: 3/0/0/3**
IV Year II Semester

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

1. Understand concepts of signal processing applications in biomedical signals
2. Apply algorithms for signal processing
3. Analyze biomedical signals and systems
4. Evaluate biomedical signal processing systems
5. Analyze stationary and non-stationary biomedical signals

UNIT –I

Introduction to Biomedical Signals Action Potential and its generation, Origin and Waveform Characteristics of Basic Biomedical Signals Like: Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyogram (EMG), Phonocardiogram (PCG), Electroneurogram (ENG), Event-Related Potentials (ERPS), Electrogastrogram (EGG), Objectives of Biomedical Signal Analysis, Difficulties in Biomedical Signal Analysis, Computer-Aided Diagnosis.

UNIT -II

Removal of Noise and Artifacts from Biomedical Signal Random and Structured Noise, Physiological Interference, Stationary and Nonstationary Processes, Noises and Artifacts Present in ECG, Time and Frequency Domain Filtering.

UNIT –III

EEG Signal Processing and Event Detection in Biomedical Signals EEG Signal and ItsCharacteristics, EEG Analysis, Linear Prediction Theory, Autoregressive Method, Sleep EEG, Application of Adaptive Filter for Noise Cancellation in ECG and EEG Signals; Detection of P, Q, R, S and T Waves in ECG, EEG Rhythms, Waves and Transients, Detection of Waves and Transients, Correlation Analysis Ad Coherence Analysis of EEG Channels. The Pan-Tompkins method for QRS detection and the Lehner and Rangayyan method to detect dicrotic notch in ECG, Use cross-correlation to detect alpha rhythm in EEG.

UNIT –IV

Morphological Analysis of ECG, Correlation coefficient, The Minimum phase correspondent. Signal length, Envelope Extraction, Amplitude demodulation, The Envelogram, Analysis of activity, Root Mean Square value, Zero-crossing rate, Turns Count, Form factor

UNIT-V

Analysis of Nonstationary Signals Heart Sounds and Murmurs, Characterization of Nonstationary Signals and Dynamic Systems, Short-Time Fourier Transform, Considerations in Short-Time Analysis and Adaptive Segmentation.

Text Books:

1. Rangayyan, R.M., 2015. Biomedical signal analysis (Vol. 33). John Wiley & Sons.
2. Reddy, D.C., 2005. Biomedical signal processing: principles and techniques. McGraw- Hill
3. Tompkins, W.J., 1993. Biomedical digital signal processing. Editorial Prentice Hall.

Reference Books:

1. Sornmo, L. and Laguna, P., 2005. Bioelectrical signal processing in cardiac and neurological applications (Vol. 8). Academic Press
2. J G Webster “Medical Instrumentation: Application & Design”, John Wiley & Sons Inc., 2001
3. C Raja Rao, S K Guha “Principles of Medical Electronics and Biomedical Instrumentation”, Universities Press, 2001
4. AV Oppenheim and RW Shafer "Discrete-time Signal Processing", Prentice Hall, Englewood Cliffs, NJ, 1989.
5. Steven M. Kay, "Modern spectral estimation theory and application ", Prentice Hall, Englewood Cliffs, NJ, 1988.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SATELLITE COMMUNICATIONS
(PROFESSIONAL ELECTIVE-VI)

Course Code: GR22A4117 **L/T/P/C: 3/0/0/3**

IV Year II Semester

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

1. Explain the basic concepts of satellite communications
2. Apply the concepts of orbital mechanics and determine parameters of launchers
3. Analyze the satellite orbits to design for transmission & reception of signals
4. Analyze various satellite subsystems and its functionality
5. Choose appropriate multiple access technique for a given satellite communicationapplication and work with earth stations.

UNIT –I

Introduction: Origin of satellite communications, basic concepts of satellite communications, frequency allocations for satellite services, applications.

Low Earth Orbit and Geo-stationary Satellite Systems: Orbit consideration, coverage and frequency considerations, delay and throughput considerations, system considerations, operational NGSO constellation designs.

UNIT -II

Orbital Mechanics, Launchers: Orbital Mechanics look angle determination, orbital perturbations, orbit determination, launches and launch vehicles, orbital effects in communication systems performance.

UNIT –III

Satellite Subsystems: Attitude and orbital control system, Telemetry, Tracking, command and monitoring, power systems, communication subsystems, satellite antenna equipment reliability and space qualification.

UNIT –IV

Satellite Link Design: Basic transmission theory, system noise temperature and G/T ratio, design of down links, uplink design, design of satellite links for specified C/N, Link budget.

UNIT-V

Earth Station Technology: Introduction, transmitters, receivers, Antennas, tracking systems, terrestrial interface, primary power test methods, VSAT, TVRO.

International and National Satellites: Intelsat, landsat, Inmarsat, Apple, Gsat, Insat, IRS.

Text Books:

1. Satellite communications-Timothi Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.

2. Satellite communications Engineering-Wilbur L.Prichard, Robert A. Nelson & Henry
3. G. Suyderhoud, 2nd Edition, Pearson Publications, 2003.
4. Satellite Communications - D. C. Agarwal, Khanna Publishers, 1996

Reference Books:

1. Satellite communications: Design Principles-M. Richharia, BS publications, 2nd Edition, 2003.
2. Fundamentals of Satellite communications K.N.Rajarao, PHI, 2004.
3. Satellite Communications-Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS SYSTEMS
(PROFESSIONAL ELECTIVE-VI)

Course Code: GR22A4118 **L/T/P/C: 3/0/0/3**
IV Year II Semester

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

1. Differentiate systems, agents and issues in modeling autonomous systems.
2. Validate the concepts of basic structure and types of artificial systems
3. Analyze the effect of influence of layers of autonomous systems with agentification.
4. Explain the role of interpreting systems and behavioral learning.
5. Understand the current representations and tendencies of autonomous systems.

UNIT –I: Introduction

Introduction to Autonomous systems - Conventional systems, Complex systems, System of systems; Autonomous systems; Agents and multi-agent systems; Systems and organisms; Issues in modeling an autonomous system.

Architecture of an Autonomous System - Reactivity of a system; Basic structure of anautonomous system; The membrane of autonomous systems; Two types of proactivity and the notion of artificial organ; Autonomy and current representation in an autonomous system; The unifying system that generates representations

UNIT -II: Multi-agent Autonomous System

Layers of Multi-agent Autonomous System: Object layer on the substratum; Agent representation of the substratum; Interpretation system and the conception agents; Aggregates, intent and the activity of conception agents; Agentifying conception agents; Activity of a conception agent; Three layers of conceptual agentification; Semantic lattices and the emergence of representations in the interpretation system.

Architecture of Multi-agent Autonomous System: General architecture of the interpretationsystem; Agentification of knowledge and organizational memory; Setting up the membrane network of an autonomous system; Behavioral learning of the autonomous system.

UNIT –III: Generation of Current Representation and Tendencies

Generation of current representation and semantic lattices; Cause leading the system to choose a concrete intent; Presentation of artificial tendencies; Algorithm for the generation of a stream of representations under tendencies

UNIT –IV: Towards the Minimal Self of an Autonomous System

Needs and desires of the autonomous system; A scaled-down autonomous system; The internal choice of expressed tendencies and the minimal self; Incentive to produce representations; Minimal self-affectivity: emotions and sensations; Algorithms for tendency activation; The feeling of generating representations.

UNIT-V: Global Autonomy of Distributed Autonomous Systems

Enhancement of an autonomous system by itself; Communication among autonomous systems in view of their

union; Autonomous meta-system composed of autonomous systems; System generating autonomous systems: the meta-level of artificial living.

Text Books:

1. Alain Cardon, Mohamed Itmi, New Autonomous Systems, Wiley-ISTE- 2016
2. Nikolaus Correll, Introduction to Autonomous Robots, Magellan Scientific, 2016

Reference Books:

1. Jitendra R. Raol, Ajith K. Gopal, "Mobile Intelligent Autonomous Systems" CRC Press, 2017.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF MANAGEMENT AND ENTREPRENEURSHIP

Course Code: GR22A3116 **L/T/P/C: 3/0/0/3**
IV Year II Semester

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

1. Understand the concepts of economics and Demand concepts, elasticity, and techniques forforecast demand of products
2. Plan the production levels in tune with maximum utilization of organizational resourcesand with maximum profitability.
3. Understand the types of markets, types of competition and to estimate the cost of productsand decide the price of the products and services produced
4. Analyze the profitability of various projects using capital budgeting techniques and
5. Prepare the financial statements and more emphasis on preparation of final accounts.

UNIT –I

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills; **Evolution of Management Thought**- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Systems Approach; Contingency Approach. Maslow's theory of Hierarchy of Human Needs- Douglas McGregor's Theory X and Theory Y - Hertzberg Two Factor Theory of Motivation - Leadership Styles and leadership theories.

UNIT -II

Planning and Organizing: Planning – Planning Process, Types of Plans, Decision making and Steps in Decision Making; **Principles of Organization:** Span of control, organizational Design & Organizational Structures; Departmentalization, Delegation; Centralization, Decentralization. controlling – basic control process – control techniques.

UNIT –III

Human Resources, Production and Marketing Management: Concepts of HRM, HR planning, Recruitment, Selection, Training and Development, elements of wage and salary, Performance Appraisal , Principles and Types of Plant Layout-Methods of Production(Job, batch and Mass Production), Work Study - Basic procedure involved in Method Study and Work Measurement - Business Process Reengineering(BPR), Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.

UNIT –IV

Entrepreneurship: Characteristics and skills of an entrepreneur, Entrepreneur scenario in India and abroad. Types of entrepreneurs, types of ownership, small business in Indian economy. Financial aspects: sources of rising capital, schemes of Department of Industries (DIC), KVIC, SIDBI, NABARD, NSIC, IFCI and IDBI. Risk Reduction strategies, Strategies for growth.

UNIT-V

Creating and starting the venture: Creativity and the business idea; Developing the business plan (Business model – Lean canvas by Alexander Osterwalder) and writing the business Plan.

Activity: Students need to submit their own business plan for the identified business area.

Text Books:

1. Fundamentals of management by Stephen P Robbins; Mary K Coulter; David A DiCenzo, Pearson 2017
2. Principles and Practice of Management, L. M. Prasad, Sultan Chand & Sons, 2012
3. Entrepreneurship- Robert D Hisrich, Michael P Peters, Dean A Shepherd, TMH.2009

Reference Books:

1. Managerial Economics 4th Edition , W. Cris Lewis, Sudhir K. Jain, H. Craig Petersen, Pearson, 2009
2. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi, 2009
3. Financial Accounting, 6/e, Dr S N Maheshwari, CA Sharad K Maheshwari & Dr Suneel K Maheshwari, Vikas Publishing, 2018
4. Entrepreneurship- Rajeev Roy, Oxford, 2011
5. Intellectual Property- Deborah E.Bouchoux, Cengage, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROJECT WORK PHASE II

Course Code: GR22A4145 **L/T/P/C: 0/0/12/6**

IV Year II Semester

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

1. Practice and acquire knowledge within the chosen area of technology for project development.
2. Identify, discuss, and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
3. Design and develop engineering projects by implementing technical aspects.
4. Work as an individual or in a team in development of technical projects.
5. Compile and report effectively the project related activities and findings.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOFT SKILLS AND INTERPERSONAL SKILLS
(OPEN ELECTIVE)

Course Code: GR22A3145 **L/T/P/C:3/0/0/3**

Course Outcomes:

1. Develop soft skills communication skills, leadership skills etc.
2. Implement goal setting techniques to build a promising career and evaluate the power of confidence building and self-esteem with examples.
3. Design formal reports and proposals with appropriate formal expressions.
4. Create a healthy workplace environment by treating others with respect and dignity.
5. Describe team dynamics and exchange ideas about the elements of positive teamwork.

Unit 1: Soft Skills

- Introduction to soft skills, Definition of Soft skills, Importance of soft skills
- Communication skills, Usage of English in Business/Corporate scenario
- Non-verbal communication - Proxemics
- Presentation skills

Unit 2: Team Building & Leadership Qualities

- Qualities of a good leader
- Problem solving and Decision Making
- Strategic management
- Crisis management

Unit 3: Personality Development

- Motivation
- Goal setting
- Self-esteem
- Team skills

Unit 4: Developing Reports and Proposals

- Understanding reports and proposals
- Planning reports and proposals
- Writing beginning, body and ending
- Formats of reports and proposals

Unit 5: Interpersonal Skills

- Understanding professional relationships
- Networking professionally
- Showing basic office courtesies
- Interview skills

Text Books:

1. Soft Skills-Key to success in workplace and life Meenakshi Raman, Raman Upadhyay, CENAGE

Reference Books:

1. Soft skills for Everyone - Jeff Butterfield, CENAGE Learning
2. Soft skills for Interpersonal Communication - S.Balasubramaniam (ORIENT BLACKSWAN)

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

Course Code: GR22A4049 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. To acquaint the student with the determinants of intra -individual, inter-personnel and inter-group behaviour in an organizational setting.
2. To Understand individual behavior in organizations, including diversity, attitudes, job satisfaction, emotions, moods, personality, values, perception, decision making, and motivational theories and apply in the organizational context.
3. To assess the group behavior in organizations, including communication, leadership, power and politics, conflict, and negotiations in the framework of organization and to familiarize the concepts, techniques and practices of human resource development in the current organizational view.
4. To impart and apprise the capable of applying the principles and techniques as professionals for developing human resources in an organization.
5. To report the current trends and applications in HRD and Balanced Scorecard to measures the performance and to develop, implement, and evaluate organizational human resource development strategies aimed at promoting organizational effectiveness in different organizational environments.

Unit I - Introduction to OB : Organizational Behaviour- Concept and Emergence of OB Concept; Nature and Theoretical frameworks; Models of Organizational Behaviour, Challenges and Opportunities for Organizational Behavior.

Unit II- Individual Behaviour: Individual Behaviour: Personality, Learning, Values and Attitudes, Perception, Stress at work. Management's assumptions about people- McGregor's Theory X and Theory Y. Motivation - Maslow's Need Hierarchy, Herzberg's Two Factors Theory, Vroom's Expectancy Theory.

Unit III-Inter-personal and Group Behaviour: Interpersonal communication and Feedback; Transactional Analysis (TA); Johari Window. Group Behaviour: Group Dynamics, Cohesiveness and Productivity; Management of Dysfunctional groups; Group Decision Making. Leadership- Concept and Styles.

Unit IV -Introduction to Human Resource Development: Concept; Relationship between human resource management and human resource development; HRD mechanisms, processes and outcomes; HRD matrix; Roles and competencies of HRD professionals; Challenges in HRD, steps in HRD Process.

Unit V-HRD Applications and Trends: Coaching and mentoring; Career management and development; Competency mapping; Balanced Score Card. HRD in Organizations: Selected cases

covering HRD practices in government Organizations, manufacturing and service industries and MNCs.

Text Books:

1. Robbins, Stephen P. and Timothy A. Judge, Organizational Behaviour, Prentice -Hall, New Delhi.
2. Werner J. M., DeSimone, R.L., Human resource development, South Western.

Reference Books:

1. Luthans, Fred, Organizational Behaviour, McGraw-Hill, New York.
2. Gregory, Moorhead and Ricky W. Griffin, Managing Organizational Behaviour, Thomson South Western Publication.
3. Pareek, Udai and V. Sisodia, "HRD in the New Millennium, Tata McGraw - Hill Publishing Co. Ltd., New Delhi, 1999.
4. Haldar, U. K., Human resource development, Oxford University Press India.
5. Rao, T.V., Future of HRD, Macmillan Publishers India.
6. Rao, T.V., HRD Score Card 2500: Based on HRD audit, Response Books, SAGE Publications.
7. Mankin, D., Human resource development, Oxford University Press India.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CYBER LAW AND ETHICS
(OPEN ELECTIVE)

Course Code: GR22A4077 **L/T/P/C: 3/0/0/3**

Course Outcomes

1. Students identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
2. Students locate and apply case law and common law to current legal dilemmas in the technology field.
3. Students apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.
4. Students will be able understand cybercrime and ethical practices and the student will be able to know and learn web technologies and related issues.
5. The student will be in a position to interface with various issues pertaining to Intellectual Property, copy rights, patents rights etc. and provide an overview of cybercrime and framework.

Unit I - The Legal System: Sources of Law and The Court Structure: Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers. (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court), Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration.

Unit II - Introduction cyber law: Computers and its Impact in Society, Overview of Computer and Web Technology, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level. , NITI Aayog and some current aspects.

Unit –III - Constitutional & Human Rights Issues in Cyber space : Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace, Access to Internet, Right to Privacy, Right to Data Protection.

Unit –IV Cyber Crimes & Legal Framework: Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act

Unit –V Intellectual Property Issues in Cyber Space: Interface with Copyright Law, Interface with Patent Law, Trademarks & Domain Names Related issues.

Text Books:

1. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
2. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012)
3. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)
4. Jonthan Rosenoer, Cyber Law, Springer, New York, (1997).
5. Sudhir Naib, The Information Technology Act, 2005: A Handbook. S. R. Bhansali, Information Technology Act, 2000 University Book House Pvt. Ltd. Jaipur (2003).

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

Course Code: GR22A4147 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Familiarize with the nature of business environment and its components.
2. The students will be able to demonstrate and develop conceptual framework of a business environment.
3. Understand the definition of ethics and the importance and role of ethical behaviour in the business world today.
4. Explain the effects of government policy on the economic environment.
5. Outline how an entity operates in a business environment.

Unit 1: Business environment-factors effecting Business Environment-need for industrial policies, Overview of Indian Economy, Trends towards market economy, problems of underdevelopment – meaning, Main problems, reasons, of underdevelopment.

Unit :2 Factors and measure, Meaning of Economic development, National income, Per capital income, Quality of life, Capital Formation – Savings, Investment.

Unit 3: NITI Aayog and Planning in India, Niti Aayog and its function, how is Niti Aayog different from planning commission, Meaning, Importance, Main reasons of adopting, planning in India, Objectives of planning, Economic development, moderation, stability, self- sufficiency, employment etc, foreign aid, Employment. Allocation of Resources,

Unit 4: Private and Public Sector, Public Sector – role and growth, Achievements of the public sector, Private Sector – Importance Problems, New foreign Trade Policy.

Unit 5: Present Economic Policy, Main feature, Globalization, Expansion of Private sector, more market orient approach. Public distribution system, Industrial policies before and after 1991, Industrial Licensing, Monetary and Fiscal Policy, elements of Indian current GDP and review of current budget.

Text Books:

1. Francis Cherunilam: Business Environment: Text and Cases. 18/e. Himalaya. 2009.
2. Misra and Puri: Indian Economy, Himalaya, 2009.

Reference Books:

1. Indian Economy- A. N. Agarwal
2. Indian Economy – Mishra &Puri
3. Indian Development and planning – M. L. Jhingan
4. Indian Economy – R. S. Rastogi Yozna and Kurukshetra Magazines

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA SCIENCE FOR ENGINEERS
(OPEN ELECTIVE)

Course Code: GR22A3049 **L/T/P/C:3/0/0/3**

Course Outcomes:

1. Illustrate a flow process for data science problems.
2. Demonstrate the mathematical foundations for data science.
3. Analyze the data science process and predictive modelling.
4. Develop R codes for data science solutions.
5. Correlate results to the solution approach followed.

UNIT I

Introduction to R, Variables and datatypes in R, Data frames, Recasting and joining ofdata frames, Recasting, and joining of data frames, Arithmetic, Logical and Matrix operations in R, Advanced programming in R : Functions, Control structures, Data visualization in R Basic graphics.

UNIT II

Linear Algebra and Statistics for Data Science: Solving Linear Equations, Linear Algebra Distance, Hyperplanes and Half spaces, Eigenvalues, Eigenvectors, Statistical Modelling, Random Variables and Probability Mass/Density Functions, Sample Statistics.

UNIT III

Introduction to Data Science, Solving Data Analysis Problems - A Guided Thought Process, Predictive Modelling, Linear Regression, Model Assessment, Diagnostics to Improve Linear Model Fit.

UNIT IV

Simple Linear Regression Model Building, Cross Validation, Multiple Linear Regression Modelling Building and Selection.

UNIT V:

Classification, K - Nearest Neighbors (KNN), K - Nearest Neighbors implementation in R, K- means Clustering, K - means implementation in R.

Text Books:

1. Data Science for Engineers, 1st Edition, Raghunathan Rangaswamy, Resmi Suresh, CRC Press, Taylor & Francis Group.
2. Introduction to Linear Algebra, Fifth Edition, Gilbert Strang, ISBN: 978-09802327-7-6.
3. Applied Statistics and Probability for Engineers, Douglas Montgomery, George C Runger, Fifth Edition, John Wiley & Sons, Inc.

Reference Books:

1. Hands On Introduction to Data Science Hardcover – 2 April 2020 by Chirag Shah (Author)

2. Essential Math for Data Science: Take Control of Your Data with Fundamental Linear Algebra, Probability, and Statistics by Thomas Nield (Author).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA ANALYTICS USING OPEN-SOURCE TOOLS
(OPEN ELECTIVE)

Course Code: GR22A3120 **L/T/P/C: 3/0/0/3**

Course Outcomes:
1. Interpret about graphics techniques in data analysis.
2. Implement data modeling techniques for a dataset.
3. Develop the simulation for mining and clustering the data.
4. Infer the data using business intelligence and predictive analytics
5. Implement the data analytics using Programming Environments

UNIT I

Graphics: A Single Variable – Dot and Jitter Plots, Histograms and Kernel Density Estimates, The Cumulative Distribution Function, Rank-Order Plots and Lift Charts, Summary Statistics and Box Plots, Practice using Numpy, Two Variables- Scatter Plots, Smoothing, Logarithmic Plots, Banking, Practice using Matplotlib, Time as A Variable- Time-Series Analysis, More Than Two Variables- False-color plots, Multi plots.

UNIT II

Modeling Data: Guesstimation and the back of the envelope- Principles, Perturbation Theory and Error Propagation, Models from scaling arguments- Models, Arguments from Scale, Mean-Field Approximations, Common Time-Evolution Scenarios, Arguments from probability models- The Binomial Distribution and Bernoulli Trials, The Gaussian Distribution and the Central Limit Theorem, Power-Law Distributions and Non-Normal Statistics, Bayesian Statistics.

UNIT III

Mining Data: Simulations- Monte Carlo Simulations, Resampling Methods, Discrete Euent Simulations with *SimPy*, Finding Clusters- Distance and Similarity Measures, Clustering Methods, Pre and Postprocessing, *Pycluster*, Seeing the Forest for the trees- PCA, Kohonen Maps, PCA with R.

UNIT IV

Applications: Reporting, Business intelligence and Dashboards- Corporate Metrics and Dashboards, Data Quality Issues, Financial calculations, and modeling- The Time Value of Money ,Uncertainty in Planning and Opportunity Costs, Cost Concepts and Depreciation, Predictive analytics- algorithms for classification.

UNIT V

Programming Environments and Data analytics

Programming Environments: Software Tools, A Catalog of Scientific Software – MAT LAB, R, Python

Results from Calculus: Common Functions, Calculus, Useful Tricks -Binomial theorem, Linear transformation.

Working with data: Sources for Data, Cleaning and Conditioning, Sampling, Data File Formats, The Care and Feeding of Your Data Zoo.

Text Books:

1. Philipp K. Janert, Data Analysis with Open-Source Tools, O'Reilly Media, Inc, November 2010: First Edition.

Reference Books:

1. G James, D. Witten, T Hastie, and R. Tibshirani, An Introduction to Statistical Learning: with Applications in R, Springer, 2013
2. Chambers, John, Software for Data Analysis Programming with R, Springer, 2008
3. Trevor Hastie Robert Tibshirani Jerome Friedman, The Elements of Statistical Learning, Data Mining, Inference, and Prediction (2nd Edition.), Springer, 2014
4. Mark Gardener, Beginning R: The Statistical Programming Language, Wiley, 2013
5. Upadhyaya and A. Upadhyaya, Material Science and Engineering, Anshan Publications, 2007.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
AUGMENTED REALITY AND VIRTUAL REALITY
(OPEN ELECTIVE)

Course Code: GR22A4054 **L/T/P/C:3/0/0/3**

Course Outcomes:
1. Analyze augmented reality.
2. Identify AR devices for various applications.
3. Analysis of virtual reality.
4. Interpret about usage of VR devices and human factors involved.
5. Apply AR & VR technology in various domains.

UNIT I
Introduction to Augmented Reality, The Relationship Between Augmented Reality and Other Technologies, Augmented Reality Concepts, How Does Augmented Reality Work?Ingredients of an Augmented Reality Experience.

UNIT II
Augmented Reality Hardware, Major Hardware Components for Augmented Reality Systems, Augmented Reality Software, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.

UNIT III
Virtual Reality: The Three I's of Virtual Reality, A Short History of Early Virtual Reality, Early Commercial VR Technology , VR Becomes an Industry, The Five Classic Components of a VR System.
Input Devices: Trackers, Navigation, and Gesture Interfaces: Three-Dimensional Position Trackers, Navigation and Manipulation Interfaces

UNIT IV
Output Devices: Graphics, Three-Dimensional Sound, and Haptic Displays : Graphics Displays, Sound Displays, Haptic Feedback.
Human Factors in VR: Methodology and Terminology, User Performance Studies, VR Healthand Safety Issues, VR and Society

UNIT V:
Augmented Reality Applications, What Makes a Good Augmented Reality Application? Application Areas: Education, Gaming, Robotics, Health care, Manufacturing, Evaluating Augmented Reality Applications.

Text Books:
1. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.
2. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley IEEE Press, 2003/2006.

Reference Books:

1. LaValle, "Virtual Reality", Cambridge University Press, 2016.
2. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.
3. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.
4. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BASICS OF JAVA PROGRAMMING
(OPEN ELECTIVE)

Course Code: GR22A3072 **L/T/P/C: 3/0/0/3**

Course Outcomes:
1. Apply knowledge on key attributes of Object-Oriented Programming (OOP) and control structures
2. create and manipulate classes and objects, employ various methods and method utilization.
3. Demonstrate expertise in both array-based and string-based structures.
4. understanding of Java's inheritance and interface concepts
5. proficient at organizing Java code using packages and exception handling

UNIT I:
Java Programming Fundamentals: Java Language, Key Attributes of Object-Oriented Programming, Java Development Kit, Simple Program, Create Blocks of Code, Keywords, Identifiers, The Java Class Libraries.
Data Types and Operators: Java's Primitive Types, Literals, Variables, Scope and Lifetime of Variables, Operators- Arithmetic, Relational, Logical, Bitwise, Assignment. Type conversion in Assignments, Using a Cast, Operator Precedence.
Program Control Structures: if, switch, for, enhanced for, while, do-while, break, continue.

UNIT II:
Introduction to Classes, Objects and Methods: Class Fundamentals, Objects creation, Reference Variables and Assignment, Methods, returning a Value, Using Parameters, passing objects to methods, passing arguments, Method Overloading, Constructors, Parameterized Constructors, Overloading Constructors. new Operator, this Keyword, Command-Line Arguments.

UNIT III:
Arrays: Introduction to Arrays, 1D Arrays, Multidimensional Arrays, Irregular Arrays, Using the Length Member. Arrays class of util package.
Strings: String class, constructors, length(), string literals, concatenation, Character extraction, string comparison, searching strings, modifying, data conversion, changing the case, joining, split(). String Buffer class: constructors, length(), capacity(), ensure Capacity(), set Length(), charAt(), setCharAt(), get Chars(), append(), insert(), reverse(), delete(), delete CharAt(), replace().

UNIT IV:
Inheritance: Basics, Inheritance Types, Using Super, Multilevel Hierarchy, Super class References and Subclass Objects, Method Overriding, Abstract Classes, Using final. **Interfaces:** Fundamentals, Creating and Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Extending Interfaces, Nested Interface.

UNIT V:
Packages: Package Fundamentals, Member Access, Importing Packages, Static import.
Exception Handling: Exception Hierarchy, Fundamentals, Handling errors, Multiple Catch, Throwing and Rethrowing an Exception, Throwable, using finally, using throws, Creating Exception Subclasses.

Text Books:
1. Herbert Schildt, Dale Skrien, Java Fundamentals A Comprehensive Introduction, 1/e, Tata

McGraw Hill, 2017.
2. Herbert Schildt, The Java complete References, 9/e, Tata McGraw Hill,2014.

Reference Books:

1. Y. Daniel Liang , An Introduction to JAVA Programming, 10/e, Tata McGraw Hill.
2. Kathy Sierra, Head First Java, 2/e, Shroff Publishers, 2012.
3. Bala guruswamy, Programming with JAVA, 2/e, Tata McGraw Hill, 2014.

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

Course Code: GR22A3141 **L/T/P/C: 3/0/0/3**

Course Outcomes:
1. Identify the role of Database System Applications and the design issues related.
2. Design the logical model for the applications.
3. Construct a Database Schema, manipulate data using a SQL.
4. Apply the Schema Refinement techniques for a database design for optimized access.
5. For a giventransaction-processingsystem, determine the transaction atomicity, consistency, isolation, and durability.

UNIT I

Introduction to Database And System Architecture: Database Systems and their Applications, Database Vs File System, View of Data, Data Models, Database Languages- DDL and DML, Transaction Management, Database users and Administrators, DatabaseSystem Structure.

UNIT II

Introduction to Database Design: ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship set, Extended ER Features, Conceptual Design with the ER Model, Logical database Design.
Relational Model: Introduction to Relational Model, Basic Structure, Database Schema, Keys, Relational Algebra

UNIT III

SQL Queries and Constraints: SQL Data Definition, Types of SQL Commands, Form of Basic SQL Query, SQL Operators, Set Operators, Nested Queries, Aggregate Operators, NULL values, Integrity Constraints Over Relations, Joins, Introduction to Views, Destroying/Altering Tables and Views, Cursors, Triggers.

UNIT IV

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies, Properties of Decomposition, Reasoning about FD, Normal Forms.

UNIT V

Transaction Management: Transaction Concept, Transaction State, Concurrent Executions, Serializability, Testing for Serializability.
Concurrency Control: Lock based Protocols, Timestamp based protocols,
Recovery System: Recovery and Atomicity, Log based recovery, Shadow Paging, Recoverywith concurrent Transactions.

Text Books:
1. "Data base Management Systems", Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition

2. "Data base Management Systems", Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition
3. "Data base System Concepts", Silberschatz, Korth, McGraw hill, 5th Edition
4. "Introduction to Database Systems", C.J. Date Pearson Education.

Reference Books:

1. "Database Systems design, Implementation, and Management", Rob & Coronel 5th Edition.
2. "Database Management Systems", P. Radha Krishna HI-TECH Publications 2005.
3. "Database Management System", Elmasri Navate, Pearson Education.
4. "Database Management System", Mathew Leon, Leo.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INTRODUCTION TO DATA MINING
(OPEN ELECTIVE)

Course Code: GR22A4080 **L/T/P/C:3/0/0/3**

Course Outcomes:

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. Apply Apriori and FP growth algorithms for forming strong association rules.
4. Extract knowledge and implementation of data mining techniques
5. Apply the data mining algorithm for solving practical problems.

UNIT I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System witha Database or a Data Warehouse System, Major issues in Data Mining.

UNIT II

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

Introduction to Data Warehouse: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Marts.

UNIT III

Mining Frequent Patterns, Associations: Basic Concepts, Market Basket Analysis, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules.

UNIT IV

Classification: Issues Regarding Classification, Classification by Decision Tree Induction,Bayesian Classification, Rule-Based Classification.

Prediction: Issues Regarding Prediction, Regression techniques.

Accuracy and Error measures: Evaluating the accuracyof a Classifier or a Predictor.

UNIT V

Cluster Analysis Introduction: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods - k-Means and k-Medoids, Hierarchical Methods – Agglomerative, BIRCH.

Text Books:

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

education.

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROGRAMMING IN PYTHON
(OPEN ELECTIVE)

Course Code: GR22A3077 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Demonstrate the concepts of control flow, data structures and Functions in Python
2. Design python programs using functional programming
3. Implement the file handling operations, exception handling mechanism
4. Design python programs using object-oriented programming and multithreaded programming concepts
5. Develop GUI based applications using Tkinter

UNIT I

Basic features of Python-Interactive execution, comments, types, variables, operators, expressions, Statements-assignment, input, print, Control flow-Conditionals, Loops, break statement, continue statement, pass statement, Functions, definition, call, scope and lifetime of variables, keyword arguments, default parameter values, variable length arguments, recursive functions.

UNIT II

Sequences-Strings ,Lists and Tuples-basic operations and functions, iterating over sequences, Sets and Dictionaries- operations and functions, Functional programming-mapping, filtering and reduction, Lambda functions, List comprehensions. Scope, namespaces and modules, import statement, creating own modules, avoiding namespace collisions when importingmodules.

UNIT III

Files-operations-opening, reading, writing, closing, file positions. Exceptions – raising and handling exceptions, try/except statements, finally clause, standard exceptions, custom exceptions. , iterators and generators, Python program examples.

UNIT IV

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

UNIT V

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

Text Books:

1. Exploring Python, Timothy A. Budd, McGraw Hill Publications

2. Introduction to Programming using Python, Y S.Daniel Liang, Pearson.
3. Python Programming, Sheetal Taneja and Naveen Kumar, Pearson.

Reference Books:

1. Introduction to Computer Science using Python, Charles Dierbach, Wiley India Edition.
2. Fundamentals of Python, K. A. Lambert, B.L. Juneja, Cengage Learning.
3. Think Python, how to think like a computer scientist, Allen B. Downey, SPD, O'Reilly.
4. Core Python Programming, Wesley J. Chun, 2nd Edition, Pearson.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INTERNET OF THINGS
(OPEN ELECTIVE)

Course Code: GR22A3147 **L/T/P/C: 3/1/0/4**

Prerequisites
Students are expected to have knowledge on Operating systems, Virtualization, and Networking

Course Outcomes:
1. Learn characteristics, applications, components, and challenges of Internet of Things (IOT)
2. Create understanding of IOT Networking Concepts–terminologies, stack components, infrastructure, and data protocols
3. Create understanding of the concept of Cloud based IOT technologies, cloud service providers and security aspects
4. Develop skills in understanding and programming the Arduino and Raspberry Pi hardware platforms
5. Make the student understand the requirements, components, challenges and develop various application areas - smart homes, smart grids, smart health care, smart cities and industrial IOT

UNIT I

Introduction to IOT: Characteristics of IOT, Applications of IOT, IOT Categories, IOT Enablers and Connectivity Layers, Sensors, Actuators, IOT Components & Implementation, Challenges for IOT

UNIT II

IOT Networking & Connectivity Technologies: Connectivity terminologies-IOT Node, LAN, WAN, Gateway, IOT protocol Stack vs. Web Stack, IOT Identification and Data Protocols-IPV4, IPV6, HTTP, MQTT, COAP, AMQP, DDS Connectivity Technologies – Zigbee, Bluetooth, LoRa

UNIT III

Cloud for IOT: IOT with Cloud-Challenges, Cloud service providers for IOT-Overview, Cloud service model, Cloud Computing – Security aspects, Case Study, Fog computing, Edgecomputing

UNIT IV

Hardware Platforms: Programming with Arduino-Features of Arduino, Components of Arduino Board, Arduino IDE, Program Elements, Raspberry Pi – Introduction, Architecture, PIN Configuration, Implementation of IOT with Raspberry Pi

UNIT V

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

Text Books:

1. Internet of Things, Jeeva Jose, Khanna Publishing, 2018
2. Internet of Things, Abhishek S Nagarajan, RMD Sundaram, Shriram K Vasudevan, Wiley, 2019
3. IOT Fundamentals: Networking Technologies, Protocols and Use Cases for IOT, Rowan Trollope, David Hanes, Patrick Gassetete, Jerome Henry, Pearson Education Limited, 2017

Reference Books:

1. The Internet of Things, Michael Miller, Pearson Education Limited, 2015
2. IOT Applications, Security Threats, and Countermeasures, Padmalaya Nayak, Niranjan Ray, P. Ravichandran, Taylor & Francis, 2021
3. Internet of Things: Architecture, Implementation and Security, Mayur Ramgir, Pearson Education Limited, 2019
4. IOT Fundamentals: Networking Technologies, Protocols and Use Cases for IOT, Rowan Trollope, David Hanes, Patrick Gassetete, Jerome Henry, Pearson Education Limited, 2017.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SCRIPTING LANGUAGES
(OPEN ELECTIVE)

Course code: GR22A4085 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Analyze a problem, identify, and define the computing requirements appropriate to its solution.
2. Design Web pages with DB.
3. Implement the PHP Authentication Methodologies.
4. Implement PHP Encryption functions and M crypt Package
5. Understand the syntax and functions in Perl and Python.

UNIT- I

PHP Basics

PHP Basics- Features, Embedding PHP Code in your Web pages, outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures. Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT -II

MySQL Basics

Introduction to MYSQL: Database Concepts, General Overview of MySQL database, Installation. Connecting and disconnecting from MySQL Server, Querying the database, Data Definition Language, Functions and Logical operators, Access privilege system.

UNIT -III

Advanced PHP Programming

Advanced PHP Programming: PHP and Web Forms, Files, PHP Authentication and Methodologies - Hard Coded, File Based, Database Based, IP Based, and Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the M crypt package.

UNIT- IV

PERL: Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

Advanced PERL: Finer points of looping, pack and unpack, file system, data structures,packages, modules, objects, interfacing to the operating system.

UNIT -V

Python: Introduction to Python language, Python-syntax, statements, functions, Built-in-functions and Methods, Modules in Python, Exception Handling.

Text Books:

1. The World of Scripting Languages, David Barron, Wiley India. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dream tech.).
2. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SERVICES SCIENCE AND SERVICE OPERATIONAL MANAGEMENT
(OPEN ELECTIVE)

Course Code: GR22A4134 **L/T/P/C:3/0/0/3**
Pre-Requisite(s): Fundamentals of Management, Operations Research

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

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

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

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

UNIT IV
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.

Vehicle Routing Problem: Managing after sales service, understanding services that involve transportation of people and vehicles, Techniques for optimizing vehicle routes.

UNIT V

Service Innovation: Services Productivity, Need for Services Innovation.

Student Project:

Option 1:

Choose any service organization around and present it from the perspective of: nature of service, classification of service, blueprint or service design analysis, service quality, and any additional perspective you would like to add.

Option 2:

Choose any latest research paper in services and explain your understanding and feedback on the same.

Text Books:

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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
IT PROJECT MANAGEMENT
(OPEN ELECTIVE)

Course Code: GR22A4135 **L/T/P/C: 3/0/0/3**

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 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)

Course Code: GR22A4136 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. The students understand the significance of marketing management concepts, marketing environment, consumer behavior elements and strategies related to STP.
2. The student will be able to understand various product management strategies and the importance of branding and 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 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); Strategyand 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. Relationships, 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 Schindl

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INTRODUCTION TO DATA SCIENCE
(OPEN ELECTIVE)

Course Code: GR22A3056 **L/T/P/C: 3/0/0/3**

Prerequisites:
Knowledge of Python programming, Linear algebra, Statistics, Probability and Calculus

Course Outcomes:
1. Learn Numpy, Pandas for mathematical computation and Data Analysis
2. Analyze the importance of pre-processing techniques for Data Science
3. Learn and analyze various prediction and classification techniques on various datasets
4. Learn and analyze the applications of clustering techniques
5. Analyze Text data and Web scrapping data at morphological and syntactic and semantic levels using NLP techniques

UNIT I
Introduction to Data Science, Components of Data Science, Application of Data Science **NumPy:** Array, Matrix and associated operations, Linear algebra and related operations **Pandas: Series, Data Frames, Panels, R**eading files, Exploratory data analysis, Datapreparation, Indexing, Slicing, Merging and Joining data. Working with MySQL databases **Data Pre-processing Techniques**: Data Imputation, Data Encoding, Standardization andNormalization, Dimensionality reduction, Feature Selection methods

UNIT II
Regression Analysis: Introduction to Regression, Simple linear regression, Multi-linear regression, Evaluation metrics for regression
Classification Methods: Introduction to Classification, Naïve Bayes classifier, Decision Tree classifier, Support Vector Machines, Logistic Regression, Ensemble methods, Random Forest, Bagging, Boosting, Evaluation metrics for classification

UNIT III
Clustering Methods: Introduction to Clustering, Similarity distance measures, K-means algorithm, Hierarchical clustering algorithm, DB Scan algorithm, Evaluation metrics for clustering.

UNIT IV
NLP Overview, Tokenization, Stemming, stop words removal, POS tagging, Lemmatization, Feature extraction using SK learn, Text Classification, Text Clustering.

UNIT V
Learning Best Practices for Model Evaluation:
Pipelining, Hyperparameter Tuning, Debugging algorithms with learning and validation curves.

Text Books:
1. Python Machine Learning, Second Edition by Sebastian Raschka Vahid Mirjalili Statistics and Machine Learning in Python Edouard Duchesnay,

Reference Books:
1. Data Science from Scratch: First Principles with Python, Second Edition (Greyscale Indian

Edition) Paperback – 5 May 2019 by Joel Grus (Author)

2. Practical Data Science with Python: Learn tools and techniques from hands-on examples to extract insights from data by Nathan George (Author)
3. HANDS ON INTRODUCTION TO DATA SCIENCE Hardcover – 2 April 2020 by Chirag Shah (Author)
4. Essential Math for Data Science: Take Control of Your Data with Fundamental Linear Algebra, Probability, and Statistics by Thomas Nield (Author)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
USER-CENTRIC HUMAN COMPUTER INTERACTION
(OPEN ELECTIVE)

Course Code: GR22A3127 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Learn the concepts of interaction design and how it relates to human computer interaction and other fields.
2. Design how technologies can be to change people's attitudes and behavior.
3. Apply the difference between qualitative and quantitative data and analysis.
4. Extract the social Mechanisms that are used by people to communicate and collaborate.
5. Explore the user Experience design and analyze the factors involved in design

UNIT I

Introduction: Introduction to User Centric Computing(UCC) and history, Issues and challenges, Latest research trends, User-Centric Design and Software Engineering.

UNIT II

Engineering User-Centric Systems: Components of SDLC - Contextual Inquiry, - Design Guidelines, Prototyping.

UNIT III

User-Centric Computing: The UCC framework with illustrative case study, User-Centric models-descriptive, predictive models and taxonomy, Introduction to GOMS family of models
Computational user models (classical), Keystroke-Level Model(KLM), (CMN)GOMS Model, The Fitts' Law, The Hick-Hyman Law.

UNIT IV

Computational user models (contemporary): 2D and 3D pointing models, the steering Law and constrained navigation, Model for hierarchical menu selection, Mobile typing models (single finger and two thumb typing), Model for touch performance(Fitts' law)

Formal system models: Introduction to formal models in UCD, Formal modelling of user-computer dialogue.

UNIT V

Empirical Research Methods: Introduction and research question formulation, Variables determination and experiment design, Data Analysis including model building
User-Centric Design Evaluation: Introduction to User-Centric design evaluation and expertevaluation technique, : User evaluation and model-based evaluation.

Text Books:

1. Samit Bhattacharya (July 2019). Human-Computer Interaction: User-Centric Computing for Design, McGraw-Hill India, Print Edition: ISBN-13: 978-93-5316-804-9; ISBN-10: 93- 5316-804-X, E-book Edition: ISBN-13: 978-93-5316-805-6; ISBN-10: 93-5316-805-8

2. Alan Dix, Janet E. Finlay, Gregory D. Abowd and Russel Beale. (2003). Human-Computer Interaction (3rd Edition), Pearson.

Reference Books:

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen and Steven Jacobs. (2009). Designing the User Interfaces: Strategies for Effective Human-Computer Interaction (5th Edition), Pearson.

Website Links:

https://paragnachaliya.in/wp-content/uploads/2017/08/HCI_Alan_Dix.pdf

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DESIGN PATTERNS
(OPEN ELECTIVE)

Course Code: GR22A4063 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Ability to analyze and apply different design patterns for real life scenarios.
2. Ability to solve Object oriented design problems with a case study of designing a Document Editor.
3. Illustrates the skill apply creational design patterns.
4. Demonstrates the ability to apply different structural design patterns.
5. Analyze and apply different behavioral design patterns.

UNIT I

Introduction: What Is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT II

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

UNIT III

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.
Structural Pattern Part-I: Adapter, Bridge, Composite.

UNIT IV

Structural Pattern Part-II: Decorator, Façade, Flyweight, Proxy.
Behavioral Patterns Part-I: Chain of Responsibility, Command, Interpreter, Iterator.

UNIT V

Behavioral Patterns Part-II: Mediator, Memento, Observer, State, Strategy, Template Method Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns, A Brief History,The Pattern Community An Invitation, A Parting Thought.

Text Books:

1. Design Patterns by Erich Gamma, Pearson Education.

Reference Books:

1. Pattern's in JAVA Vol-I by Mark Grand, Wiley Dream Tech.
2. Pattern's in JAVA Vol-II by Mark Grand, Wiley Dream Tech.
3. JAVA Enterprise Design Patterns Vol-III by Mark Grand, Wiley Dream Tech.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
NON-CONVENTIONAL ENERGY SOURCES
(OPEN ELECTIVE)

Course Code:GR22A3019 **L/T/P/C: 3/0/0/3**

Course Outcomes

1. Illustrate the concepts of solar radiation at different instants.
2. Analyze the performance characteristics of PV modules.
3. Compare the performance of wind energy at various circumstances.
4. Make use of various sustainable energy resources for power generation.
5. Explain operation and performance of Wave energy, Fuel cells and Batteries.

UNIT I

Solar Spectrum-Solar Radiation on Earth's surface- Solar radiation geometry-Solar radiation measurements-Solar radiation data-Solar radiation on horizontal and tilted surfaces. Solar Thermal Conversion-Flat plate collectors concentrated collectors- construction and thermal analysis- Solar Applications-Solar Ponds-Heliostat systems-water heater-air heater- solar still.

UNIT II

Photovoltaic Cells - Equivalent Circuit - V-I Characteristics- Photovoltaic Modules – Constructional details - Design considerations – Tracking - Maximum power point tracking – Algorithms - PV solar system design with energy backup - Solar Thermo electric conversion.

UNIT III

Fundamentals of wind energy-power available in wind-BetzLimit- Aerodynamics of wind turbine-Wind Turbines-Horizontal and vertical axis turbines – their configurations-Wind Energy conversion systems.

UNIT IV

Various fuels-Sources-Conversion Technologies-Wet Processes–Dry Processes-Biogas generation–Aerobic and an aerobic digestion- Factors affecting generation of bio gas – Classification of bio gas plants-Different Indian Digesters-Digester design considerations- Gasification process-Gasifiers – Applications. Geo-thermal Energy-sources-Hydrothermal Convective-Geo-pressure resources-Petro-thermal systems (HDR)-Magma Resources-Prime Movers.

UNIT V

Principle of operation-Open and closed cycles, Energy from Tides-Principle of Tidal Power-Components of tidal Power Plants-Operation Methods-Estimation of Energy in Single and double basin systems-Energy and Power from Waves-Wave energy conversion devices-Fuel Cells-Design and Principle of operation-Types of Fuel Cells-Advantages and disadvantages- Types of Electrodes-Applications-Basics of Batteries –Constructional details of Lead acid batteries- Ni-Cd Batteries.

Text Books:

1. G.D. Rai, Non-Conventional Energy Sources, Khanna publishers.
2. D.P.Kothari, Singal, Rakesh, Ranjan, Renewable Energy sources and Emerging Technologies, PHI, 2009.

Reference Books:

1. B.H.Khan, Non-Conventional Energy Sources, PHI Publications.
2. John Twidell & Wier, Renewable Energy Resources, CRC Press, 2009.
3. T. Ackermann, “Wind Power in Power Systems”, John Wiley and Sons Ltd., 2005.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CONCEPTS OF CONTROL SYSTEMS
(OPEN ELECTIVE)

Course Code: GR22A3095 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Infer the basic concept control systems.
2. Develop the mathematical model of the systems.
3. Analyze the time domain specifications and steady state error.
4. Outline the concept of stability of the system.
5. Solve the frequency response analysis.

UNIT I

BASIC CONCEPTS OF CONTROL SYSTEM

Terminology - plant, process, system, disturbances, controlled variable, manipulated variable etc., Block diagram of basic control system, application areas with examples. Classifications of control systems

UNIT II

MATHEMATICAL MODELLING OF SYSTEMS

Translational and rotational mechanical systems, electrical systems, Force voltage and force current analogy, Block diagram and signal flow graph representation of physical systems along with rules, properties, comparison and limitation, Mason's gain formula.

UNIT III

TIME RESPONSE ANALYSIS

Standard test signals along with examples of their usage, steady state errors for step, ramp andparabolic inputs, analysis of first and second order systems, Transient response specifications with numerical examples, Basic control actions and two position, proportional, P, PI, PID controllers, Limitations of time domain analysis.

UNIT IV

STABILITY

Concept of stability, types of stability, Routh's stability criterion, special cases with numerical examples, stability of closed loop system, concept of root locus, open loop and closed loop transfer poles, step by step procedure for root loci, numerical examples.

UNIT V

FREQUENCY RESPONSE ANALYSIS

Need of frequency response analysis, Sinusoidal response of linear system, methods used in frequency response, Bode Plot, Frequency domain specifications.

Text Books:

1. I J Nagrath, M. Gopal, Control System Engineering, New Age International Publishers, 5th Edition.
2. Norman S Nise, Control system engineering, John Wiley & Sons, Inc., 6th Edition.

Reference Books:

1. Richard C. Dorf, Robert H Bishop, Modern control systems, Pearson Education International, Twelfth edition.
2. A Nagoor Kani, Control Systems, CBS Publishers.

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

Course Code: GR22A4045 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Analyze the properties of basic Modulation techniques and apply them to Digital Communication
2. Apply error probability concepts to evaluate the performance of spread spectrum systems.
3. Understand the principle concepts of telecommunication systems and networking
4. Analyze link budgets for satellite communication, considering factors such as path loss, atmospheric effects, and antenna gain.
5. Evaluate the suitability of various technologies in cellular, mobile and wireless communication scenarios.

UNIT- I: Review of Digital Communication System

Review of fundamental concepts and parameters in Digital Communication. Digital modulation schemes, Power spectra of digital modulation signals.

UNIT- II: Spread-Spectrum Modulation

Introduction, Pseudo-Noise sequences, direct- sequence spread spectrum (DSSS) with coherent BPSK, processing gain, probability of error, frequency-hop spread spectrum (FHSS). Application of spread spectrum: CDMA.

UNIT- III: Telecommunication Systems

Telephones Telephone system, Paging systems, Internet Telephony.

Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

UNIT- IV

Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.
Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT-V:

Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, and WCDMA.
Wireless Technologies: Wireless LAN, PANs and Bluetooth, ZigBee, and Mesh WirelessNetworks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

Text Books:

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education, 2005.
2. Simon Haykin and Michael Moher, “Modern Wireless Communications,” Pearson Education,

2005.
3. Marvin K. Simon, Sami M. Hinedi and W. C. Lindsay, "Digital Communication Techniques," Eastern Economy Edition, 2010.

Reference Books:

1. Principles of communication systems By Taub Schilling, T.M.H
2. Andrew J Viterbi, "CDMA principles spread spectrum communications," Adison Wesley, 1995.

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

Course Code: GR22A3113 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Demonstrate the concept of resistive sensors which can be employed for real life applications
2. Realize the concept of reactive sensors and understand the implications while deploying them in practice.
3. Understand the working principle of special purpose sensors and the need for developing smart sensors.
4. Comprehend the design and development of various wearable sensors for use in healthcare applications.
5. Able to design and perform experiments on the sensors and develop the projects based on the customer needs.

UNIT-I

General concepts and terminology of Sensor systems, Transducers classification-sensors and actuators, General input-output configurations, Static and dynamic characteristics of measurement system.

UNIT-II

Resistive sensors- Potentiometers, strain gages (piezo-resistive effect), resistive temperature detectors (RTD), thermistors, light dependent resistor (LDR), resistive hygrometers, resistive gas sensors.

UNIT-III

Inductive sensors - variable reluctance sensors, Hall effect, Eddy current sensors, Linear variable differential transformers (LVDT), variable transformers, magneto-elastic, magneto- resistive, and magneto strictive sensors. Capacitive sensors- variable capacitor, differential capacitor.

UNIT-IV

Accelerometers: Characteristics and working principle, Types- Capacitive, Piezoresistive, piezoelectric; Gyroscopes: Characteristics and working principle, Rotor Gyroscope; Diaphragm Pressure Sensor –resistive & capacitive type (micro press sensor).

UNIT-V

Overview of various smart sensors: Digital temperature sensor (DS1621, TMP36GZ), Humidity sensor (DHT11, DHT22), Gas sensor (MQ2,MQ8), Pressure sensors (BMP180), Accelerometers (ADXL335); Structural health monitoring sensors, Introduction to MEMS and Flexible sensors.

Text Books:

1. B. C. Nakra, K.K. Choudhury, “Instrumentation, Measurement and Analysis”-3rd Edition, Tata McGraw, 2009
2. Jacob Fraden, “Hand Book of Modern Sensors: Physics, Designs and Applications”, 3rd Edition.,

Springer, 2010.

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PRINCIPLES OF COMMUNICATIONS
(OPEN ELECTIVE)

Course Code: GR22A3040 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Apply concepts of modulation, frequency translation, gain and attenuation in communication systems.
2. Analyze the power spectrum characteristics of different modulation techniques.
3. Understand the role of multiplexing techniques in optimizing bandwidth utilization of Communication Systems.
4. Evaluate the suitability of specific digital modulation techniques for different communication applications.
5. Critically perform error analysis of each modulation scheme.

UNIT - I: Basics of Communication Systems

Definition and scope of communication systems, Types of communication systems: Analog and Digital, Block diagram of a communication system, Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

UNIT - II: Analog Modulation

Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation (PM) and its variants, Power Spectrum of different modulations, Comparison of modulation techniques.

UNIT - III: Pulse Analog Modulation

Ideal sampling, Sampling theorem, aliasing, interpolation, natural and flat top sampling in time and frequency domains. Introduction to PAM, PWM, PPM modulation schemes. Frequency Division Multiplexing (FDM) and Time division multiplexing (TDM).

UNIT – IV: Digital Modulation

Basics of digital modulation, Advantages of digital modulation over analog modulation, Types of digital modulation: ASK, FSK, PSK, QAM, Comparison of digital modulation techniques

UNIT - V: Performance Analysis of Analog and Digital Modulation

Sources of Noise in Communication Systems, Super heterodyne Receiver, Figure of Merit, Noise Figure. Signal-to-Noise Ratio (SNR) and Eb/N0 ratio, Bit Error Rate (BER) and its significance, Error performance analysis for different modulation schemes, Channel capacity and bandwidth efficiency.

Text Books:

1. An Introduction to Analog and Digital Communications, 2nd Edition, Simon Haykin, Michael Moher, John Wiley, March 2006.
2. Communication Systems by Simon Haykin, Second Edition, Wiley Student Edition, 2007.
3. Digital Communications by John G. Proakis and Masoud Salehi, 5e, McGraw Hill Publications, 2014.

Reference Books:

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education, 2005.
2. Digital & Analog Communication Systems by K.S. Shanmugam, John Wiley.

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

Course Code: GR22A3030 **L/T/P/C:3/0/0/3**

Prerequisites: Manufacturing Technology

Course Outcomes:

1. Explain the major automation theories, approaches and methodologies used in manufacturing.
2. Apply the knowledge for implementing the automated flow lines.
3. Employ the assembly systems and line balancing for automation
4. Implement the knowledge of material handling and storage systems in current industries.
5. Design adaptive control system for automated manufacturing.

UNIT I

Introduction: Introduction to automation, principles, reasons, types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools. Mechanical feeding, tool changing, and machine tool control transfer the automaton.

UNIT II

Automated flow lines: Methods of work part transport transfer, Mechanical buffer storage control function, design and fabrication consideration. Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines**.**

UNIT III

Assembly system and line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT IV

Automated material handling and storage systems: Types of equipment, functions, analysis and design of material handling systems, conveyor systems, automated guided vehicle systems. Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

UNIT V

Adaptive control systems: Introduction, adaptive control with optimization, adaptive control with constraints, application of adaptive control in machining operations. Consideration of various parameters such as cutting force, temperatures, vibration and acoustic emission in the adaptive controls systems.

Text Books:

1. Mikell P.Groover, Automation, Production Systems, and Computer- integrated Manufacturing, prentice Hall, 2014
2. Serope Kalpakjian and Steven R. Schmid, Manufacturing– Engineering and Technology, 7th

edition, Pearson, 2013.

Reference Books:

1. Automation, Production Systems, and Computer-Integrated Manufacturing. (2016). India: Pearson India.
2. Bolz, R. W. (2012). Manufacturing Automation Management: A Productivity Handbook. United States: Springer US.
3. Boucher, T. O. (2012). Computer Automation in Manufacturing: An Introduction. Switzerland: Springer US.
4. Altintas, Y. (2012). Manufacturing Automation: Metal Cutting Mechanics, Machine Tool Vibrations, and CNC Design. United States: Cambridge University Press.
5. Morriss, S. B. (1995). Automated manufacturing systems. United Kingdom: Glencoe.

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

Course Code: GR22A3105 **L/T/P/C: 3/0/0/3**
Prerequisites: Material Engineering

Course Outcomes:
1. Identify the types of composite materials and their characteristic features
2. Explain the methods employed in composite fabrication.
3. Differentiate the strengthening mechanisms of composite and its corresponding effect on performance
4. Analyze the various criteria for isotropic, anisotropic, and composite materials, prediction of laminates failure.
5. Examine experimental techniques utilized for failure mode of composites.

UNIT I
Definition and applications of composite materials, Fibers- glass, carbon, ceramic and aramid fibers; Matrices- polymer, graphite, ceramic and metal matrices; characteristics of fibers and matrices. Lamina- assumptions, macroscopic viewpoint, generalized Hooke's law, reductionof homogeneous orthotropic lamina, isotropic limit case, orthotropic stiffness matrix, commercial material properties, rule of mixtures, transformation matrix, transformed stiffness.

UNIT II
Manufacturing of composite materials, bag moulding, compression moulding, pultrusion, filament welding, other manufacturing processes

UNIT III
Basic assumptions of laminated anisotropic plates, symmetric laminates, angle ply laminates, cross ply laminates, laminate structural moduli, evaluation of lamina properties, determination of lamina stresses, maximum stress and strain criteria.

UNIT IV
Von Mises Yield criterion for isotropic materials, generalized Hill's criterion for anisotropic materials, Tsai- Hill's criterion for composites, prediction of laminate failure, thermal analysis of composite laminates.

UNIT V
Analysis of laminated plates- equilibrium equations of motion, energy formulation, static bending analysis, buckling analysis, free vibrations, natural frequencies.

Text Books:
1. Gibson R.F. Principles of Composite Material Mechanics, 2nd Edition, McGraw Hill,1994.
2. Hyer M.W., Stress Analysis of Fiber- Reinforced Composite Materials, McGraw Hill,1998.

Reference Books:

1. Clyne, T. W. and Withers, P. J, “Introduction to Metal Matrix Composites”, Cambridge University Press, 1993.
2. Strong, A.B., “Fundamentals of Composite Manufacturing”, SME, 1989.
3. Sharma, S.C., “Composite materials”, Narosa Publications, 2000.
4. Broutman, L.J. and Krock,R.M., “ Modern Composite Materials”, Addison-Wesley, 1967.
5. Introduction to Composite Materials Design by Ever J. Barbero 3rd Edition 2017

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OPERATIONS RESEARCH
(OPEN ELECTIVE)

Course Code: GR22A3018 **L/T/P/C: 3/0/0/3**

Course Outcomes:

1. Apply the various linear programming techniques for optimal allocation of limited resources such as machine, material, and money
2. Solve transportation problems to minimize cost and understand the principles of assignment of jobs and recruitment policies.
3. Solve sequencing problems and to distinguish various inventory models and develop proper inventory policies
4. Apply game theory to analyze various business competitions and analyze the various waiting line-oriented situations.
5. Develop optimum replacement policy and Dynamic Programming Techniques.

UNIT I

Introduction: Development – Definition– Characteristics and Phases of operations Research– Types of models – operation Research models– applications.

Allocation: Linear Programming Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques -Two–phase method, Big-M method – Duality Principle.

UNIT II

Transportation models: Formulation – Methods for finding feasible solutions; North west corner rule, least cost entry method, Vogel's approximation method. Optimal solution; MODI method. Unbalanced transportation problem and Degeneracy.

Assignment models - Formulation – Optimal solution - Variants of Assignment Problem

UNIT III

Sequencing: Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines.

Inventory: Introduction – Single item – Deterministic models – Purchase inventory model with one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be a discrete variable or continuous variable – Instantaneous production. Instantaneous demand and continuous demand and no set up cost.

UNIT IV

Theory of games: Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – dominance principle– m X 2 and 2 X n games -graphical method.

Waiting lines: Introduction – Single Channel – Poisson arrivals – exponential service times – with infinite population and finite population models– Multichannel – Poisson arrivals – exponential service times with infinite population single channel Poisson arrivals.

UNIT V

Replacement: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, group replacement.

Dynamic programming: Introduction – Bellman's Principle of optimality – Applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

Text Books:

1. Operations Research - Prem Kumar Gupta and D S Hira/ S Chand Publishing/ 2015
2. Operations Research / S. D.Sharma / KedarNath RamNath Publication/2020

Reference Books:

1. Operations Research / R. Panneer selvam, 3rd Edition/PHI Publications/ 2023
2. Operations Research an Introduction - Hamdy A Taha/8th Edition/ Prentice Hall/2006
3. Principles of Operations Research: With Applications to Managerial Decisions - Harvey
4. M. Wagner/Prentice-Hall Operations Research/2020
5. Operations Research - Kanthi Swarup, P.K. Gupta, Man Mohan Sultan Chand & Sons/ 2019
6. Operations Research/A.M. Natarajan, P. Balasubramani, A. Tamilarasi/Pearson Education/2006.

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

Course Code: GR22A3009 **L/T/P/C: 3/0/0/3**

Pre-requisites: Building materials and construction planning, Concrete Technology

Course Outcomes:

1. Describe the different types of environmental factors effecting materials
2. Report the work in sustainability for research and education
3. Illustrating the broad perspective in thinking for sustainable practices
4. Perform cost/benefit analysis and life-cycle analysis of green buildings.
5. Identify and compare cost and performance of building materials

UNIT I

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

UNIT II

Air Pollution, effects of Air Pollution; Water pollution-sources, Sustainable wastewater treatment, Solid waste-sources, impacts of solid waste, zero waste concept, 3R concept, Global environmental issues- Resource degradation, climatic change, Global warming, Ozone layer depletion, Regional and Local Environmental issues. Carbon credits and carbon trading,carbon foot print.

UNIT III

Green Building Materials, Basic concepts of sustainable habitat, green buildings, green materials for building construction, material selection for sustainable design, green building certification, Methods for increasing energy efficiency of buildings. Sustainably managed Materials, Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; non-renewable Energy of Materials

UNIT IV

Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds like acetone, formaldehyde, BTEX substances, Natural Non-Petroleum Based Materials, Recycled materials, Renewable and Indigenous Building Materials, Engineering evaluation of these materials

UNIT V

Green Building Planning and Specifications, Environment friendly and cost effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green Strategies for Building

Systems, Alternative Construction Methods, Energy Conservation Measures in Buildings, Waste &Water management and Recycling in Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar & Daylight, Plumbing and its Effect on Energy Consumption.

Text Books:

1. Alternative Building Materials and Technologies (2007) – K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao – New Age International Publishers
2. Integrated Life Cycle Design of Structures (2002)– AskoSarja – SPON Press
3. Non-conventional Energy Resources (2012) – D S Chauhan and S K Srivastava – New Age International Publishers

Reference Books:

1. Green Buildings (2007) McGraw hill publication by Gevorkian
2. Emerald Architecture (2008) case studies in green buildings, The Magazine of Sustainable Design
3. Understanding Green Building Guideline (2010): For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.
4. Understanding Green Building Materials (2011) Traci Rose Rider, W. W. Norton & Company Publisher.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONSTRUCTION PROJECT PLANNING AND SYSTEMS
(OPEN ELECTIVE)

Course Code: GR22A4090 **L/T/P/C:3/0/0/3**

Pre-Requisite: Building Materials and Construction planning, Computational methods.

Course Outcomes:

1.Understand how structures are built and projects are developed on the field.

2.Analyze good idea of basic construction dynamics- various stakeholders, project objectives, processes, resources required and project economics.

3.Interpret Plan, control and monitor construction projects with respect to time and cost, and also to Optimize construction projects based on costs.

4.Remember how construction projects are administered with respect to contract structures and issues.

5.Summarize ideas and understandings to others with effective communication processes.

UNIT I

Construction Planning and Scheduling: Definition of Projects; Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT Assumptions underlying PERT analysis, determining three-time estimates, analysis, slack computations, calculation of probability of completion. Allocation of Resources- materials, equipment, staff, labour and finance; resource levelling and optimal schedules; Project organization, documentation and reporting systems.

UNIT II

Construction Methods and Contract Management: Control & monitoring; Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems; Advent of Lean Construction; Importance of Contracts Management; Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation.

UNIT III

Construction Materials and Resource Leveling: Materials, concepts of planning, procurement, and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow, sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and levelling. Common Good

Practices in Construction.

Introduction to formwork: Requirements and Selection of Formwork, Formwork Materials-Timber, Plywood, Steel, Aluminum, Plastic, and Accessories. Form work selection.

UNIT IV

Project Monitoring & Control: Project Monitoring &Control- Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modelling (BIM) in project management.

UNIT V

Quality Control and Quality Assurance: Quality control, concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.

Text Books

1. Varghese, P.C., “Building Construction”, Prentice Hall India, 2007.
2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
3. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

Reference Books

1. Chudley, R., Construction Technology, ELBS Publishers, 2007.
2. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011.
3. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006.
4. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL IMPACT ASSESSMENT
(OPEN ELECTIVE)

Course Code:GR22A4011 **L/T/P/C: 3/0/0/3**

Pre-Requisites: Environmental science

Course Outcomes:

1. Identify, predict, and evaluate the environmental effects of proposed actions and projects.
2. Explain the appropriate methodologies for environmental impact prediction and assessment.
3. Analyze the importance of Public Participation, Fault Tree Analysis and Consequence analysis in EIA.
4. Understand the activities in environmental auditing.
5. Plan EIA for developmental projects.

UNIT I

Introduction: Concepts of EIA methodologies – Sustainable development- Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – Evolution of EIA: Screening and scoping; Rapid EIA and Comprehensive EIA

UNIT II

Introduction to EIA, Criteria for the selection of EIA Methodology, General Framework for Environmental Impact Assessment, Characterization and site assessment. Environmental Risk Analysis, Definition of Risk, Matrix Method; Checklist method.

UNIT III

Prediction and Assessment: Public participation Fault tree analysis, Consequence Analysis; Socioeconomic aspects, measures of the effectiveness of pollution control activities;

UNIT IV

Environmental Legislation: Introduction to Environmental Management Systems; Environmental Statement - procedures; Environmental Audit: Cost-Benefit Analysis.

UNIT V

Life Cycle Assessment, Resource Balance, Energy Balance & Management Review - Operational Control - Case Studies on EIA with reference to Indian Scenario.

Text Books:

1. Y Anjaneyulu, and Valli Manikkam, Environmental Impact Assessment Methodologies, BSP Books PVT Ltd., 2nd Edition, 2011.
2. R.R. Barthwal, Environmental Impact Assessment, New Age International Private Limited, 2nd Edition, 2012.
3. Canter R.L., Environmental Impact Assessment, Mc Graw Hill International Edition, 2nd Edition, 1997.

Reference Books:

1. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York, 1996.
2. Judith Petts, Handbook of Environmental Impact Assessment Vol. I &II, Blackwell Science,1999.
3. Cutter, S.L., "Environmental Risk and Hazards", Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
4. Anji Reddy Mareddy, Environmental Impact Assessment: Theory and Practice, Butterworth-Heinemann publisher, 1st Edition, 2017.
5. MoEF & CC, Govt. of India: EIA notification and subsequent amendments.