Academic Regulations
Programme Structure
&
Detailed Syllabus

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

Civil Engineering

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

ACADEMIC REGULATIONS

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD

DEPARTMENT OF CIVIL ENGINEERING

PROGRAMME BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING

GR20 REGULATIONS

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

1. **Programme Offered:** The programme offered by the Department is B. Tech in Civil Engineering, a four-year regular programme.

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

3. **Admissions:** Admission to the B. Tech in Civil Engineering Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the State Government/University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the Government/University or on the basis of any other order of merit approved by the Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. **Programme Pattern:**

   a) Each Academic year of study is divided in to two semesters.
   b) Minimum number of instruction days in each semester is 90.
   c) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
   d) The total credits for the Programme is160.
   e) Student is introduced to "Choice Based Credit System (CBCS)".
   f) A student has a choice to register for all courses in a semester / one less or one additional course from other semesters provided the student satisfies prerequisites.
   g) All the registered credits will be considered for the calculation of final CGPA.
   h) Each semester has - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.
   i) **Subject / Course Classification:** All subjects/ courses offered for the under graduate programme in E & T (B.Tech. degree programmes) are broadly classified as follows.

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

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

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

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

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

d) The Degree of B. Tech in Computer Science and Engineering shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfill all the requirements for the award of the degree.

6. Attendance Requirements:

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

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

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

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

e) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. They may seek reregistration for that semester when offered next with the academic regulations of the batch into which he/she gets re-registered.

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

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

b) Distribution and Weightage of marks

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

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

Assessment Procedure:

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

d) Mini Project with Seminar: The Mini Project is to be taken up with relevance to Industry and is evaluated for 100 marks. Out of 100 marks, 30 marks are for internal evaluation and 70 marks are for external evaluation. The supervisor continuously assesses the students for 20 marks (Continuous Assessment – 15 marks, Report – 5 marks). At the end of the semester, Mini Project shall be displayed in the road show at the department level for the benefit of all students and staff and the same is to be evaluated by Mini Project Review Committee for 10 marks. The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for 70 marks. Mini Project Review Committee consists of HOD, Mini Project Coordinator and Supervisor. Plagiarism check is compulsory for mini project report as per the plagiarism policy of GRIET.

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

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

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

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

g) EngineeringGraphics:

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

8. **Recounting of Marks in the End Examination Answer Books:** A student can request for recounting of his/her answer book on payment of a prescribed fee.

9. **Re-evaluation of the End Examination Answer Books:** A student can request for re- evaluation of his/her answer book on payment of a prescribed fee.

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

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

12. **Academic Requirements and PromotionRules:**

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

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

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

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

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

Earning of Credit:
A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range O-P. Letter grade 'F' in any Course implies failure of the student in that course and no credits earned.
Computation of SGPA and CGPA:
The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

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

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

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course and n is the number of courses registered in that semester. ii) The CGPA is calculated in the same manner taking into account all the courses m, registered by student over all the semesters of a programme, i.e., upto and inclusive of S_k, where $k \geq 2$.

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

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

14. **Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B. Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the160 credits.

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

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

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

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

18. **General Rules**

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

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

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

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

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

(Applicable for Batches Admitted from 2021-2022)

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

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

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

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

2. Academic Requirements and Promotion Rules:

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

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

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

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

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

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

Gokaraju Rangaraju Institute of Engineering and Technology

(Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090, India

B. Tech Civil Engineering GR20 Course Structure

I B. Tech (CE) - 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	GR20A1001	Linear Algebra and Differential Calculus	3	1	0	4	3	1	0	4	30	70	100
2	Physics	BS	GR20A1004	Engineering Physics	3	1	0	4	3	1	0	4	30	70	100
3	English	HS	GR20A1006	English	2	0	0	2	2	0	0	2	30	70	100
4	CSE	ES	GR20A1007	Programming for Problem Solving	2	1	0	3	2	1	0	3	30	70	100
5	ME	ES	GR20A1010	Engineering Graphics	1	0	2	3	1	0	4	5	30	70	100
6	Physics	BS	GR20A1013	Engineering Physics Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
7	CSE	ES	GR20A1016	Programming for Problem Solving Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
8	English	HS	GR20A1015	English Language and Communication Skills Lab	0	0	1	1	0	0	2	2	30	70	100
		TOTAL			**11**	**3**	**6**	**20**	**11**	**3**	**12**	**26**	**240**	**560**	**800**
9	Mgmt	MC	GR20A1020	Design Thinking	1	0	0	1	2	0	0	2	30	70	100

I B.Tech(CE) - 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	GR20A1002	Differential Equations and Vector Calculus	3	1	0	4	3	1	0	4	30	70	100
2	Chemistry	BS	GR20A1005	Engineering Chemistry	3	1	0	4	3	1	0	4	30	70	100
3	ME	ES	GR20A1009	Engineering Mechanics	3	1	0	4	3	1	0	4	30	70	100
4	CSE	ES	GR20A1011	Data Structures	2	1	0	3	2	1	0	3	30	70	100
5	Chemistry	BS	GR20A1014	Engineering Chemistry Lab	0	0	1.5	1.5	0	0	3	3	30	70	100
6	CSE	ES	GR20A1018	Data Structures Lab	0	0	1	1	0	0	2	2	30	70	100
7	ME	ES	GR20A1019	Engineering Workshop	1	0	1.5	2.5	1	0	3	4	30	70	100
		TOTAL			**12**	**4**	**4**	**20**	**12**	**4**	**09**	**25**	**210**	**490**	**700**
8	Mgmt	MC	GR20A1021	Life skills and Personality Development	1	**0**	0	1	**2**	**0**	0	2	30	70	100

II B.Tech (CE) - 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	CE	PC	GR20A2009	Building Materials and Construction Planning	2	0	0	2	2	0	0	2	30	70	100
2	CE	PC	GR20A2010	Engineering Geology	2	0	0	2	2	0	0	2	30	70	100
3	CE	PC	GR20A2011	Solid Mechanics – I	2	1	0	3	2	1	0	3	30	70	100
4	Maths	BS	GR20A2008	Computational Mathematics for Engineers	3	0	0	3	3	0	0	3	30	70	100
5	CE	PC	GR20A2012	Introduction to Fluid Mechanics	3	0	0	3	3	0	0	3	30	70	100
6	CE	PC	GR20A2013	Surveying and Geomatics	3	0	0	3	3	0	0	3	30	70	100
7	CE	PC	GR20A2014	Engineering Geology lab	0	0	2	2	0	0	4	4	30	70	100
8	CE	PC	GR20A2015	Solid Mechanics Lab	0	0	2	2	0	0	4	4	30	70	100
		TOTAL			**15**	**1**	**4**	**20**	**15**	**1**	**8**	**24**	**240**	**560**	**800**
9	Mgmt	MC	GR20A2002	Value Ethics and Gender Culture	2	0	0	2	2	0	0	2	30	70	100
10	Chemistry	MC	GR20A2001	Environmental Science	2	0	0	2	2	0	0	2	30	70	100

II B.Tech (CE) - 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	CE	PC	GR20A2016	Solid Mechanics – II	2	1	0	3	2	1	0	3	30	70	100
2	EEE	ES	GR20A2017	Basic Electrical and Electronics Engineering	3	0	0	3	3	0	0	3	30	70	100
3	CE	PC	GR20A2018	Structural Analysis – I	3	0	0	3	3	0	0	3	30	70	100
4	Mgmt	HS	GR20A2004	Economics and Accounting for Engineers	3	0	0	3	3	0	0	3	30	70	100
5	CE	PC	GR20A2019	Hydraulic Engineering	2	0	0	2	2	0	0	2	30	70	100
6	CE	PC	GR20A2020	Surveying Lab	0	0	2	2	0	0	4	4	30	70	100
7	CE	PC	GR20A2021	Computer Aided Design Lab	0	0	2	2	0	0	4	4	30	70	100
8	CE	PC	GR20A2022	Fluid Mechanics and Hydraulic Machinery Lab	0	0	2	2	0	0	4	4	30	70	100
		TOTAL			**13**	**1**	**6**	**20**	**13**	**1**	**12**	**26**	**240**	**560**	**800**

III B.Tech (CE) - 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	CE	PC		Geotechnical Engineering	2	0	0	2	2	0	0	2	30	70	100
2	CE	PC		Concrete Technology	2	0	0	2	2	0	0	2	30	70	100
3	CE	PC		Hydrology and Water Resources Engineering	3	0	0	3	3	0	0	3	30	70	100
4	CE	PC		Design of Reinforced Concrete Structures	2	1	0	3	2	1	0	3	30	70	100
5	CE	PE		Professional Elective-I	3	0	0	3	3	0	0	3	30	70	100
6	CE	OE		Open Elective-I	3	0	0	3	3	0	0	3	30	70	100
7	CE	PC		Geotechnical Engineering Lab	0	0	2	2	0	0	4	4	30	70	100
8	CE	PC		Concrete Technology Lab	0	0	2	2	0	0	4	4	30	70	100
		TOTAL			**15**	**1**	**4**	**20**	**15**	**1**	**8**	**24**	**240**	**560**	**800**
9	Mgmt	MC		Constitution of India	2	0	0	2	2	0	0	2	30	70	100

Professional Elective-I		
S.No.	**Course Code**	**COURSE**
1	CE	Structural Analysis - II
2	CE	Traffic Engineering and Management
3	CE	Groundwater
4	CE	Irrigation Management

Open Elective I
Engineering Materials for Sustainability

III B.Tech (CE) - 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	CE	PC		Design of Steel Structures	2	1	0	3	2	1	0	3	30	70	100
2	CE	PC		Foundation Engineering	3	0	0	3	3	0	0	3	30	70	100
3	CE	PC		Environmental Engineering	2	0	0	2	2	0	0	2	30	70	100
4	CE	PE		Professional Elective-II	3	0	0	3	3	0	0	3	30	70	100
5	CE	OE		Open Elective-II	3	0	0	3	3	0	0	3	30	70	100
6	CE	PC		Environmental Engineering Lab	0	0	2	2	0	0	4	4	30	70	100
7	CE	PC		GIS Lab	0	0	2	2	0	0	4	4	30	70	100
8	CE	PW		Mini Project with Seminar	0	0	2	2	0	0	4	4	30	70	100
		TOTAL			**13**	**1**	**6**	**20**	**13**	**1**	**12**	**26**	**240**	**560**	**800**

Professional Elective II		
S. No.	**Course Code**	**COURSE**
1	CE	Masonry Structures
2	CE	Rock Mechanics
3	CE	Open Channel flow
4	CE	Construction Equipment and Automation

Open Elective II
Geographic Information Systems and Science

IV B.Tech (CE) - 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	CE	PC		Estimation & Costing	2	1	0	3	2	1	0	3	30	70	100
2	CE	PC		Transportation Engineering	3	0	0	3	3	0	0	3	30	70	100
3	CE	PE		Professional Elective-III	3	0	0	3	3	0	0	3	30	70	100
4	CE	PE		Professional Elective-IV	3	0	0	3	3	0	0	3	30	70	100
5	CE	OE		Open Elective-III	3	0	0	3	3	0	0	3	30	70	100
6	CE	PC		Transportation Engineering Lab	0	0	2	2	0	0	4	4	30	70	100
7	CE	PC		Computer Applications in Structural Engineering Lab	0	0	2	2	0	0	4	4	30	70	100
8	CE	PW		Project Work-Phase I	0	0	6	6	0	0	12	12	30	70	100
		TOTAL			**14**	**1**	**10**	**25**	**14**	**1**	**20**	**35**	**240**	**560**	**800**

Professional Elective III		
S.No.	**Course Code**	**COURSE**
1	CE	Bridge Engineering
2	CE	Ground Improvement Techniques
3	CE	Surface Hydrology
4	CE	Tall Buildings

Professional Elective IV		
S.No.	**Course Code**	**COURSE**
1	CE	Industrial Structures
2	CE	Geometric Design of Highways
3	CE	Physico-Chemical Processes for Water and Wastewater Treatment
4	CE	Rehabilitation and Retrofitting of Structures

Open Elective III
Environmental Impact Assessment and Life Cycle Analyses

IV B.Tech (CE) - 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	CE	PE		Professional Elective-V	3	0	0	3	3	0	0	3	30	70	100
2	CE	PE		Professional Elective-VI	3	0	0	3	3	0	0	3	30	70	100
3	Mgmt	HS		Entrepreneurship and Project Management	2	1	0	3	2	1	0	3	30	70	100
4	CE	PW		Project Work-Phase II	0	0	6	6	0	0	12	12	30	70	100
		TOTAL			**8**	**1**	**6**	**15**	**8**	**1**	**12**	**21**	**120**	**280**	**400**

Professional Elective V		
S.No.	**Course Code**	**COURSE**
1	CE	Prestressed Concrete
2	CE	Pavement Design
3	CE	Design of hydraulic structures
4	CE	Construction Project Planning and Systems

Professional Elective VI		
S.No.	**Course Code**	**COURSE**
1	CE	Earthquake Engineering
2	CE	Urban Transportation and Planning
3	CE	Green Building Technology
4	CE	Pavement Materials

PROFESSIONAL ELECTIVES - 4 THREADS

S. No.	Structural Engineering	Geotechnical and Transportation Engineering	Environmental and Hydrology Engineering	Construction Technology & Management
1	Structural Analysis II	Traffic Engineering and Management	Groundwater	Irrigation Management
2	Masonry Structures	Rock Mechanics	Open Channel flow	Construction Equipment & Automation
3	Bridge Engineering	Ground Improvement Techniques	Surface Hydrology	Tall Buildings
4	Industrial Structures	Geometric Design of Highways	Physico-Chemical Processes for Water and Wastewater Treatment	Rehabilitation and Retrofitting of Structures
5	Prestressed Concrete	Pavement Design	Design of hydraulic structures	Construction Project Planning & Systems
6	Earthquake Engineering	Urban Transportation and Planning	Green Building Technology	Pavement Materials

OPEN ELECTIVES FOR GR20 REGULATIONS:

THREAD 1	THREAD 2	OFFERED BY
1. Soft Skills and Interpersonal Communication. 2. Human Resource Development and Organizational Behavior. 3. Cyber Law and Ethics 4. Economic Policies in India	1. Principles of E-Commerce 2. Business Analytics 3. Augmented Reality and Virtual Reality	CSE
	1.Internet of Things 2.Augmented Reality and Virtual Reality 3.Human Computer Interaction	CSE (AIML)
	1. Augmented Reality and Virtual Reality 2.Internet of Things 3.Human Computer Interaction	CSE (DS)
	1. Artificial Intelligence 2. Human Computer Interaction 3. Data Science	IT
	1. Non-Conventional Energy Sources 2. Machine Learning 3. Artificial Intelligence Techniques	EEE
	1. Artificial Neural Networks 2. Software Defined Radio and Cognitive Radio 3. Fundamentals of Mimo Wireless Communications	ECE
	1. Operations Research 2. Robotics 3. Mechatronic Systems	ME
	1. Engineering Materials for Sustainability 2. Geographic Information Systems and Science 3. Environmental Impact Assessment and Life Cycle Analyses	CE

I YEAR

I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

LINEAR ALGEBRA AND DIFFERENTIAL CALCULUS

Course Code: GR20A1001 **L/T/P/C: 3/1/0/4**

I Year I Semester

Course Objectives

1. Apply ideas to solve linear systems, at the core of many engineering concepts.
2. Apply concept of latent values of a matrix which is critical in many engineering applications.
3. Take part in, function approximation using the tools of mean value theorems.
4. Compose optimal values of multi-variable functions.
5. Utilize definite integral concept for various geometrical applications.

Course Outcomes

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

1. Compile the rank of a matrix to determine the existence of solutions of a linear algebraic system
2. Determine the eigenvalues and eigenvectors of a square matrix which arise in several engineering applications
3. Determine approximate solution of over determined systems using the pseudo inverse.
4. Develop the skill of determining optimal values of multivariable functions using classical methods.
5. Apply the definite integral concept for various computational problems in geometry.

UNIT I

VECTOR AND MATRIX ALGEBRA

Vector space (definition and examples), linear independence of vectors, orthogonality of vectors, projection of vectors

Symmetric, Hermitian, skew-symmetric, skew-Hermitian, orthogonal and unitary matrices; Rank of a matrix by echelon reduction, Solution of a linear algebraic system of equations (homogeneous and non-homogeneous)

UNIT II

MATRIX EIGENVALUE PROBLEM AND QUADRATIC FORMS

Determination of eigenvalues and eigenvectors of a matrix, properties of eigenvalues and eigenvectors (without proof), diagonalization of a matrix, orthogonal diagonalization of symmetric matrices, Similarity of matrices

Quadratic Forms: Definiteness and nature of a quadratic form, reduction of quadratic form to canonical form by orthogonal transformation

UNIT III

MATRIX DECOMPOSITION AND PSEUDO INVERSE OF A MATRIX

Spectral decomposition of a symmetric matrix, L-U decomposition,Gram-Schmidt orthonormalization of vectors, Q-R factorization, Singular value decomposition

Moore-Penrose pseudo inverse of a matrix, least squares solution of an over determined system of equations using pseudo inverse

UNIT IV

MULTIVARIABLE DIFFERENTIAL CALCULUS AND FUNCTION OPTIMIZATION

Partial Differentiation: Total derivative. Jacobian; Functional dependence

Unconstrained optimization of functions using the Hessian matrix, constrained optimization using Lagrange multiplier method

UNIT V

SINGLE VARIABLE CALCULUS

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem and Taylor's theorem (without proof), their geometrical interpretation, approximation of a function by Taylor's series

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (for Cartesian coordinates)

TEXT BOOKS

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa publishing house, Fourth edition 2014
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thedition,Pearson, Reprint.

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING PHYSICS

Course Code: GR20A1004 **L/T/P/C: 3/1/0/4**

I Year I Semester

Course Objectives:

1. Understand interaction of light with matter through interference and diffraction phenomena.
2. Discuss the use of lasers as light sources in optical fiber applications.
3. Outline the behavior of free electrons in materials.
4. Study the properties and fabrication methods of nanomaterials.
5. Recognize the basic concepts of Acoustics and ultrasonic.

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

1. Apply the principles of interference and diffraction of light in engineering applications.
2. Analyze the properties of Laser and its propagation in different types of optical fibers.
3. Classify materials based on the theory of Kronig Penny model.
4. Understand the nature and characterization of nanomaterials and its applications.
5. Comprehend the concepts of Acoustics and Non-destructive testing in solving engineering problems.

UNIT I

Wave Optics: Superposition of waves and interference of light by wave front splitting and amplitude splitting, Young's double slit experiment, Interference in thin films by reflection, Newton's rings, Difference between interference and diffraction, Fraunhofer diffraction from a single slit, Diffraction grating, Grating spectrum and resolving power, Determination of wavelength of light using diffraction grating.

UNIT II

Lasers: Interaction of radiation with matter: Absorption, Spontaneous emission and Stimulated emission, Characteristics of lasers, Einstein coefficients, Resonating cavity, Active medium-Meta stable state, Pumping, Population inversion, Construction and working of Ruby laser and He-Ne 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, Acceptance angle-Numerical aperture, Types of fibers, Losses associated with optical fibers, Applications of optical fibers.

UNIT III

Introduction to solids: Fermi Energy level, Fermi distribution function, Bloch's theorem, Kronig – Penny model (Qualitative), E-K diagram, Brillouin Zones, Effective mass of electron, Origin of energybands, Classification of materials on the basis of energy bands, Intrinsic and extrinsic semiconductors (Qualitative), Direct and Indirect band gap semiconductors.

UNIT IV

Engineered semiconductor materials: Nanomaterials, Introduction, Quantum confinement, Surface to volume ratio, Classification of nanomaterials as 0D, 1D, 2D and 3D (qualitative), Examples of low-dimensional systems such as quantum wells, wires and dots, Fabrication: Top-Down technique by CVD method, Bottom–Up technique by Sol-Gel method, Characterization techniques: SEM, TEM and EDAX.

UNIT V

Acoustics: Basic requirements of acoustically good hall, Reverberation and Reverberation time, Sabine's formula for Reverberation time (Qualitative), Measurement of absorption coefficient of a material, Factors affecting the architectural acoustics and their remedies.

Ultrasonic: Introduction, Classification of ultrasonic waves: Longitudinal waves, Transverse waves, Surface waves and Plate waves, Production of ultrasonic waves: Piezoelectric method and Magnetostriction method, Properties of ultrasonic waves, Applications of ultrasonic: SONAR and NDT (Pulse echo method).

Teaching methodologies:

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

Text Books:

1. Engineering Mechanics, 2nd ed.- MK Harbola, Cengage Learning
2. Mechanics, D S Mathur and P S Hemne, S Chand
3. I. G. Main, "Vibrations and waves in physics', 3rd Edn, Cambridge University Press, 2018
4. Applied Physics, T. Bhīma Sankaram, BSP Publishers.
5. Engineering Physics, P.K Palanisamy, Scitech Publishers.
6. AjoyGhatak, "Optics", McGraw Hill Education, 2012

References:

1. H. J. Pain, "The physics of vibrations and waves", Wiley, 2006
2. O. Svelto, "Principles of Lasers"
3. "Introduction to Mechanics", M.K.Verma, Universities Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH

Course Code: GR20A1006 **L/T/P/C:2/0/0/2**

I Year I Semester

Course Objectives:

The course will help to

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
3. Develop study skills and communication skills in formal and informal situations.
4. Understand the importance of defining, classifying and practice the unique qualities of professional writing style.
5. Employ the acquired knowledge in classroom with reference to various social and professional spheres thus leading to a life-long learning process

Course Outcomes:

Students will be able to

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. Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively by listening carefully and respect others point of view

UNIT I

Where the Mind is without Fear poem by Rabindranath Tagore

Vocabulary Building: 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

Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences-Importance of Proper Punctuation- Techniques for writing precisely – Paragraph writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT II

The Last Leaf by O. Henry

Vocabulary: Synonyms and Antonyms.

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

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Note Making, PrécisWriting, Writing an Abstract, Nature and Style of Sensible Writing- **Defining- 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-Verbs 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, Use of phrases for formal and informal letter writing.

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-Types of Essays- Picture Composition

UNIT V

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press. Vocabulary: Technical Vocabulary and their usage

Vocabulary: One Word Substitutes, Technical vocabulary and their usage

Grammar: Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

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

PROGRAMMING FOR PROBLEM SOLVING

Course Code: GR20A1007 **L/T/P/C: 2/1/0/3**

I Year I Semester

Course Objectives:

1. To interpret the various steps in program development.
2. To recall and recite the fundamentals, syntax and semantics of C programming language.
3. To illustrate problem solving using arrays, strings, structures and pointers.
4. To demonstrate using of structured and modular programming approach in solving problems.
5. To code, Interpret and debug the given program using files.

Course Outcomes:

1. To write algorithms and to draw flowcharts and remember and reuse the fundamentals of C language.
2. To apply decision making statements and arrays to solve problems.
3. To illustrate the need for strings and functions in problem solving.
4. To implement pointers and structures in writing programs.
5. To illustrate working with files and pre-processor directives in c.

UNIT I

Introduction to Programming: Introduction to Algorithms: Representation of Algorithm, Flowchart, Pseudo code with examples, Compiling &executing program, Syntax and logical errors.

Introduction to C Programming Language: Structure of c program,Variables, Data types, Constants,Operators, Expressions and precedence, Expression evaluation,Type conversion.

I/O: Simple input and output with formatted I/O and unformatted I/O.

UNIT II

Decision Making and Arrays: Conditional Branching and Loops: Conditional branching with if, if-else, nestedifelse, else if ladder, switch-case, Loops: for, while, do-while, Jumping statements: goto, break,continue.

Arrays: One and Two dimensional arrays, creating, Accessing and manipulating elements of arrays

Searching: Basic searching in an array of elements, Linear and Binary search.

UNIT III

Strings and Functions: 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.

Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function(categories of functions), call by value,call by reference,passing arrays to functions, recursion, merits and demerits of recursive functions, Storage classes.

UNIT IV

Pointers and Structures: Pointers: Idea of pointers, Defining pointers, Pointer to pointer, void pointer, Null pointer, Pointers to Arrays and Structures, Function pointer.

Structures and unions: Defining structures, Initializing Structures, Array of structures, Arrays within structures, Nested structures, Passing structures to functions, Unions, typedef.

UNIT V

File handling and Preprocessor in C:

Files: Text and Binary files, Creating and Reading and writing text and binary files, Random access to files, Error Handling in files, Command line arguments, Enumeration data type.

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef,elif.

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, PrenticeHall 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 GRAPHICS

Course Code: GR20A1010 **L/T/P/C: 1/0/4/3**

I Year I Semester

Course Objectives:

1. Provide basic conventions and standards used in Engineering Graphics.
2. Impart knowledge on various Engineering curves and their significance.
3. To draw orthographic, sectional and pictorial views of a given solid.
4. To develop skills in three dimensional visualization of engineering components.
5. To inculcate CAD packages on modelling and drafting.

Course Outcomes:

1. Familiarize with BIS standards and conventions used in engineering graphics.
2. Draw various engineering curves e.g., ellipse, parabola, cycloids and involutes etc and construct various reduced scales e.g., plain, diagonal and Vernier scales.
3. Differentiate between first angle and third angle methods of projection and distinguish parallel and perspective projection.
4. Visualize different views like elevation and plan for a given line, plane figures or solid objects.
5. Apply drafting techniques and use 2D software e.g., AutoCAD to sketch 2D plane figures.

Unit I

Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance; **Conic Sections-** ellipse, parabola and hyperbola – General method only. **Cycloidal curves** –cycloid**,** epi-cycloid and hypo-cycloid; **Scales**– plain and diagonal.

Unit II

Projections of Points, Lines and Planes: Introduction to principal planes of projections, **Projections of the points** located in same quadrant and different quadrants, **Projections of line** with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes. **Projections of regular planes** (polygons, circle and Square etc.,) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane.

Unit III

Projections of solids (regular and right solids only) - Classification of solids, Projections of solids (Cylinder, Cone, Pyramid and Prism) **Intersection of solids** – concept of lines of intersection and curves of intersection, intersection of solids (Prism Vs Prism and Cylinder Vs Cylinder) with their axes perpendicular to each other.

Unit IV

Section of solids – Sectional views of solids (Cylinder, Cone, Pyramid and Prism) and the true shape of the section, **Development of surfaces-** Development of surfaces of solids (Cylinder, Cone, Pyramid and Prism).

Unit V

Orthographic Projections: Fundamental of projection along with classification, Projections from the pictorial view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method; **Isometric Projections and Isometric View:** Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non-isometric lines. Isometric Projection of Spherical Parts, Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions

Introduction to CAD: (**For Internal Evaluation Weightage only**): Introduction to CAD Software Package Commands.- Free Hand Sketches of 2D- Creation of 2D Sketches by CAD Package

Text /Reference Books:

1. Engineering Drawing by N.D.BHATT/CHAROTAR PUBLISHING HOUSE PVT LTD
2. Engineering Drawing by BasanthAgrawal/ C M Agrawal/ McGraw Hill Education
3. Engineering Drawing by K.VenuGopal/New Age Publications.
4. Engineering Graphics Essentials with AutoCAD 2018 Instruction by KirstiePlatenberg/SDC publications.
5. Computer Aided Engineering Drawing / K Balaveerareddy et al-CBS publishers
6. Engineering Graphics and Design by Kaushik Kumar / Apurbakumar Roy / Chikesh

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING PHYSICS LAB

Course Code: GR20A1013 **L/T/P/C: 0/0/3/1.5**
I Year I Semester

Course Objectives:

1. Experiment with resonance phenomena using mechanical and electrical sources.
2. Analyze the mechanical properties of solid materials.
3. Recall the basic properties of light through hands on experience.
4. Apply the theoretical concepts of Lasers and optical fibers in practical applications.
5. Outline the characteristics of various semiconducting materials.

Course Outcomes:

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

1. Evaluate the frequency of tuning fork, spring constant through coupled oscillation and analyze the resonance phenomena in LCR circuit.
2. Compare the rigidity modulus of wires of different materials using Torsional pendulum.
3. Interpret the properties of light like interference and diffraction through experimentation.
4. Asses the characteristics of Lasers and infer the losses in optical fibers.
5. Identify the type of semiconductor by measuring energy gap.

LIST OF EXPERIMENTS:

1. Melde's experiment: To determine the frequency of a turning fork using Melde's arrangement.

2. Torsional pendulum: To determine the rigidity modulus of the given wire using Torsional pendulum.

3. Newton's rings: To determine the radius of curvature of the lens by forming Newton's rings.

4. Diffraction grating: To determine the wavelength of the light source by using diffraction grating.

5. Dispersive power: To determine the dispersive power of prism by using spectrometer.

6. Coupled Oscillator: To determine the spring constant by single coupled oscillator.

7. LCR Circuit: To determine the resonant frequency and quality factor of LCR circuit in series and parallel.

8. LASER: To study the V-I and P-I characteristics of LASER sources.

9. Optical fiber: To determine the Numerical aperture and bending losses of Optical fibers.

10. Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.

Note: Any 8 experiments are to be performed.

GOKARAJURANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING LAB

Course Code: GR20A1016 **L/T/P/C: 0/0/3/1.5**

I Year I Semester

Course Objectives:

1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. To write programs to create, read from and write to text and binary files.

Course Outcomes:

1. Formulate the algorithms for simple problems and translate algorithms to a working and correct program.
2. Identify, analyse and correct syntax and logical errors encountered during coding.
3. Interpret and implement programs using branching and looping statements.
4. Represent and manipulate data with arrays, strings and structures and use pointers.
5. Create, read and write to and from simple text and binary files and modularize the code with functions so that they can be reused

TASK 1

a. Write a C program to implement operators in c?
b. Write a C program to find greatest and smallest among three numbers using conditional operator.
c. Write a C program to implicit and explicit type conversion in c?

TASK 2

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 add two numbers without using arithmetic operators in c?

TASK 3

a. Write a C program to find the roots of a quadratic equation using if-else.
b. The program should request the user to input two numbers and display one of the following as per the desire of user. (a). Sum of numbers (b) difference of numbers (c) product of the numbers (d)division of the numbers. Write a C program using switch statement to accomplish the above task.

TASK 4

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.

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TASK 5

a. Write a C program to display the following patterns.

i) 1

2 3

4 5 6

7 8 9 10

ii. 1

2 3

4 5 6

7 8 9 10

b. 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.
c. Write a C program to calculate the following Sum:
    a. Sum=1+x/1!-x2/2!+x3/3!-x4/4!+…..xn/n!

TASK 6

1) Write a C program to find sum, average and minimum and maximum in a list of numbers.
2) Write a C program to implement linear search.
3) Write a C program to implement binary search.

TASK 7

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

TASK 8

a. Write a C program to implement the following string handling functions.
    i.strlen() ii.strcpy() iii.strcmp() iv.strcat()
b. Write a C program to read first name , middle name and last name of a student and display a string full name without using string handling functions.

TASK 9

a. Write a C program to determine if a String is Palindrome or not.
b. Write a C program to sort the names of n students in the alphabetical order.

TASK 10

a. Write a C program to implement the following using recursive and non-recursive functions to find the factorial of a given integer.
b. Write a C program to implement the following using recursive and non-recursive functions to find the GCD (greatest common divisor) of two given integers

TASK 11

a. Write a C program to implement transpose of a matrix using functions.
b. Write a C program to display binary equivalent of a given decimal number.

TASK 12

a. Create a structure student with name ,rollno,marks of 3 subjects as members . Write a c program to sort student details based on total using structures and functions .
b. Write a C program that uses structures and functions to perform the following operations:
    i. Addition of two complex numbers
    ii. Subtraction of two complex numbers
    iii. Multiplication of two complex numbers

TASK 13

a. Write a C program using functions and pointers that compares two strings to see whether they are identical. The function returns 1 if they are identical, 0 otherwise.
b. Write a C program to sort list of numbers using pointers.

TASK 14

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

TASK 15

a. Write a C program to merge two files into a third file.
b. Write a C program to find some of n numbers using command line arguments.

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, PrenticeHall 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. HerbertSchildt, C: The Complete Reference, McGraw Hill, 4th Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Course Code: GR20A1015 **L/T/P/C: 0/0/2/1**

I Year I Semester

Course Objectives:

The course will help to

1. Facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. Sensitize students to the nuances of English speech sounds, word accent, intonation rhythm and Neutralization of accent for intelligibility
3. Bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4. Improve the fluency of students in spoken English and neutralize their mother tongue influence
5. Train students to use language appropriately for public speaking and interviews

Course Outcomes:

Students will be able to

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. Evaluate and use a neutral and correct form of English.

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 and Strong Forms in Context.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in 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 – Exposure to Structured Talks.

Practice: Debates- Making a Short Speech – Extempore.

Exercise IV

CALL Lab:

Understand: Listening Skills and its importance-– Purpose- Process- Types- Barriers of Listening.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: How to make informal and Formal Presentations

Practice: Collages / Poster Presentations-Power point presentations

Exercise V

CALL Lab:

Understand: Listening for General/Specific Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Story Telling – Narrating a story – Using appropriate language elements

Practice: Weaving Stories

Minimum Requirement of infrastructural facilities for ELCS Lab:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN THINKING

Course Code: GR20A1020 **L/T/P/C: 2/0/0/1**

I Year I Semester

Course Objectives

1. Study a problem from multiple perspectives
2. Learn how to frame the design challenge properly.
3. Learn how to ideate, prototype and Iterate solutions.
4. Learn from the overall design process how to create value as entrepreneurs
5. Learn how to design successful products or enterprises

Course Outcomes

1. Students will be able to identify an Opportunity from a Problem
2. Students will be able to frame a Product/Service Idea
3. Students will be able to empathize with the customers
4. Students will be able to design and develop a Prototype
5. Students will be able to pitch their idea

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-Empathise, Define (the problem), Ideate, Prototype, and Test,

UNIT III: Ideation tools & exercises. Sample Design Challenge, Introduction to the Design Challenge Themes,Story telling and Tools for Innovation

UNIT IV: Empathize-Understand customers, Empathy Maps, Empathise-Step into customers 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 Pitch

TEXT BOOKS :

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

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: GR20A1002 **L/T/P/C: 3/1/0/4**

I Year II Semester

Course Objectives:

1. Knowledge to solve engineering problems governed by differential equations
2. The skill of evaluating multiple integrals needed for applications in mechanics and electro-magnetic field theory
3. The knowledge to interpret the functions arising in vector field theory and utilize mathematical tools for some computations
4. The skill of evaluating work done by a field and flux across a surface
5. The skill of utilizing specialized theorems for fast evaluation of work and flux

Course Outcomes:

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

1. Classify the differential equations of first order and solve them analytically by suggested methods
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 and mechanics
4. Apply vector differential operators on scalar and vector fields and apply them to solve 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

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

UNIT II

ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

LDE with constant coefficients: Complementary function, over damping, under damping and critical damping of a system, Particular integrals for *f(x)* of the form e^{ax}, x^n, $cosax$, $sinax$, $e^{ax}V(x)$ and $x\,V(x)$where $V(x) \equiv cosax \text{ and } sinax$, the method of variation of parameters.

LDE with variable coefficients: Cauchy's homogeneous equation, 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)

Applications: Area using the double integral –Volume of a solid using the double and triple integral-Mass, Center of mass and Center of gravity using double and triple integrals

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 theorems: 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, Fourth 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, 9thEdition, 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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY

Course Code: GR20A1005 **L/T/P/C: 3/1/0/4**

I Year II Semesters

Course Objectives:

1. To relate how the basic concepts and principles of chemistry can be applied to practical utility in a broader perspective of the society.
2. To distinguish the ranges of electromagnetic spectrum and its interaction with matter and to develop knowledge of various spectroscopic techniques at atomic and molecular levels.
3. To identify and apply various principles of electrochemistry, corrosion and water treatment which are essential for an engineer in industry
4. To acquire knowledge of existence of different organic molecules in different stereo chemical orientations useful for understanding reaction pathways.
5. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.

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 inengineering.
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: (8 Lectures)

Atomic and molecular orbitals, Linear Combination of Atomic Orbitals (LCAO), Molecular orbitals of homo-nuclear diatomic molecules, MO energy diagrams of N_2, and O_2.

Metallic bonding, Valence Bond Theory, Crystal Field Theory, Crystal Field Splitting of transition metal ion d-orbitals in tetrahedral, octahedral, and square planar geometries.

Unit II

Spectroscopic Techniques and Applications: (10 Lectures)

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 an harmonic oscillators of a diatomic molecule, selection rules, applications of IR spectroscopy.

NMR Spectroscopy: criteria for NMR activity (Magnetic and nonmagnetic nuclei), basic concepts and principle of 1H NMR spectroscopy, Chemical shift, Magnetic Resonance Imaging.

Unit III

Electrochemistry and Corrosion: (12 Lectures)

Electrochemistry**:** Electrode potential, types of electrodes: calomel and glass electrodes-construction and working, electrochemical series and applications, electrochemical cells: Galvanic & electrolytic cells, Nernst equation- applications, numerical problems, Batteries: primary and secondary types, lithium metal, lithium ion and lead acid batteries. Types of Fuel cells: hydrogen-oxygen fuel cell - applications and advantages, microbial fuel cell.

Corrosion: Definition ,causes and effects of corrosion, The ories of chemical and electro chemical corrosion with mechanism, Types of corrosion - Galvanic, concentration cell and pitting corrosions, factors affecting corrosion (Nature of metal & Nature of Environment), corrosion control methods: Proper designing, cathodic protection (sacrificial anodic and impressed current cathodic protection), Metallic coatings: Hot dipping- Galvanization and tinning, electroplating, electroless plating of nickel.

Unit IV

Engineering Materials and Water Technology: (8 Lectures)

Semiconductors: Si and Ge, preparation, purification and crystal growth by zone refining and Czochralski pulling methods, doping.

Polymeric Materials: plastics-classification, types of polymerization, properties of polymers-crystallinity, Compounding and fabrication by compression moulding and injection moulding, conducting polymers – definition, classification, applications of conducting polymers in mobile phones and displays.

Water: impurities, hardness-causes of hardness, types, Units, Total Dissolved Solids (TDS), Boiler troubles-scales and sludges, caustic embrittlement, water purification by reverse osmosis (RO)method.

Unit V

Stereochemistry and Energy Resources (8 Lectures)

Stereo chemistry: Representations of 3D structures for organic molecules, stereo isomers: Conformational and Configurational isomers. Conformational isomers: conformational analysis of n-butane. Configurational isomers: geometrical isomers (E, Z isomers) and optical isomers. Optical isomers: symmetry, chirality, enantiomers, diastereomers, optical activity. 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-synthetic petrol – Fischer Tropsch's process, cracking - Definition and its significance, knocking and its mechanism in Internal Combustion engine, Octane rating, Composition and Uses of Natural gas, LPG and CNG, biodiesel synthesis, biogas.

Text Books:

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

References:

1. Organic Chemistry by Morrison, Boyd &Bhattacharjee (Pearson Pubs)
2. Solomons' Organic Chemistry, Wiley pubs
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell. McGraw HillPublication
4. ATextbookofEngineeringChemistrybyShashiChawla,DhanpatRaiPublishingCompany(P) Ltd., New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING MECHANICS

Course Code: GR20A1009 **L/T/P/C: 3/1/0/4**
I Year II Semester

Course Objectives:

1. Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium.
2. Perform analysis of bodies lying on rough surfaces.
3. Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections.
4. Determine the forces in the members of the trusses.
5. Explain the concepts of work-energy method, impulse-momentum and its applications to translation, rotation and plane motion.

Course Outcomes:

At the end of the course students will be able to

1. Determine resultant of forces acting on a body and analyze equilibrium of a body subjected to a system of forces.
2. Solve problem of bodies subjected to friction.
3. Find the location of centroid and calculate moment of inertia of a given section.
4. Determine the forces in the members of the trusses
5. Solve problems using work energy equations for translation, fixed axis rotation and plane motion of rigid bodies.

Unit I

INTRODUCTION TO ENGINEERING MECHANICS - FORCE SYSTEMS

Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems ; Static Indeterminacy

Unit II

FRICTION

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw Centroid and Centre of Gravity-Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications.

Unit III

AREA MOMENT OF INERTIA

Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem, Mass Moment of Inertia , Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies

Unit IV

ANALYSIS OF TRUSSES

Introduction, Classification of trusses, Assumptions made in the analysis of perfect truss, Methods of Analysis of Trusses- Method of Joints and Method of Sections. Principle of Virtual Work: Equilibrium of ideal systems, efficiency of simple machines, stable and unstable equilibriums.

Unit V

REVIEW OF PARTICLE DYNAMICS

Rectilinear motion, Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion, Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work- kinetic energy, power, potential energy. Impulse-momentum (linear, angular), Impact (Direct and oblique).

Text/Reference Books:

1. Reddy Vijay Kumar K. and J. Suresh Kumar (2010), Singer's Engineering Mechanics – Statics & Dynamics
2. A. Nelson, "Engineering Mechanics: Statics & Dynamics", Tata McGraw-Hill Education, 2009.
3. Timoshenko S.P and Young D.H., "Engineering Mechanics", McGraw Hill International Edition, 1983.
4. Andrew Pytel, JaanKiusalaas, "Engineering Mechanics", Cengage Learning, 2014.
5. Beer F.P & Johnston E.R Jr. "Vector Mechanics for Engineers", TMH, 2004.
6. Hibbeler R.C & Ashok Gupta, "Engineering Mechanics", Pearson Education, 2010.
7. Tayal A.K., "Engineering Mechanics – Statics & Dynamics", Umesh Publications, 2011.
8. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press, 2008.
9. Meriam. J. L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons, 2008.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA STRUCTURES

Course Code: GR20A1011 **L/T/P/C: 2/1/0/3**
I Year II Semester

Course Objectives:

1. To impart the basic concepts of data structures, algorithms and various searching and sorting techniques.
2. To demonstrate operations of linear data structures like stacks and queues.
3. To develop algorithms to implement operations on linked lists.
4. To demonstrate operations of non-linear data structures trees and graphs.
5. To realize the merits and demerits and applications of various data structures.

Course Outcomes:

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

1. Analyze basic concepts of data structures, computation complexity and implement various searching and sorting techniques.
2. Apply various operations on linear data structures Stack and Queue and their applications.
3. Develop algorithms for operations on linked lists and convert them to programs.
4. Apply various operations on non-linear data structure tree.
5. Implement various graph traversals techniques and idea of hashing.

UNIT I

Sorting: Bubble sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort (Algorithms and implementation)
Algorithms: 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.

UNIT II

Stacks: Introduction to Data Structures: Basic Stack Operations-pop, push, display, delete. Representation of a Stack, Implementation of stack using Arrays, Stack Applications: Recursion, Infix to postfix Transformation, Evaluating Post-fix Expressions
Queues: Basic Queue Operations-enqueue, dequeue, Representation of a Queue using array, Implementation of Queue Operations using arrays, Applications of Queues, Circular Queue.

UNIT III

LIST: Introduction, Dynamic memory allocation, 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, Implementation of stack, queue using linked list. Circular linked list, Double linked list.

UNIT IV

TREES: Basic tree concepts, Binary Trees: Properties, Representation of Binary Trees using arrays and linked lists, Operations on a Binary Search Tree, Binary Search Tree Traversals (recursive), Creation of binary tree from traversals.

UNIT V

Graphs: Definition, Basic Terminology, Representation of Graphs, Graph Traversal Techniques –Breadth First Traversal, Depth First Traversal. Introduction to Hashing (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 Structure with C, Seymour Lipschutz, TMH
2. Classic Data Structures, 2/e, Debasis, Samanta, PHI, 2009
3.Fundamentals of Data Structure in C, 2/e, Horowitz, Sahni, Anderson Freed, UniversityPrees

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING CHEMISTRY LAB

Course Code: GR20A1014 **L/T/P/C: 0/0/3/1.5**
I Year II Semesters

Course Objectives:

1. Introduce practical applications of chemistry concepts to solve engineering problems.
2. To determine the rate constant of reactions from concentrations as a function of time.
3. Measure the molecular or ionic properties such as conductance, redox potentials
4. Synthesize a drug molecule to learn how organic compounds are prepared in industry.
5. Know the laboratory practices implemented in a research and industrial chemistry laboratory setting.

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: (any 12 experiments out of 14)

1. Determination total hardness of water by complexometric method using EDTA.
2. Determination of chloride content of water by Argentometry.
3. Redox titration: Estimation of ferrous iron using standard $KMnO_4$
4. Estimation of HCl by Conduct ometrictitrations
5. Estimation of Acetic acid by Conduct ometrictitrations
6. Estimation of Ferrous iron by Potentiometry using dichromate
7. Determination of rate constant of acid catalyzed reaction of methylacetate
8. Determination of acid value of coconut oil.
9. Adsorption of acetic acid by charcoal
10. Determination of surface tension of liquid by using stalagmometer
11. Determination of viscosity of liquid by using Ostwald'sviscometer.
12. Determinationofpartitioncoefficientofaceticacidbetweenn-butanolandwater.
13. Synthesis of Aspirin
14. Synthesis of Paracetamol.

Reference Books:

1. Vogel's text book of Practical organic chemistry, 5^{th}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, NewDelhi)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DATA STRUCTURES LAB

Course Code: GR20A1018 **L/T/P/C: 0/0/2/1**
I Year II Semester

Course Objectives:

1. To work with sorting techniques.
2. To translate algorithms to programs.
3. To develop programs to implement basic data structures.
4. To develop modular, reusable and readable C Programs.
5. To implement tree and graph traversals.

Course Outcomes:

1. Formulate the algorithms for sorting problems and translate algorithms to a working and correct program.
2. Implement stack and queue data structures and their applications.
3. Interpret linked list concept to produce executable codes.
4. Develop working procedure on trees using structures, pointers and recursion.
5. Implements graph traversal 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. Implement Quick sort using a C program.
b. Implement Merge sort using a C program.

TASK 3

a. Implementation of Stack operations using arrays in C.
b. Implementation of Queue operations using arrays in C.

TASK 4

a. Write a c program to convert Infix to Postfix expression.
b. Write a c program to evaluate a Postfix expression

TASK 5

a. Implement Circular Queue operations in C.

TASK6

a. Implement Single Linked List operations in C.

TASK 7

a. Implement Circular Linked List operations in C.

TASK 8

a. Implement Double Linked List operations in C.

TASK 9

a. Implement the following operations on Binary Search Tree.
   i. Create
   ii. Insert
   iii. Search

TASK 10

a. Implement Preorder, Inorder and Postorder traversals of Binary Search Tree using recursion in C.

TASK 11

a. Implement Depth First Traversal on graphs in C.

TASK 12

a. Implement Breadth First Traversal on graphs in C.

Teaching methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING WORKSHOP

Course Code: GR20A1019 **L/T/P/C: 1/0/ 3/2.5**

I Year II
Semester

Course objectives:

1. To prepare and practice of scientific principles underlying the art of manufacturing in workshop/manufacturing practices.
2. To demonstrate basic knowledge of various tools and their use in different sections.
3. To make students to execute applications of various tools in carpentry.
4. To make students recognize applications of manufacturing methods casting, forming machining, joining and advanced manufacturing methods.
5. To develop generate safety rules, safe practices and workshop dress code.

Course Outcomes:

At the end of the course students will be able to

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

LIFE SKILLS AND PERSONALITY DEVELOPMENT (LSPD)

Course Code: GR20A1021 **L/T/P/C: 2/0/0/1**

I Year II Semester

Course Objectives:

Students undergoing the course are expected to

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

Course Outcomes:

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

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

UNIT I

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

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

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

UNIT II

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

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

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

UNIT III

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

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

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

UNIT IV

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

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

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

UNIT V

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

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

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

Textbooks:

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

Reference:

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

II YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BUILDING MATERIALS AND CONSTRUCTION PLANNING

Course Code: GR20A2009 **L/T/P/C: 2/0/0/2**

II Year I Semester

Course Objectives:

1. Identify various building materials and their structural requirements.
2. Explain the significance of cement and lime in construction.
3. Identify the suitable material for construction and various building components.
4. Review different types of masonry construction.
5. Discuss about various building services and planning and their characteristics.

Course Outcomes:

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

1. Distinguish between various types of building stones, bricks and tiles and their structural requirements.
2. Recognize the need and process of manufacture of cement and lime.
3. Identify function of various materials like wood, glass, paints and building components.
4. Find the importance of masonry, finishing and form woks.
5. Assess various building services and principles of building planning.

Unit I

Building Stones, Bricks and Tiles

Stone- Building stones, classification of building stones, quarrying procedures, characteristics of good building stone, dressing, and tools for dressing of stones. Bricks -Composition of brick earth, manufacturing of brick, characteristics of good brick, field and lab test. Tiles - Types of tiles, manufacturing of tiles, structural requirements of tiles.

Unit II

Cement, Lime, Admixtures

Ingredients of cement, manufacturing of cement. Admixtures - physical admixtures, chemical admixtures. Lime -Various ingredients of lime, constituents of limestone and classification of lime, manufacturing of lime.

Unit III

Wood, Glass, Paints

Wood- structure, types of wood, properties of wood, seasoning, defects, alternative material for wood. Glass-types of glasses, manufacturing of glass. Paints -Constituents of paints, types of paints. Introduction to Building Components -Lintel, arches, staircase, floors, roofs, foundation. Joinarys-Doors, windows, materials and types.

Unit IV

Masonry and Finishing, Form Works

Brick Masonry- Types and bonds. Stone Masonry- Types. Finishing- plastering, pointing and cladding- Types of ACP (Aluminum composite panel). Form Works - requirements, standards, Scaffolding, shoring, under pinning.

Unit V

Building Services and Building Planning

Building Services- Plumbing services, water distribution, sanitary lines and fittings, ventilators, functional requirements, air conditioning essentials and types, acoustics. Characteristics- Absorption, fire protections, fire hazards, classification of fire resistance materials and construction. Building Planning - Principles of building planning, classification of building and building by-laws, Typical Building Byelaws as per National Building Code and General Development Control Regulation.

Text/Reference Books:

1. SK Duggal, Building Materials, New Age Publications 4th Edition, April, 2014.
2. B C Punmia, Ashok Kumar Jain and Arun Kumar Jain, Building Construction, Laxmi Publications (P) Ltd., New Delhi, 10th Edition, 2013.
3. Roy Chudley "Construction Technology" Vol. – 1 & 2,2nd Edition, Longman, UK, 1987.
4. P C Varghese, Building Construction, Prentice Hall of India Private Ltd., New Delhi, 2nd Edition, 2007.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING GEOLOGY

Course Code: GR20A2010 **L/T/P/C: 2/0/0/2**
II Year I Semester

Course objectives:

1. Recognize the importance of weathering.
2. Identify the physical properties of minerals and their importance in Civil Engineering
3. Express knowledge on various types of rocks and their study.
4. Analyse various geological structures like faults, folds, joints and unconformity.
5. Identify various consequences of water table, landslides and earthquakes.

Course outcomes:

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

1. Identify the weathering effects and various deposits.
2. Recognize the minerals and its importance from civil engineering point of view.
3. Distinguish features of igneous, sedimentary and metamorphic rocks.
4. Recognize various geological structures and the failures of dams, reservoirs and tunnels due to geological reasons
5. Relate water table and the failures of earthquake and landslides

Unit I

Physical Geology

Branches of geology useful to civil engineering, Scope of geological studies in various Civil Engineering projects. Weathering, Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. Development of river, River meandering, Alluvial cones and fans, Placer Deposits, Delta deposits and natural levees.

Unit II

Mineralogy

Mineralogy - Mineral, Origin and composition. Physical properties of minerals, Role of study of physical properties of following common rock forming minerals: Feldsper, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Megascopic identification of common primary & secondary minerals.

Unit III

Petrology

Rock forming processes. Specific gravity of rocks. Field Classification chart. Igneous rocks - Various forms of rocks, Structures and Classification of Igneous rocks on the basis of Chemical composition. Texture and its types. Detailed study of Igneous rocks like Granite, Pegmatite, Dolerite and Basalt. Sedimentary rocks - mode of formation, Structures and Textures. Detailed study of Conglomerate, Sandstone, Shale and Limestone. Metamorphic rocks - structures and textures in metamorphic rocks. Important distinguishing features of rocks as Lineation and Foliation. Detailed study of Gneiss, Schist, Slate.

Unit IV

Structural Geology

Outcrop and width of outcrop. Fold - Types and nomenclature, Criteria for their recognition in field Faults: Classification, recognition in field. Types of Joints & Unconformity. Geological structures - Required geological consideration for selecting dam, reservoir and tunnel site.

Unit V

Earthquake and Landslides

Pervious & impervious rocks and ground water. Earthquake - Magnitude and intensity of earthquake. Seismic zone in India. Consequences of failure due to Land sliding and Earthquake.

Text Books

1. N.Chennkesavulu, Mc-Millan, Text book of Engineering Geology, India Ltd. 2005, 2nd edition, 2009, Reprint 2012
2. K.V.G.K. Gokhale, Principles of Engineering Geology, B.S publications, 2005

References Books

1. P.C.Varghes, Engineering Geology for Civil Engineers, PHI learning, New Delhi,2012
2. F.G. Bell, Fundamental of Engineering Geology, Butter worths Publications London, New Delhi, B.S publications-2005
3. Krynine& Judd, Principles of Engineering Geology & Geotechnics, McGraw Hill New york 1956

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOLID MECHANICS - I

Course Code: GR20A2011 **L/T/P/C: 2/1/0/3**
II Year I Semester

Prerequisite: Mathematics, Engineering Mechanics.

Course Objectives:

1. Knowledge of engineering materials based on first energy principles, deformation and strain, concept of strain energy, momentum balance, stress and stress states, elasticity and elasticity bounds, plasticity and yield design.
2. Skill to determine the Principal stresses and strains under different loading using analytical and Mohr's Circle method.
3. Understanding the shear force and bending moment for different types of beams which allows them to understand, modeling and design of a large range of engineering materials.
4. Utility to evaluate the flexural and shear stress concepts for the different materials and shapes of the structure.
5. Knowledge on deflection of beam for different materials under various loading conditions using moment area, double integration & Macaulay's method.

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

1. Determine the stresses, strains, elastic constants such as modulus of elasticity, modulus of rigidity, Poisson's ratio and bulk density. And also to determine the strain energy for various types of loading.
2. Analyze the principal stresses and strains in different planes by using analytical and graphical methods
3. Determine the shear force, bending moment diagrams and identify the point of contra flexure for different types of beams such as cantilever, simple supports and fixed beams with different loading.
4. Formulate the bending equation and shear equation to calculate the bending stresses and shear stresses for the different sections of the structural members.
5. Evaluate the slope and deflection of different beams for different end conditions and loads by using double integration, Macaulay's and Moment area methods.

Unit I: Simple Stresses and Strains

Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law – stress – strain diagram for mild steel -- Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience– Gradual, sudden, impact and shock loadings – simple applications.

Unit II: Compound Stresses and Strains

Two dimensional system, stress at a point on an inclined section of a bar under axial loading-Normal and Tangential stresses on an inclined plane for biaxial stresses-two perpendicular normal stresses accompanied by a state of simple shear-Mohr's circle of stresses.

Principal stresses and strains -Analytical and graphical solutions-Various theories of failures-Maximum Principal stress theory-maximum shear stress theory- Maximum strain energy theory-Maximum shear strain energy theory.

Unit III: Bending Moment and Shear Force Diagrams

Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments. Relationship between SF, BM and rate of loading at a section of beam.

Unit IV: Flexural Stresses

Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ - Neutral axis – Determination of bending stresses –Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

Unit V: Slope and Deflection

Relationship between moment, slope and deflection, double integration method, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinate beams.

Text /Reference Books:

1. Dr.B.C.Punmia, Mechanics of Materials, Laxmi publications, 10thEdition, 2013.
2. B. S. Basavarajaiah, Strength of Materials, University Press, Hyderabad, 3rd Edition, 2010.
3. Dr.R.K.Bansal, Strength of material, Laxmi Publications, New Delhi, 5thEdition, 2012.
4. Ferdinand Beer and others, Mechanics of Solid, Tata Mc. Graw Hill publications, 6th Edition,2000.
5. Schaum' soutline series , Strength of materials, Mc.GrawHillInternationalEditions,6th Edition, 2011.
6. R.K.Rajput, Strength of materials, S.Chand &Co, NewDelhi, 5thEdition, 2010.
7. A.R.Basu, Strength of materials, Dhanpat Rai &Co,NaiSarah,New Delhi, 2nd Edition, 2010.
8. BhaviKatti, Strength of materials, New Age Publications, 3rd Edition, 2008, Re-print 2009.
9. R. Subramanian, Strength of materials Oxford University Press, New Delhi, 2rd Edition, 2010.
10. S. Ramamrutham, Strength of material- Dhanpat Rai Publishing Company, New Delhi, 15thEdition,2007.
11. R.S.Khurmi, Strength of material-S.Chand & CompanyLtd., NewDelhi, 2010 Re-print.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTATIONAL MATHEMATICS FOR ENGINEERS

Course code: GR20A2008 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives:

1. Distinguish between analytical and numerical solutions arising in mathematics.
2. Take part in providing solutions to problems hitherto unsolvable due to their complex nature.
3. Construct a hidden function from given data
4. Interpret concepts like interpolation, numerical differentiation and integration.
5. Utilize the concept of finite differences and its applications in numerical techniques**.**

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

1. Apply well known techniques to find real roots of an equation and linear algebraic systems by iterative methods.
2. Utilize interpolation techniques for univariate and bivariate data using Gaussian and cubic spline methods.
3. Apply numerical techniques to find eigenvalues and corresponding eigenvectors of a matrix.
4. Make use of numerical techniques in differentiation and integration.
5. Model finite differences method to solve IVP in ODE and PDE.

UNIT-1

Root finding and Numerical solution of linear algebraic systems

Finding the real root of an equation by regula-falsi and Newton Raphson method-Gauss Jacobi and Gauss Seidel iterative methods to solve a linear algebraic system

UNIT-II

Interpolation and Cubic spline

Interpolation with non-uniform data: Newton divided differences formula, Hermite interpolation, Interpolation with uniform data- Newton and Gauss formulas-Newton's bivariate interpolation for uniform data,Fitting natural cubic spline to data

UNIT-III

E**igenvalues and Eigenvectors**

Jacobi iteration method for finding all eigenvalues and eigenvectors of a symmetric matrix-Power method and inverse power method for finding the largest and smallest eigenvalues and eigenvectors of a matrix

UNIT-IV

Numerical differentiation and Numerical integration

Numerical differentiation using the Newton's forward, backward and central difference formulas. Numerical integration by Trapezoidal rule, Simpson's 1/3rd and $3/8^{th}$ rules, Gauss-Legendre one point, two point and three point rules.

UNIT-V

Numerical solution of initial and boundary value problems in ODE and PDE

Euler and R-K fourth order methods to solve initial value problems in ODE- Finite differences method to solve boundary value problems in ODE- Solution of Laplace's equation by Jacobi and Successive over relaxation (SOR) methods

TEXT BOOKS

1. M.K.Jain, S.R.K. Iyengar, R.K.Jain-.Numerical methods for scientific and engineering computation-New Age International publishers-Fourth edition-2—3
2. Robert J.Schilling and Sandra L.Harries- Applied numerical methods for engineers using MATLAB and C-Thomson Brooks/Cole-2002

REFERENCE BOOKS

1, GRIET reference manual

2. S.S.Sastry- Introductory methods of numerical analysis- Prentice Hall (India)- Fourth edition-2010

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTRODUCTION TO FLUID MECHANICS

Course Code: GR20A2012 **L/T/P/C: 3/0/0/3**

II Year I Semester

Pre Requisite: Mathematics, Physics.

Course Objectives:

1. To introduce the concepts of fluid mechanics useful in Civil Engineering application
2. Measurement of pressure, computations of hydrostatic forces and the concepts of Buoyancy all final useful applications in many engineering problems.
3. Identifying the nature and behavior of fluid flows and distinguish fluid dynamics and kinematics
4. Describe the boundary layer flows and predict the drag and lift forces
5. Classify the head losses in pipe flows and skill seeing of measurement of flows.

Course Outcomes:

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

1. Comprehend the various fluid properties and fluid statics.
2. Understand the broad principles of hydrostatic forces on submerged planes
3. Analyzing fluid dynamics and kinematics.
4. classify concept of boundary layer and predict the laminar and turbulent flows
5. Predict the losses in pipes flows and able to calculate discharge measurement.

Unit-I

Basic Concepts and Definitions Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility. Fluid Statics - Fluid Pressure: Pressure at a point, Pascal law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micro manometers. pressure gauges

Unit-II

Hydrostatic Law, Hydrostatic pressure and force: horizontal, vertical and inclined curved surfaces. Introduction explanatory to Buoyancy and meta centre

Unit-III

Fluid Kinematics- Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows ,Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three - dimensional continuity equations in 3D-Cartesiancoordinates

Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter, Momentum principle; Forces exerted by fluid flow on pipe bend;

Unit-IV

Boundary Layer Analysis-Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Controlof boundary layer. N-S equation explanatory.

Laminar Flow- Laminar flow through straight circular pipes.

Turbulent Flow- Reynolds experiment, Transition from laminar to turbulent flow. Definition of turbulence, Causes of turbulence, effect of turbulent flow in pipes. Characteristics of laminar and turbulent flows

Unit-V

Flow through Pipes: Loss of head through pipes, Darcy-Wiesbatch equation, minor losses (explanatory), total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel.

Measurement of Discharge and Velocity : Flow over rectangular, triangular and trapezoidal and Stepped notches. Venture meter, orifice meter and pitot tube.

Text Books

1. Modi and Seth, Fluid Mechanics, Standard book house, 19th Edition, 2011.
2. S.K.Som & G.Biswas, Introduction to Fluid Machines, Tata Mc.Graw Hill publishers,Pvt. Ltd., 3rd Edition, 2012.
3. Edward J. Shaughnessy, M. Katz and James P. Schaffer, Introduction to FluidMachines, Oxford University Press, New Delhi, 1st Edition, 2005

References Books

1. J.F.Douglas, J.M. Gaserek and J.A.Swaffirld, Fluid Mechanics, 5th longmanEdition, 2005.
2. Frank.M. White, Fluid Mechanics, Tata Mc. Graw Hill Pvt. Ltd, 4th Edition, 2013.
3. A.K. Mohanty, Fluid Mehanics, Prentice Hall ofIndia Pvt. Ltd., New Delhi, 2nd Edition, 1994.
4. Dr. R.K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi
5. Publications (P) ltd., New Delhi, 9th Edition, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SURVEYING AND GEOMATICS

Course Code: GR20A2013 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course objectives:

1. Describe the function of surveying in civil engineering construction and work with survey observations, and perform calculations.
2. To introduce basics and concepts of curves which will enable to setup and map the curves on ground with precision.
3. To understand the working of Total Station equipment and solve the surveying problems.
4. To introduce basics and concepts of aerial photography, acquisition and mapping from aerial photographs using different types of stereo plotters.
5. The objective of this course is to familiarize about the principles of remote sensing, data acquisition and analyse of satellite data.

Course Outcomes:

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

1. Apply the knowledge, techniques, skills, and applicable tools of the discipline to Engineering and surveying activities.
2. To be able to calculate, design and layout of horizontal and vertical curves, Understand, interpret, and prepare plan, profile, and cross-section drawings.
3. Understand the advantages of electronic surveying over conventional surveying methods.
4. Acquire knowledge about photogrammetry principles, methods and. product generation strategies in both Analytical and digital Photogrammetry system.
5. Acquire knowledge about the principles and physics of Remote sensing and data acquisition and getting familiarized with various data analysis techniques.

Unit I: Introduction to Surveying

Introduction - Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.
Measurement of Distances and Directions Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.
Prismatic Compass - Bearings, included angles, Local Attraction, Magnetic Declination and dip

Unit II: Leveling

Simple Leveling: Basic definitions; Types of levels and levelling staves - classification of methods of leveling; Sources of errors in leveling - Curvature and Refraction – Contour: contour interval; Characteristics of contours; Methods of plotting of contours; Uses of contour maps.
Areas and Volumes: Introduction- Simpson's rule - Boundaries with offsets at irregular intervals - coordinate method - planimeter; level section - two level section - trapezoidal and prismoidal rule - volume from contour plan - capacity of a reservoir.

Unit III:

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometric leveling when base is accessible and inaccessible.

Traversing: Methods of traversing, traverse computations and adjustments, Omitted measurements

Unit IV:

Curves: Types of curves and their necessity, elements of simple, compound, reverse, transition and vertical curves.

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tachometry.

Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Field Procedure for total station survey, Errors in Total Station Survey, Global Positioning System- Principle and Applications.

Unit V: Photogrammetry Surveying

Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes. Digital Photogrammetry – Introduction.

Text/Reference Books:

1. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: TotalStation, GISand Remote Sensing, Pearson India, 2006.
2. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011.
3. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010.
4. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P)Limited, 2002.
5. Anji Reddy, M., Remote sensing and Geographical information system, B.S.Publications, 2001.
6. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING GEOLOGY LAB

Course Code: GR20A2014 **L/T/P/C: 0/0/4/2**

II Year I Semester

Course Objectives:

1. Identify various Rocks and Minerals, their physical properties and use in industry.
2. Study the macroscopic description of few Rocks and Minerals.
3. Based on topic, usage of different rocks and minerals in commercial aspect.
4. Interpret various Geological maps showing structures like faults, folds, beds and unconformities etc.
5. Solve structural geology problems.

Course Outcomes:

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

1. Identify various minerals and their properties.
2. Identify various rocks and their properties.
3. Understand various rocks and minerals used in the industries.
4. Prepare and interpret various sections of geological maps showing structures like faults, folds and Unconformities etc.
5. Resolve simple structural Geology problems.

CONTENTS:

1. Study of physical properties and identification of minerals referred under theory.
2. Megascopic description and identification of rocks referred under theory.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, Unconformities etc.
4. Simple Structural Geology problems.

LAB EXAMINATION PATTERN:

1. Description and identification of six minerals.
2. Description and identification of six rocks (including Igneous, Sedimentary and Metamorphic Rocks).
3. Interpretation of a Geological map along with a geological section.
4. Simple strike and Dip problems.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOLID MECHANICS LAB

Course Code: GR20A2015 **L/T/P/C:0/0/4/2**
II Year I Semester

Prerequisites: Engineering Mechanics, Mathematics and Physics.

Course Objectives:

1. Understanding the effect of tension in mild steel bars under tensile loading.
2. Skill to examine the resistance of various materials using hardness test and impact test
3. Find the modulus of rigidity in springs using spring test.
4. An idea on the compressive stress of concrete, wood etc.
5. Knowledge of pure bending theory and evaluate the Young's modulus of materials and Maxwell's reciprocal Theorem on beams.

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

1. Determine the important mechanical properties of materials.
2. Identify the stiffness of an elastic isotropic material.
3. Evaluate the Reciprocal theorem.
4. Measure any substance's resistance to uniform compression.
5. Resistance of various materials against abrasion and impact.

Task- 1: Tension test on metals

Task- 2: Torsion test on metals

Task- 3: Hardness test on metals

Task- 4: Spring test on metals

Task-5: Compression test on wood or concrete or brick or block.

Task-6: Impact test on metals.

Task-7: Deflection test on continuous beam.

Task-8: Deflection test on cantilever beam.

Task-9: Deflection test on simply supported beam.

Task-10: Verification of Maxwell's Reciprocal theorem on beams.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

VALUE ETHICS AND GENDER CULTURE

Course Code: GR20A2002 **L/T/P/C:2/0/0/2**

II Year I Semester

Course objectives:

1. To understand about the importance of ethical values
2. To understand the significance of human conduct and self-development
3. To enable students to imbibe and internalize the value and Ethical behaviour in personal and professional lives.
4. To provide a critical perspective on the socialization of men and women.
5. To create an awareness on gender violence and condemn it.

Course Outcomes

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 labour, 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: R. Subramanian, Oxford University Press, 2015.
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, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, 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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL SCIENCE

Course Code: GR20A2001 **L/T/P/C:2/0/0/2**

II Year I Semester

Course Objectives:

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations
4. Integrate human ecology and science of environmental problems.
5. The effect of human activities on atmospheric pollution

Course Outcomes:

Based on this course, the Engineering graduate will

1. Understand the harmonious co-existence in between nature and human being
2. Recognize various problems related to environment degradation.
3. Develop relevant research questions for environmental investigation.
4. Generate ideas and solutions to solve environmental problems due to soil, air and water pollution.
5. Evaluate and develop technologies based on ecological principles and environmental regulations which in turn helps in sustainable development.

UNIT-I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnification, ecosystem resources and resilience, ecosystem value, services and carrying capacity.

UNIT-II

Natural Resources: Classification of Resources: Living and Non-Living resources, natural capital & Resources water resources: use and over utilization of surface and ground water, conflicts over water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards.

Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Waste water Treatment methods: Primary, secondary and Tertiary.
Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. Anthropogenic activities, influence on the occurrence of COVID-19 Pandemic? How environment benefitted due to global lockdown arising out of corona outbreak.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Life cycle analysis (LCA), Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Resource exploitation, Crazy Consumerism, Environmental Education, Environmental Ethics, Concept of Green Building.

TEXT BOOKS:

1. Environmental Studies by Anubha Kaushik, 4th Edition, New Age International Publishers.
2. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

REFERENCE BOOKS:

1. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications..
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela.2008 PHI Learning Pvt. Ltd.
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
5. Introduction to Environmental Science by Y. Anjaneyulu, BS Publications.
6. Environmental Studies by R. Rajagopalan, Oxford University Press.

II YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SOLID MECHANICS- II

Course Code: GR20A2016 **L/T/P/C: 2/1/0/3**

II Year II Semester

Prerequisites: Mathematics, Physics, Engineering Mechanics and Solid Mechanics I

Course Objectives:

1. Knowledge of various stresses in thin and thick cylinders under pressures and show stress distribution diagrams.
2. Introduce concept of torsion and bending in circular shafts and springs.
3. Evaluate the bulking or failure load for axially loaded and eccentrically loaded columns and struts.
4. Knowledge of direct and bending stresses in concrete structures like retaining wall, chimney, dams, and stability in dams.
5. Describe unsymmetrical bending in simply supported beams and to memorise beams in curved plan.

Course Outcomes:

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

1. Compute various stresses in thin and thick cylinders under pressure, show stress distribution diagrams and define Lame's theorems.
2. Analyse the torsional strength of structural members and differentiate between closed and open coiled helical springs.
3. Determine the buckling failure load for axially loaded and eccentrically loaded columns.
4. Evaluate stresses in chimneys, retaining walls and dams and to check the stability of dams.
5. Evaluate the behaviour of members under unsymmetrical bending and locates hear centres for the section and find stresses in circular and semi-circular beams.

Unit I: Thin Cylinders and Thick Cylinders

Derivation of formula for longitudinal and calculation of hoop stress, longitudinal stress in a cylinder, longitudinal and volumetric strains, changes in diameter, volume of thin cylinders and sphere subjected to internal pressures. Introduction -Lame's theory for thick cylinders- Derivation of Lame's formulae, distribution of hoop, radial stresses across thickness due to internal pressure, design of thick cylinders and thick spherical shells.

Unit II: Torsion and Springs

Derivation of torsion equation and its assumptions**,** Torsional moment of resistance, polar section modulus, power transmitted by shafts, torsional rigidity, combined bending, torsion and end thrust of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion.

Springs Introduction, types of springs, analysis of close coiled helical spring.

Unit III: Columns, Struts and Beam Columns

Introduction –Types of columns–Short, medium, and long columns**.** Axially loaded compression members, crushing load. Euler's theorem for long columns, assumptions, derivation of Euler's critical load formulae for various end conditions. Effective length of a column, slenderness ratio, Euler's critical stress. Limitations of Euler's theory. Rankine's formula, Gordon formula. Long columns subjected to eccentric loading. Secant formula, Empirical formulae. Straight line formula.

Beam Columns: Laterally loaded struts subjected to uniformly distributed concentrated loads, Maximum B.M and stress due to transverse and lateral loading.

Unit IV: Direct and Bending Stresses of Chimneys, Retaining walls and Dams

Stresses under the action of direct loading and bending moment, core of a section**.** Determination of stresses in the case of chimneys, retaining walls and dams. Conditions for stability of dams. Stresses due to direct loading and bending moment about its axis.

Unit V: Unsymmetrical Bending of Beamsand Curved Beams

Introduction–Centroid principal axes of section–Graphical Stresses in beams subjected to unsymmetrical bending. Principal axes- Resolution of bending moment into two rectangular axes through the centroid - Location of neutral axis. Deflection of beams under unsymmetrical bending.

Curved Beams: Introduction – Circular beams loaded uniformly and supported on symmetrically placed columns and Semi-circular beams simply supported on three equally spaced supports.

Text/Reference Books:

1. R.K Bansal, A textbook of Strength of materials, Laxmi Publications(P)Ltd., NewDelhi, 6th Edition,2018.
2. B.S. Basavrajaiah and P. Mahadevappa,Strength ofmaterials, University Press, Hyderabad, 3rd Edition, 2010.
3. S.S. Bhavikatti, Strength of materials, Vikas Publications, 4th Edition,2010.
4. Ferdinand Beer and others, Mechanics of solid, Tata Mc. Graw Hill Publications, 6th Edition.
5. S.Rama Krishna and R.Narayan, Strength of materials, Dhanpat Rai Publications.
6. R.K.Rajput, Strength of materials,S.Chand&Co,NewDelhi,5th Edition,2010.
7. A.R.Basu,Strength of materials, Dhanpat Rai & Co, NaiSarah, NewDelhi, firstrevisedon 2005, Re-print 2009.
8. L.S.Srinath, Strength of materials, Macmillian India Ltd.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Course Code: GR20A2017 **L/T/P/C: 3/0/0/3**

II Year II Semester

Course Objectives:

1. Understand and apply fundamental electrical theory and laws in basic series and Parallel dc circuits including ohm's law, power, application of ohm's law & Kirchhoff's laws.
2. Learn the principle, working operations of various DC and AC machines.
3. Measure the fundamental electrical quantities using digital and analog multi-meters and an oscilloscope.
4. Learn the rectification (AC to DC) by using diodes.
5. Learn the basic semiconductor switching devices and its characteristics.

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

1. Know the application of ohms law & Kirchhoff's laws.
2. Know about fundamental principles of electrical machines.
3. Measure the fundamental electrical quantities using oscilloscope.
4. Illustrate the basic principles of semi conducting devices.
5. Analyse the different applications of a transistor.

UNIT I:

Electrical Circuits : Basic definitions, Types of elements, Ohm's Law, Resistive networks, Kirchhoff's Laws, Inductive networks, capacitive networks, Series, Parallel circuits and Star-delta and deltastar transformations.

UNIT II:

DC Machines and AC Machines Principle of operation of DC Generator - emf equation - types– DC motor types – torque equation– applications – three point starter. Principle of operation of alternators – regulation by synchronous impedance method – Principle of operation of induction motor – slip – torque characteristics – applications.

UNIT III:

Transformers and Instruments Principle of operation of single phase transformers – EMF equation – losses – efficiency and regulation. Basic Principle of indicating instruments – permanent magnet moving coil and moving iron instruments. Cathode Ray Oscilloscope Principles of CRT (Cathode Ray Tube), Deflection, Sensitivity, Electrostatic and Magnetic deflection, Applications of CRO - Voltage, Current and frequency measurements.

UNIT IV:

Diode and its Characteristics P-N junction diode, symbol, V-I Characteristics, Diode Applications, and Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems).

UNIT V:

Transistors P-N-P and N-P-N Junction transistor, Transistor as an amplifier, SCR characteristics and applications.

Text/Reference Books:

1. David V. Kerns, JR. J. David Irwin, Essentials of Electrical and Computer Engineering.
2. V.K.Mehta, S.Chand& Co, Principles of Electrical and Electronics Engineering.
3. M.S Naidu and S. Kamakshaiah, Introduction to Electrical Engineering,TMH Publications.
4. Kothari and Nagarath, Basic Electrical Engineering, TMH Publications, 2nd Edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
STRUCTURAL ANALYSIS - I

Course Code: GR20A2018 **L/T/P/C: 3/0/0/3**
II Year II Semester

Prerequisites: Engineering Mechanics, Solid mechanics.

Course Objectives:

1. Skill to Estimate the deflections of simple beams and pin-jointed trusses using energy theorems.
2. Ability to analyze three and two hinged, circular and parabolic arches
3. Knowledge to Analyze statically in-determinate structures using force and displacement methods.
4. To understand the effect of moving loads and analyse statically determinate beams and simple trusses.
5. To understand the effect using influence diagrams in analysis of statically determinate beams and simple trusses.

Course Outcomes:

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

1. Determine deflections of beams and trusses using energy methods.
2. Analyse three and two hinged of circular and parabolic arches.
3. Analyse indeterminate beams using force method for propped cantilever, fixed and Continuous beams (Clapeyorns's three moment theorem).
4. Apply Slope deflection, Moment distribution and Kani's methods to analysestatically In-determinate structures.
5. Analyse statically determinate structures using rolling load and influence line methods.

Unit I: **Energy Theorems:**

Introduction – strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castiglione's first theorem – Deflections of simple beams and pin jointed trusses(Use Unit load method)

Unit II: **Arches:**

Classification of arches, advantage of arch, three and two hinged arches – Circular and parabolic arches yielding of supports, Effect of rib shortening, Effect of temperature changes, Tied and linear arch, Eddy's theorem.

Unit III: Indeterminate Beams (Force Method)

a. Propped cantilevers
b. Fixed beams
c. Continuous Beams (By Clapeyorns's theorem of threemoments).

Unit IV: Analysis of Simple and Continuous Beams (Indeterminate Structures)

(up to 2nd degree of Static in-determinacy)

a. Slope Deflection method

b. Moment Distribution method

c. Kani's Method.

Unit V: Moving Loads and Influence Line Diagrams:

Introduction, maximum SF and BM at a given section and absolute maximum S.F and B.M due to single concentrated load, U.D load longer than the span, U.D load shorter than the span, two point loads with fixed distance between them and several point loads – Equivalent uniformly distributed load – focal length.

Definition of influence line for SF, Influence line for B.M- load position for maximum SF at a section –Load positions for maximum BM at a section – Point loads , UDL longer than the span, UDL shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

Text/Reference Books:

1. V. N. Vazirani& M. M. Ratwani, Analysis of structures –Vol. & Vol. II, Khanna Publications,New Delhi.
2. T.S. Thandavamoorthy, Analysis of structures, Oxford University Press, New Delhi.
3. S.S Bhavikatti, Structural Analysis, Vikas Publishing House.
4. S.B. Junnakar, Mechanics of structures, Charotar Publishing House, Anand, Gujarat.
5. Pandit& Gupta, Theory of structures, Tata Mc. Graw Hill Publishing Co. Ltd., New Delhi.
6. R. S. Khurmi, Theory of structures, S. Chand Publishers.
7. B. C. Punmia, Strength of materials and Mechanics of Structures, Khanna Publications, New Delhi.
8. B.D. Nautical, Introduction to structural analysis, new age internationalpublishers,New Delhi

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ECONOMICS AND ACCOUNTING FOR ENGINEERS

Course Code: GR20A2004 **L/T/P/C : 3/0/0/3**

II Year II Semester

Course Objectives:

1. To provide the student with a clear understanding of demand analysis, elasticity of demand and demand forecasting;
2. To provide the insight on theory of production and cost analysis.
3. To describe different types of markets and competition and to elaborate the different forms of organisation and different methods of pricing.
4. To make the students understand various capital budgeting techniques
5. To Provide an insight of fundamental of accounting and emphasis on describe final accounts preparation

Course Outcomes: After studying this course, students will be in a position 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-1: Introduction & Demand Analysis: ***Definition and Scope:*** Introduction to Economics, Nature and Scope of Managerial Economics. ***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-2: 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-3: 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 Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types.

Unit-4: 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-5: 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. Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.
2. Managerial Economics: Analysis, Problems and Cases - P. L. Mehta, Edition, 13. Publisher, Sultan Chand, 2007.
3. Financial Accounting -1: S P Jain and K. L. Narang, Kalyani Publishers,2005.

Reference Books

1. Peterson, Lewis and Jain: Managerial Economics, Pearson, 2009
2. Mithani : Managerial Economics , HPH, 2009
3. Lipsey&Chrystel, Economics, Oxford University Press, 2009
4. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2009
5. Horngren : Financial Accounting, Pearson, 2009.
6. Dr. S. N. Maheswari and Dr. S.K. Maheshwari: Financial Accounting, Vikas, 2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HYDRAULIC ENGINEERING

Course Code: GR20A2019 **L/T/P/C: 2/0/0/2**
II Year II Semester

Prerequisite: Fluid Mechanics

Course Objectives:

1. Describe the type of channel flow and application of chezys and manning equation
2. Predict the non-uniform flow in open channel flows.
3. Analyze the dimensions of model with prototype.
4. Identify the hydraulic jump losses, surface profiles and channel bed slopes.
5. Compute hydropower and work done by the centrifugal pumps.

Course Outcomes:

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

1. Describe and predict the various economical channel sections
2. Apply dynamic equation in the uniform flows.
3. Analysing modal and prototype similarities.
4. Visualize behaviour the hydraulic jump, surface profiles of channel flows.
5. Evaluate the efficiency of the pumps and hydropower.

Unit I: Introduction to Open Channel Flow Computation of Uniform flow: Comparison between open channel flow and pipe flow,geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient 'n'. Most economical section of channel.

Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth.

Unit II: Non-Uniform Flow Channel Transitions. Measurement of Discharge and Velocity – Venturi Flume, Parshall Flume,Measurement of Velocity- Current meter, Floats, Hot-wire.Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile. Computation of water surface profile. Direct Step method.

Unit III: Dimensional Analysis and Hydraulic Similitude

Dimensional homogeneity, Rayleigh method, Buckingham's Pi method. Buckingham's πTheorem application of dimensional analysis and model studies to fluid flow problem Dimensionless groups. Similitude, Model studies, Types of models. Definitions of ReynoldsNumber, Froude Number, Mach Number, Weber Number and Euler Number.

Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally.

Unit IV: Hydraulic Jump

Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, types, applications and location of hydraulic jump. Energy dissipation and other uses, surges a moving hydraulic jump.

Hydraulic Turbines-I: Layout of a typical Hydropower installation Heads and Efficiencies classification of turbines-pelton wheel, Francis turbine, Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency , draft tube theory and function efficiency. Angular momentum principle, Applications to radial flow turbines. Governing of turbines, characteristic curves.

Unit V: Centrifugal Pumps

Pump installation details-classification-work done- Manometric head minimum starting speed losses and efficiencies-specific speed multistage pumps-pumps in parallel- performance of pumps-characteristic curves- NPSH-Cavitations - Reciprocating pumps basics and definition.

Hydropower Engineering: Classification of Hydropower plants Definition of terms Load factor, utilization factor, capacity factor, estimation of hydropower potential.

Text/Reference Books:

1. Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
2. Open channel Flow, K. Subramanya, Tata McGraw Hill.
3. Open Channel Hydraulics, VenTe Chow, Tata McGraw Hill.
4. Burnside, C.D., "Electromagnetic Distance Measurement," Beekman Publishers.
5. J.F.Douglas, J.M. Gaserek and J.A.Swaffirld, Fluid Mechanics, 5thlongman Edition,2005.
6. Frank.M. White, Fluid Mechanics, Tata Mc. Graw Hill Pvt. Ltd, 4th Edition, 2013.
7. A.K. Mohanty, Fluid Mehanics, Prentice Hall ofIndia Pvt. Ltd., New Delhi, 2nd Edition,1994.
8. Dr. R.K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi.
9. Publications (P) ltd., New Delhi, 9th Edition, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SURVEYING LAB

Course Code: GR20A2020 **L/T/P/C:0/0/4/2**

II Year II Semester

Prerequisite: Surveying

Course Objectives:

The objectives of this course is to make the student to

1. Introduction to the applicability of basic surveyinstruments.
2. Skill of determining relative positions in land surveying.
3. Visualization of elevations, areas and volumes.
4. Skill of plotting existing geographical surface information.
5. Knowledge to judge the compatibility of instruments.

Course Outcomes:

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

1. Define the characteristics and applications of basic survey instruments.
2. Apply knowledge of mathematics, science and engineering inlandmeasurement Techniques.
3. Calculate distances, inclinations, elevations, areas and volumes.
4. Generate maps of earth surfaces.
5. Analyzing the data and transfer relevant points onto ground.

Task-1: (i) Measurement of an area by Chain Survey (Open and Closed Traverse).
(ii) Study of Topo sheets

Task-2: Chaining across obstacles (Three Exercises).

Task-3: Simple, fly, Differential Levelling.

Task-4: Study of Theodolite- Measurement of horizontal and vertical angles- (Repetition and Reiteration method).

Task-5: Trigonometric Levelling- Heights and distances problems.

Task-6: Calculation of R.L and distance using tachometric survey.

Task-7: Curve setting by any two methods.

Task-8: Determine the area of the field by using totalstation.

Task-9: Column and foundation marking using TotalStation.

Task-10: (i) Distance, gradient, differential height between two inaccessible points using Total Station.
(ii) GPS Hand Application

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER AIDED DESIGN LAB

Course Code: GR20A2021 **L/T/P/C:0/0/4/2**
II Year II Semester

Prerequisite: Engineering Graphics

Course Objectives: The objectives of this course is to make the student to

1. Introduction of computer aided drafting software and define its use in construction work.
2. Understand the basic building drawing fundamentals for creating and manipulate geometric models by CAD System.
3. Apply the knowledge of innovative competencies of CAD to increase the creativity to design projects.
4. Visualize and draw the building components like truss, windows and doors.
5. Understand the concepts of various truss members and its applications.

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

1. Comprehend the fundamentals of building drawings and understand CAD software for drafting.
2. Draw Material, Sanitary, Electrical Symbols and various brick bonds by using drawing commands in CAD.
3. Develop Geometric Plan, Sections and Elevations for single and multi-storeyed building with suitable scale and dimensions.
4. Draft the building components and sectional view of doors, windows and trusses.
5. Create the drawings of various trusses like King post truss, Queen post truss and North light truss.

LIST OF EXPERIMENTS

1. Introduction to Computer Aided Drafting
2. Software and Basic drawing commands for CAD
3. Conventional Symbols used in Building Construction
    a. Building materials symbols
    b. Plumbing fixtures and
    c. Electric fixtures
4. Bonds in brick masonry
5. Drawing Plan, Section and Elevation of Building
    a. Single room with R.C.C flat roof
    b. A Residential building with single bedroom
    c. R.C.C framed structure with R.C.C roofslab
    d. Library building with R.C.C flat roof
    e. Planning of fully tiled gabled house
    f. Workshop building with north light roof truss
6. Drawing Plan, Section and Elevation of Multi-storeyed Building
7. Detailing of Building Components
    a. Doors
    b. Windows
    c. Ventilator
    d. Stairs
    e. Lintel Cum Shade
8. Drawing of King post truss, Queen post truss and North light Truss.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Course Code: GR20A2022 **L/T/P/C:0/0/4/2**

II Year II Semester

Prerequisite: Fluid Mechanics and Hydraulic Engineering

Course Objectives:

On completion of this Subject/Course the student shall be able to

1. Demonstration of the discharge through venture meter and orifice meter
2. Verify the Energy head in the pipe flows and able to compute impact coefficients of jet.
3. Describe the laminar and turbulent flows and velocity distribution in pipe lines
4. Evaluate the major and minor losses in pipe flow
5. Compute the efficiency of pelton wheel turbine and multistage centrifugal pump

Course Outcomes:

On completion of this Subject/Course the student shall be able to

1. Predict the discharge through venture meter and orifice meter.
2. Estimate the energy heads.Compute the laminar flow, length of flow.
3. Predict the velocity distribution in pipe flows
4. Compute the major and minor losses in pipe flow
5. Evaluate the efficiency of Hydraulic machines

LIST OF EXPERIMENTS

1. Verification of Bernoulli's Theorem
2. Calibration of Venturimeter
3. Calibration of Orifice meter
4. Impacts of jets on vanes
5. Reynolds experiment Laminar Flow and Turbulent flow through pipes
6. Multi stage centrifugal pump
7. Major losses
8. Minor losses in pipe(Hydraulic losses due to sudden enlargement of pipe)
9. Minor losses in pipe(Hydraulic losses due to sudden contraction of pipe)
10. Pelton wheel turbine
11. Hydraulic Jump
12. Calibration of Rectangular notch
13. Calibration of Triangular notch

Text Books

1. Modi and Seth, Fluid Mechanics, Standard book house, 19th Edition, 2011.
2. S.K.Som & G.Biswas, Introduction to Fluid Machines, Tata Mc.Graw Hill publishers, Pvt. Ltd., 3rd Edition, 2012.
3. Edward J. Shaughnessy, M. Katz and James P. Schaffer, Introduction to Fluid Machines, Oxford University Press, New Delhi, 1st Edition, 2005

References Books

1. J.F.Douglas, J.M. Gaserek and J.A.Swaffirld, Fluid Mechanics, 5th longman Edition,2005.
2. Frank.M. White, Fluid Mechanics, Tata Mc. Graw Hill Pvt. Ltd, 4th Edition, 2013.
3. A.K. Mohanty, Fluid Mehanics, Prentice Hall of India Pvt. Ltd., New Delhi, 2nd Edition,1994.
4. Dr. R.K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) ltd., New Delhi, 9th Edition, 2012.