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 be condoned.

e) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. They 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 marks each for a duration of 2 hours. Average ofthe 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) Continuous Assessment- 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 Phase II.

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

g) Engineering Graphics:

- 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 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.

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

GOKARAJURANGARAJUINSTITUTE OF ENGINEERINGANDTECHNOLOGY

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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	CourseCode	Course Name	Credits				Hours				Int	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	CE	PC	GR20A3001	Geotechnical Engineering	2	0	0	2	2	0	0	2	30	70	100
2	CE	PC	GR20A3002	Concrete Technology	2	0	0	2	2	0	0	2	30	70	100
3	CE	PC	GR20A3003	Hydrology and Water Resources Engineering	3	0	0	3	3	0	0	3	30	70	100
4	CE	PC	GR20A3004	Design of Reinforced ConcreteStructures	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	GR20A3010	Geotechnical Engineering Lab	0	0	2	2	0	0	4	4	30	70	100
8	CE	PC	GR20A3011	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	GR20A2003	Constitution of India	2	0	0	2	2	0	0	2	30	70	100

Professional Elective-I			
S.No.	**BOS**	**Course Code**	**COURSE**
1	CE	GR20A3005	Structural Analysis - II
2	CE	GR20A3006	Traffic Engineering and Management
3	CE	GR20A3007	Groundwater
4	CE	GR20A3008	Irrigation Management

Open Elective-I			
S.No.	**BOS**	**Course Code**	**COURSE**
1	CE	GR20A3009	Engineering Materials for Sustainability

III B. Tech (CE) - II Semester

S.No	BOS	Group	CourseCode	Course Name	Credits				Hours				Int	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	CE	PC	GR20A3081	Design of Steel Structures	2	1	0	3	2	1	0	3	30	70	100
2	CE	PC	GR20A3082	Foundation Engineering	3	0	0	3	3	0	0	3	30	70	100
3	CE	PC	GR20A3083	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	GR20A3089	Environmental Engineering Lab	0	0	2	2	0	0	4	4	30	70	100
7	CE	PC	GR20A3090	GIS Lab	0	0	2	2	0	0	4	4	30	70	100
8	CE	PW	GR20A3141	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	**BOS**	**Course Code**	**COURSE**
1	CE	GR20A3084	Masonry Structures
2	CE	GR20A3085	Rock Mechanics
3	CE	GR20A3086	Open Channel Flow
4	CE	GR20A3087	Construction Equipment and Automation

Open Elective II			
S.No	**BOS**	**Course Code**	**COURSE**
1	CE	GR20A3088	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	GR20A4001	Estimation and Costing	2	1	0	3	2	1	0	3	30	70	100
2	CE	PC	GR20A4002	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	GR20A4012	Transportation Engineerig Lab	0	0	2	2	0	0	4	4	30	70	100
7	CE	PC	GR20A4013	Computer Applications in Structural Engineering Lab	0	0	2	2	0	0	4	4	30	70	100
8	CE	PW	GR20A4129	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.	**BOS**	**CourseCode**	**COURSE**
1	CE	GR20A4003	Bridge Engineering
2	CE	GR20A4004	Ground Improvement Techniques
3	CE	GR20A4005	Surface Hydrology
4	CE	GR20A4006	Tall Buildings

Professional Elective IV			
S.No.	**BOS**	**Course Code**	**COURSE**
1	CE	GR20A4007	Industrial Structures
2	CE	GR20A4008	Geometric Design of Highways
3	CE	GR20A4009	Physico-Chemical Processes for Water andWastewater Treatment
4	CE	GR20A4010	Rehabilitation and Retrofitting of Structures

Open Elective III			
S.No.	**BOS**	**Course Code**	**COURSE**
1	CE	GR20A4011	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	GR20A4091	Entrepreneurship and Project Management	2	1	0	3	2	1	0	3	30	70	100
4	CE	PW	GR20A4130	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.	**BOS**	**Course Code**	**COURSE**
1	CE	GR20A4083	Prestressed Concrete
2	CE	GR20A4084	Pavement Design
3	CE	GR20A4085	Design of Hydraulic Structures
4	CE	GR20A4086	Construction Project Planning and Systems

Professional Elective VI			
S.No.	**BOS**	**Course Code**	**COURSE**
1	CE	GR20A4087	Earthquake Engineering
2	CE	GR20A4088	Urban Transportation and Planning
3	CE	GR20A4089	Green Building Technology
4	CE	GR20A4090	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 and 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 andEthics 4. Economic Policiesin 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. Services Science and Service Operational Management 2. IT Project Management 3. Marketing Research and Marketing Management	**CSBS**
	1. Artificial Intelligence 2. Introduction to Data Science 3. Human Computer Interaction	**IT**
	1. Non-Conventional Energy Sources 2. Machine Learning 3. Artificial Intelligence Techniques	**EEE**
	1. Principles of Communication 2. Sensor Technology 3. Cellular and Mobile Communications	**ECE**
	1. Robotics 2. Composite Materials 3. Operations Research	**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:

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 orthogonaltransformation

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:

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 oflow-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:

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:

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, Précis Writing, Writing an Abstract, Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events – **Classifying**- Providing Examples orEvidence

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, PrenticeHallof 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 etcand 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:

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. Torsionalpendulum: 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 findthe 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:

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:

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-magneticfield 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:

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 $V(x) \equiv cosax\ and\ sinax,$ 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 andto develop knowledge of various spectroscopic techniques at atomic and molecular levels.
3. To identify and apply various principles of electrochemistry, corrosion and watertreatment 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 intermolecularforces.
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 ableto explain different prevention techniques and apply concepts of chemistry in engineering.
4. Know the origin of different types of engineering materials used in modern technology and interpret different problems involved in industrial utilization of water.
5. Understand the processing of fossil fuels for the effective utilization of chemical energy.

Unit I

Atomic and Molecular Structure: (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, WileyPublications

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:

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:

1. Analyze basic concepts of data structures, computation complexity and implement various searching andsorting 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, New Delhi)

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:

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 discardingbad habits and how to hold difficult conversations in crisis situations.
5. Understand the importance of creative thinking, continuous and lifelong learning and cross culture sensitization. They will know what is meant by collaboration and team working.

Course Outcomes:

1. Apply the concept of Time Management to his own day to day life. They will also learn to cope with Information Overload, which has become a serious problem for the digital generation. They will be in a position to withstand harmful peer pressure, and steer themselves towards attaining their own objectives in the four years time they spend in the college.
2. Apart from understanding the importance of English language skills in a globalized world, they will learn 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 behavior Vs goal directive behavior; The concept of time log; What are the usual time wasters for students; How to minimize timewasters.

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; Dangers of 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 teamworking 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:

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:

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:

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, 10^{th}Edition, 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, 2^{nd} 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, 15^{th}Edition,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:

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:

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 Control of 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:

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:

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:

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:
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 showstress 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 retainingwall, chimney, dams, and stability in dams.
5. Describe unsymmetrical bending in simply supported beams and to memorise beams in curved plan.

Course Outcomes:

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 Beams and 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:

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:

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 organization 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:

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 Significanceof 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 Organization: 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:

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:

1. Introduction to the applicability of basic survey instruments.
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:

1. Define the characteristics and applications of basic survey instruments.
2. Apply knowledge of mathematics, science and engineering in land measurementTechniques.
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 Total Station.

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:

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:

1. Comprehend the fundamentals of building drawings and understand CAD software for drafting.
2. Draw Material, Sanitary, Electrical Symbols and various brick bonds byusing 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:

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 centrifugalpump

Course Outcomes:

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.

III YEAR

I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GEOTECHNICAL ENGINEERING

Course Code:GR20A3001 **L/T/P/C:2/0/0/2**
III Year I Semester

Prerequisites: Engineering Geology

Course Objectives:
1. Explain basic engineering properties of soil.
2. Assess various aspects in permeability and effective stresses.
3. Find details about compaction and stress distribution.
4. Identify the nature and behavior of soil during consolidation process.
5. Relate the properties of shear strength of soils.

Course Outcomes:
1. Identify basic Engineering properties of soil and classify the soil.
2. Evaluate coefficient of permeability and effective stresses of soil.
3. Assess the mechanism of stress distribution and compaction in soils.
4. Analyse the behaviour of soil during consolidation process.
5. Evaluate the performance of shear strength of soil mass.

UNIT I
Introduction - Types of soils and their formation, Scope of soil mechanics, Basic definitions and relationships, Soil mass as two and three-phase system, Specific gravity, Consistency limits, Consistency indices, Grain size analysis, Indian standard soil classification system and Plasticity chart.

UNIT II
Permeability of Soil – Capillary rise, Darcy's law, determination of coefficient of permeability by constant-head method and falling-head method. Field methods by pumping-out test. Permeability of stratified soils and factors affecting permeability of soil.
Seepage Analysis - characteristics of flow nets, total stress, neutral stress and effective stress. Principle of effective stress, effect of water table and fluctuations in effective stress, quicksand condition.

UNIT III
Stresses in soils – Introduction, Pressure bulb and Isobars, Boussinesq's equation for the vertical stress due to point load, line load, strip load, uniformly loaded circular area. Representation of stress along the vertical plane and horizontal plane. Westergaard's equation, Theory of Newmark's Influence Chart. Appropriate stress distribution methods - equivalent point load method and two to one method.
Compaction of Soil – Mechanism of compaction, laboratory tests, factors affecting compaction, effects of compaction on soil properties, Field compaction and quality control.

UNIT IV

Consolidation of Soil – stress history of clay, primary consolidation and secondary consolidationsettlement, Terzaghi's theory of consolidation, interpretation of consolidation test results, determination of pre-consolidation pressure.

UNIT V

Shear Strength - Mohr circle and its characteristics, Mohr-Coulomb theory. Types of laboratory shear tests – direct shear test, tri-axial compression test, unconfined compression test and vane shear test. Shear strength of clays and sands.

TEXT BOOKS

1. Gopal Ranjan and ASR Rao, Basic and Applied Soil Mechanics, New Age International Pvt. Ltd, New Delhi, 3rd edition (2016).
2. K.R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers Distributors, Delhi, 5th edition (2000), Reprint (2020).

REFERENCES

1. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil Mechanics and Foundations, Laxmi publications Pvt. Ltd., New Delhi, 16th edition, Reprint (2017).
2. C. Venkataramiah, Geotechnical Engineering, New age International publishers (2002),5th edition (2017).
3. Dr. P. Purushotham Raj, Soil Mechanics and Foundation Engineering, Pearson Education India (2008).
4. S. K.Gulhati & Manoj Datta, Geotechnical Engineering, Mc.Graw Hill Education Pvt Ltd., New Delhi (2005), Reprint (2017).
5. Braja M. Das, Advanced Soil Mechanics, Taylor and Francis, 4th edition (2013).
6. Soil Mechanics by Craig R.F., Chapman & Hall, 8th edition 2012, CRC Press.
7. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph B. Peck, and Gholamreza Mesri- Wiley Inter science, 3rd edition- 1996.
8. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering (Civil and Environmental Engineering) by V.N.S.Murthy, Publishers: Marcel Dekker, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CONCRETE TECHNOLOGY

Course Code:GR20A3002 **L/T/P/C:2/0/0/2**
III Year I Semester

Prerequisites: Building Materials and Construction Planning

Course Objectives:

1. Identify the physical and chemical properties of concrete ingredients and able to conduct tests on cement and aggregates.
2. Comprehend the workability of concrete, manufacturing processes of concrete and the behaviour of fresh, hardened concrete.
3. Gain the knowledge about NDT methods, quality control of concrete and how to conduct the tests on hardened concrete.
4. Identify the properties like elasticity, creep, shrinkage; special concretes and their applications in the diverse construction field.
5. Acquire the practical knowledge on mix design principles, concepts and methods

Course Outcomes:

1. Explain the physical and chemical properties of concrete ingredients and able to conduct tests on cement and aggregates.
2. Illustrate workability of fresh concrete and also explain the properties of fresh and hardened concrete
3. Demonstrate different tests such as compression and tension on hardened concrete and also summarize the quality control of concrete under different conditions.
4. Estimate the creep and shrinkage of concrete and also distinguish the special concretes
5. Design the mix proportions for the specific work for required strength and workability with available materials at workplace.

UNIT I

Concrete Ingredients and its Properties:

Cements & Admixtures: Portland cement – Chemical composition – Hydration, setting of cement – Structure of hydrated cement – Tests on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures.

Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum size of aggregate.

UNIT II

Fresh Concrete: Production of concrete, mixing, compaction curing, Properties of fresh concrete. Workability – Factors affecting workability – Measurement of workability by different tests–Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding.

Hardened Concrete: Water / Cement ratio – Abram's Law – Gel Space ratio – Nature of strengthof concrete – Maturity concept – Strength in tension & compression – Factors affecting strength
– Relation between compression & tensile strength -Curing.

UNIT III

Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Non-destructive testing methods – Codal provisions for NDT.

Quality control of Concrete: Behavior of concrete in extreme environment; temperature problem in concreting, hot weather, cold weather and under water conditions, Resistance to freezing, sulphate and acid attack, efflorescence, fire resistance; Inspection and testing of concrete-Concrete cracking, types of cracks, causes and remedies.

UNIT IV

Elasticity, Creep & Shrinkage: Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – Types of shrinkage.

Special concretes: Lightweight aggregate concrete – Cellular concrete– No-fines concrete – High density concrete – Fibre Reinforced concrete – Different types of fibres– Factors affecting properties & Applications of F.R.C – Polymer concrete – Types of Polymer concrete – Properties of polymer concrete & Applications – High performance concrete – Self-consolidating concrete – SIFCON.

UNIT V

Mix Design: Factors in the choice of mix proportions – Durability of concrete– Statistical methods – Acceptance criteria – Proportioning of concrete mixes by BIS method of mix design.

TEXT BOOKS:

1. Concrete Technology by M. S. Shetty– S. Chand & Co. ;2006
2. Concrete Technology by M.L. Gambhir – Tata Mc. Graw Hill Publishers,5th edition 2017 New Delhi.

REFERENCES:

1. Properties of Concrete by A. M. Neville – Pearson Education – 2nd edition 2019.
2. Concrete Technology by A.R. Santha Kumar, Oxford University Press, NewDelhi-2006.
3. Concrete: Microstructure, Properties and materials by P Kumar Mehta, P J M Monteiro, MC Graw Hill Education Publisher, New Delhi- 4th edition-2017.
4. IS 10262 :2019, Concrete Mix Proportioning- Guidelines (Second Revision).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HYDROLOGY AND WATER RESOURCES ENGINEERING

Course Code:GR20A3003 **L/T/P/C:3/0/0/3**
III Year I Semester

Pre-Requisites: Introduction to Fluid Mechanics

Course Objectives:

1. Analyze the applications of Hydrology for Rainfall Measurement and Analysis, Runoff measurement and analysis & measurement and estimation Evaporation, Evapotranspiration and infiltration
2. Apply the Hydrographic Analysis of Runoff
3. Assess the processes of groundwater occurrence
4. Design the types and methods of application of irrigation water and Standards for quality and to analyze the soil-water–plant relationship.
5. Design of irrigation canals and design discharge over a catchment.

Course Outcomes:

1. Measure, estimate and process rainfall data, runoff data, evaporation data, Evapotranspiration data and infiltration data.
2. Design a model in a region for direct run off hydrograph, unit hydrograph, S-Curve hydrograph and Synthetic unit hydrograph.
3. Calculate the discharge of radial flow to wells in a region of confined and unconfined aquifers by determining the aquifer parameters by field tests and pumping tests.
4. Design a suitable irrigation method depending on soil, water and plant conditions on the field & Prepare irrigation schedules and irrigation efficiencies for farmers on the field
5. Design irrigation canals and estimate discharge by SCS Curve Number Method, analyze the regional flood frequency, discuss the methods of stream gauging and evaluate the forces acting on gravity dam.

UNIT I

Introduction to Engineering Hydrology and its applications: Hydrologic Cycle, types and forms of precipitation, rainfall measurement, types of Rain gauges, computation of average rainfall over a basin, processing of rainfall data- adjustment of record-Rainfall Double Mass Curve. Runoff-Factors affecting Runoff over a Catchment-Empirical and Rational Formulae.

Abstraction from rainfall: Evaporation, factors effecting Evaporation, Measurement of evaporation– Evapotranspiration-Penman and Blaney & Criddle Methods -Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices'. Important aspects of National Water Policy 2012.

UNIT II

Distribution of Runoff: Hydrograph Analysis; Flood Hydrograph – Effective Rainfall - Base Flow- Base Flow Separation - Direct Runoff Hydrograph– Unit Hydrograph, definition and limitations of application of Unit hydrograph, Derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa S- Curve hydrograph, Synthetic Unit Hydrograph

UNIT III

Ground water Occurrence: Types of aquifers, aquifer parameters,' porosity' Specific yield, permeability, transmissivity and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers, Types of wells, Well Construction - Well Development.

UNIT IV

Necessity and importance of irrigation: Advantages and ill-effects of irrigation, Types of irrigation, Methods of application of irrigation water, Indian Agriculture soils, Methods of improving soil fertility-Crop rotation, preparation land for irrigation, Standards of quality for irrigation water.

Soil-water-plant relationship: Vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, Duty and delta, factors Affecting duty- design discharge for a water course. The depth and frequency of Irrigation, Irrigation efficiencies- Water Logging.

UNIT V

Classification of canals: Design of Irrigation canals by Kennedy's and Laceys theories, balancing depth of cutting, IS standards for canal design canal lining.

Design discharge over a catchment: computation of design discharge–Rational formula, SCS curve number method, flood frequency analysis introductory part only. Stream gauging-measurement and estimation of stream flow.

Dams: Types of Reservoirs, Dams and Spillways. Stability Analysis on Gravity Dams and Earthen Dams. Very Basic Concepts only in Water Data visualization and extraction from India- WRIS (Water Resources Information Systems) and BHUVAN-Names and Numbers of ten important IS codes in Water Resources Engineering- Listing only

Software Applications to WRE- Listing only

TEXT BOOKS

1. A Text book of Hydrology by P. Jaya Rami Reddy,3rd Edition, Laxmi publications, 2016.
2. Engineering Hydrology by K.Subramanya, Fourth Edition, McGraw Hill Education,2017.
3. Irrigation and Water Power Engineering- B.C.Punmia, Pande B.B.Lal, Ashok Kumar Jain,Arun Kumar Jain-Laxmi Publications, 17th edition- 2021.
4. Irrigation Engineering & Hydraulic Structures- Santosh Kumar Garg,first edition 2006.

REFERENCES

1. Elementary Hydrology by V.P.Singh, PHI publications, Fascimile edition-1991
2. Irrigation and Water Resources &Water Power by P. N. Modi, Standard Book House, 11th edition 2019.
3. Irrigation Water Management by D.K. Majumdar, Prentice Hall of India., 2nd edition-2013.
4. Applied Hydrologyby Ven Te Chow, David R Maidment, Larry WMays, Tata Mc Graw Hill Education, first edition 2017.
5. Introduction to Hydrology by Warren Viessman, Jr. Garyl Lewis- Pearson, 5th edition 2003.
6. NPTEL Web and Video Courses.
7. HEC-HMS (hec.usace.army.mil/software/hec-hms/features.aspx)
8. MODFLOW (usgs.gov/mission-areas/water-resources)
9. SWAT (swat.tamu.edu)
10. India –WRIS (www.indiawris.gov.in)
11. BHUVAN (bhuvan.nrsc.gov.in)
12. Handbook of Hydrology – Edited by David R. Maidment, mc Graw Hill Education,1992.
13. Handbook of Applied Hydrology -Edited by V.T.Chow, Mc Graw Hill education, 1964.
14. Groundwater Hydrology – David K. Todd and Larry W. Mays Wiley 3rd edition-2005.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DESIGN OF REINFORCED CONCRETE STRUCTURES

Course Code:GR20A3004 **L/T/P/C: 2/1/0/3**
III Year I Semester

Prerequisite: Solid Mechanics, Structural Analysis, Building Materials and Construction Planning and Engineering Graphics.

Course Objectives:
1. Classify Working Stress and Limit State method in design of reinforced concrete structures.
2. Analyze and design of beams.
3. Design of slabs, staircase and canopy.
4. Design of columns.
5. Design of footings, beams and slabs for limit state of serviceability.

Course Outcomes:
1. Classify Working Stress and Limit State method in design of reinforced concrete structures.
2. Analyze and design of beams.
3. Design of slabs, staircase and canopy.
4. Design of columns.
5. Design of footings, beams and slabs for limit state of serviceability.

UNIT-I
Concepts of R.C Design: Study of the strength, behavior, and design of indeterminate reinforcedconcrete structures. Loads and stresses, load combinations. Working stress method and limit stateapproach as per IS-456-2000.

UNIT-II
Analysis and Design of Beams: Analysis and design of singly and doubly reinforced rectangular, T and L-sections using limit state method. Design for shear, torsion and bond using limit state concept. Mechanism of shear and bond failure. Development length of bars; I.S. code provisions-design examples in simply supported and continuous beams with detailing.

UNIT-III
Design of Slabs: Design of two-way slab and one way slab using I S coefficients. Placement of reinforcement in slabs. Design of flat slab – Direct method
Design of Stair case and Canopy: Design of staircase and canopy(portico).

UNIT-IV
Design of Columns: Design of Short columns, columns with uni-axial and bi-axial bending. Design of long columns, use of design charts - I S code provisions.

UNIT-V

Design of Foundation: Wall footing, Isolated and combined footing for columns. Limit state design of serviceability for deflection, cracking and codal provisions

TEXT BOOKS:

1. Fundamentals of reinforced concrete design by M.L.Gambhir, Prentice Hall of India Private Ltd.,2010, New Delhi.
2. Reinforced concrete structural elements-behavior, analysis and design by Purushotam, Tata Mc.Graw Hill, New Delhi, 1984.
3. Limit State design by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jai, Laxmi publication Pvt. Ltd., New Delhi, 2016.

REFERENCES:

1. IS 456-2000; Indian Standard Code of Practice for Plain and Reinforced Concrete.
2. SP 16: Design Aids for Reinforced Concrete

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
STRUCTURAL ANALYSIS-II
(PROFESSIONAL ELECTIVE-I)

Course Code:GR20A3005 **L/T/P/C: 3/0/0/3**
III Year I Semester

Pre-requisites: Solid Mechanics, Structural Analysis -I

Course Objectives:
1. Analyze the building frames using Slope deflection and Moment distribution method
2. Analyze the building frames using Kani's methods.
3. Demonstrate the Approximate analysis of multi-storey frames using portal, cantilever and substitute frame methods.
4. Analyze the simple beams and frames using stiffness matrix and flexibility matrix methods
5. Evaluate the collapse load and plastic moment carrying capacity of beams and frames.

Course Outcomes:
1. Analyze various types of frames with and without sway using Slope deflection and Moment distribution methods
2. Analyze various types of frames using Kani's methods of Analysis
3. Evaluate the shear forces, bending moments and axial forces in beams, columns and at joints of multi-storey frames using approximate methods of analysis
4. Analyze the simple beams and frames using stiffness matrix and flexibility matrix methods of analysis.
5. Apply the principles of virtual work to estimate the collapse load and plastic moment carryingcapacity of simple beams and frames.

UNIT I
Analysis of building frames- Slope deflection and Moment Distribution Methods of analysis to simple portal frames without and with sway - frames with inclined legs.

UNIT II
Analysis of building frames- Kani's Method for analysis of continuous beams and Portal frames (up to single bay two storeys).

UNIT III
Approximate method of Analysis: Frames with vertical loads using Substitute frame method – Frames with horizontal loads using Portal and Cantilever methods

UNIT IV
Matrix method of analysis: Static and Kinematic indeterminacies- different approaches to matrix methods- analysis using stiffness matrix methods for beams and frames (3 DOF) and flexibility matrix methods for beams and frames (2 DOF)

UNIT V

Plastic analysis: Concepts - Plastic hinges- mechanism- -Shape factors- upper and lower bound theorem- Plastic analysis for simple beam and simple portal frames

TEXT BOOKS:

1. Theory of structures - B.C.Punmia, Jain, Ashok Kumar Jain &Arun Kumar Jain, Laxmi publications, 13th edition-2017.
2. Indeterminate Structural Analysis - K.U. Muthu, H. Narendra, Maganti Janardhana, M. Vijayanand – I K International Publishing House Pvt. Ltd., 2014.
3. Structural Analysis 1 and II 4/e – S S Bhavikatti,Vikas Publishing House,4th edition, 2013.

REFERENCES:

1. Analysis of structures -T.S.Thandava Moorthy, Oxford University Press.
2. Structural Analysis –Devdas Menon -Alpha Science International Ltd., 2007.
3. Advanced Structural Analysis - Devdas Menon - Narosa Publishers, 2009.
4. Wang C.K.,"Indeterminate Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010
5. William Weaver Jr. & James M. Gere, "Matrix Analysis of Framed Structures", CBS Publishers and Distributors, Delhi, 2004.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
TRAFFIC ENGINEERING AND MANAGEMENT

(PROFESSIONAL ELECTIVE-I)

Course Code:GR20A3006 **L/T/P/C: 3/0/0/3**

III Year I Semester

Prerequisite: Surveying and Geomatics

Course Objectives:

1. Explain a solid understanding of the principles of highway engineering and traffic analysis.
2. Summarize traffic surveys and present the collected data.
3. Describe the type of conflicts that occur at intersection and design the intersection accordingly.
4. Discuss analytical and practical knowledge of Planning, Designing and solving transportation problems by signal phasing and timing plan.
5. Express the knowledge on traffic management systems.

Course Outcomes:

1. Analyze traffic problems and plan for traffic systems various uses
2. Explain traffic surveys and plan parking arrangements
3. Analyze traffic studies and implement traffic regulation and control measures and intersection design
4. Organize the basic traffic signal phasing and timing plan
5. Develop Traffic management Systems

UNIT I

Traffic Planning And Characteristics-Road Characteristics – Road user characteristics –PIEV theory – Vehicle –Performance characteristics – Fundamentals of Traffic Flow. Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency, Components of Traffic Engineering-Road, Traffic and Land Use Characteristics.

UNIT II

Traffic Surveys and Analysis-Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey– Accident analyses -Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting – Level of service – Concept, applications and significance as per Indian HCM (Highway Capacity Manual)

UNIT III

Geometric Design Of Intersections-Conflicts at Intersections, Classification of Intersections at Grade, Channelized and Un-channelized Intersection - Grade Separators (Concepts only), Principles of Intersection Design, Elements of Intersection Design, Channelization and Rotary design, Grade Separators

UNIT IV

Traffic Control-Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination, Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design.

UNIT V

Traffic Management-Traffic Management- Traffic System Management (TSM) and Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS)

TEXT BOOKS

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 10th edition,2018.
2. Introduction to Traffic Engineering by R. Srinivasa Kumar, Universities Press
3. Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Technical Publications, Delhi, 2000.

REFERENCES

1. Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management
2. Guidelines of Ministryof Road Transport and Highways, Government of India.
3. Subhash C. Saxena, A Course in Traffic Planning and Design, CBS, 2020.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GROUNDWATER

(PROFESSIONAL ELECTIVE-I)

Course Code:GR20A3007 **L/T/P/C: 3/0/0/3**

III Year I Semester

Pre-Requisites: Introduction to Fluid Mechanics

Course objectives:

1. Describe the Ground water hydrological cycle, types of aquifers
2. Discuss the Ground the Water Movement and water contours
3. Classify the flow towards a well in confined and unconfined aquifers
4. Explain the Surface and Subsurface Investigation
5. Express well construction and seawater intrusion

Course outcomes:

1. Estimate the porosity and specific yield of aquifers
2. Apply ground water flow equation
3. Compute Dupuit's and Theim's equations
4. Apply the Surface methods and subsurface method of exploration.
5. Construct the Artificial recharge pits.

UNIT I

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

UNIT II

Ground Water Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

UNIT III

Steady groundwater flow towards a well in confined and unconfined aquifers – Dupuit's and Theim's equations, Assumptions, Formation constants, yield of an open well Well interface and well tests – Recuperation Test.

Unsteady flow towards a well – Non equilibrium equations – Theis' solution – Jocob and Chow's simplifications, Leaky aquifers – Well Interference.

UNIT IV

Surface and Subsurface Investigation: Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

Artificial Recharge of Ground Water: Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies.

UNIT V

Well Construction – Drilling Equipment used for Well Construction–Bore log – Interpretation of Log Data.

Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben-Herzberg relation, Shape of interface, control of seawater intrusion. Groundwater Basin Management: Concepts of conjunction use, Case studies.

Listing of Case Studies using MODFLOW.

TEXT BOOKS:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York, 3rd edition-2005.
2. Groundwater by H. M. Raghunath, New Age Publishers, 3rd edition-2007.
3. Ground Water Hydrology by D.K. Todd and L.R Mays John Willey, 3rd edition-2005.

REFERENCES:

1. Groundwater Hydrology by H.Bower, Mc Graw Hill Inc. US,2000.
2. Groundwater System Planning & Management – R. Willes & W. W. G. Yeh, Prentice Hall.,1987.
3. Applied Hydrogeology by C. W. Fetta, Pearson, 4th edition,2000.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

IRRIGATION MANAGEMENT

(PROFESSIONAL ELECTIVE-I)

Course Code:GR20A3008 **L/T/P/C: 3/0/0/3**

III Year I Semester

Pre-Requisites: Hydrology and Water Resources Engineering

Course Objectives:

1. Educate the fundamentals of soils physical & chemical properties with respect to soil water plant relationship.
2. Estimate water requirement of various principal crops.
3. Design and development of various irrigation methods.
4. Identify conveyance of water through field channels and through underground pipe lines and land management.
5. Analyse irrigated areas and design of drainage systems

Course Outcomes:

1. Inculcate knowledge of soil physical & chemical properties with respect to soil water plant relationship.
2. Acquire the knowledge to estimate water requirement for various principal crops
3. Apply the various methods to design and development of irrigation structures
4. Design the conveyance of water through field channels through underground pipe lines.
5. Analyze irrigated areas and design drainage systems

UNIT I

Introduction: Necessity of irrigation and Scope, Benefits of Irrigation, Types of Irrigation, Physical and Chemical properties of soils, Field Capacity, Temporary and Permanent Wilting Points, Hydraulic Conductivity.

UNIT II

Water Requirement for Crops: Meteorological Parameters needed in estimating water requirement of crops, their measurements, Methods for estimating evapotranspiration of crops, Consumptive Use, Irrigation Requirement of Principal Crops, Duty, Delta and Base Period and Interrelationships, Factors Affecting the Duty, Cropping Patterns, Irrigation Efficiencies.

UNIT III

Methods of Irrigation: Surface Irrigation Methods, Border, Check, Furrow, Sub-irrigation Methods and their Relative Merits, Principles of Design of Surface Irrigation Methods, Micro-Irrigation, Sprinkler and Drip Irrigation Methods and their advantages and disadvantages.

UNIT IV

Planning of Irrigation Projects, Command Area Development Programmes, Classification of Irrigable Soils, soils Management, Texture and structure of Soils, Soil groups of India, Soil Water plant Relations in Irrigation, Measurement of Soil Moisture. Land Grading Survey and Design, Equipment of Land Grading, Field Layout suiting different crops. Conveyance of Irrigation Water, Field Channels, Different lining materials, Design of field channels, Drop structures, Conveyance of water through underground pipe lines.

UNIT V

Irrigation Management, Diagnostic Analysis of Irrigation System, Micro Irrigation, Water Logging, Reclamation, Water Quality for Irrigation, Participatory Irrigation Management, Strategies, Conflict Management, Legal aspects in water sharing and management.

Listing of Applications of Softwares in Irrigation Management

TEXT BOOKS:

1. Irrigation: Theoryand Practice by Michael. A.M, S. Chand,2nd Edition, 2009.
2. Land and Water Management Engineering by V.V.N. Murthy, Kalyani Publishers, 2013.
3. Irrigation –Theory and Practice" by Withers and Vipond, S, Cornell University Press, 1980.

REFERENCES:

1. Soil and Water Management Systems by Schwab G.O., Fangmeir, D.D. and Elliot W.J,John Wiley & Sons, 1996.
2. Irrigation, Drainage and Salinity by Hutchinson.
3. Irrigation and Water Resources Engineering by Asawa, G.L, New age Publishers,2005.
4. Irrigation Principles and Practice by Hansen, V.E., Israelson O.S. and Stringham G.C.John Wiley & Sons, N York, 4th edition, 1981.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING MATERIALS FOR SUSTAINABILITY

(OPEN ELECTIVE-I)

Course Code:GR20A3009 **L/T/P/C: 3/0/0/3**
III Year I Semester

Pre-requisites: Building materials and construction planning

Course Objectives:

1. Discover on awareness among students on issues in area of sustainability
2. Establish a clear idea of the role and impact of various aspects of engineering and engineering decisions on environmental and materials
3. Discuss about the energy efficient green building materials and to have understanding on the cost-effective Building Technologies
4. Differentiate various renewable and non-renewable sources of energy along with their carbon foot prints and enumerate the process of performance testing including building modelling and energy analysis
5. Correlate the Integrated Life cycle design of Materials and Structures

Course Outcomes:

1. Describe the different types of environmental factors effecting materials
2. Analyze the work in sustainability for research and education
3. Illustrating the broad perspective in thinking for sustainable practices by utilizing the engineering knowledge and principles gained from this course
4. Perform cost/benefit analysis and life-cycle analysis of green buildings.
5. Identify and compare Building Planning Specifications.

UNIT I

Sustainability – Introduction, Need and concept of sustainability, Social- environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols – Clean Development Mechanism (CDM), Environmental legislations in India – Water Act, Air Act

UNIT II

Green Building Materials, Basic concepts of sustainable habitat, green buildings, green materials for building construction, material selection for sustainable design, green building certification, Methods for increasing energy efficiency of buildings. Sustainably managed Materials, Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials.

UNIT III

Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds (VOC's), Natural Non-Petroleum Based Materials, Recycled materials, Renewable and Indigenous Building Materials, Engineering evaluation of these materials

UNIT IV

Green Building Planning and Specifications**,** Environment friendly and cost effective Building Technologies, Green Strategies for Building Systems, Energy Conservation Measures in Buildings, Waste &Water management and Recycling in Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar & Daylight, Plumbing and its Effect on Energy Consumption.

UNIT V

Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) – Scope and Goal, Bio-mimicking, Environment Impact Assessment (EIA) – Procedures of EIA in India with reference to construction related projects.

TEXT BOOKS:

1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao – New Age International Publishers, 2017.
2. Integrated Life Cycle Design of Structures – By AskoSarja – SPON Press, 2007.
3. Non-conventional Energy Resources – By D S Chauhan and S K Srivastava – New Age International Publishers, 2012.

REFERENCES:

1. Green Buildings (McGraw hill publication): byGevorkian
2. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design
3. Understanding Green Building Guidelines: For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.
4. Understanding Green Building Materials, Traci Rose Rider, W. W. Norton & Company Publisher.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

GEOTECHNICAL ENGINEERING LAB

Course Code: GR20A3010 **L/T/P/C: 0/0/4/2**

III Year I Semester

Pre-Requisites: Geotechnical Engineering.

Course Objectives:

1. Distinguish various soil properties and its behaviour.
2. Carryout firm foundation in testing various types of soils and their properties.
3. Experience with the measurement of geotechnical laboratory parameters.
4. Excel in experiment research and to succeed with real time projects.
5. Ability to design and conduct experiments as well as analyse and interpret data.

Course Outcomes:

1. Analyse soil behaviour and its mechanism.
2. Analyse basic properties of soil in simple and complex applications.
3. Develop a proficiency in handling experimental data.
4. Compute the results of a laboratory experiment.
5. Recommend extensive research in geotechnical properties.

List of experiments:

1. Liquid limit and plastic limit
2. Grain size distribution by sieve analysis
3. Field density by core cutter method
4. Field density by sand replacement method
5. Relative density of sand
6. Standard and modified compaction test
7. Permeability of soil by constant and variable head test
8. California Bearing Ratio Test
9. Consolidation test
10. Unconfined compression test
11. Direct shear test
12. Vane shear test
13. Tri-axial test (Demonstration)

REFERENCES:

1. Bowles, J.E. (1979). Physical and Geotechnical Properties of Soils, McGraw Hill Publishers.
2. BS 1377 (Part 1 to 8). Methods of Test for Soils for Civil Engineering Purposes, British Standard Institute.
3. Head, K.H. (1982). Manual of Soil Laboratory Testing, Vol. 1,2, 3 Soil classification and compaction tests, Whittles Publishing, Scotland, UK.
4. IS 2720 (Various parts). Methods of Test for Soils, Bureau of Indian Standards.
5. Lambe (1951). Soil Testing in Engineering, Wiley & Sons.
6. Mandal, J.N. and Divshikar, D.G. (1994). Soil Testing in Civil Engineering, Oxford &IBH Publishing Company Pvt. Ltd., New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CONCRETE TECHNOLOGY LAB

Course Code: GR20A3011 **L/T/P/C: 0/0/4/2**

III Year I Semester

Pre-Requisites: Concrete Technology

Course Objectives:

1. Familiarize the students with physical and mechanical properties of cement concrete constituents
2. Provide practical knowledge and understanding towards the materials used for concrete.
3. Provide exposure about the fresh and hardened concrete
4. Acquire practical skills in the area of cement, fresh and hardened concrete testing.
5. Give good understanding about water to be added to cement for various purposes.

Course Outcomes:

1. Identify the suitable materials used for concrete for particular purpose
2. Gauge the quality control of Cement and concrete
3. Identify, describe and carry out the main laboratory tests relevant to the use of concrete on site
4. Design normal concrete mixes.
5. Interpret the properties in tern to design or invent the new materials

List of Experiments:

1. Normal Consistency test on cement
2. Initial Setting time and final setting time of cement
3. Fineness test of cement
4. Specific gravity of cement
5. Soundness test of cement
6. Compressive strength of cement
7. Sieve analysis of coarse and fine aggregate
8. Bulking of sand (Field test & Laboratory Test)
9. Workability test on concrete using slump Cone
10. Workability test on concrete by compaction factor test
11. Workability test on concrete by Vee-Bee Test
12. compressive strength of concrete
13. Split tensile strength test on concrete

REFERENCES

1. Concrete Technology Theory and Practice, Shetty M. S, S. CHAND, 8th edition, 2019.
2. Concrete Technology: Theory and Practice Gambhir Murari Lal, Mcgraw Hill, fifth edition., 2013.
3. IS 269:2013 – Ordinary Portland cement, 33 grade- Specification (Fifth Revision)
4. IS 383:2016 – coarse and fine aggregates for concrete- Specification (Third Revision)
5. IS 10262 :2019, Concrete Mix Proportioning- Guidelines (Second Revision).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CONSTITUTION OF INDIA

Course Code:GR20A2003 **L/T/P/C: 2/0/0/2**
III Year I Semester

Course Objectives:

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

Course Outcomes:

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

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

TEXT/REFERENCE BOOKS:

1.'Indian Polity' by Laxmikanth 5th Edition, McGraw Hill Edition. 2.Indian Constitution by Subhash C. Kashyap, Vision Books Publisher

3.'Introduction to Indian Constitution' by D.D. Basu, 21st Edition, LexisNexis Publisher4.'Indian Administration by avasthi and avasthi-by lakshminarain agarwal publication

III YEAR

II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DESIGN OF STEEL STRUCTURES

Course Code: GR20A3081 **L/T/P/C: 2/1/0/3**
III Year II Semester

Pre-Requisites: Solid Mechanics, Structural Analysis II and Engineering Graphics.

Course Objectives:

1. Identify various types of structural steel and its properties. Also able to define concepts of LSD.
2. Classify and design various types of connections.
3. Design of tension and compression members for the given loads and moments.
4. Design of steel beams for the given loads and moments.
5. Design of eccentric connections for the given loads and moments.

Course Outcomes:

1. Identify various types of structural steel and its properties. Also able to define concepts of LSD.
2. Classify and design various types of connections.
3. Design of tension and compression members for the given loads and moments.
4. Design the beams and purlins.
5. Design of eccentric and moment connections.

UNIT – I

Materials: Properties of materials. Concepts of limit state method, loads and stresses. Types of structural steel- making of iron and steel. Deflection limits, serviceability and stability check as per IS 800-2007.

UNIT – II

Bolted Connections: IS – 800 – 2007 specifications, Design strength and efficiency of joint.
Welded connections: Types of welded joints, specifications and design requirements.

UNIT – III

Design of tension member: Design of tension members subjected to axial tension and bending, splicing of tension member and lug angle.
Design of compression members: Design of columns, laced and battened columns, column-splice, column slab base and gusset base.

UNIT – IV

Design of Beams: Design of flexural members, lateral stability of beams, lateral torsional buckling, shear strength of beams; web buckling, web crippling, built-up beams, lintels and purlins.

UNIT – V

Eccentric and Moment connections: Introduction, beam-column connections; connections subjected to eccentric shear, bolted framed connections, bolted seat connections, bolted bracket connections, welded framed connections, welded seat connections, welded bracket connection, moment resistant connection; bolted moment connections and welded moment connections.

TEXT BOOKS:

1. Design of steel structures – N. Subramanian, Oxford University Press – 2019.
2. Limit State Design of steel structures, S.K.Duggal, Tata McGraw – Hill, 3rd edition -2019.
3. Design of Steel Structures Vol. 1 & 2 – Ramchandra, Scientific publications, 2011.

REFERENCES:

1. Design of steel structures, S. S. Bhavikatti, IK int Publication House, New Delhi,3rd edition, 2010
2. IS 800:2007 Indian Standard General Construction in Steel – Code of Practice (Third Revision)
3. Design of steel structures, BC Punmia A. K. Jain , Ashok Kumar Jain, Laxmi Publications, 2nd edition, 2015.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FOUNDATION ENGINEERING

Course Code: GR20A3082 **L/T/P/C: 3/0/0/3**
III Year II Semester

Pre-Requisites: Geotechnical Engineering
Course Objectives:
1. Identify various soil exploration methods.
2. Estimate the factors of safety against slope stability.
3. Utilize the knowledge of earth pressure theories and retaining walls.
4. Interpret bearing capacity of shallow foundations.
5. Analyze bearing capacity deep foundations.

Course Outcomes:
1. Identify various soil exploration methods and interpret the results.
2. Assess the stability of slopes.
3. Compute earth pressures and stability of retaining walls.
4. Apply bearing capacity equations for shallow foundations and analyze settlement.
5. Estimate pile and pile group capacity and recognize the shapes and components of well foundations.

UNIT I
Soil Exploration: Introduction, methods of site exploration and soil investigation, methods of boring, soil samplers, penetrometer tests, analysis of borehole logs, preparation of soil investigation report.

UNIIT II
Stability of Slopes: Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, stability analysis by standard method of slices, Taylor's stability Number. Stability of earth dam slopes under different conditions.

UNIT III
Earth pressure and retaining walls: Introduction, Rankine's theory of earth pressure, active and passive earth pressures, Coulomb's earth pressure theory, Culmann's graphical method, types of retaining walls, stability of cantilever retaining walls.

UNIT IV
Bearing capacity and settlement analysis of shallow foundations: Types and choice of foundation, location of depth, modes of soil failure, safe bearing capacity by Terzaghi, Meyerhof, Skempton and IS methods. Effect of water table on bearing capacity, safe bearing pressure based on N value, settlement analysis, contact pressure, settlement from plate load test.

UNIT V
Deep foundations: Types of piles, static pile formulae, dynamic pile formulae, pile load tests, load carrying capacity of pile groups in sands and clays, negative skin friction, types and different shapes of well foundations, components of well foundations.

TEXT BOOKS

1. Gopal Ranjan and ASR Rao, Basic and Applied Soil Mechanics, New Age International Pvt. Ltd, New Delhi, 3rd edition 2016.
2. Braja M. Das, Principles of Foundation Engineering, Cengage Learning, New Delhi, 8 thedition (2017).
3. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil Mechanics and Foundations, Laxmi publications Pvt. Ltd., New Delhi, 16th edition, Reprint (2017).

REFERENCES

1. VNS Murthy, Soil Mechanics and Foundation Engineering, CBS Publishers and Distributors.
2. Bowles, J.E., Foundation Analysis and Design, McGraw-Hill Publishing Company, New york, 5th edition 2001.
3. A. Singh, Modern Geotechnical Engineering, 3rd Ed., CBS Publishers, New Delhi, 2006.
4. N. Som, Theoryand Practice of Foundation Design, Prentice Hall, New Delhi, 2003.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENVIRONMENTAL ENGINEERING

Course Code: GR20A3083 **L/T/P/C: 2/0/0/2**
III Year II Semester

Pre-Requisites: Engineering Chemistry, Environmental Science.

Course Objectives:

1. Identify opportunities in environmental engineering field.
2. Identify, formulate and solving problems on analysis of water.
3. Predict the population in a city such that design of water treatment plant and quantity of water required can be estimated.
4. Assess various techniques in treatment of water and wastewater.
5. Identify methods of disposal of sewage and their impact on environment

Course Outcomes:

1. Analyze characteristics of water and wastewater.
2. Assess water demand and design components of water distribution systems.
3. Design conveyance elements of wastewater collection systems.
4. Assess sources of water and wastewater.
5. Plan and design water treatment units and wastewater treatment systems.

UNIT I

Sources, Quality and Quantity Perspectives of Water: Surface sources, subsurface sources, physical, chemical and biological characteristics, BIS standards for potable water, Estimation of water demand, water consumption rate, fluctuations in rate of demand, design period, population forecasting methods. Collection and Conveyance of Water, Intakes, types of Intakes.

UNIT II

Water Pollution: Types of pollutants, their sources and impacts.

Water Treatment: Layout and general outline of water treatment units, screening, plain sedimentation, sedimentation aided with coagulation, filtration, disinfection, water softening, miscellaneous treatments. Design of Clarifiers, working of slow and rapid gravity filters, multimedia filters.

UNIT III

Distribution Systems: Requirements of a good distribution system, methods of distribution, systems of supply of water, Distribution reservoirs, layout of distribution system, design of distribution system, analysis of pipe networks, appurtenances in distribution system- Joints, Valves and Water Meters.

UNIT IV

Quality and Quantity Perspectives of wastewater: Physical, chemical and biological characteristics of wastewater, analysis of wastewater, Importance of BOD and COD, Effluent standards, BIS for disposal of Industrial Waste water, impacts of disposal, Wastewater Collection, Estimation of dry weather flow and stormwater flow.

UNIT V

Primary Treatment of wastewater: Preliminary & primary treatment of wastewater: screening, grit removal basins, removal of oil and grease, sedimentation, sedimentation aided with coagulation.

Secondary Treatment of wastewater: Principles and classification of secondary treatment, activated sludge process, trickling filters, miscellaneous methods such as oxidation ditch, oxidation ponds, aerated lagoons, rotating biological contractors. Disposal of wastewater, self-purification of streams, sewage irrigation, BIS standards for waste water irrigation, Treatment and disposal of sludge, On-site disposal methods.

Tertiary Treatment of wastewater: Principles and classification of Tertiary treatment

TEXTBOOKS:

1. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt. Ltd, New Delhi.,2nd edition- 2016.
2. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers- 3rd edition-1996.
3. P.N. Modi (2008), Sewage treatment & Disposal and waste water Engineering-Environmental Engineering (Vol.II) – Standard Book House, 5th edition, 2018.
4. S.K. Garg (1999), Sewage Disposal and Air Pollution Engineering – Environmental Engineering (Vol.II) – Khanna Publishers.

REFERENCS:

1. Water and Waste Water Technology by Mark J Hammer and Mark J. Hammer Jr., Pearson 7th edition, 2011
2. Water and Waste Water Engineering by Fair, Geyer and Okun- Wiley, 3rd edition,2010.
3. Waste water treatment- concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India., 2013.
4. Wastewater Engineering by Metcalf and Eddy., 5th edition-2013.
5. Unit operations in Environmental Engineering by R. Elangovan and M.K. Saseetharan,New age International, 1997.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MASONRY STRUCTURES

(PROFESSIONAL ELECTIVE-II)

Course Code: GR20A3084 **L/T/P/C: 3/0/0/3**

III Year II Semester

Pre-Requisites: Structural Analysis II, Design of Reinforced Concrete Structures.

Course Objectives:

1. Explain about Masonry and its advantages, disadvantages and their applications.
2. Identify different types of Masonry units, types and grades of Mortar as per IS Code, properties of masonry units and mortar.
3. Analyze the strength of masonry unit and masonry prism for different types of masonry structures
4. Design different types of masonry structures selecting suitable masonry units and mortar using IS 1905 (revised in 2002) and SP20.
5. Explain about the use of different types of Masonry, their advantages and disadvantages.

Course Outcomes:

1. Identify the types of masonry units and Strength and stability of concentrically loaded masonry walls and factors affecting them.
2. Analyze the emerging permissible compressive, tensile and shear stress and factors influencing them for masonry elements.
3. Identify the concept of effective height of walls and columns, effective length, effective thickness of wall and factors affecting them.
4. Analyze how to design load bearing masonry walls for buildings up to three stories using IS:1905 andSP-20.
5. Explain the concept of reinforced masonry and its applications, and how to bring flexural and compression elements (beams and columns) of reinforced masonry shear walls.

UNIT I

Introduction: Brick stone, and block masonry units - Strength, modulus of elasticity and water absorption of masonry materials - classification and properties of mortars, selection of mortars. Defects and errors in masonry construction, cracks in masonry, types, reasons for cracking and remedial methods.

Strength and stability of concentrically loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of ageing, workmanship, strength formulae and mechanism of failure of masonry subjected to direct compression.

UNIT II

Load Analysis: Permissible compressive stresses- stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses. Load considerations for masonry: walls carrying axial load, eccentric load with different eccentric ratios— walls with openings and free-standing wall

UNIT III

Design considerations: Effective height of walls and columns, opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action and lintels

UNIT IV

Masonry Design: Design of load bearing masonry walls for building up to 3storeys using IS 1905-1987 and SP20 Procedure.

UNIT V

Masonry Types: Reinforced masonry and its application, flexural and compression elements of reinforced masonry, shear walls. Composite masonry walls, composite wall beam elements, in filled frames.

TEXT BOOKS:

1. Henry, A.W (1990), "Structural masonry", Macmillan Education Ltd.
2. Dayarathnam.P (1987), "Brick and reinforced brick structures", Oxford & IBHPublication, 2nd edition-2017.

REFERENCES:

1. Sinha, B.P and Davies, S.R (1997), "Design of Masonry Structures", E & FN spon.
2. IS 1905-1987 (3rd revision), "Code of practice for structural use of unreinforced masonry",BIS, New Delhi.
3. SP 20 (S& T) 1991, "Hand book on Masonry Design and Construction (1strevision)", BIS, New Delhi

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ROCK MECHANICS

(PROFESSIONAL ELECTIVE-II)

Course Code: GR20A3085 **L/T/P/C: 3/0/0/3**

III Year II Semester

Pre-Requisites: Engineering Geology

Course Objectives:

1. Explain basics of characteristics of rocks.
2. Describe about geology and its effect on civil engineering structures.
3. Apply rock mechanics principles in the design of foundations.
4. Classify the subsidence and slopes in rocks.
5. Compute and measure state of stress in rock mass.

Course Outcomes:

1. Identify the objectives of geotechnical data collection and rock mass classification methods, and successfully collect and analyze a range of geotechnical datasets for design purposes.
2. Annotate on impact of geological features on civil engineering projects
3. Analyze the problems associated with different geological features on civil engineering structures and suggest alternatives.
4. Demonstrate various methods to improving the properties of rock masses.
5. Describe the theory and analysis of in situ and induced stresses in a rock mass and structurally controlled failure.

UNIT-I

Importance and application of rock mechanics to engineering problems, Rock mass classification, Lithological classification of rocks, Engineering classification of intact and fissured rocks, Classification of fissures, Physico-mechanical properties of rocks.

UNIT-II

Joints and faults, Engineering properties of rocks, Stability of rock slope, Modes of failure in rock mass, Definition of stress in rock, Simple methods of determining in-situ stresses and stress distribution around mine openings.

UNIT-III

Causes and impacts of subsidence, Mechanics of surface subsidence, discontinuous and continuous subsidence. Monitoring, prediction, control and management of subsidence.

UNIT-IV

Analysis by simple field Bishop's method and use of Hoek's chart, Foundations on rocks, Consideration of uplift pressures; Methods of improving the properties of rock masses.

UNIT-V

Mechanics of rock burst and bumps, Stability of slopes. Instrumentation and measurement of insitu stresses and rock strength, Photoelasticity.

TEXT BOOKS:

1. Jager. J C & Cook NGW Fundamentals of Rock Mechanics, Wiley India Pvt.Ltd,4th edition 2012.
2. Jumikis Alfreds. R, Rock Mechanics, CRC Press, 2nd edition,1988.
3. Goodman, R.E. (1989), 'Introduction to Rock Mechanics', John Wiley, Chichester, 2nd edition.
4. Hudson, J.A. and Harrison, J.P. (2000), 'Engineering Rock Mechanics', Pergamon Press, Amsterdam.

REFERENCES:

1. Peng. Syd. S. Coal Mining Ground Control West Virginia University.
2. Brady, BHG& Brown.ET, Rock mechanics for underground mining, George Allen & Unwio Ltd, 1992.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPEN CHANNEL FLOW

(PROFESSIONAL ELECTIVE-II)

Course Code: GR20A3086 **L/T/P/C: 3/0/0/3**

III Year II Semester

Pre-requisites: Hydraulics and Water Resource Engineering

Course objectives:

1. Describe the types of open channels and flows
2. Express the channel flows and types of channel sections
3. Identify the uniform flows of channel
4. Compute the about the gradual varied flow and surface profiles
5. Explain the rapid varied flow and surface profiles

Course outcomes:

1. Explain properties and the type of channel flows
2. Design the different shapes channel section
3. Compute the energy loss due to hydraulic jump
4. Apply the dynamic equations and different method for energy loss in the Gradually Varied Flow
5. Apply the dynamic equation in Rapidly Varied Flow.

UNIT I

Introduction: Basic Concepts, types of channels, types of flows in open channels Geometric properties of various sections, Velocity and pressure distribution. Velocity distribution coefficients. Effects of slope on pressure distribution.

UNIT II

Uniform Flow: Chezy's equation, Darey - Weisbach friction factor. Manning's formula, Factors effecting Manning's roughness coefficient, Equivalent Channels of compound section. Conveyance of a channel section. Section factor for uniform flow, Channels of first and second kind - Hydraulically efficient channel sections - rectangular, trapezoidal, triangular and circular: Hydraulic exponent N, Compound sections, composite roughness.

UNIT III

Critical Flow in Open Channel: Energy in open channel flow: Specific energy – features, Criterion for critical state of flow - Critical depth in Rectangular, Triangular, Trapezoidal and circular channels; section factor - specific force.

UNIT IV

Gradually Varied Flow: Types of non-uniform flow, Dynamic equation: Governing equation for wide rectangular channels - Surface Profiles - classification. Characteristics-Control sections- Transitional depth - Length of surface profiles - Standard step method - Direct integration methods - Brasses' method Tolmkit method, Bekhmeteff's method. Chow's method.

UNIT V

Rapidly Varied Flow: Hydraulic jump application of momentum equation Types of jump, Location of jump, Characteristics of jump in rectangular channels Dimensionless method; Jump on sloping floor; Oblique jump. Spatially Varied Flow: Basic Principles and assumptions. Dynamic equation for flow with increasing and decreasing discharges; Analysis of flow profiles. Flow In Non — Prismatic Channels: Transitions — humps, flumes, gradual and sudden transitions.

TEXT BOOKS:

1. Flow in open channels — K. Subramanya TMH Publishing Co. Ltd '5th edition, 2019.
2. Flow through open channels — K.G. Ranga Raju. THM Publishing Co. Ltd.1st edition,2001.

REFERENCES:

1. Open Channel Hydraulics — French R.H. McGraw Hill book Company, 2nd edition, 1986.
2. Open Channel Flow -Hanif Chaudhary. M. Printice — Hall of India Pvt. Ltd., 1994.
3. Open Channel Hydraulics — V.T. Chow, McGraw Hill book company, Illustatrated edition, 2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
CONSTRUCTION EQUIPMENT AND AUTOMATION
(PROFESSIONAL ELECTIVE-II)

Course Code: GR20A3087 **L/T/P/C: 3/0/0/3**
III Year II Semester

Pre-Requisites: Building Material and Construction Planning

Course Objectives:

1. Identify various construction methods and equipment's and associate them with different works on the construction site
2. Attain knowledge in Primary Construction and Project Planning
3. Broaden the career potential of individuals through applied learning experiences in construction, management and technology.
4. Attain knowledge in Equipment selection for various kinds of activities involved in construction.
5. Develop construction cost accounting and resource optimization techniques using knowledge acquired through Scheduling

Course Outcomes:

1. Identify how structures are built and projects are developed in the field.
2. Explain modern construction practices.
3. Outline the process and importance of cost estimation, cost budgeting and cost control.
4. Demonstrate the handling of various kinds of Construction Equipment involved in the Construction industry.
5. Analyze construction projects cost based on Equipment Operational and Maintenance costs

UNIT – I
Conventional construction methods, Mechanized methods and advantages of latter-Equipment for Earthmoving, Dewatering - Concrete mixing, transporting & placing – plastering machines - Prestressing jacks and grouting equipment.

UNIT – II
Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities - Use of Drones for spread-out sites - Use of robots for repetitive activities.

UNIT –III
Earthmoving, Excavating, and Lifting Equipment Selection - Bulldozers, Front-end Loaders, Scrapers, Trucks, Excavators, Backhoes, Front shovels, Cranes; Piles and Pile-Driving Equipment - Production of Crushed-stone Aggregate - Concreting Equipment

UNIT – IV
Planning Process for Equipment and Methods - Cost of Owning and Operating Construction Equipment - Ownership cost, Depreciation, Operating cost, Ownership and operating costs calculation methods.

UNIT – V

Equipment Life and Replacement Procedures - Physical, profit and economic life, Replacement analysis - Engineering Fundamentals of Moving Earth - Rolling resistance, Effect of grade on tractive effort.

TEXT BOOKS:

1. D. G. Gransberg, C. M. Popescu and R. C. Ryan, Construction equipment management for engineers, estimators, and owners, Taylor & Francis, New York, 1st edition 2006.
2. R. L. Peurifoy, C. J. Schexnayder, A. Shapira and R. Schmitt, Construction planning, equipment, and methods, 8 th ed., McGraw Hill, New York, 2008..

REFERENCES:

1. F. Harris, R. McCaffer and F. Edum-Fotwe, Modern construction management, Blackwell Publishing, Oxford, 6th edition, 2006.
2. K. Knutson, C. J. Schexnayder, C. M. Fiori and R. Mayo, Construction management fundamentals, 2 nd ed., McGraw Hill, New York, 2008.
3. Cameron K. Andres, Ronald C. Smith, Principles and Practices of Commercial Construction, 8th Edition, Prentice Hall, 2009.
4. Arora and Bindra, Building Construction, DhanpatRai,2010.
5. National Building Code of India, Bureau of Indian Standards, 2005.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GEOGRAPHIC INFORMATION SYSTEMS AND SCIENCE

(OPEN ELECTIVE-II)

Course Code: GR20A3088 **L/T/P/C: 3/0/0/3**
III Year II Semester

Pre-Requisites: Surveying and Geomatics

Course Objectives:

1. Identify the basic components of GIS and various data structures
2. Predict various errors occurred during digitization through manual or digital digitization.
3. Classify the different types of digital maps with respect to different themes.
4. Process spatial analysis with integration of remote sensing data to prepare thematic maps.
5. Formulate and solve geospatial real life problems.

Course Outcomes:

1. Interpret the fundamental concepts of Geographic Information Science and Technology along with different data structures.
2. Demonstrate Map creation and design principles, including thematic map display, employment of map projections and cartographic design.
3. List out the types of digital maps for different themes.
4. Apply the spatial analysis to remote sensing data to generate thematic maps.
5. Solve the real life problems associated with geospatial and remote sensing.

UNIT I

Fundamentals of GIS – Information Systems, Modelling Real World Features Data, Data Formats, Applications of GIS, – Spatial and Non-spatial, Components, Data Collection and Input, Data Conversion, Database Management – Database Structures, Files; Standard Data Formats, Compression Techniques, Hardware – Computing, printing and scanning systems; Software – Standard Packages like Arc view, ArcGIS (commercial) & Auto-CAD Map, Map Info etc. QGIS open software- Salient features.

UNIT II

Topology – Types of Errors, Editing and Error Rectification, Types of Topology, Modeling topological Relationships, Tolerances.

UNIT III

Map – mapping concepts, analysis with paper based maps, limitations, Computer Automated Cartography– History and Developments, GIS- Definition, advantages of digital maps.

UNIT IV

Spatial Analysis and Modelling – Proximity Analysis, Overlay Analysis, Buffer Analysis, Network Analysis, Spatial Auto Correlation, Gravity Modelling, DTM/DEM, Integration with Remote Sensing data

UNIT V

GIS Project Planning and Implementation – Under Standing the Requirements, Phases of Planning, Specifications, Data Procurement, Tendering, Human Resources, Back Up, Monitoring Progress

TEXTBOOKS:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K. W. Yonng, Prentice Hall (India) Publications, 2nd edition, 2016.
2. Fundamental of GIS by Mechanical designs John Wiley &Sons, 4th edition, 2008.
3. Principals of Geographic Information Systems – Peter Beur and Rachael A.Mc Donnell, Oxford Publishers 2016.
4. Remote Sensing and Geographical Information systems by M. Anji Reddy JNTU Hyderabad. 4th edition, 2014, B. S. Publications.
5. Introduction to Geographic Information Systems by Kang-tsung Chang, Tata McGraw-Hill Publishing Company Limited- 2008.

REFERENCES:

1. Remote sensing of the environment –An earth resource perspective by John R Jensen, Prentice Hall 4. GIS by Kang – tsungchang, TMH Publications & Co., 2nd edition, 2013.
2. Basics of Remote sensing & GIS byS.Kumar, Laxmi Publications, 1st edition,2016.
3. Remote Sensing and its applications by LRA Narayana, University Press 1999.
4. Remote sensing and image interpretation by Thomas Lillesand, 7th Edition, John Wiley& sons, 6th edition 2011.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL ENGINEERING LAB

Course Code: GR20A3089 **L/T/P/C: 0/0/4/2**

III Year II Semester

Pre-Requisites: Engineering Chemistry

Course Objectives:

1. Gain knowledge in various parameters of water.
2. Identify the significance to conduct experiments on water purity
3. Explain current environmental issues through laboratory experiments.
4. Prepare the students to excel in experiment research Programmed or to succeed in
5. Develop problem solving and laboratory skills using modern instrumentation

Course Outcomes:

1. Describe the knowledge of physical, chemical and biological parameters of water and their importance.
2. Develop the social responsibility to eradicate water borne diseases
3. Recognize the methods to control environmental pollution
4. Express water quality parameters in written reports
5. Generalize the various quality control aspects of industrial effluents by performing the different lab tests.

List of Experiments

1. Determination of pH and Turbidity
2. Determination of Conductivity and Total dissolved solids.
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides and iron.
5. Determination and Estimation of total solids, organic solids and inorganic solids.
6. Determination of Nitrogen/total Phosphorous.
7. Determination of Dissolved Oxygen (DO) and B.O.D
8. Determination of C.O.D
9. Determination of Optimum coagulant dose.
10. Determination of Chlorine demand.
11. Presumptive coliform test.

REFERENCES:

1. Standard Methods for Analysis of water and Wastewater – APHA.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty., Mc Graw-Hill Publications, 2003.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

GIS LAB

Course Code: GR20A3090 **L/T/P/C: 0/0/4/2**

III Year II Semester

Pre- Requisites: Surveying and Geomatics

Course Objectives:

1. Inculcate the functions and commands of GIS software
2. Educate the development of thematic Maps
3. Convert raster layer to vector Layer by using Digitization
4. Apply spatial query and buffering for a given map
5. Convert Digital Elevation modelling to contour map and vice versa.

Course Outcomes:

1. Inculcate hands on experience on fundamental commands.
2. Demonstrate proficiency in the basic functions of geospatial software.
3. To create awareness on raster layer to vector layer conversion
4. Analyze proficiency in the creation and acquisition of spatial data.
5. Recognize conversion of DEM to contour map and Contour to DEM map

SOFTWARE: Q GIS (Open Source)

EXCERCISES:

1. Demonstrating the concept of Labeling in GIS using Quantum GIS
2. Demonstrating the concept of Symbolism in GIS using Quantum GIS.
3. Creation of point features Maps using Toposheets (Ex- Trees, Post office, Wells etc.,)
4. Creation of Line features Maps using Toposheets (Ex – Road Networks, Railway Tracks etc.)
5. Creation of polygon features Maps using Toposheets (Ex – Waterbodies, Forest areas, buildings etc.,)
6. Creation of thematic maps for a region of interest
7. Identify the demographic study using attribute tool
8. Preparation of contour maps, flow accumulation maps from Digital Elevation model maps
9. GIS applications in various civil engineering aspects- Network Analysis, Watershed Analysis.
10. Performing SQL queries on created Thematic maps (Pre-Requisites: 6,8,9 exercises)

REFERENCES:

1. Introduction to Geographic Information Systems by Kang-tsung Chang, Tata McGraw-Hill Publishing Company Limited- 2008.
2. Concept and Techniques of GIS by C.P.L.O Albert, K.W. Yong, Prentice Hall Publishers.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MINI PROJECT WITH SEMINAR

Course Code: GR20A3141 **L/T/P/C: 0/0/4/2**

III **Year II Semester**

Pre-Requisite: Knowledge of all Civil Engineering subjects and Laboratories

Course Objectives:

1. Demonstrate a through and methodical insight of project contents with techniques and principles.
2. Identify the methodologies and professional way of documentation and communication.
3. Know the key stages in development of the project.
4. Extend or practice the idea in mini project for major project.
5. Develop effective communication skills by delivering a seminar based on mini project work.

Course Outcomes:

1. Acquire fundamental knowledge and practical knowledge to implement towards industries.
2. Analysis the building with software and Design, testing of materials with relevant standards.
3. Apply project management skills and scheduling of work in stipulated time.
4. Develop and demonstrate the problem finding ability in civil engineering technologies.
5. Communicate technical information by means of written and oral reports.

IV YEAR

I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ESTIMATION AND COSTING

Course Code:GR20A4001 **L/T/P/C: 2/1/0/3**

IV Year I Semester

Pre-Requisite: Building Materials and Construction planning.

Course Objectives:

1. Analyze the process of quantity survey.
2. Estimating the quantities of materials for buildings and roads.
3. Calculate rate per unit of any item.
4. Provide knowledge on Contracts and tendering process.
5. Assessing the value of a property

Course Outcomes:

1. Estimate the quantities of materials and different types of materials required for different types of Buildings, Roads and Structures.
2. Produce the tendering process for executing any civil engineering work.
3. Recognize the process and importance of cost estimation, cost budgeting and cost control.
4. Estimate the rate per unit of any item of work.
5. Assess the value of any property and interpret the process and importance of valuation of buildings and other structures.

UNIT I

General items of work in building: Standard Units, Principles of working out quantities for detailed and abstract estimates, approximate methods of Estimating. Detailed Estimates of Buildings – centerline method, longwall short wall method.

UNIT II

Earthwork for roads, hill roads (two level sections only) and canals. Quantities of materials for different types of roads.

UNIT III

Rate Analysis: Working out data for various items of work over head and contingent charges. Reinforcement bar bending and bar requirement schedules.

UNIT IV

Contracts: Types of contracts – contract Documents – Conditions of contract, contract procedures, Tendering process, Rights and responsibilities of parties to contracts

UNIT V

Valuation of buildings: Purpose and principles of valuation, Depreciation, methods of calculating depreciation, methods of valuation, Rental method, development method, profit based method

TEXTBOOKS:

1. Estimating & Costing by B.N.Dutta, UBS publishers, 28th edition, Dec 2020.
2. Estimating & Costing by G.S.Birdie, 6th edition, 2014.
3. Valuation of real properties by S.C. Rangawala, Charotar publishing house, 10th edition, 2015.

REFERENCES:

1. Estimating, Costing & Specifications by M.Chakraborthi, Laxmi publications, 29th edition,2006.
2. Standard schedule of rates and standard Data Book by Public works department, 2019
3. SP:27, Handbook of method of measurement of building works, Bureau of Indian Standards,1987.
4. IS:1200-1992, Methods of measurements
5. National Building code, 2016.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

TRANSPORTATION ENGINEERING

Course Code:GR20A4002 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Surveying and Geomatics

Course Objectives:

1. Analyse the principles of highway engineering and traffic analysis
2. Develop and interpret design standards for horizontal and vertical geometry.
3. Describe analytical and practical knowledge of Planning, Designing and solving transportation problems
4. Illustrate the type of conflicts that occur at intersection and design the intersection accordingly
5. Discuss the knowledge in Railway Engineering and Airport Engineering.

Course Outcomes:

1. Demonstrate the significance of highway alignment and road development
2. Compute the geometric features of road pertaining to horizontal and vertical alignment
3. Illustrate the basic traffic stream parameters and perform basic traffic signal phasing and timing plan.
4. Demonstrate the role of intersections and their significance
5. Analyze and compare the characteristics of Railway and Airport Engineering.

UNIT I

Highway Development and Planning: Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT II

Highway Geometric Design: Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements -Sight Distances-Stopping sight Distance, Overtaking Sight Distance, Intermediate Sight Distance and Head light sight distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical Alignment-Gradients- Vertical curves-Summit Curves and Valley Curves.

UNIT III

Traffic Engineering: Traffic flow parameters-Volume, Speed, Density and headway- Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies, Parking types and Parking characteristics- Road Accidents- Causes and Preventive measures -Presentation of Accident Data–Condition Diagram and Collision Diagrams.

Traffic Regulation and Management: Road Traffic Signs–Types and Specifications–Road Markings-Need for Road Markings-Types of Road Markings- Design of Traffic Signals – Webster Method –IRC Method.

UNIT IV

Intersections: Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections- Channelization: Objectives –Traffic Islands and Design Criteria-Types of Grade Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria-Advantages and Disadvantages of Rotary Intersection.

UNIT V

Introduction to Railway Engineering and Airport Engineering: Permanent Way and functions of Rail, Sleeper and Ballast-Gradients-Grade Compensation-Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – Crossings and Turnouts.

Factors affecting Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system.

TEXT BOOKS:

1. Highway Engineering – S.K.Khanna &C.E.G. Justo, Nemchand & Bros., 10th edition 2017.
2. Highway Engineering Design – L.R.Kadiyali and Lal- Khanna Publications, 10th edition, 2017.
3. Airport Planning and Design- S.K.Khanna and Arora, Nemchand Bros,6th edition 1999.
4. Railway engineering- A Textbook of Railway Engineering-Subhash C.Saxena, Satyapal Arora – Dhanpat Rai & Sons –2015

REFERENCES:

1. Highway Engineering – S. P. Bindra, Dhanpat Rai & Sons. – 5th Edition (2008)
2. Traffic Engineering & Transportation Planning –Dr.L.R.Kadyali, Khanna Publications– 8th Edition –2011.
3. Railway Engineering – A text book of Transportation Engineering –S.P.Chandola, first edition 2016.
4. Air Transportation Planning & design – Virendhra Kumar & Statish Chandhra–Gal Gotia Publishers (1999).
5. Railway Engineering by Satish Chandra, M M Agarwal, Oxford University Press,2nd edition,2013.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BRIDGE ENGINEERING
(PROFESSIONAL ELECTIVE III)

Course Code:GR20A4003 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Design of Reinforced Concrete Structures, Structural Analysis II

Course Objectives:

1. Explain different types of Bridges and IRC standards.
2. Classify concepts and design of Slab Bridges
3. Understand concepts and design of T Beam Bridges
4. Demonstrate the concepts of design of Plate Girder Bridges
5. Prepare concepts of design of substructure, piers and abutments

Course Outcomes:

1. Explain different types of Bridges with diagrams and Loading standards
2. Relate analysis and design of Slab bridges and suggest structural detailing
3. Distinguish analysis and design of T Beam bridges and suggest structural detailing
4. Differentiate analysis and design of Plate girder bridges
5. Explain analysis and design of substructure, piers and abutments

UNIT-I

Introduction– Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, prestressed concrete bridges, Truss Bridges, Culverts, – Nomenclature- Selection of Bridge Site- Economical span-Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading.

UNIT-II

Slab bridges-Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Guyon's – Massonet Method –Hendry- Jaegar Methods- Courbon's theory- Pigeaud's method.

UNIT-III

T-Beam bridges– Analysis and design of various elements of bridge –Design of deck slab, Longitudinal girders, Secondary beams- Reinforcement detailing.

UNIT-IV

Plate Girder Bridges: Elements of plate girder and their design-web- flange- intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing.

UNIT-V

Design of piers - pier caps and Abutments, different types of bearings.

TEXT BOOKS:

1. 'Design of Concrete Bridges' by Aswini, Vazirani, Ratwani,2nd edition 1995.
2. 'Essentials of Bridge Engineering' by Johnson Victor D, sixth edition 2019.
3. 'Design of Bridge Structures' by T. R. Jagadeesh, M.A. Jayaram, PHI, third edition, 2020.
4. 'Design of RC Structures' by B. C. Punmia, Jain & Jain, Lakshmi Publications, 10th edition 2015.

REFERENCES:

1. 'Design of Steel Structures' by B. C. Punmia, Jain & Jain, Lakshmi Publications, 2nd edition 2015.
2. 'Design of Bridges' by Krishna Raju fifth edition 2019.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GROUND IMPROVEMENT TECHNIQUES
(PROFESSIONAL ELECTIVE III)

Course Code:GR20A4004 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre- Requisites: Geotechnical Engineering, Foundation Engineering

Course Objectives:

1. Recognize various types of ground improvement techniques.
2. Select various ground improvement techniques like dewatering, grouting, in-situ densification methods, geo-synthetics, reinforced earth, soil stabilization, etc.
3. Educate solid foundation in terms of in-situ ground improvement methods required for different projects that come across in difficult foundation conditions.
4. Identify the aptness of best ground improvement technique.
5. Improve on in most contemporary ground modification methods to be successful in real-time projects.

Course Outcomes:

1. Identify dewatering technique for the field related problem
2. Assess the field problems related to problematic soils by adopting various ground improvement techniques.
3. Differentiate reinforced earth retaining structures.
4. Recognize the suitability and practicability required for various ground improvement methods.
5. Assess the importance of extensive research in various ground improvement techniques.

UNIT I

Introduction: Need for ground improvement, objectives, classification of ground improvement techniques.

Dewatering: Methods of dewatering - sumps, single and multistage well points, vacuum well points, electro-osmosis method, horizontal wells and drains.

UNIT II

In-situ densification methods in granular soils: Vibration at the ground surface, impact at the ground surface, vibration at depth, impact at depth.

In-situ densification methods in cohesive soils: Preloading, vertical drains, sand drains, stone and lime columns, thermal methods.

UNIT III

Grouting: Characteristics of grouts, grouting methods, grouting technology, ascending, descending and stage grouting.

Stabilization: Methods of stabilization, mechanism of cement and lime stabilization, factors effecting stabilization.

UNIT IV

Reinforced Earth: Mechanism, components of reinforced earth, types of reinforcing elements, applications, factors governing design of reinforced earth walls, design principles of reinforced earth walls, soil nailing.

UNIT V

Geosynthetics: Types of geo synthetics, functions and applications of geo synthetic materials- geotextiles, geogrids and geomembranes.

Expansive soils: Problems of expansive soils, tests for identification, swelling pressure tests, improvement of expansive soils, foundation techniques in expansive soils, under-reamed piles.

TEXT BOOKS

1. Hausmann M.R. Engineering Principles of Ground Modification, McGraw-Hill International Edition (1990).
2. Dr. P. Purushotham Raj, Ground Improvement Techniques, Laxmi Publications, NewDelhi, 2nd edition 2016.

REFERENCES

1. Moseley M.P. and K. Kirsch, Ground Improvement, Blackie Academic and Professional, Florida,2nd edition (2007).
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A, Ground Control and Improvement, JohnWiley and Sons, New York, USA (1994).
3. Robert M. Koerner, Designing with Geosynthetics, Xlibris Corporation, 6th edition (2012).
4. F.H.Chen, Foundations on Expansive soils, Elsevier Science, 2nd edition (1988).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SURFACE HYDROLOGY

(PROFESSIONAL ELECTIVE III)

Course Code:GR20A4005 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Hydrology and Water Resource Engineering

Course Objectives:

1. Define surface water hydrology
2. Solve problems on infiltration and evaporation
3. Calculate and Visualization of stream flow and run off
4. Calculate and recognize the type of hydrographs
5. Compute the flood estimation

Course Outcomes:

1. Express the different types of hydrology definitions
2. Evaluate the consumptive use, infiltration and evaporation
3. Compute the discharge in the streams
4. Apply the hydrographs for the computing rain fall and run off
5. Apply the knowledge of computing flood estimation by various methods

UNIT I

Introduction: Hydrology- definition, Surface and ground water hydrology, Hydrologic cycle- Precipitation, Evaporation, Infiltration, Rain-gauges, Mass rainfall curve, characteristics, Mean rainfall on a basin-Arithmetic, Theissen and Isohytol Methods, Intensity-duration analysis, Intensity-frequency-duration analysis, depth-area- duration curves, estimation of missing rainfall data, consistency of rainfall records- double mass curves, rain-gauge network analysis.

UNIT II

Evaporation & Infiltration: Evaporation process, Factors affecting, estimation, measurement of Evaporation, Evaporation pans, Transpiration, Evapotranspiration, PET, Consumptive use Lysimeter, formulae for estimating PET. Infiltration process, factors affecting, measurement of infiltration, infiltrometers, infiltration capacity curve, Horton's Relation, Infiltration Indices.

UNIT III

Stream flow and Runoff: Measurement of stage, measurement of velocities-surface floats, velocity rods and current meter, measurement of discharge in a river, stage- discharge relation, extension of stage- discharge curves, selection of site for stream- discharge gauging. Components of Runoff - factors affecting and estimation of runoff - basin yield - flow duration

UNIT IV

Hydrographs: Hydrograph-components, separation of hydrograph into base flow, and DRO methods, Unit Hydrograph-principles, derivation of UH of Isolated unit storms, UH for various durations, S-curve technique. Estimation of runoff from UH, limitations of UH theory, Synthetic UH, IUH.

UNIT V

Design Flood: Maximum flood and design flood, estimation of flood- different methods, flood frequency analysis- probability table, different plotting positions, Gumble's extreme value theory, Log Pearson type-III analysis, selection of design flood. Flood routing: Flood Routing through reservoirs- Puls method and modification puls method. Channel routing-Muskinghum method, derivation of routing equations, Goodrich method. Flood Control: Flood control measures, flood control through reservoirs, channel improvements, Bank protection measures, Flood fighting, flood proofing, flood forecasting and flood warning.

TEXT BOOKS:

1. "A text book of Hydrology", P. Jayaram Reddy,3rd edition,2011, Laxmi Publications, New Delhi.
2. "Engineering Hydrology", K Subramanya, 4th edition, Tata-Mc Graw Hill Publishing company limited, New Delhi,2017.
3. "Hydrology", Madan Mohan Das, Mim Mohan Das, PHI Learning Private Ltd., New Delhi,2009.

REFERENCES:

1. "Hydrology", by, Rangaraju.
2. "Engineering Hydrology", EM Wilson, The Mac million press limited.
3. "Hydrology", H MRaghunath, New Age International Pvt Ltd,3rd edition, 2015.
4. "Introduction to Hydrology", W.Viessman Jr. & G L Lewis, Harper & Row Publications,2nd edition 1977.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
TALL BUILDINGS

(PROFESSIONAL ELECTIVE III)

Course Code:GR20A4006 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Structural analysis II and Design of Reinforced Concrete structures

Course objectives:

1. Describe the types and nature of High-Rise Structures i.e., tall buildings and the concept of design for tall buildings
2. Design aspects and material properties
3. Study behaviour of tall building under various types of loads
4. Study the structural behaviour tall buildings with and without shear walls
5. Prepare the students design of shear walls and Reinforcement detailing of shear walls used in tall buildings

Course outcomes:

1. Analyse the components and various types of tall buildings
2. Design concepts and material properties used in tall building constructions.
3. Analyse the behaviour of tall buildings subjected to different types of loads
4. Analyse the tall buildings with and without shear walls.
5. Analyse shear walls with and without openings

UNIT I

Introduction: Evolution of tall buildings-Classification of Buildings – Low-rise, medium-rise, high rise – Ordinary framed buildings & Shear-wall buildings –Behaviour of buildings under lateral loads like Wind loads, Earthquake loads & Blast loads – Basic structural & functional design requirements – Strength, Stiffness & Stability

UNIT II

Design Criteria and Materials-Development of High-Rise Structures – General Planning Considerations – Design philosophies – Materials used for Construction – High Strength Concrete – High Performance Concrete – Self Compacting Concrete – Glass – High Strength Steel

UNIT III

Loading -Gravity Loading – Dead Load – Live Load – Live load reduction technique – Impact Load – Construction Load – Sequential Loading. Lateral Loading – Wind load – Earthquake Load. Combination of Loads.

UNIT IV

Behaviour of Various Structural Systems-Factors affecting growth, Height and Structural form. High rise behaviour of Various structural systems – Rigid frames, braced frames, Infilled frames, shear walls, coupled shear walls, wall frames, tubular structures, cores, outrigger – braced and hybrid mega systems.

UNIT V

Methods of analysis: Shear walls with and without openings- Estimation of stiffness by simple cantilever theory & Deep Beam theory- Equivalent frame for large frames.

TEXTBOOKS:

1. Design of Tall Buildings by Taranath M. McGraw Hill, first edition, 2010.
2. Bryan Stafford Smith, Alex coull, "Tall Building Structures, Analysis and Design", John Wiley and Sons, Inc., 1991.
3. Taranath B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill, first edition,2011.

REFERENCES:

1. Lin.T.Y, Stotes Burry.D, "Structural Concepts and systems for Architects andEngineers", John Wiley, 1988.
2. Lynn S.Beedle, "Advances in Tall Buildings", CBS Publishers and Distributors,Delhi, 1986.
3. Wolfgang Schueller "High Rise Building Structures", John Wiley and Sons, New York1977.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INDUSTRIAL STRUCTURES
(PROFESSIONAL ELECTIVE IV)

Course Code:GR20A4007 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-requisites: Design of reinforced concrete structures, Design of steel structures.

Course Objectives:

1. Discuss different industrial steel buildings
2. Differentiate the design concept of transmission and communication towers, chimney
3. Discriminate design of Silos and Bunkers
4. Analyze and design folded plates and cylindrical shell
5. Classify the concepts on machine foundations

Course Outcomes:

1. Analysis and design of different industrial steel buildings.
2. Calculate the forces on transmission and communication towers
3. Correlate of silos and bunkers
4. Assess the design of concrete shell structures
5. Evaluate the design parameters of machine foundation

UNIT-I

Industrial steel building frames: Types of frames, bracing, crane girders and columns, workshop sheds

UNIT-II

Transmission and Communication towers: Types and configuration, Analysis and design; Chimneys; Loads and stresses in chimney shaft, Earthquake and wind effect, Stresses due to temperature difference, combined effect of loads and temperature, temperature. Design of chimney;

UNIT-III

Silos and Bunkers: Jassen's theory, Airy's theory, Shallow and deep bins, rectangular bunkers with slopping bottom, rectangular bunkers with high side walls;

UNIT-IV

Concrete Shell Structures: Folded plate and cylindrical shell structures; Introduction, structural behavior of long and short shells, beam and arch action, analysis and design of cylindrical shell structures.

UNIT-V

Machine foundations: introduction, machine vibration, structural design of foundation to rotary machines, impact machines, vibration characteristics, design consideration of foundation to impact machine, grillage, pile and raft foundation.

TEXT BOOKS:

1. Subramanian, N. (2018), Design of Steel Structures-Limit State Design, Oxford University press, India.
2. Dunham, (2002), Planning of industrial structures, Tata McGraw Hill
3. Transmission Line Structures - S S Murthy, A R Shantha kumar, Tata McGraw Hill
4. Design of Reinforced Concrete Shells and Folded Plates, P.C. Verghese, PHI (2010)

REFERENCES:

1. Krammer., "Earthquake Geotechnical Engineering", first edition, 2003.
2. Bowles, J. E., "Foundation Analysis & Design", McGraw Hill, 5th Edition, 1996.
3. Ghali, A, "Circular Storage Tanks and Silos", E & F N Spon, London, 2nd edition 2000.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GEOMETRIC DESIGN OF HIGHWAYS

(PROFESSIONAL ELECTIVE IV)

Course Code:GR20A4008 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Transportation Engineering

Course Objectives:

1. Explain the principles of highway engineering elements
2. Develop and interpret design standards for horizontal and vertical geometry.
3. Describe Intersection Planning and solving transportation problems
4. Analyze the type of conflicts that occur at intersection and design the intersection accordingly
5. Discuss Highway furniture for road safety and information.

Course Outcomes:

1. Analyze the factors influencing road vehicle performance, characteristics and design.
2. Compute the geometric features of road including horizontal and vertical alignment
3. Demonstrate the need of intersection planning and design and suggest solutions
4. Illustrate the importance of geometric design in highway system and suggest measures.
5. Demonstrate the need for road safety furniture and its importance in highway system

UNIT-I:

Highway Cross Section Elements: Functional Classification of Highway System; Design Controls – Topography, Driver characteristics, Vehicle Characteristics, Traffic, Capacity and Level of Service, Design Speed., Carriageway, Shoulders, Formation width, Right of way; Kerbs, foot paths, Medians, Camber, Objectives of Camber - Pavement Surface characteristics – Skid Resistance, factors affecting Skid resistance, Road Roughness.

UNIT-II:

Horizontal Alignment: Objectives; Sight Distances – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Importance of Sight Distances on Horizontal curves, Super elevation – Need for Super elevation; Method of computing super elevation; Minimum Radius of Curve; Methods of attainment of super-elevation; Extra widening on Curves; Transition Curves

.

UNIT-III:

Vertical Alignment – Objectives, Design. Gradients – Types of Gradients, Design Standards; Vertical Curves – Summit Curves, Valley Curves and Design criteria for Vertical Curves; Combination of Vertical and Horizontal Curves – Grade Compensation.

UNIT-IV:

Intersections in Highways - Types of Intersections; Design Principles for Intersections; Types of At-grade Intersections – Channelization Objectives; Traffic Islands, Rotary Intersection – Concept and Design, Advantages and Disadvantages; Grade separated Interchanges – Types, warrants and Design standards

UNIT-V:

Highway Safety Furniture: Basic Road furniture- Signs boards and Road Markings: Types of Road Signs; Guidelines for the provision of Road Signs; Cautionary Signs, Regulatory Signs, Information Signs – Design standards; Road markings – Objective of Road Markings; Types of Road Markings; Role of Road markings in Road Safety and Traffic Regulation; Specification for Road Markings. Highway Appurtenances – Delineators, Traffic Impact Attenuators, Safety Barriers

TEXT BOOKS:

1. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna Publications (2017)
2. Traffic Engineering and Transportation Planning, L.R.Kadiyali, Khanna Publications, 8th edition (2011)

REFERENCES:

1. Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers,10th edition, 2019.
2. IRC Codes for Signs, Markings and Mixed Traffic Control in Urban Areas, Part 4, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PHYSICO-CHEMICAL PROCESSES FOR WATER AND WASTEWATER TREATMENT

(PROFESSIONAL ELECTIVE IV)

Course Code:GR20A4009 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Environmental Engineering

Course Objectives:

1. Identify opportunities in environmental engineering field.
2. Identify, formulate and solving problems on analysis of water.
3. Predict the population in a city such that design of water treatment plant and STP can be done and quantity of water required can be estimated.
4. Assess various techniques in treatment of water and wastewater.
5. Identify methods of disposal of sewage and their impact on environment

Course Outcomes:

1. Estimate water for domestic and industrial requirement.
2. Determine the quality of generated sludge by treatment of water and wastewater and various methods for disposal of sludge
3. Explain methods of disinfection, chlorination – chlorine dose, chlorine demand,
4. Describe process for removal of oil, grease etc & disposal of skimming
5. Operate and maintain the sedimentation plant

UNIT I

Water purification in natural systems- variation in water flow and the steps to estimate - water for domestic and industrial requirement -waste water quantity- List the standards of potable water quality, gas flow, physical processes, chemical processes and biological processes. Primary, secondary and tertiary treatment.

UNIT II

Unit operations, unit processes - Aeration and gas transfer - Sedimentation, different types of settling, sedimentation tank design. Coagulation and flocculation, coagulation processes, stability of colloids, destabilization of colloids, destabilization in water and wastewater treatment, transport of colloidal particles, design aspects.

UNIT III

Filtration: filtration processes, Hydraulics of flow through porous media, Rate control patterns and methods, Filter effluent quality parameters, mathematical model for deep granular filters, slow sand filtration, rapid sand filtration, pre-coat filtration, design aspects.

Disinfection: Types of disinfectants, Kinetics of disinfection, chlorination and its theory, Design of Chlorinators.

UNIT IV

Precipitation: Hardness removal, Iron, Mn, and heavy metal removal; Adsorption, adsorption equilibria and adsorption isotherm, rates of adsorption, Sorption kinetics in batch reactors, continuous reactors, factors affecting adsorption.

UNIT V

Ion Exchange - exchange processes, materials and reactions, methods of operation, Application, design aspects. Membrane Processes, Reverse osmosis, Ultrafiltration, Electrodialysis

TEXT BOOKS:

1. Text book of Water supply and Sanitary Engg. S K Hussain Oxford AndIBH2 Water Supply and Sanitary Engg . G S Birdi Dhanpatraj and Sons, 3rd edition (2017)
2. A text book of Water Supply. V N Gharpure Allied Book House
3. A text book of Sanitary Engg. V N Gharpure Allied Book House

REFERENCES:

1. Water supply and Sanitary Engg. Vazirani and Chandola Khanna Publishers, 1986.
2. Wastewater Engineering, Treatment, Disposal, Reuse Metcalf and Eddy McGraw Hill International Edition, 5th edition.
3. Water supply and Sewerage. E W Steel and Terence J McGhee McGraw Hill Book Company,6th edition 1991.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

REHABILITATION AND RETROFITTING OF STRUCTURES

(PROFESSIONAL ELECTIVE IV)

Course Code:GR20A4010 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-requisite: Solid Mechanics, Structural Analysis

Course Objectives:

1. Mechanisms for Structural distress and deterioration.
2. Causes and prevention of corrosion in concrete and steel structures
3. Inspection and Repair of distressed concrete and steel structures
4. Rehabilitation of distressed concrete and steel structures
5. Health Monitoring and assessment of concrete and steel structures

Course Outcomes:

1. Recognize various mechanisms for Structural distress and deterioration.
2. Learn the measures to prevent corrosion in concrete and steel structures
3. Apply the Inspection and Repair methods of distressed concrete and steel structures
4. Employ the methods of Rehabilitation in distressed concrete and steel structures
5. Carry out health monitoring and conditional assessment surveys on concrete and steel Structures

UNIT I

Structural distress mechanisms- Maintenance and Repair Strategies – Inspections - Assessment procedure for evaluating a damaged structure, causes of deterioration – Cracks - causes - structural and non-structural damages- Physical deterioration due to moisture, temperature, shrinkage, freeze-thaw, abrasion, erosion, cavitation, crystallization of salts, Efflorescence, exposure to severe environment like marine exposure, Chemical deterioration due to corrosion of reinforcement (chloride induced, carbonation induced), Alkali-silica reaction, sulphate attack, Acid attack – case studies

UNIT II

Basics of corrosion phenomena- electrochemical process - Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection- Case studies

UNIT III

Inspection and Testing – Damage assessment techniques– Non-Destructive testing systems – Repairs in under-water structures- -materials for repair - Repair of structures distressed due to fire, Leakage, earthquake – Demolition Techniques – Engineered demolition methods – Effects due to climate, temperature, Sustained elevated temperature- fire damaged structures - Fire rating of structures- Case studies

UNIT IV

Simple systems of rehabilitation of structures - Guniting, Epoxy injection, Shoring, Underpinning, Use of carbon fibre wrapping, FRPs and carbon composites in repairs – strengthening methods in concrete and steel structures – Retrofitting – Jacketing – Case studies

UNIT V

Structural health monitoring of structures- Sensors –Building instrumentation- smart sensing technology - strain rosette - Condition survey- Special Concretes - Quality assurance for concrete- Construction chemicals for repairs- design and construction errors- Case studies

TEXTBOOKS:

1. Ravishankar, Krishnamoorthy. T. S," Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
2. Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK,1991.
3. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987

REFERENCES:

1. Shetty M.S., "Concrete Technology – Theory and Practice", S.Chand and Company, 8th edition 2018.
2. Dov Kominetzky. M.S., "Design and Construction Failures", Galgotia Publications Pvt.Ltd.,2001
3. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.
4. Gambhir. M.L., "Concrete Technology", McGraw Hill, 2013

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL IMPACT ASSESSMENT AND LIFE CYCLE ANALYSIS

(OPEN ELECTIVE III)

Course Code:GR20A4011 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Environmental science

Course Objectives:

1. Learn the purpose and role of EIA in the decision-making process.
2. Provide knowledge on the strengths of EIA regarding environmental management.
3. Introduce the technical and social/political limitations of EIA.
4. Teach the administration and procedures that apply in the student's jurisdiction.
5. Demonstrate the format of an EIA Report (Environmental Impact Statement, or Environmental Statement)

Course Outcomes:

1. Identify Elements of Community and Environment Likely to Be Affected by The Proposed Developments.
2. Develop Framework for Environmental Impact Assessment and Understand the Risk Analysis and EIA Methods.
3. Explain The Importance of Public Participation, Fault Tree Analysis and Consequence Analysis in EIA
4. Assess the Process of Environmental Impact Modelling and Prediction as A Design Tool.
5. Explain The Environmental Monitoring Systems and Legislation. Interact With Experts of Other Fields to Assess the Impact.

UNIT I

Introduction: Concepts of EIA methodologies – Sustainable development- Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – Evolution of EIA: Screening and scoping; Rapid EIA and Comprehensive EIA

UNIT II

Introduction to EIA, Criteria for the selection of EIA Methodology, General Framework for Environmental Impact Assessment, Characterization and site assessment. Environmental Risk Analysis, Definition of Risk, Matrix Method; Checklist method.

UNIT III

Prediction and Assessment: Public participation Fault tree analysis, Consequence Analysis; Socioeconomic aspects, measures of the effectiveness of pollution control activities;

UNIT IV

Environmental Legislation: Introduction to Environmental Management Systems; Environmental Statement - procedures; Environmental Audit: Cost-Benefit Analysis;

UNIT V

Life Cycle Assessment, Resource Balance, Energy Balance & Management Review - Operational Control - Case Studies on EIA with reference to Indian Scenario.

TEXTBOOKS:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S.Publication, Sultan Bazar, Hyderabad,2nd edition - 2011
2. Environmental Science and Engineering, by Suresh K. Dhaneja– S.K.Katania &Sons Publication., New Delhi Reprint 2013 edition (1 January 2013)

REFERENCES:

1. Environmental Impact Assessment, by Larry Canter, 2nd edition, Mc Graw Hill Publishers, 2nd edition, 1995.
2. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I &II", Blackwell Science,1999
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke Prentice Hall Publishers- 2nd Edition 2015
4. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P)Ltd, Delhi, 2nd edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

TRANSPORTATION ENGINEERING LAB

Course Code:GR20A4012 **L/T/P/C: 0/0/4/2**

IV Year I Semester

Pre-Requisites: Transportation Engineering.

Course Objectives:

1. Provide knowledge of physical and mechanical characteristics of highway materials.
2. Demonstrate various experiments on highway materials to check their suitability in road construction.
3. Illustrate design methods and test procedures for strength determination of bituminous mixes
4. Facilitate knowledge of optimum material selection for pavement layers.
5. Understand the behavior of the materials under vehicle load conditions

Course Outcomes:

1. Estimate desired characteristics of aggregates.
2. Distinguish suitable materials for road construction.
3. Categorize pavement materials by their physical and mechanical properties.
4. Demonstrate various experiments on bitumen to measure various properties.
5. Demonstrate bituminous mixes as per pavement requirement.

List of experiments:

Task 1: Tests on Aggregates

1. Crushing value
2. Impact value
3. Specific gravity and water absorption
4. Abrasion test
5. Shape test.

Task 2: Tests on Bitumen

1. Penetration test
2. Ductility test
3. Softening point test
4. Flash and fire point tests

Task 3: Tests on Bituminous Mixes

1. Specific Gravity- Demonstration
2. Marshall stability test -Demonstration

REFERENCES:

1. Highway Engineering – S. K. Khanna & C. E. G. Justo. New Chand & Brothers, 10th edition,2019.
2. Highway Material Testing - S. K. Khanna & C. E. G. Justo. (2013)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER APPLICATIONS IN STRUCTURAL ENGINEERING LAB

Course Code:GR20A4013 **L/T/P/C: 0/0/4/2**
IV Year I Semester

Pre-Requisites: Structural Analysis – II, Design of Reinforced Concrete Structures, Design of Steel Structures, AUTOCAD

Course Objectives:

1. Analyze and Design the Reinforced Cement Concrete (RCC) beams with different supports and loads.
2. Analyze and Design the RCC multi- storeyed buildings with different load and load combinations.
3. Analyze and Design the RCC water tanks of different shapes.
4. Analyze and Design the Steel beams of different sections with various load combinations.
5. Analyze and Design the trusses of different sections with various load combinations

Course Outcomes:

1. Analyze and design the various beams for the different supports and loads.
2. Analyze and Design a Two and Three Dimensional (2D and 3D) frames of Multi-Storeyed Building with Wind and Seismic loads and Load combinations.
3. Analyze and Design a Reinforced Cement Concrete Over Head tank.
4. Analyze and design the distinct types of Steel Trusses and Industrial Steel Truss
5. Analyze and design the various types of Steel Beams for the different loads.

SYLLABUS:

1. Introduction to STAAD.Pro Software
2. Design of beams for Simply Supported, Over Hanging, Cantilever and Fixed conditions with Point Load and Uniformly Distributed Load.
3. Design of beams for Simply Supported, Over Hanging, Cantilever and Fixed conditions with Uniformly Varying Load and Moment.
4. Analysis and Design of multi-storeyed building with simple 2D frame.
5. Analysis and Designof multi-storeyed building with 3D frame with Dead Load and Live Load
6. Analysis and Design of multi-storeyed building with 3D frame considering Wind load and Load combinations.
7. Analysis and Design of multi-storeyed building with 3D frame with Seismic Load and load combinations.
8. Analysis and Design of multi-storeyed building with 3D frame with plates.
9. Analysis and Design of multi-storeyed building (3D frame) and Result analysis.
10. Analysis and Design of RCC Rectangular Over Head Tank.
11. Analysis and Design of RCC Circular Over Head Tank.
12. Analysis and Design of beams for various steel cross sections (I, C, T, L and composite sections).

13. Analysis and Design of Steel Tubular Trusses.
14. Analysis and Design of Industrial buildings with truss elements.
15. Analysis and Design of Steel Over Head Tank.

REFERENCES:

1. STAAD. Pro Reference Guide, Chetan Publication; 2010th edition (1 January 2010).

2. Advanced Structural Analysis, A K Jain, Nem Chand & Bros. Third edition, 2015.

3. Advanced Structural Analysis, Devadas Menon, Alpha Science International,Ltd (Publisher),2009.

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

Course Code:GR20A4129 **L/T/P/C: 0/0/12/6**

IV Year I Semester

Pre-Requisites: Knowledge of all Civil Engineering subjects and Laboratories, communication skills

Course Objectives:

1. Improve the technical presentation skills of the students.
2. Train the students to do Survey and study of published literature on the assigned topic
3. Impart practical skills and knowledge in their project.
4. Learn different tools and techniques to solve problems
5. Prepare technical reports

Course Outcomes:

1. Interpret ideas and thoughts into practice in a project and work in a team
2. Analyze the gap between theoretical and practical knowledge and evaluate the available literature on the chosen problem
3. Compose technical presentation in the conference and to develop organizational skills and team work
4. Apply the principles, tools and techniques to solve the problem
5. Prepare and present project report

IV YEAR

II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PRESTRESSED CONCRETE

(PROFESSIONAL ELECIVE V)

Course Code:GR20A4083 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Pre-Requisites: Structural Analysis, Design of Reinforced Concrete Structures

Course Objectives:

1. To describe the various types of prestress technology, their advantages and disadvantages, and their applications;
2. To explain the behaviors of prestressed concrete elements under different limit states
3. To explain fundamentals of prestressed concrete design using advanced construction materials
4. To understand the applications of precast prestressed components in civil infrastructure
5. Attain the overall knowledge of pre-stressed concrete structures.

Course Outcome:

1. Examine the transfer and development length as well as pre-stress losses.
2. Demonstrate the design calculations to predict service behaviour of pre-stressed concrete structures, accounting for the time-dependent effects of concrete creep and shrinkage.
3. Design for ultimate strength of pre-stressed concrete structures.
4. Illustrate the pre-stressed concrete structures to satisfy relevant Design Standards.
5. Evaluate the pre-stressed concrete fabrication and construction process.

UNIT I

Introduction: Historic development – General principles of prestressing, pretensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics. I.S.Code provisions, Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System, Freyssinet system and Gifford – Udall System.

UNIT II

Losses of prestress: Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses. Analysis of sections for flexure; Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.

UNIT III

Design of sections for flexure and shear: Allowable stress, Design criteria as per I.S. Code – Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile. Analysis of end blocks: by Guyon's method and Mugnel method, Anchorage zone stresses – Approximate method of design – Anchorage zone reinforcement – Transfer of pretensioned members.

UNIT IV

Composite section: Introduction – Analysis of stress – Differential shrinkage – General designs considerations.

UNIT V

Deflections of prestressed concrete beams: Importance of control of deflections – factors influencing deflections – short term deflections of uncracked members, prediction of long-term deflections, requirements of IS: 1343 - 2012

TEXT BOOKS:

1. Prestressed Concrete by N. Krishna Raju; - Tata Mc.Graw Hill Publications, 6th edition (2018)
2. Prestressed Concrete by N.Rajasekharan; - Narosa publications, 2nd edition (2005)

REFERENCES:

1. Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns, John Wiley & Sons, 3rd edition (2010).
2. Prestressed concrete – A fundamental approach, Nawy Edward G., Prentice Hall, Englewood Cliffs (1989)
3. NPTEL Web and Video Courses on "Prestressed Concrete"

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PAVEMENT DESIGN

(PROFESSIONAL ELECIVE V)

Course Code:GR20A4084 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Pre-Requisites: Transportation Engineering.

Course Objectives:

1. To give a detailed notion of methods of highway design and controlling factors
2. To provide the idea of design standards and traffic data collection for flexible and rigid pavements
3. To give the knowledge of predictability about material constraints and optimal utilization
4. To introduce the vital traffic parameters and the methods of their estimation.
5. To provide the knowledge of major failures in pavements, causes and preventive measures

Course Outcomes:

1. Illustrate highway design methods, constraints and controlling factors.
2. Apply the design standards in designing principal elements of the highway.
3. Predict the resource constraints and utilize the available materials in a sustainable way.
4. Examine the basic parameter of traffic engineering and the methods which help to estimate those parameters.
5. Recognize the major failure modes of flexible and rigid pavement and helps in maintaining them properly.

UNIT I

Introduction to pavement design: Types of Pavements-Functions of individual layers, Variables considered in Pavement Design- Factors affecting Pavement Design: Wheel loads, Tire Pressure, Contact Pressure, ESWL & ESAL concepts

UNIT II

Material characteristics: Tests on sub-grade, Tests on aggregates-Aggregate properties and their importance-Tests on Bitumen-Requirements of design mix-Marshall method of mix design.

UNIT III

Stresses in flexible and rigid pavements: Stresses in Flexible Pavements-Layered systems concept-One layer system-Boussinesq two layer system-Burmister theory of Pavement design. Stresses in Rigid pavements -Importance of Joints in rigid Pavements-Types of joints-use of tie bars and dowel bars-Relative Stiffness-Modulus of Subgrade Reaction-Stresses due to warping Stresses due to loads-Stresses due to friction.

UNIT IV

Flexible and rigid pavement design: Flexible Pavement Design concepts-CBR method of Flexible Pavement design-IRC method of design-Asphalt Institute method and AASTHO methods. Rigid Pavement design concepts-IRC method of Rigid pavement design-PCA method-Design of tie bars and dowel bars.

UNIT V

Highway construction and maintenance: Construction: Construction of Bituminous Pavements, construction of Cement Concrete Roads. Highway maintenance –Pavement failures: failures in flexible Pavements, Rigid Pavement failures, Pavement evaluation-Overlay design by Benkelman Beam method.

TEXT BOOKS:

1. Pavement Design by R Srinivasa Kumar, University Press (India) Pvt Ltd, 2013
2. Highway Engineering-S.K. Khanna & C.E.G. Justo, Nemchand & Bros.9th edition 2011.
3. Highway and traffic Engineering-Subash Saxena (2015)

REFERENCES:

1. Principles of traffic and highway engineering- Garber & Hoel, 5th edition, 2014.
2. Pavement Analysis and Design – Yang H. Huang, 2nd edition
3. Principles of Pavement Design – E. J. Yoder, M. W. Witczak,2nd edition, 1991.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DESIGN OF HYDRAULIC STRUCTURES
(PROFESSIONAL ELECIVE V)

Course Code:GR20A4085 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Pre-Requisites: Hydraulics and Water Resource Engineering

Course Objectives:

1. Apply the principles of reservoir planning and principles of design of irrigation channels
2. Evaluate the forces and stability of gravity dams
3. Design suitable earthen dams and Ogee spillways
4. Design various diversion head works
5. Design canal falls, canal regulator works and cross drainage works and discuss the components of hydroelectric schemes.

Course Outcomes:

1. Plan and assess the capacity of reservoir by mass curve method and design different types of irrigation channels
2. Evaluate the forces acting on gravity dams and analyze the stability of the gravity dam.
3. Apply the principles of design of the earthen dams and Ogee spillways
4. Design various diversion head works by using Bligh's and Khosla's theory.
5. Design of various hydraulic structures like canal falls, canal regulator works and cross drainage works along with their suitability& explain the components of hydroelectric schemes.

UNIT I

Reservoir Planning and Canals design: Estimation of crop water requirement; Fixing the capacities of reservoirs by mass curves of inflow and outflow. Analysis for surface and sub-surface flow at hydraulic structures, Cross section of channels, Silt control methods in canals. Estimation of channel losses. Design of unlined channels by Lacey's method - Relevant three IS codes-Names and Numbers only.

UNIT II

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary, common profile and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety -'stability Analysis, Foundation fora Gravity Dam, drainage and inspection galleries and their impact, stress analysis of a gravity dam. Relevant three IS codes- Names and Numbers only.

Spillways: types of spillways, Design principles of Ogee spillways – Spillway gates- Relevant three IS codes- Names and Numbers only.

UNIT III

Earth dams: Types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage through embankments and foundations.

UNIT IV

Diversion Head works: Types of Diversion head works- weirs and barrages, layout of diversion head work - components. causes and failure of weirs and Barrages on permeable foundations, Silt Ejectors and Silt Excluders weirs on Permeable Foundations - creep Theories - Bligh's, Lanet and Khosla's theories, Determination of uplift pressure- Various Correction Factors - Design principles of weirs on permeable foundations using creep theories - exit gradient, U/s and D/s Sheet Piles - Launching Apron – Relevant three IS codes- Names and Numbers only.

UNIT V

Canal falls: Types of falls and their location, design principles of Notch fall and sarada type fall. Canal regulation works, principles of design of distributor and head regulators, canal cross regulators-canal outlets, types of canal modules, proportionality, sensitivity and flexibility. Cross drainage works types: selection of site, design principles of aqueduct siphon aqueduct and super passage. Components of Hydroelectric schemes and selection of turbines - Relevant three IS codes- Names and Numbers only.

TEXT BOOKS:

1. Irrigation Engineering and Hydraulic Structures. S.K.Garg 2014- Khanna Publishers' 19th edition.

REFERENCES:

1. Irrigation and water power engineering. B.C.Punmia, Pande B.B.Lal, Ashok kumar jain, Arun kumar Jain- Laxmi publications 16th edition 2009.
2. Irrigation Engineering and Hydraulic structures. S.R.Sahasrabudhe, 2013 S.K.Kataria & sons
3. Theory and Design of Irrigation Structures-Volume II – R.S. Varshney, S.C.Gupta and R.L.Gupta 2014
4. Water Power Engineering by M.M.Dandekar and K.N.Sharma, 2nd edition 2013.
5. IS Code 6512: Criteria for Design of Solid Gravity Dams, 1984.
6. IS Code 7894: Code of Practice for Stability Analysis of Earth Dams, 1975.
7. IS Code 8826: Guidelines for Design of Large Earth and Rockfill Dams, 1978.
8. IS Code 6966: Part 1: 1989 Guidelines for hydraulic design of barrages and weirs: Part 1Alluvial Reaches
9. IS Code 7720: 1991 Criteria for Investigation, Planning and Layout for Barrages and Weirs
10. IS code: 7112-2002 Criteria for design of cross section for Unlined canals in Alluvial Soils
11. IS code: 10430 :2000 Criteria for Design of Lined Canals and Guidance for selection oftype of lining.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONSTRUCTION PROJECT PLANNING AND SYSTEMS

(PROFESSIONAL ELECIVE V)

Course Code: GR20A4086 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Pre-Requisites: Estimation and Costing

Course Objectives:

1. Attain knowledge in Primary Construction and Project Planning
2. Identify various construction methods and equipment's and associate them with differentworks in the construction site
3. Ability to define fundamentals of planning and organizing in a day to day construction practices
4. Develop construction cost accounting and resource optimization techniques using knowledge acquired through Scheduling
5. Identify the career potential of individuals through applied learning experiences in construction, management and technology.

Course Outcomes:

1. Understand how structures are built and projects are developed on the field
2. Analyze good idea of basic construction dynamics- various stakeholders, project objectives, processes, resources required and project economics
3. Interpret Plan, control and monitor construction projects with respect to time and cost, and also to Optimize construction projects based on costs
4. Remember how construction projects are administered with respect to contract structures and issues.
5. Summarize ideas and understandings to others with effective communication processes

UNIT 1

Construction Planning and Scheduling: Definition of Projects -Stages of project planning-Process of development of plans and schedules, work break-down structure - Techniques of planning-Bar charts - Gantt Charts. Networks representation - CPM networks - Computation of float values, critical and semi critical paths, calendaring networks.

PERT Analysis - Determining three-time estimates, analysis, slack computations, calculation of probability of completion. Allocation of Resources - resource levelling and optimal schedules; Project organization, documentation and reporting systems.

UNIT II

Construction Methods and Contract Management: Control & monitoring; Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems; Advent of Lean Construction; Importance of Contracts Management; Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation;

UNIT III

Construction Materials and Resource Leveling: Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow, sources of funds; Histograms and S- Curves. Earned Value; Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and levelling. Common Good Practices in Construction;

UNIT IV

Project Monitoring & Control: Project Monitoring &Control- Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modelling (BIM) in project management;

UNIT V

Quality Control and Quality Assurance: Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.

TEXT BOOKS:

1. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.
2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
3. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

REFERENCES:

1. Chudley, R., Construction Technology, ELBS Publishers, 2007.
2. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
3. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
4. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
EARTHQUAKE ENGINEERING

(PROFESSIONAL ELECIVE VI)

Course Code: GR20A4087 **L/T/P/C: 3/0/0/3**
IV Year II Semester

Pre-Requisites: Engineering Geology, Design of Reinforced Concrete Structures

Course Objectives:

1. Explain movements of Tectonic Plates, and Effects of Earthquakes
2. Describe movements of Tectonic Plates, and Effects of Earthquakes
3. Analyze Dynamic Behavior of simple structural systems
4. Analyze Structural dynamics of simple systems subject to harmonic and random earthquake loading
5. Apply scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy

Course Outcomes:

1. Identify movements of tectonic plates, and characterize earthquake ground shaking
2. Estimate the magnitude & intensity of earthquake
3. Utilize the principles behind earthquake resistant design of structures
4. Formulate earthquake analysis of multi storeyed buildings
5. Design earthquake resistant design and ductile detailing of frame members

UNIT I

Earth and its interior, circulations, plate tectonics, faults, seismic waves, strong ground motions, characteristics of strong ground motions, Magnitude (and Richter Scale), Intensity (and Modified Mercalli Scale)

UNIT II

Earthquake Resistant Design Philosophy for Normal Buildings: Four Virtues of Earthquake Resistant Buildings – Structural Configuration, Lateral Stiffness, Lateral Strength and Ductility; Seismic Zones in India; IS Codes for Earthquake Resistant Design and Construction of Buildings; geotechnical Design Considerations and Selection of Sites

UNIT III

Special aspects in Multi- Storey Buildings -Open Ground Storeys, P-delta effect, Soil-Structure Interaction, Drift Limitation, Short Column Effect

UNIT IV

Introduction to IS 1893 (Part 1) - 2016, Design Base Shear, Earthquake Analysis of Buildings by Equivalent Static Method

UNIT V

Introduction to IS 13920 - 2016, design strategy, capacity design of RC frame members, Structural Walls and Beam-Column joints, ductile detailing in RC Beams and Columns

TEXT BOOKS:

1. Pankaj Agrawal and Manish Shrikhande, Earthquake resistant Design of Structures, 3rd Edition, Prentice Hall of India Pvt, Ltd. Publications, 2006

REFERENCES:

1. S. K. Duggal, Earthquake Resistant Design of Structures, 1st Edition, Oxford University Press Publications,2nd edition 2013

2. Dowrick, D. L., Earthquake Resistance Design for Engineers and Architects‖, 2nd Edition, John Willey & Sons, 1987

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

URBAN TRANSPORTATION AND PLANNING

(PROFESSIONAL ELECIVE VI)

Course Code: GR20A4088 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Pre-requisites: Transportation Engineering

Course Objectives:

1. Explain about urban planning, assignment and their attributes
2. Explain the various surveys involved in the planning process
3. Analyse the planning variables required for planning process
4. Design the trip generation, distribution and mode choice characteristics
5. Describe the master plans and mass transit systems

Course Outcomes:

1. Comprehend the urban travel demand and independent variables
2. Analyze the traffic surveys and trip generations modules
3. Assess, analyze and study the trip distribution factors and mode choice analysis
4. Evaluate the traffic assignment methods and plans
5. Illustrate device short term and long-term plans

UNIT-I

Urban Travel Demand-Urban development - Urban transport problems - Urban travel characteristics - Need for planning urban travel demand - Trends - Overall planning Process-Components of travel demand

Independent Variables-Travel Attributes- Assumptions in demand estimation - Sequential travel demand modeling -Simultaneous travel demand modeling - Study area - Cordon lines Screen lines -Zoning.

UNIT-II

Travel Demand Surveys-Sampling methods - Home interview surveys - Road side interview surveys - Terminal surveys -Cordon surveys - Taxi surveys - Onboard surveys - Economic surveys - Data checking.

Trip Generation-Trip characteristics - factors influencing Trip productions and attractions - Trip rates - Zonal regression models -Category analysis - Personal trip generation models.

UNIT-III

Trip Distribution-Factors influencing trip distribution - Growth factor methods - Trip length frequency diagram Growth models - LP method - Opportunity models - Gravity opportunity model

Mode Choice Analysis

Factors influencing passenger mode choice- Zonal regression models- Utility maximization- Discrete choice situation - Binary and Multinomial Logit models - Probability curves - Probitaridnested Logit models.

UNIT – IV

Traffic Assignment-Need for Assignment - Objectives - Diversion curves - Shortest path Algorithms - All or nothing Assignment technique - Capacity Restraint Assignment technique - Multi path Assignment technique - Link flows - Sufficiency and Deficiency analysis.

UNIT- V

Plan Preparation and Evaluation-Types of plans- conceptual plan, Master plan - Short term planning vs Long term planning -Corridor Identification and Evaluation - Plan preparation- Application of RS&GIS in Corridor Identification.

TEXT BOOKS:

1. Kadiyali L.R - Traffic Engineering and Transportation Planning -Khanna Publishers, New Delhi- 2011.
2. Papacostas C.S. - Fundamentals of Transportation Engineering Prentice Hall ofIndia Pvt.Ltd; NewDelhi, 3rd edition 2002.
3. John KhistyC - Transportation Engineering - An Introduction, Prentice Hall, Engle wood Cliffs, New Jersey, 3rd edition 2002.
4. Nicholas J. Garber, A. Hoel, Raju Sarkar, Cengage learning, Principles of Traffic and Highway Engineering,1st edition 2010.

REFERENCES:

1. Chari, S.R.UTP Lecture Notes-Regional Engg. College, Warangal.
2. Hutchinson, B.G. Introduction to Urban System Planning, Mc Graw Hil - 1974
3. Mayer M and Miller E, Urban Transportation Planning: A decision-oriented Approach, McGraw Hill. Bruton, Urban Transportation Planning.2nd edition 2001.
4. Dicky, Metropolitan Transportation Planning, DC Script Book Co., 2nd edition 1988.
5. Saxena, Traffic Planning and Design, Dhanpat Rai Publishers,2001, NewDelhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREEN BUILDING TECHNOLOGY

(PROFESSIONAL ELECIVE VI)

Course Code: GR20A4089 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Prerequisite: Environmental Science, Concrete Technology

Course Objectives:

1. Create awareness about the principles of green building technology and to have insight about the criteria for rating systems along with the established Indian codes and guidelines.
2. Explain various renewable and non-renewable sources of energy along with their carbon foot prints and also enumerate the process of performance testing including building modeling and energy analysis.
3. Discuss about the energy efficient green building materials and to have understanding on the cost-effective Building Technologies, Strategies for Green Building Systems and Energy Conservation Measures.
4. Describe the principles of sustainable development in green building design.
5. Explain the best green building practices adopted along with cost/benefit and life-cycle analysis of green buildings.

Course Outcomes:

1. Correlate the underlying principles, history, environmental and economic impacts of green building technology and to identify the criteria for rating systems along with the established Indian codes and guidelines.
2. Identify various Renewable and Non-renewable sources of energy along with their carbon foot prints and building modeling and energy analysis, monitoring and metering.
3. Recognize the energy efficient green building materials and the cost-effective Building Technologies and materials with low embodied energy and incorporate them into design.
4. Explain the application of design guidelines of Green Building considering the Energy Conservation Measures. Perform cost/benefit analysis and life-cycle analysis of green buildings.
5. Explain broad perspective in thinking for sustainable practices by utilizing the engineering knowledge and principles gained from this course.

UNIT-I

Concept of Green Buildings: Definition of Green Buildings, typical features of green buildings, Necessity, Initiatives, Green buildings in India, Green building Assessment- Green Building Rating Systems (BREEAM, USGBC, LEED, IGBC, TERI-GRIHA, GREEN STAR), Criteria for rating, Energy efficient criteria, environmental benefits economic benefits, health and social benefits, Major energy efficiency areas for building, Contribution of buildings towards Global Warming., Codes and Certification Programs.

UNIT-II

Sources of Energy: Renewable and Non-renewable sources of energy ; Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources; potential of these sources, hazards, pollution; Global scenario with reference to demand and supply in India, Global efforts to reduce carbon emissions, Building modeling , Energy analysis, Commissioning, Metering, Monitoring.

Carbon emission: Forecasting, Control of carbon emission, Air quality and its monitoring carbon foot print; Environmental issues, Minimizing carbon emission, Energy retrofits

UNIT-III

Green Building Materials: Sustainably managed Materials, renewable and recyclable resources; energy efficient materials; Embodied Energy of Materials, Green cement, Biodegradable materials, Smart materials, Volatile Organic Compounds (VOC's), Natural Non-Petroleum Based Materials, Recycled materials, Renewable and Indigenous Building Materials, Engineering evaluation of these materials.

Green Building Planning and Specifications: Environment friendly and cost effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green Strategies for Building Systems, Energy Conservation Measures in Buildings, Waste &Water management and Recycling in Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar & Daylight

UNIT-IV

Design of Green Buildings; Sustainable sites, Impact of building on environment, Life cycle assessment, Principles of sustainable development in Building Design, Design on Bioclimatic and solar passive architecture, Considerations of energy consumption, water use, and system reliability, indoor air quality, noise level, comfort, cost efficiency in building design, Advanced Green building technologies and innovations.

UNIT-V

Construction of Green Buildings: Energy efficient construction, Practices for thermal efficiency and natural lighting. Eco- friendly water proofing; ECB codes building rating, Maintenance of green buildings, Cost and Performance Comparisons and Benchmarking, Green Project Management Methods and Best Practices, Cost/benefit analysis of green buildings, Life-cycle analysis of green buildings, Case studies of rated buildings (new and existing)

TEXTBOOKS:

1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao – New Age International Publishers (2014)
2. Integrated Life Cycle Design of Structures – By AskoSarja – SPON Press, first edition 2019.
3. Non-conventional Energy Resources – By D S Chauhan and S K Sreevasthava – New Age International Publishers, 3rd edition 2017.
4. Sustainable Energy Systems Engineering: The Complete Green Building Design Resource (McGraw hill publication): by Gevorkian-2007

5. Understanding Green Building Guidelines: For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher, 2010.
6. Abe Kruger and Carl," Green Building, Principles and practices in Residential Construction", In 2012, Seville Publication
7. Ross Spiegel, Dru Meadows, "Green Building Materials: A Guide to product selection andSpecification",3rd Edition, October 2010

REFERENCES:

1. IGBC reference guide
2. Free abridged versions of LEED reference guides
3. ECBC latest version
4. US GBC's Reference Material:
5. http://www.ncrec.gov/pdfs/bicar/Greenbuilding.pdf

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PAVEMENT MATERIALS
(PROFESSIONAL ELECIVE VI)

Course Code: GR20A4090 **L/T/P/C: 3/0/0/3**

IV Year II Semester

Pre-Requisites: Building Materials and Construction Planning

Course Objectives:

1. Identify the nature, behavior and characteristics of soil.
2. Analyse the behavioral characteristics of aggregates under various tests and optimization by gradation
3. Explain Bitumen characteristics and gradation for mixes.
4. Design bituminous mixes and specifications
5. Explain the basics of Cement & Cement Concrete Mix characterization

Course Outcomes:

1. Categorize the soil based on the geotechnical properties and justify the applicability.
2. Analyze the engineering properties of aggregates and customizing for application under various field situations
3. Categorize the bitumen based on the properties and justify the applicability.
4. Select appropriate asphalt binder for construction of a flexible pavement depending upon the traffic and climatic conditions.
5. Analyze Cement & Cement Concrete Mix characterization and application in various pavements.

UNIT I

Subgrade Soil Characterization: Different types of soils, Mechanical response of soil; Soil Classification; Index and other basic properties of soil; Properties of subgrade layers; Suitable lab and field test like Atterberg limits, CBR, Sieve analysis, Field Density; Suitability of different type of soil for the construction of highway embankments and pavement layers; Field compaction and control.

UNIT II

Aggregate Characterization: Origin, Classification, Types of aggregates; Sampling of aggregates; Mechanical and shape properties of aggregates, Aggregate texture and skid resistance, polishing of aggregates - Proportioning and Blending of aggregates - Super pave gradation - Use of locally available materials in lieu of aggregates.

UNIT III

Bitumen Characterization: Origin, preparation, properties and tests, constitution of bituminous road binders – requirements - Criterion for selection of different binders. Bituminous Emulsions and Cutbacks - Preparation, characteristics, uses and tests.

UNIT IV

Bituminous Mixes: Mechanical properties - Resilient modulus, dynamic modulus and fatigue characteristics of bituminous mixes - Weathering and Durability of Bituminous Materials and Mixes, bituminous mix design methods and Specifications. Performance based Bitumen Specifications; Introduction to Superpave mix design.

UNIT V

Cement and Cement Concrete Mix Characterization: Types of cements and basic cement properties, Special cements; Quality tests on cement; Tests on cement concrete including compressive strength, flexural strength, modulus of elasticity and fatigue properties; Flexible and Rigid Pavements, Joint fillers for Jointed Plain Cement Concrete Pavements and their characterization.

TEXT BOOKS:

1. Soil Mechanics and Foundation Engineering- K.R. Arora, Standard Publishers Distributors, Delhi,
2. Highway Engineering - S.K. Khanna & C.E.G. Justo, Nemchand & Bros, 9th edition 2011.
3. Highway and traffic Engineering - Subash Saxena, 2015.

REFERENCES:

1. Principles of Pavement Design – E. J. Yoder, M. W. Witczak, 2nd edition 2011.
2. Concrete Technology by M.S.Shetty. – S.Chand & Co. ; 2006
3. Relevant IRC and IS codes.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENTERPRENEURSHIP AND PROJECT MANAGEMENT

Course Code: GR20A4091 **L/T/P/C: 2/1/0/3**
IV Year II Semester

Pre-Requisite: Estimation and Costing

Course Objectives:

1. Explain principles of Project Planning and development of Schedules
2. Enhance the ability to Monitor the Projects through Critical Path in Networks like CPM and PERT
3. Analyse break down sequence of Construction Activities, Learn Project Quality Planning and Identify Inspection and Testing Plans of Project Works
4. Recognize and get acquainted with various Construction Equipment and their Management; to identify different Tests for Soils and Concrete.
5. Apply the Concepts of Entrepreneurship; Understand the Social entrepreneurship and Challenges of Social Entrepreneurship.

Course Outcomes:

1. Apply Project Planning techniques and develop Project Schedules in real time conditions.
2. Identify Critical path in CPM & PERT Networks; Evaluate Floats and Slacks for Activities & Events respectively to Progress and Complete the Project in Time.
3. Recall the Method Statements of various Activities and their ITPs with the Knowledge of Project Quality Plans.
4. Identify ideal Construction Equipment required and deploy in the best possible manner for better productivity; Conducts Field Tests for Soils at specified frequency.
5. Explore the Concept of Entrepreneurship & Social Entrepreneurship; Becomes an entrepreneur being familiar with Characteristics of Entrepreneurship & Entrepreneurs.

UNIT - I

Construction project planning- Stages of project planning: Steps involved in Project Planning pre-tender planning, Scheduling, Steps involved in Scheduling, Process of development of Schedules, Gantt Chart, Milestone Chart,

UNIT - II

Construction Project Monitoring - CPM and PERT Networks, basic terminology, types of precedence relationships Preparation of CPM Networks for Construction Activities, Critical Path, Float-Types of Float, computation of Float values, work break-down structure, Three- Time Estimate, PERT- Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.

UNIT - III

Construction Methods basics: Types of foundations and construction methods; Basics of Formwork and Striping of Formwork; Common building construction methods conventional walls and slabs; conventional framed structure with blockwork walls; Precast concrete construction methods; Project Quality Plan (PQP), Method Statements, Inspection and Test Plans (ITPs), Quality Control Vis-à-vis Quality Assurance. Acceptance Criteria of Concrete, Core Cutting of Concrete Members. Load Test for Flexural Members

UNIT - IV

Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of Mechanized methods; Equipment for Excavation-Excavators, Front End Loaders and Earthmoving-Tippers, Compaction of Soils, OMC, Dozers, Motor graders, Rollers-Static and Vibratory (Tandem), Field Tests to Test Density of Soils-Core Cutting, Sand Replacement and Nuclear Density Gauge. Concrete Mix-Nominal and Design Mix. Concrete mixing – Batching Plants, transporting (Transit Mixers) and placing - Concrete Pumping and Boom Placers, Cranes, Tower Crane.

UNIT – V

Entrepreneurship: Concept of Entrepreneurship – entrepreneurs; Types of Entrepreneurship, Importance of Entrepreneurship, Main Characteristics of Entrepreneurship, Purpose of Entrepreneurship, Nature of Entrepreneurship, 10 characteristics of Entrepreneurs, Examples of Entrepreneurship, How do you start Entrepreneurship, Benefits of Entrepreneurship, Difference between Entrepreneurship and Business, Risks of Entrepreneurship, 7 Practical Tips to Become an Entrepreneur with No Money, Social Entrepreneurship, Challenges of Social Entrepreneurship.

TEXTBOOKS:

1. Jha, Kumar Neeraj., Construction Project management, Theory& Practice, Pearson Education India, 2015.
2. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

REFERENCES:

1. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011.
2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
3. Chudley, R., Construction Technology, ELBS Publishers, 2007.
4. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006.

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

Course Code: GR20A4130 **L/T/P/C: 0/0/12/6**

IV Year II Semester

Pre-Requisite: Knowledge of all Civil Engineering subjects and Laboratories, communication skills

Course Objectives:

1. Improve the technical presentation skills of the students.
2. Train the students to do Survey and study of published literature on the assigned topic
3. Impart practical skills and knowledge in their project.
4. Learn different tools and techniques to solve problems
5. Prepare technical reports

Course Outcomes:

1. Interpret ideas and thoughts into practice in a project and work in a team
2. Analyze the gap between theoretical and practical knowledge and evaluate the available literature on the chosen problem
3. Compose technical presentation in the conference and to develop organizational skillsand team work
4. Apply the principles, tools and techniques to solve the problem
5. Prepare and present project report

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOFT SKILLS AND INTERPERSONAL SKILLS
(OPEN ELECTIVE)

Course Code: GR20A3136 **L/T/P/C: 3/0/0/3**

Course Objectives:

1. To know the importance of soft skills.
2. To identify good leadership skills /qualities.
3. To recognize the importance of interpersonal skills.
4. To demonstrate the significance of confidence building.
5. To define and differentiate between a report and a proposal.

Course Outcomes:

1. Develop soft skills communication skills, leadership skills etc.
2. Implement goal setting techniques to build a promising career.
3. Design formal report and proposals with appropriate formal expressions.
4. Create healthy workplace environment by treating others with respect and dignity.
5. Evaluate the power of confidence building and self-esteem with examples.

UNIT I: Soft Skills

- Introduction to soft skills, Definition of Soft skills, Importance of soft skills
- Communication skills, Usage of English in Business/Corporate scenario
- Nonverbal communication - Proxemics
- Presentation skills

UNIT II: Team Building & Leadership Qualities

- Qualities of a good leader
- Problem solving and Decision Making
- Strategic management
- Crisis management

UNIT III: Personality Development

- Motivation
- Goal setting
- Self-esteem
- Team skills

UNIT IV: Developing Reports and Proposals

- Understanding reports and proposals
- Planning reports and proposals
- Writing beginning, body and ending
- Formats of reports and proposals

UNIT V: Interpersonal Skills

- Understanding professional relationships
- Networking professionally
- Showing basic office courtesies
- Interview skills

TEXT BOOKS:

1. Soft Skills-Key to success in workplace and life Meenakshi Raman, Raman Upadhyay, CENAGE

REFERENCES:

1. Soft skills for Everyone - Jeff Butterfield, CENAGE Learning
2. Soft skills for Interpersonal Communication - S. Balasubramaniam (ORIENT BLACKSWAN)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOUR
(OPEN ELECTIVE)

Course Code:GR20A3137 **L/T/P/C: 3/0/0/3**

Course Objectives:

1. OB provides perspectives and skills that enhance understanding of our own behaviour and our ability to influence the behaviour of others in organizational settings
2. OB and HRM together can instill sustainability deep within an organizations' culture.
3. To equip them with behavioural skills in managing people at work.
4. To make student aware of the concepts, techniques and practices of human resource development.
5. This course is intended to make students capable of applying the principles and techniques as professionals for developing human resources in an organization.

Course Outcomes:

1. To acquaint the student with the determinants of intra -individual, inter-personnel and inter-group behaviour in organisational setting.
2. To Understand individual behavior in organizations, including diversity, attitudes, job satisfaction, emotions, moods, personality, values, perception, decision making, and motivational theories and apply in the organizational context.
3. To assess the group behavior in organizations, including communication, leadership, power and politics, conflict, and negotiations in the framework of organization and to familiarize the concepts, techniques and practices of human resource development in the current organizational view.
4. To impart and apprise the capable of applying the principles and techniques as professionals for developing human resources in an organization.
5. To report the current trends and applications in HRD and Balanced Scorecard to measures the performance and to develop, implement, and evaluate organizational human resource development strategies aimed at promoting organizational effectiveness in different organizational environments.

UNIT I - Introduction to OB: Organisational Behaviour- Concept and Emergence of OB Concept; Nature and Theoretical frameworks; Models of Organisational Behaviour, Challenges and Opportunities for Organisational Behavior;

UNIT II- Individual Behaviour: Individual Behaviour: Personality, Learning, Values and Attitudes, Perception, Stress at work. Management's assumptions about people- McGregor's Theory X and Theory Y. Motivation - Maslow's Need Hierarchy, Herzberg's Two Factors Theory, Vroom's Expectancy Theory.

UNIT III-Inter-personal and Group Behaviour: Interpersonal communication and Feedback; Transactional Analysis (TA); Johari Window. Group Behaviour: Group Dynamics, Cohesiveness and Productivity; Management of Dysfunctional groups; Group Decision Making. Leadership- Concept and Styles.

UNIT IV -Introduction to Human Resource Development: Concept; Relationship between human resource management and human resource development; HRD mechanisms, processes and outcomes; HRD matrix; Roles and competencies of HRD professionals; Challenges in HRD, steps in HRD Process.

UNIT V-HRD Applications and Trends: Coaching and mentoring; Career management and development; Competency mapping; Balanced Score Card. HRD in Organisations: Selected cases covering HRD practices in government organisations, manufacturing and service industries and MNCs.

TEXT BOOKS:

1. Robbins, Stephen P. and Timothy A. Judge, Organisational Behaviour, Prentice -Hall, New Delhi.
2. Werner J. M., DeSimone, R.L., Human resource development, South Western.

REFERENCES:

1. Luthans, Fred, Organizational Behaviour, McGraw-Hill, New York.
2. Gregory, Moorhead and Ricky W. Griffin, Managing Organizational Behaviour, Thomson South Western Publication.
3. Pareek, Udai and V. Sisodia, "HRD in the New Millennium, Tata McGraw - Hill Publishing Co. Ltd., New Delhi, 1999.
4. Haldar, U. K., Human resource development, Oxford University Press India.
5. Rao, T.V., Future of HRD, Macmillan Publishers India.
6. Rao, T.V., HRD Score Card 2500: Based on HRD audit, Response Books, SAGE Publications.
7. Mankin, D., Human resource development, Oxford University Press India.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CYBER LAW AND ETHICS
(OPEN ELECTIVE)

Course Code:GR20A3138 **L/T/P/C: 3/0/0/3**

Course Objectives:

1. Provide the fundamental skill to understand cyber laws.
2. Understand the legal frameworks
3. Understand different cyber crimes
4. Provides overview on Intellectual Property, copy rights, patents rights etc.
5. Give rapid changes in technology and the corresponding changes in crime and the law

Course Outcomes:

1. Identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
2. Students locate and apply case law and common law to current legal dilemmas in the technology field.
3. Students apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.
4. Students will be able understand cybercrime and ethical practices and the student will be able to know and learn web technologies and related issues.
5. Be in position to interface with various issues pertaining to Intellectual Property, copy rights, patents rights etc. and provide an overview of cybercrime and framework.

UNIT I - The Legal System: Sources of Law and The Court Structure: Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers. (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court), Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration.

UNIT II - Introduction cyber law: Computers and its Impact in Society, Overview of Computer and Web Technology, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level.

UNIT III -Constitutional & Human Rights Issues in Cyber space: Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace, Access to Internet, Right to Privacy, Right to Data Protection.

UNIT IV - Cyber Crimes & Legal Framework: Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act

UNIT V: Intellectual Property Issues in Cyber Space: Interface with Copyright Law, Interface with Patent Law, Trademarks & Domain Names Related issues.

TEXT BOOKS:

1. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
2. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012)
3. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)
4. JonthanRosenoer, Cyber Law, Springer, New York, (1997).
5. Sudhir Naib, The Information Technology Act, 2005: A Handbook.
6. S. R. Bhansali, Information Technology Act, 2000
7. University Book House Pvt. Ltd. Jaipur (2003).
8. Vasu Deva, Cyber Crimes and Law Enforcement, Commonwealth Publishers, New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ECONOMIC POLICIES IN INDIA
(OPEN ELECTIVE)

Course Code:GR20A3139 **L/T/P/C: 3/0/0/3**

Course Objective:

1. Analyse the overall business environment and evaluate its various components in business decision making.
2. Provide an analysis and examination of significant contemporary ethical issues and challenges.
3. Emphases the manager's social and environmental responsibilities to a wide variety of stakeholders.
4. Know the various Government policies governing industry.
5. Know economic terms and its scope.

Course Outcomes:

1. Familiarize with the nature of business environment and its components.
2. The students will be able to demonstrate and develop conceptual framework of business environment.
3. Understand the definition of ethics and the importance and role of ethical behaviour in the business world today.
4. Explain the effects of government policy on the economic environment.
5. Outline how an entity operates in a business environment.

Unit 1: Business environment-factors effecting Business Environment-need for industrial policies, Overview of Indian Economy, Trends towards market economy, problems of underdevelopment –meaning, Main problems, reasons, of underdevelopment.

Unit :2 Factors and measure, Meaning of Economic development, National income, Per capital income, Quality of life, Capital Formation – Savings, Investment.

Unit 3: NITI Aayog and Planning in India, Niti Aayog and its function, how is Niti Aayog different from planning commission, Meaning, Importance, Main reasons of adopting, planning in India, Objectives of planning, Economic development, moderation, stability, self-sufficiency, employment etc, foreign aid, Employment. Allocation of Resources

Unit 4: Private and Public Sector, Public Sector – role and growth, Achievements of the public sector, Private Sector – Importance Problems, New foreign Trade Policy.

Unit 5: Present Economic Policy, Main feature, Globalization, Expansion of Private sector, more market orient approach. Public distribution system, Industrial policies before and after 1991, Industrial Licensing, Monetary and Fiscal Policy, elements of Indian current GDP and review of current budget.

TEXT BOOKS

1. Francis Cherunilam: Business Environment: Text and Cases. 18/e. Himalaya. 2009.
2. Misra and Puri: Indian Economy, Himalaya, 2009.

REFERENCES:

1. Indian Economy- A. N. Agarwal
2. Indian Economy – Mishra &Puri
3. Indian Development and planning – M. L. Jhingan
4. Indian Economy – R. S. Rastogi Yozna and Kurukshetra Magazines