Academic Regulations
Programme Structure
&
Detailed Syllabus

Bachelor of Technology
(B. Tech)
(Four Year Regular Programme)
(Applicable for Batches admitted from 2018)

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 (B. Tech)
GR18 REGULATIONS

Gokaraju Rangaraju Institute of Engineering and Technology 2018 Regulations (GR18 Regulations) are given hereunder. These regulations govern the programmes offered by the Department of Civil Engineering with effect from the students admitted to the programmes in 2018-19 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 is 160.
   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.

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	Course Description
1	BSC	Basic Science Courses	Basic Science Courses
2	ESC	Engineering Science Courses	Includes Engineering subjects
3	HSMC	Humanities and Social Sciences	Includes management courses
4	PCC	Professional Core Courses	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5	PEC	Professional Elective Courses	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
6	OEC	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	PROJ	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 Civil 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 of the two mid exams shall be considered **i) Subjective - 15 marks** **ii) Objective - 5 marks** **2) Tutorials - 5 marks** **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-10 marks** **ii) Record - 5 marks** **iii) Continuous Assessment - 15marks**
		70	Semester end examination	The semester-end examination is for a duration of 3 hours

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

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

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 - 15 marks.
- Continuous Assessment - 5 marks.

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.

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

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

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

Earning of Credit:

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range O-P. Letter grade 'F' in any Course implies failure of the student in that course and no credits earned.

Computation of SGPA and CGPA:

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

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

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

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

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

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

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

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

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

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

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

18. General Rules

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

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

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

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

Academic Regulations for B.Tech (Lateral Entry) under GR18
(Applicable for Batches Admitted from 2019-2020)

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 or not.**
3	**Third year first semester to third year second semester.**	**Regular course of study of third year first semester.**
4	**Third year second semester to fourth year first semester.**	**(i) Regular course of study of third year second semester.** **(ii) Must have secured at least 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**

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

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

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

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090, India. (040) 6586 4440

CIVIL ENGINEERING

I YEAR I SEMESTER

S.NO.	Course Code	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1	GR18A1001	Linear Algebra and Differential Calculus	3	1	0	4	4	30	70	100
2	GR18A1004	Engineering Physics	3	1	0	4	4	30	70	100
3	GR18A1007	Programming for Problem Solving	3	1	0	4	4	30	70	100
4	GR18A1010	Engineering Graphics	1	0	4	5	3	30	70	100
5	GR18A1012	Engineering Physics Lab	0	0	3	3	1.5	30	70	100
6	GR18A1015	Programming for Problem Solving Lab	0	0	3	3	1.5	30	70	100
		Induction Programme								
Total			**10**	**3**	**10**	**23**	**18**	**180**	**420**	**600**

I YEAR II SEMESTER

S.NO.	Course Code	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Total Marks
			L	T	P					
1	GR18A1002	Differential Equations and Vector Calculus	3	1	0	4	4	30	70	100
2	GR18A1005	Engineering Chemistry	3	1	0	4	4	30	70	100
3	GR18A1009	Engineering Mechanics	3	1	0	4	4	30	70	100
4	GR18A1006	English	2	0	0	2	2	30	70	100
5	GR18A1013	Engineering Chemistry Lab	0	0	3	3	1.5	30	70	100
6	GR18A1014	English Language and Communication Skills Lab	0	0	2	2	1	30	70	100
7	GR18A1017	Engineering Workshop	1	0	3	4	2.5	30	70	100
Total			**12**	**3**	**8**	**23**	**19**	**210**	**490**	**700**

II YEAR I SEMESTER

S.NO.	Course Code	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1	GR18A2007	Building Materials and Construction Planning	2	0	0	2	2	30	70	100
2	GR18A2008	Engineering Geology	2	0	0	2	2	30	70	100
3	GR18A2009	Solid Mechanics – I	3	1	0	4	4	30	70	100
4	GR18A2006	Computational Mathematics for Engineers	3	0	0	3	3	30	70	100
5	GR18A2010	Introduction to Fluid Mechanics	3	0	0	3	3	30	70	100
6	GR18A2011	Pavement Materials	3	0	0	3	3	30	70	100
7	GR18A2012	Engineering Geology lab	0	0	2	2	1	30	70	100
8	GR18A2013	Solid Mechanics Lab	0	0	2	2	1	30	70	100
Total			**16**	**1**	**4**	**21**	**19**	**240**	**560**	**800**
9	GR18A2002	Value Ethics and Gender Culture	2	0	0	2	2	30	70	100
10	GR18A2001	Environmental Science	2	0	0	2	2	30	70	100

II YEAR II SEMESTER

S.NO.	Course Code	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1	GR18A2014	Solid Mechanics – II	3	1	0	4	4	30	70	100
2	GR18A2015	Basic Electrical and Electronics Engineering	3	0	0	3	3	30	70	100
3	GR18A2016	Mechanical Engineering	2	0	0	2	2	30	70	100
4	GR18A2017	Surveying & Geomatics	3	1	0	4	4	30	70	100
5	GR18A2018	Hydraulic Engineering	3	0	0	3	3	30	70	100
6	GR18A2019	Structural Analysis –I	3	0	0	3	3	30	70	100
7	GR18A2020	Surveying Lab	0	0	4	4	2	30	70	100
8	GR18A2021	Computer Aided Design Lab	0	0	2	2	1	30	70	100
9	GR18A2022	Fluid Mechanics & Hydraulic Machinery Lab	0	0	2	2	1	30	70	100
Total			**17**	**2**	**8**	**27**	**23**	**270**	**630**	**900**
10	GR18A2083	Design Thinking	2	0	0	2	1	30	70	100

III YEAR I SEMESTER

S.NO.	Course Code	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1	GR18A3001	Structural Analysis II	3	0	0	3	3	30	70	100
2	GR18A3002	Geotechnical Engineering	3	0	0	3	3	30	70	100
3	GR18A3003	Design of Concrete Structures I	3	0	0	3	3	30	70	100
4	GR18A3004	Environmental Engineering	2	0	0	2	2	30	70	100
5	GR18A3005	Hydrology & Water Resources Engineering	3	0	0	3	3	30	70	100
6		Professional Elective I	3	0	0	3	3	30	70	100
7	GR18A3010	Geotechnical Engineering Lab	0	0	2	2	1	30	70	100
8	GR18A3011	Environmental Engineering Lab	0	0	2	2	1	30	70	100
9	GR18A3012	Concrete Technology Lab	0	0	2	2	1	30	70	100
		Total	**17**	**0**	**6**	**23**	**20**	**270**	**630**	**900**
10	GR18A2003	Constitution of India	2	0	0	2	2	30	70	100

PROFESSIONAL ELECTIVE - 1		
S. No.	**Course Code**	**COURSE**
1.	GR18A3006	Masonry Structures
2.	GR18A3007	Urban Transportation Planning
3.	GR18A3008	Environmental Impact Assessment and Life Cycle Analyses
4.	GR18A3009	Construction Equipment and Automation

III YEAR II SEMESTER

S.NO.	Course Code	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1	GR18A2004	Economics & Accounting for Engineers	3	0	0	3	3	30	70	100
2	GR18A3065	Transportation Engineering	3	0	0	3	3	30	70	100
3	GR18A3066	Foundation Engineering	3	0	0	3	3	30	70	100
4	GR18A3067	Design of Steel Structures	3	0	0	3	3	30	70	100
5		Professional Elective II	3	0	0	3	3	30	70	100
6		Open Elective I	3	0	0	3	3	30	70	100
7	GR18A3072	Transportation Engineering Lab	0	0	2	2	1	30	70	100
8	GR18A3116	Mini Project with Seminar	0	0	6	6	3	30	70	100
		Summer Internship	-	-	-	-	-			
		Total	**18**	**0**	**8**	**26**	**22**	**240**	**560**	**800**

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PROFESSIONAL ELECTIVE - 2		
S. No.	**Course Code**	**COURSE**
1	GR18A3068	Reinforced Concrete
2	GR18A3069	Rock Mechanics
3	GR18A3070	Open Channel Flow
4	GR18A3071	Concrete Technology

IV YEAR I SEMESTER

S.NO.	Course Code	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1	GR18A4001	Estimation & Costing	3	1	0	4	4	30	70	100
2	GR18A4002	Project management & Entrepreneurship	3	0	0	3	3	30	70	100
3		Professional Elective III	3	0	0	3	3	30	70	100
4		Professional Elective IV	3	0	0	3	3	30	70	100
5		Open Elective II	3	0	0	3	3	30	70	100
6	GR18A4011	Computer Applications in Structural Engineering Lab	0	0	4	4	2	30	70	100
7	GR18A4061	Project work (Phase I)	0	0	12	12	6	30	70	100
Total			**15**	**1**	**16**	**32**	**24**	**210**	**490**	**700**

PROFESSIONAL ELECTIVE - 3		
S. No.	**Course Code**	**COURSE**
1.	GR18A4003	Industrial Structures
2.	GR18A4004	Geometric Design of Highways
3.	GR18A4005	Surface Hydrology
4.	GR18A4006	Engineering Materials for Sustainability

PROFESSIONAL ELECTIVE - 4		
S. No.	**Course Code**	**COURSE**
1.	GR18A4007	Earthquake Engineering
2.	GR18A4008	Traffic Engineering and Management
3.	GR18A4009	Groundwater
4.	GR18A4010	Geographic Information Systems and Science

IV YEAR II SEMESTER

S.NO.	Course Code	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1		Professional Elective V	3	0	0	3	3	30	70	100
2		Professional Elective VI	3	0	0	3	3	30	70	100
3		Open Elective III	3	0	0	3	3	30	70	100
4	GR18A4108	Project work (Phase II)	0	0	12	12	6	30	70	100
Total			**9**	**0**	**12**	**21**	**15**	**120**	**280**	**400**

PROFESSIONAL ELECTIVE - 5		
S. No.	**Course Code**	**COURSE**
1	GR18A4062	Prestressed Concrete
2	GR18A4063	Ground Improvement Techniques
3	GR18A4064	Design of Hydraulic Structures/Irrigation Engineering
4	GR18A4065	Construction Project Planning and Systems

PROFESSIONAL ELECTIVE – 6		
S. No.	**Course Code**	**COURSE**
1	GR18A4066	Bridge Engineering
2	GR18A4067	Pavement Design
3	GR18A4068	Physico-Chemical Processes for Water and Wastewater Treatment
4	GR18A4069	Repairs and Rehabilitation of Structures

PROFESSIONAL ELECTIVES - 4 THREADS

S. No.	Structural Engineering	Geotechnical and Transportation Engineering	Environmental and Hydrology Engineering	Construction Technology & Management
1	Masonry Structures	Urban Transportation Planning	Environmental Impact Assessment and Life Cycle Analyses	Construction Equipment& Automation
2	Reinforced Concrete	Rock Mechanics	Open Channel flow	Concrete Technology
3	Industrial Structures	Geometric Design of Highways	Surface Hydrology	Engineering Materials for Sustainability
4	Earthquake Engineering	Traffic Engineering and Management	Groundwater	Geographic Information Systems and Science
5	Prestressed Concrete	Ground Improvement Techniques	Design of hydraulic structures/Irrigation Engineering	Construction Project Planning & Systems
6	Bridge Engineering	Pavement Design	Physico-Chemical Processes for Water and Wastewater Treatment	Repairs & Rehabilitation of Structures

OPEN ELECTIVES – THREADS

S. No.	THREAD 1	THREAD 2
1	Soft Skills and Interpersonal Skills (GR18A3117)	CSE: 1. Principles of E-Commerce (GR18A3129) 2. Database Management Systems (GR18A2068) 3. Java Programming (GR18A2075)
2	Human Resource Development and Organizational Behaviour (GR18A3118)	IT: 1. Multimedia and Application Development (GR18A3123) 2. Web Programming (GR18A3057) 3. Operating Systems (GR18A2074)
3	Cyber Law and Ethics (GR18A3119)	EEE: 1.Embedded Systems (GR18A4102) 2. Control Systems (GR18A2032) 3. Artificial Intelligence Techniques (GR18A3016)
4	History of Science (GR18A3120)	ECE:1.Artificial Neural Networks (GR18A3124) 2.Software Defined Radio and Cognitive Radio (GR18A3125) 3.Cloud Computing (GR18A3102)
5	Introduction to Art and Aesthetics (GR18A3121)	ME: 1.Operations Research (GR18A3126) 2. Automobile Engineering (GR18A3127) 3. Robotics (GR18A4079)
6	Economic Policies in India (GR18A3122)	CE: 1. Green Building Technology (GR18A3128) 2.Building Materials and Construction Planning (GR18A2007) 3. Introduction to Fluid Mechanics (GR18A2010)

Syllabus
I-Year

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

LINEAR ALGEBRA AND DIFFERENTIAL CALCULUS

Course code: GR18A1001 **L/T/P/C: 3/1/0/4**

Course Objectives: To provide the student with

- The ideas of linearity and linear systems, which lie at the core of many engineering concepts
- The concept of latent values of a matrix which is critical in many engineering applications
- The ideas of function approximation using the tools of mean value theorems
- The skill of using a definite integral for various geometrical applications
- The skill of finding the optimal values of multi-variable functions

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

- Compute the rank of a matrix to determine the existence of solutions of a linear algebraic system
- Determine the eigenvalues and eigenvectors of a square matrix which arise in several engineering applications
- Determine approximate solution of over determined systems using the pseudo inverse
- Apply the definite integral for various computational problems in geometry and Evaluate some improper integrals using special functions
- Develop the skill of determining optimal values of multivariable functions using classical methods

Unit I: VECTOR AND MATRIX ALGEBRA

Vector space (definition and examples), linear independence of vectors, orthogonality of vectors, projection of vectors, Gram-Schmidt ortho normalization of vectors, Symmetric, Hermitian, skew- symmetric, skew-Hermitian, orthogonal and UNIT-ary 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 forms by orthogonal transformation.

Unit III: MATRIX DECOMPOSITION AND PSEUDO INVERSE OF A MATRIX

Spectral decomposition of a symmetric matrix, L-U decomposition, 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: SINGLE VARIABLE CALCULUS

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem and Taylor's theorem (without proof), their geometrical interpretation and applications, approximation of a function by Taylor's series, Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (only in Cartesian coordinates), Evaluation of improper integral using Beta and Gamma functions.

Unit V: 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

Text/Reference Books:

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa publishing house,
2. Fourth edition 2014
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th edition,Pearson, Reprint,
5. 2002.
6. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
7. GRIET reference manual.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING PHYSICS

Course code: GR18A1004 **L/T/P/C: 3/1/0/4**

Course Objectives: At the end of the course the student is expected to

- Demonstrate skills in scientific inquiry and problem solving techniques.
- Illustrate the wave nature of light through the phenomena of interference and diffraction.
- Interpret the properties of Laser light and its uses in optical fiber communication.
- Classify and analyze the properties of solid and engineered semiconductor materials.
- Demonstrate competence and understanding of the concepts of Harmonic oscillations and waves.

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

- Apply the phenomenon of interference and diffraction of waves.
- Analyze the properties of Laser and its propagation in optical fibers.
- Classify materials based on free electron theory.
- Extend the knowledge of characterization techniques to know the composition of Nano material.
- Describe the quality factor for damped mechanical and electrical oscillators.

Unit I: WAVE OPTICS

Huygens's principle, 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, Michelson's interferometer, Fraunhofer diffraction from a single slit, double slit and N slits, Diffraction grating: Grating spectrum and resolving power.

Unit II: LASERS AND FIBER OPTICS

Lasers: Interaction of radiation with matter: Spontaneous and Stimulated emission and absorption, Einstein coefficients, Characterizes of lasers, Resonating cavity, Active medium, pumping, population inversion, Construction and working of laser: Ruby laser, He-Ne laser, application of lasers.

Fiber Optics: Introduction, Principle and Construction of an optical fiber, Acceptance angle, Numerical aperture, Types of Fibers, losses associated with optical fibers, Basic components in optical fiber communication system, Application of optical fibers.

Unit III: INTRODUCTION TO SOLIDS

Free electron theory of metals, Classical and quantum free electron theory, Density of states, Dependence of Fermi level on temperature, Bloch's theorem, Kronig – Penny model(Qualitative treatment), E – K diagram, origin of energy bands, Classification of materials on the basis of energy bands, Effective mass.

Unit IV: ENGINEERED SEMICONDUCTOR MATERIALS

Nano Materials: Introduction, quantum confinement, surface to volume ratio, density of states in 2D, 1D and 0D (qualitatively), Practical examples of low-dimensional systems such as quantum wells, wires and dots. Fabrication: Top-Down by CVD, Bottom –Up by Sol-Gel and characterization techniques: SEM, TEM and EDAX.

Unit V: HARMONIC OSCILLATIONS

Mechanical oscillators: Differential equation of simple harmonic motion, Phase relationship between displacement, velocity and acceleration, energy of a harmonic oscillator, Damped harmonic oscillator: heavy, critical and light damping, Energy decay in a damped harmonic oscillator, Quality factor. Electrical oscillators: L-C Circuit.

Text/Reference 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
7. H. J. Pain, "The physics of vibrations and waves", Wiley, 2006
8. O. Svelto, "Principles of Lasers"
9. "Introduction to Mechanics", M.K.Verma, Universities Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING

Course Code: GR18A1007 **L/T/P/C: 3/1/0/4**

Prerequisite: Knowledge of Mathematics required.

Course Objectives:

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of C programming language.
- To learn the usage of structured programming approach in solving problems.

Course Outcomes:

The Student will learn:

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.

Unit I: INTRODUCTION TO PROGRAMMING

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program, Number systems

Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code , Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops

I/O: Simple input and output with scanf and printf, formatted I/O.

Unit II: ARRAYS, STRINGS, STRUCTURES AND POINTERS

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

Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of structures.

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation)Enumeration data type

Unit III: PREPROCESSOR AND FILE HANDLING IN C

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef **Files:** Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions. Introduction to stdin,stdout and stderr.

Unit IV: FUNCTION AND DYNAMIC MEMORY ALLOCATION

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series , Limitations of Recursive functions

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

Unit V: INTRODUCTION TO ALGORITHMS

Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number,Basic searching in an array of elements (linear and binary search techniques),Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING GRAPHICS

Course Code: GR18A1010 **L/T/P/C : 1/0/4/3**

Course Objectives:

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

Course Outcomes:

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

Unit I: INTRODUCTION TO ENGINEERING DRAWING

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Scales – Plain and Diagonal.

Unit II: ORTHOGRAPHIC PROJECTIONS

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures-Auxiliary Planes.

Unit III: PROJECTIONS OF REGULAR SOLIDS

Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere

Unit IV: DEVELOPMENT OF SURFACES OF RIGHT REGULAR SOLIDS

Prism, Cylinder, Pyramid and Cone, Intersection of Solids: Intersection of – Prism vs Prism- Cylinder Vs Cylinder

Unit V: ISOMETRIC PROJECTIONS

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
2. Engineering Drawing/ N.S.Parthasarathy and Vela Murali/Oxford
3. Engineering Graphics. By Basanth Agrawal/CM Agrawal/McGraw Hill Education
4. Engineering Drawing by K.Venu Gopal/New Age Publications.
5. Computer Aided Engineering Drawing / K Balaveerareddy et al-CBS publishers
6. Engineering Graphics and Design by Kaushik Kumar / Apurba kumar Roy /Chikesh Ranjan

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING PHYSICS LAB

Course Code: GR18A1012 **L/T/P/C: 0/0/3/1.5**

Course Objectives: At the end of the course the student is expected to

- Experiment with resonance phenomena using electrical source.
- Recall the basic properties of light like interference and diffraction through hands on experience.
- Apply the theoretical concepts of optical fibers in practical application.
- Analyze the mechanical properties of solid materials.
- Analyze the behavior of semiconductors in various aspects.

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

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

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

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

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

TASK 4: Diffraction grating: To determine the number of lines per inch of the grating.

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

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

TASK 7: LCR Circuit: To determine quality factor and resonant frequency of LCR circuit.

TASK 8: LASER: To study the characteristics of LASER sources.

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

TASK 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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMING FOR PROBLEM SOLVING LAB

Course Code: GR18A1015 **L/T/P/C: 0/0/3/1.5**

Prerequisite: Basic operations of computer and knowledge of mathematics

Laboratory Objectives: The students will learn the following:

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

Laboratory Outcomes The candidate is expected to be able to:

- formulate the algorithms for simple problems and translate given algorithms to a working and correct program.
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures and use pointers of different types
- 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: (Practice sessions)

a. Write a simple program that prints the results of all the operators available in C (including pre/ post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values form standard input.

Task 2: (Simple numeric problems)

a. Write a program for fiend the max and min from the three numbers.
b. Write the program for the simple, compound interest.
c. Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.

Task 3: (Simple numeric problems)

a. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
    i. 5 x 1 = 5
    ii. 5 x 2 = 10
    iii. 5 x 3 = 15

b. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Task 4: (Expression Evaluation)

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s = ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
b. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
c. Write a program that finds if a given number is a prime number

Task 5: (Expression Evaluation)

a. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
b. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
c. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Task 6: (Expression Evaluation)

a. Write a C program to find the roots of a Quadratic equation.
b. Write a C program to calculate the following, where x is a fractional value.
   1-x/2 +x^2/4-x^3/6
c. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x^2+x^3+……+x^n. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Task 7: (Arrays and Pointers and Functions)

a. Write a C program to find the minimum, maximum and average in an array of integers.
b. Write a functions to compute mean, variance, Standard Deviation, sorting of n elements in single dimension array.
c. Write a C program that uses functions to perform the following:
   i. Addition of Two Matrices
   ii. Multiplication of Two Matrices
   iii. Transpose of a matrix

   with memory dynamically allocated for the new matrix as row and column counts may not be same.

Task 8: (Arrays and Pointers and Functions)

a. Write C programs that use both recursive and non-recursive functions
   i. To find the factorial of a given integer.
   ii. To find the GCD (greatest common divisor) of two given integers.
   iii. To find x^n
b. Write a program for reading elements using pointer into array and display the values using array.
c. Write a program for display values reverse order from array using pointer.
d. Write a program through pointer variable to sum of n elements from array.

Task 9: (Files)

a. Write a C program to display the contents of a file to standard output device.

b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

Task 10: (Files)

a. Write a C program that does the following:It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function) Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function).The program should then read all 10 values and print them back.
b. Write a C program to merge two files into a third file (i.e., the contents of the firs t file followed by those of the second are put in the third file).

Task 11: (Strings)

a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
c. Write a C program that uses functions to perform the following operations:
   i. To insert a sub-string in to a given main string from a given position.
   ii. To delete n Characters from a given position in a given string.

Task 12: (Strings)

a. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
b. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn‘t contain ch.
c. Write a C program to count the lines, words and characters in a given text.

Task 13: (Miscellaneous)

a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.
b. Write a C program to construct a pyramid of numbers as follows:

```
1          *          1          1          *
1 2        * *        2 3        2 2        * *
1 2 3      * * *      4 5 6      3 3 3      * * *
                                 4 4 4 4    * *
                                            *
```

Task 14: (Sorting and Searching)

a. Write a C program that uses non recursive function to search for a Key value in a given list of integers using linear search method.
b. Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using binary search method.

c. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

Task 15: (Sorting and Searching)

a. Write a C program that sorts the given array of integers using selection sort in descending order.
b. Write a C program that sorts the given array of integers using insertion sort in ascending order .
c. Write a C program that sorts a given array of names.

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Code : GR18A1002 **L/ T/P/C : 3/1/0/4**

Course Objectives: To provide the student with

- The knowledge to visualize solutions to engineering problems governed by differential equations
- The skill of evaluating multiple integrals needed for applications in mechanics and electro-magnetic field theory
- The knowledge to visualize the functions arising in vector field theory and use mathematical tools for some computations
- The skill of calculating work done by a field and flux across a surface
- The skill of using specialized theorems for fast computation of work and flux

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

- Classify the differential equations of first order and solve them analytically by suggested methods
- Solve linear differential equations of higher order under various forcing functions
- Evaluate double and triple integrals and apply them to some problems in geometry and mechanics
- Perform vector differential operations on scalar and vector fields and apply them to solve some field related problems
- Apply classical vector integral theorems for fast computation of work done around closed curves and flux across closed surfaces

Unit I: FIRST ORDER ODE

LDE of the first order: Solution of Exact, linear and Bernoulli equations, modeling of Newton's law of cooling, growth and decay models, modeling an R-L circuit.Non - linear differential equations of the first order: Equations solvable for *p*, equations solvable for *x*, equations solvable for *y*.

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, $cosax$, $sinax$, (x) and x (x) where $(x) \equiv cosax\ and\ sinax$, 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: Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallelepipeds

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 fields, irrotational fields, potentials

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 proofs) and their applications

Text/Reference Books:

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa publishing house,
2. Fourth edition 2014
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
4. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
5. 4.. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
6. GRIET reference manual
7. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
8. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY

Course Code: GR18A1005 **L/T/P/C: 3/1/0/4**

Course Objectives:

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

Course Outcomes:

- Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Relate electromagnetic spectra used for exciting different molecular energy levels in various spectroscopic techniques and their application in medicine and other fields.
- Recognise various problems related to electro chemistry and corrosion in industry and is able to explain different prevention techniques and apply concepts of chemistry in Engineering.
- Know the origin of different types of engineering materials used in modern technology and Interpret different problems involved in industrial utilization of water.
- Understand the processing of fossil fuels for the effective utilization of chemical energy.

Unit I: ATOMIC AND MOLECULAR STRUCTURE

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

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. Nuclear Magnetic Resonance: Basic concepts of NMR, Chemical shift. Magnetic resonance Imaging.

Unit III: ELECTROCHEMISTRY AND CORROSION

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. Fuel cells: hydrogen-oxygen fuel cell - applications and advantages.

Corrosion: Definition, causes and effects of corrosion, Theories 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

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, melting and boiling points, glass transition temperature, viscoelasticity. Compounding and fabrication by compression moulding and injection moulding, conducting polymers – definition, classification, application.

Water: impurities, hardness- causes of hardness, types, UNIT-s. Boiler troubles- scales and sludges, caustic embrittlement, water purification by reverse osmosis (RO) method.

Unit V: STEREOCHEMISTRY AND ENERGY RESOURCES

Stereo chemistry: Structural isomers and stereoisomers, representations of 3D structures, configurations and symmetry, chirality, enantiomers, diastereomers, optical activity, conformational analysis of n-butane. Structure, synthesis and pharmaceutical applications of paracetamol and aspirin.

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 engines, Octane rating and cetane number. Composition and Uses of Natural gas, LPG and CNG.

Text/Reference Books:

1. Engineering Chemistry by P.C. Jain and M. Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. Engineering Chemistry by Prasanta Rath, B. Rama Devi, Ch. Venkata Ramana reddy, S.Chakroborty. Cengage publications, 2018.
3. University Chemistry, by B.H. Mahan.
4. Engineering Chemistry by B. Siva Sankar, Mc Graw Hill Publication.
5. Fundamentals of Molecular Spectroscopy, by C.N. Banwell. Mc Graw Hill Publication
6. A Text book of Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING MECHANICS

Course Code: GR18A1009 **L/T/P/C: 3/1/0/4**

Course Objectives:

- Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
- Perform analysis of bodies lying on rough surfaces.
- Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections
- Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies.
- Explain the concepts of work-energy method, impulse-momentum and its applications to translation, rotation and plane motion

Course Outcomes:

- Determine resultant of forces acting on a body and analyze equilibrium of a body subjected to a system of forces.
- Solve problem of bodies subjected to friction.
- Find the location of centroid and calculate moment of inertia of a given section.
- Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, fixed axis rotation and plane motion.
- 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 and Spatial Systems; Static Indeterminacy.

Unit II: Friction

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

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: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.

Unit IV: 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).

Unit V: Kinetics of Rigid Bodies

Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work Energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.

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, Jaan Kiusalaas, "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

ENGLISH

Course Code: GR18A1006 **L/T/P/C: 2/0/0/2**

INTRODUCTION

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. *The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.*

Course Objectives: The course will help to

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

Course Outcomes: Students should be able to

- Use English Language effectively in spoken and written forms.
- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts and different cultures.
- Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively by listening carefully and respect others point of view.

Unit I: 'The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

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: Letter Writing

Vocabulary: Synonyms and Antonyms. Use of phrases for formal and informal letter writing. Eg.., I would like to apply, I regret to inform, This is to bring to your kind notice... etc.

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

Reading: Improving Comprehension Skills – Techniques for Good Comprehension, Read a letter

Writing: Format of a Formal Letter-**Writing Formal Letters** E.g.., Letter of Complaint, Letter of Requisition, Job Application with Resume. Reorganising of sentences /paragraphs in a letter.

Unit III: 'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events – **Classifying**- Providing Examples or Evidence

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

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension- Intensive Reading and Extensive Reading

Writing: Writing Practices--Writing Introduction and Conclusion - Essay Writing-Précis Writing.

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

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/Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY LAB

Course code: GR18A1013 **L/T/P/C: 0/0/3/1.5**

Course Objectives:

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

Course Outcomes:

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

List of Experiments: (any 12 experiments out of 14)

TASK 1: Determination total hardness of water by complexometric method using EDTA.

TASK 2: Determination of chloride content of water by Argentometry.

TASK 3: Redox titration: Estimation of ferrous iron using standard $KMnO_4$

TASK 4: Estimation of HCl by Conductometric titrations

TASK 5: Estimation of Acetic acid by Conductometric titrations

TASK 6: Estimation of Ferrous iron by Potentiometry using dichromate

TASK 7: Determination of rate constant of acid catalyzed reaction of methyl acetate

TASK 8: Determination of acid value of coconut oil.

TASK 9: Adsorption of acetic acid by charcoal

TASK 10: Determination of surface tension of liquid by using stalagmometer

TASK 11: Determination of viscosity of liquid by using Ostwald's viscometer.

TASK 12: Determination of partition coefficient of acetic acid between n-butanol and water.

TASK 13: Synthesis of Aspirin

TASK 14: Synthesis of Paracetamol.

Text/Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Course code: GR18A1014 **L/T/P/C: 0/0/2/1**

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
- To sensitize students to the nuances of English speech sounds, word accent, intonation, rhythm and Neutralization of accent for intelligibility
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize their mother tongue influence
- To train students to use language appropriately for public speaking and interviews

Course Outcomes:

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

Listening Skills Objectives:

1. To enable students develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation

2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

- Listening for general content
- Listening for specific information

Speaking Skills

Objectives:

- To involve students in speaking activities in various contexts
- To enable students express themselves fluently and appropriately in social and professional contexts
- Oral practice: Just A Minute (JAM) Sessions
- Describing objects/situations/people
- Role play – Individual/Group activities

Exercise – I

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.

Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab:

Understand: Communication at Work Place- Spoken vs. Written language.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – 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:

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: How to make Formal Presentations.

Practice: Formal Presentations.

Exercise – IV:

CALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks.

Practice: Making a Short Speech – Extempore.

Exercise – V:

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Interview Skills.

Practice: Mock Interviews.

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning** (CALL) Lab

Computer systems, headphones and English language learning software for self- study by students.

2. Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs, audio-visual aids with a Podium, LCD and a projector.

Reference Books:

1. Kumar, S and Lata, P.(2018). Communication Skills. Oxford University Press.
2. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING WORKSHOP

Course Code: GR18A1017 **L/T/P/C: 1/0/1.5/2.5**

Course objectives :

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

Course Outcomes:

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

1. TRADES FOR EXERCISES: At least two exercises from each trade:

i. Carpentry
ii. Fitting Shop
iii. Tin-Smithy
iv. Casting
v. Welding Practice
vi. House-wiring
vii. Black Smithy

2. 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

Syllabus
II-Year

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BUILDING MATERIALS AND CONSTRUCTION PLANNING

Course Code: GR18A2007 **L/T/P/C: 2/0/0/2**

II Year I Semester

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

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

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

- Distinguish between various types of building stones, bricks and tiles and their structural requirements.
- Recognize the need and process of manufacture of cement and lime.
- Identify function of various materials like wood, glass, paints and building components.
- Find the importance of masonry, finishing and form woks.
- 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, lab tests. 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.

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: GR18A2008 **L/T/P/C: 2/0/0/2**

II Year I Semester

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

- Identify the importance of study of Engineering Geology for the construction of any Civil Engineering structure.
- Express knowledge on the structure of earth, formation of various types of rocks and minerals and their study.
- Find and analyse various geological structures like faults, folds, effect on civil engineering structures and precautions to be taken.
- Identify various surface and subsurface flows like Rivers, Canals, Lakes and Ground water studies etc.
- Recognize the failures of tunnels, dams and reservoirs due to geological reasons.

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

- Recognize the importance of geology from civil engineering point of view.
- Find the physical properties of minerals and their role for common rock forming.
- Distinguish features of igneous, sedimentary and metamorphic rocks.
- Distinguish various geological structures.
- Analyse the failures of dams, reservoirs and tunnels due to geological reasons.

Unit I: **Introduction**

Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Mineralogy-Mineral, Origin and composition. Physical properties of minerals, Rock forming minerals, megascopic identification of common primary & secondary minerals.

Unit II: Petrology

Rock forming processes. Specific gravity of rocks. Chemical and Mineralogical Composition. Texture and its types. Various forms of rocks. Field Classification chart. Structures Classification of Igneous rocks on the basis of Chemical composition. Detailed study of Acidic Igneous rocks like Granite, Rhyolite or Tuff, Pegmatite, Hornfels. Basic Igneous rocks Like Gabbro, Dolerite, and Basalt. Engineering aspect to Basalt. Sedimentary petrology- mode of formation, Mineralogical Composition. Texture and its types, Structures. Detailed study of Conglomerate, Breccia, Sandstone, Shale and Limestone. Metamorphic petrology- structures and textures in metamorphic rocks. Important distinguishing features of rocks as Rock cleavage, Foliation. Classification .Detailed study of Gneiss, Schist, Slate.

Unit III: Physical Geology

Weathering, Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landform, Loess, Residual deposits of Clay with flints, mudflows, Coastal deposits. Rock masses as construction material. Basic element and structures of rock those are relevant in civil engineering areas.

Unit IV: Strength Dip and Strike

Outcrop and width of outcrop. Fold- Types and nomenclature, Criteria for their recognition in field Faults: Classification, recognition in field. Joints & Unconformity Types. Strength of Igneous rock structures. Geology of dam and reservoir site- Required geological consideration for selecting dam and reservoir site. Failure of Reservoir.

Unit V: Types of Landslide

Pervious & impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic zone in India. Rock Mechanics. Consequences of failure as land sliding, Earthquake and Subsidence.

Text/Reference Books:

1. Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.
2. Text Book of Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2009), Macmillan Publishers India.
3. Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SOLID MECHANICS - I

Course Code: GR18A2009 **L/T/P/C: 3/1/0/4**

II Year I Semester

Course objectives: The objective of this course is to provide the student to

- 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.
- Skill to determine the Principal stresses and strains under different loading using analytical and Mohr's Circle method.
- Understanding of the shear force and bending moment for different types of beams which allows the overarching theme to understand, modelling and design of a large range of engineering materials.
- Utility to evaluate the flexural and shear stress concepts for the different materials and shapes of the structure.
- Knowledgeondeflectionofbeamfordifferentmaterialsundervariousloadingconditions by moment area, double integration & Macaulay's method.

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

- 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.
- Analyse the principal stresses and strains in different planes by using analytical and graphical methods
- 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.
- Formulatethebendingequationandshearequationtocalculatethebendingstressesand shear stresses for the different sections of the structural members.
- Evaluatetheslopeanddeflectionofdifferentbeamsforthedifferentendconditionsand loading by using different methods such as 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,10th 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'soutlineseries ,Strength of materials, Mc.GrawHillInternationalEditions,6th Edition,2011.
6. R.K.Rajput, Strength of materials ,S.Chand &Co,NewDelhi,5thEdition,2010.
7. A.R.Basu, Strength of materials, Dhanpat Rai &Co, NaiSarah,New Delhi, 2nd Edition, 2010.
8. BhaviKatti, Strength of materials, New Age Publications, 3rd Edition, 2008, Re-print 2009.
9. R. Subramanian, Strength of materials Oxford University Press, New Delhi, 2rd Edition,2010.
10. S. Ramamrutham, Strength of material- Dhanpat Rai Publishing Company, New Delhi, 15th 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: GR18A2006 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course objectives: The objective of this course is to provide the student to

- Distinguish between analytical and numerical solutions arising in mathematics.
- Learn methods that provide solutions to problems hitherto unsolvable due to theircomplex nature.
- Acquire skills that equip him to approximate a hidden function from data.
- Understand the usefulness of concepts like interpolation and signal correlations.
- Learn the significance of matrix factorization techniques.

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

- Apply well known techniques to find real roots of an equation and linear algebraic systems by iterative methods.
- Apply interpolation techniques for uni-variate and bivariate data using Gaussian and cubic spline methods.
- Apply numerical techniques to find eigenvalues and corresponding eigenvectors of a matrix.
- Perform matrix factorizations for advanced system solving techniques and apply numerical techniques to compute signal characteristics like correlation and covariance.
- Apply finite differences method to solve IVP in ODE.

Unit I: 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 Seitel 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: Eigenvalues 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 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.

Unit V: Matrix Factorizations and Correlation of Signals
L-U decomposition, Cholesky decomposition, QR factorization of a matrix- Singular value decomposition of a matrix- Covariance, correlation and auto correlation of signals.

Text/Reference 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.
3. GRIET reference manual.
4. S.S.Sastry- Introductory methods of numerical analysis- Prentice Hall (India)- Fourth edition- 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTRODUCTION TO FLUID MACHANICS

Course Code: GR18A2010 **L/T/P/C: 3/0/0/3**

II Year I Semester

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

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

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

- Comprehend the various fluid properties and fluid statics.
- Understand the broad principles of hydrostatic forces on submerged planes.
- Analysing fluid dynamics and kinematics.
- Classify concept of boundary layer and predict the laminar and turbulent flows.
- Predict the losses in pipes flows and able to calculate discharge measurement.

Unit I: Fluid Statics

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, cavitations; 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 Forces

Hydrostatic Law, Hydrostatic pressure and force exerted on horizontal, vertical, inclined and curved surfaces. Introduction explanatory to Buoyancy and metacentre.

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-Cartesian coordinates

Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venture meter, 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. 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, and pipes in parallel. Measurement of Discharge and Velocity: Flow over rectangular, triangular, trapezoidal and stepped notches. Orifice meter and pitot tube.

Text / References 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
4. Machines, Oxford University Press, New Delhi, 1st Edition, 2005
5. J.F.Douglas, J.M. Gaserek and J.A.Swaffirld, Fluid Mechanics, 5th longman 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 of India Pvt. Ltd., New Delhi, 2nd Edition, 1994.
8. Dr. R.K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) ltd., New Delhi, 9th Edition, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PAVEMENT MATERIALS

Course Code: GR18A2011 **L/T/P/C: 3/0/0/3**

II Year I Semester

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

- Identify the nature, behaviour and characteristics of soil.
- Understand the behavioural characteristics of aggregates under various tests and optimization by gradation.
- Obtain the Knowledge of Bitumen characteristics and gradation for mixes.
- Learn basic principles and design of bituminous mixes and specifications.
- Understand the basics of Cement &Cement Concrete Mix characterization.

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

- Characterize the soil based on the geotechnical properties and justify the applicability.
- Analyse the engineering properties of aggregates and customizing for application under various field situations.
- Characterize the bitumen based on the properties and justify the applicability.
- Selectappropriateasphaltbinderforconstructionofaflexiblepavementdependingupon the traffic and climatic conditions.
- Analyse 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 Super pave mix design.

Unit V: Cement and Cement Concrete Mix Characterization

Types of cement sand 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/ Reference Books:

1. SoilMechanics and Foundation Engineering- K.R. Arora, Standard Publishers Distributors, Delhi.
2. Highway Engineering - S.K. Khanna & C.E.G. Justo, Nemchand& Bros.
3. Concrete Technology by M.S.Shetty. – S.Chand& Co; 2004.
4. Highway and traffic Engineering – SubashSaxena.
5. Principles of Pavement Design – E. J. Yoder, M. W. Witczak
6. Relevant IRC and IS codes.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING GEOLOGY LAB

Course Code: GR18A2012 **L/T/P/C: 0/0/2/2**

II Year I Semester

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

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

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

- Identify various minerals and their properties.
- Identify various rocks and their properties.
- Understand various rocks and minerals used in the industries.
- Prepare and interpret various sections of geological maps showing structures like faults, folds and Unconformities etc.
- 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: GR18A2013 **L/T/P/C: 0/0/2/2**

II Year I Semester

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

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

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

- Determine the important mechanical properties of materials.
- Identify the stiffness of an elastic isotropic material.
- Evaluate the Reciprocal theorem.
- Measure any substance's resistance to uniform compression.
- 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: GR18A2002 **L/T/P/C: 2/0/0/2**

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.
2. Student will be able to realize the significance of ethical human conduct and self-development
3. Students will be able to inculcate positive thinking, dignity of labour and religious tolerance.
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.

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.

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.

Unit IV: INTRODUCTION TO GENDER

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

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, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by Telugu Akademi, Hyderabad,Telangana State in the year 2015.

Reference Books

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012.

2. Abdulali Sohaila. "I Fought For My Life…and Won."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

3. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e, Cengage learning, 2015.

4. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL SCIENCE

Course Code: GR18A2001 **L/T/P/C: 2/0/0/2**

Course Objectives:

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

Course Outcomes: Based on this course, the Engineering graduate will be able to

- Understand the harmonious co-existence in between nature and human being
- Recognize various problems related to environment degradation.
- Develop relevant research questions for environmental investigation.
- Generate ideas and solutions to solve environmental problems due to soil, air and water pollution.
- 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 value, services and carrying capacity.

Unit II: Natural Resources

Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground 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.

Unit V: Environmental Policy, Legislation & EIA

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

TEXT BOOKS:

1. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS. Publications.
2. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela.2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha, Kaushik, 4th Edition, New age international publishers.
5. Introduction to Environmental Science by Y. Anjaneyulu, BS Publications.
6. Environmental Studies by R. Rajagopalan, Oxford University Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SOLID MECHANICS II

Course Code: GR18A2014 **L/T/P/C: 3/1/0/4**

II Year II Semester

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

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

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

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

Unit I: Thin 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

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 and Struts

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

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 both axis.

Unit V: Unsymmetrical Bending

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.

Beams Curved in Plan: Introduction – Circular beams loaded uniformly and supported on symmetrically placed columns and Semicircular beams simply supported on three equally spaced supports.

Text/Reference Books:

1. R.KBansal, A text book of Strength of materials, Laxmi Publications (P)Ltd., New Delhi, 5thEdition,2012.
2. Basavrajaiah and Mahadevappa,Strength of materials, University Press, Hyderabad, 3rdEdition, 2010.
3. Bhavikatti, Strength of materials,Vikas Publications,3rdEdition,2008.
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 ofmaterials,S.Chand&Co,NewDelhi,5thEdition,2010.
7. A.R.Basu, Strength of materials, Dhanpat Rai & Co, NaiSarah, NewDelhi, first revised on 2005, Re-print 2009.
8. L.S.Srinathetal., Strength of materials, Macmillian India Ltd.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Course Code: GR18A2015 **L/T/P/C: 3/0/0/3**

II Year II Semester

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

- 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.
- Learn the principle, working operations of various DC and AC machines.
- Measure the fundamental electrical quantities using digital and analog multi-meters and an oscilloscope.
- Learn the rectification (AC to DC) by using diodes.
- Learn the basic semiconductor switching devices and its characteristics.

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

- Know the application of ohms law & Kirchhoff's laws.
- Know about fundamental principles of electrical machines.
- Measure the fundamental electrical quantities using oscilloscope.
- Illustrate the basic principles of semi conducting devices.
- 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

MECHANICAL ENGINEERING

Course Code: GR18A2016 **L/T/P/C: 2/0/0/2**

II Year II Semester

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

- To understand the parts of turbines and working principles.
- To know the classification of power plants and functioning of different power plants.
- To learn the classification, main components like 2-stroke and 4 – stroke engines.
- To know the processes of Refrigeration and Air conditioning.
- To know the processes of Transmission of Power.

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

- Recognize the types of turbines.
- Recognize the types of power plants.
- Recognize internal components of Internal Combustion Engines.
- Understand the desirable properties and methods in Refrigeration & Air Conditioning.
- Recognize the types of belts.

Unit I: Steam Turbines

Main parts of a steam turbine, types of turbines, working of a single stage impulse turbine (De-Level Turbine) Compounding of impulse steam turbines, Working of Parson's Reaction turbine, Differences between Impulse and Reaction Turbines.

Unit II: Power Plants

Classification of power plants, steam power plants, Nuclear Power plant, Gas Turbines, Diesel Power Plant, Hydro Power Plant, Environmental constraints of power Generation, Solar Energy, Wing Energy, Tidal power, Geothermal Power, ocean Thermal Energy Conversion (OTEC).

Unit III: Internal Combustion Engines

Classification, Main components, 2-stroke and 4-stroke Petrol Engines, 2-stroke and 4-stroke diesel engines, Fuel System in a petrol Engine, Battery or Coil Ignition System, Cooling System in I.C. Engines, Lubrication System, Fuel System for Diesel Engines, Petrol Injection, Differences between Diesel Injection and Petrol Injection.

Unit IV Refrigeration and Air Conditioning

Refrigeration, Refrigerants and their desirable properties, methods of Refrigeration, Requirements of Comfort Air Conditioning, Window Air Conditioner, Thermo Electric Cooling.

Unit V: Transmission of Power

Belt and rope Drives, Types of Belts, Materials, Types of Flat Belt Drives, Velocity Ratio or Speed Ratio, Rope Drives, Gear Trains and Their Types.

Text/Reference Books:

1. G. Shanmugham& S. Raveendran-Basic Mechanical Engineering, Tata MC Graw Hill, 2007.
2. Wickert J – An Introduction to Mechanical Engineering, Thomson Brooks Cole, 2004 Edition.
3. Aroraz&Domkundwaqr-Power Plant Engineering, dhanpatRai& Co., 5th Revised Edition.
4. R.S. Khurmi& J.K. Gupta – Thermal Engineering, S. Chand, 2008. 3. C.P.arora-Refrigeration and Air Conditioning, Tata Mc Graw Hill, 2008.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SURVEYING AND GEOMATICS

Course Code: GR18A2017 **L/T/P/C: 3/1/0/4**

II Year II Semester

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

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

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

- Apply the knowledge, techniques, skills, and applicable tools of the discipline to Engineering and surveying activities.
- To be able to calculate, design and layout of horizontal and vertical curves, Understand, interpret, and prepare plan, profile, and cross-section drawings.
- Understand the advantages of electronic surveying over conventional surveying methods.
- Acquire knowledge about photogrammetry principles, methods and. product generation strategies in both Analytical and digital Photogrammetry system.
- 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**

Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, bearing of survey lines, Levelling: Plane table surveying, Principles of levelling- booking and reducing levels; differential, reciprocal levelling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; contouring: Characteristics, methods, uses; areas and volumes.

Unit II: **Triangulation and Trilateration**

Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control - methods -triangulation -network- Signals. Baseline - choices - instruments and accessories - extension of base lines - corrections - Satellite station - reduction to Centre – Intervisibility of height and distances - Trigonometric levelling - Axis single corrections. Curves- Elements of simple and compound curves – Method of setting out – Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve - Vertical curves.

Unit III: **Modern Field Survey Systems**

Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

Unit IV: 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.

Unit V: **Remote Sensing**

Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

Text/Reference Books:

1. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, 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

HYDRAULIC ENGINEERING

Course Code: GR18A2018 **L/T/P/C: 3/0/0/3**

II Year II Semester

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

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

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

- Describe and predict the various economical channel sections
- Apply dynamic equation in the uniform flows.
- Analysing modal and prototype similarities.
- Visualize behavior the hydraulic jump, surface profiles of channel flows.
- 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 π-Theorem application of dimensional analysis and model studies to fluid flow problem Dimensionless groups. Similitude, Model studies, Types of models. Definitions of Reynolds Number, 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.

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

Text/Reference Books:

1. Fuid 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, 5th longman 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 of India 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

STRUCTURAL ANALYSIS I

Course Code: GR18A2019 **L/T/P/C: 3/0/0/3**

II Year II Semester

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

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

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

- Determine deflections of beams and trusses using energy methods.
- Analyze three and two hinged, circular and parabolic arches.
- Analyze indeterminate beams using force method for propped cantilever, fixed and Continuous beams (Clappeyorn's three moment theorem).
- Apply Slope deflection, Moment distribution and Kani's methods to analyze statically indeterminate structures.
- Analyze statically determinate and indeterminate structures using rolling load and influence line method.

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.

Unit II: Arches

Types of arches- three and two hinged arches – Circular and parabolic arches – yielding of supports –Effect of shortening of rib-Effect of temperature changes –Tied and linear arch.

Unit III: Indeterminate Beams (Force Method)

a. Propped cantilevers
b. Fixed beams
c. Continuous Beams (By Clapeyron's theorem of three moments).

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

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 international publishers, New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SURVEYING LAB

Course Code: GR18A2020 **L/T/P/C: 0/0/4/2**

II Year II Semester

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

- Introduction to the applicability of basic survey instruments.
- Skill of determining relative positions in land surveying.
- Visualization of elevations, areas and volumes.
- Skill of plotting existing geographical surface information.
- Knowledge to judge the compatibility of instruments.

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

- Define the characteristics and applications of basic survey instruments.
- Apply knowledge of mathematics, science and engineering in land measurement Techniques.
- Calculate distances, inclinations, elevations, areas and volumes.
- Generate maps of earth surfaces.
- Analysing the data and transfer relevant points onto ground.

Task-1: Measurement of an area by Chain Survey (Open and Closed Traverse).

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

Task-3: Measurement of an area by compass survey.

Task-4: Simple, fly, Differential Leveling.

Task-5: Exercise of L.S and C.S and plotting.

Task-6: Study of Theodolite- Measurement of horizontal and vertical angles- (Repetition and Reiteration method).

Task-7: Trigonometric Levelling- Heights and distances problems.

Task-8: Calculation of R.L and distance using tachometric survey.

Task-9: Curve setting by any two methods.

Task-10: Determine the area of the field by using total station.

Task-11: Column and foundation marking using Total Station.

Task-12: Distance, gradient, differential height between two inaccessible points using Total Station.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CAD LAB

Course Code: GR18A2021 **L/T/P/C: 0/0/2/1**

II Year II Semester

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

- Introduction of CAD Software and describe its applications in different fields.
- Understanding of the basic drawing fundamentals that are used to create and manipulate geometric models by CAD System.
- Knowledge of advanced capabilities of CAD to increase the creativity to design projects.
- Visualize the Real time Components of Building Drawings.
- Skill of Design to create Real time Building Drawings.

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

- Comprehend the fundamentals of building drawings and understand CAD software for drafting.
- Draw Material, Sanitary, Electrical Symbols and various brick bonds by using drawing commands in CAD.
- Develop geometric plan for single and multi-storeyed building with suitable scale and dimensions.
- Develop the Sections and Elevations for Single and Multi Storeyed Buildings using CAD software.
- Draft the building components and sectional view of doors, windows and trusses.

Task-1: Introduction to CAD (Computer Aided Drafting).

Task-2: Software for CAD and Introduction to different Softwares.

Task-3: General Commands and Practice exercises on CAD Software.

Task-4: Drawing of Material Symbols, Sanitary Symbols and Electrical Symbols.

Task-5: Drawing of Various Bonds in Brick Work.

Task-6: Drawing of Plans of Buildings using software.
a)Single Storied Buildings (b) Multi Storied Buildings.

Task-7: Developing Sections and Elevations for
a)Single Storied Buildings (b) Multi Storied Buildings.

Task-8: Detailing of Building Components like
a) Doors b) Windows c) Trusses

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Course Code: GR18A2022 **L/T/P/C: 0/0/2/1**

II Year II Semester

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

- Demonstration of the discharge through venturi meter and orifice meter.
- Verify the Energy head in the pipe flows and able to compute impact coefficients of jet.
- Describe the laminar and turbulent flows and velocity distribution in pipe lines.
- Evaluate the major and minor losses in pipe flow.
- Compute the efficiency of Pelton wheel turbine and multistage centrifugal pump.

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

- Predict the discharge through Venturi meter and orifice meter.
- Estimate the energy heads.
- Compute the Reynolds number for types of flows.
- Compute the losses in pipe flow.
- Evaluate the efficiency of hydraulic machines.

Task-1: Verification of Bernoulli's Theorem

Task-2: Calibration of Venturi meter.

Task-3: Calibration of Orifice meter.

Task-4: Impacts of jets on vanes.

Task-5: Reynolds experiment Laminar Flow through pipes.

Task-6: Reynolds experiment Turbulent flow through pipes.

Task-7: Multi stage centrifugal pump.

Task-8: Major losses in pipe flow.

Task-9: Minor losses in pipe (Hydraulic losses due to sudden enlargement of pipe).

Task-10: Minor losses in pipe (Hydraulic losses due to sudden contraction of pipe).

Task-11: Pelton wheel turbine.

Task-12: Hydraulic Jump.

Task-13: Calibration of Rectangular notch.

Task-14: Calibration of Triangular notch.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN THINKING

Course Code: GR18A2083 **L/T/P/C: 2/0/0/1**

II Year I Semester

Course Objectives and Outcomes:

- Study a problem from multiple perspectives.
- Learn how to frame the design challenge properly.
- Ideate, prototype and Iterate solutions.
- Learn from the overall design process how to create value as entrepreneurs.

Students will be equipped with all the skills in the design mindset

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, Ideation tools & exercises. Sample Design Challenge, Introduction to the Design Challenge Themes

UNIT-III

Story telling and Tools for Innovation: Empathize-Understand customers, Empathy Maps, Empathise-Step into customers shoes- Customer Journey Maps, Define- Analysis & Drawing Inferences from Research

UNIT-IV

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

References:

- Designkit.org
- Ideo.org
- Adobe Kickbox

Syllabus
III-Year

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRUCTURAL ANALYSIS-II

Course Code: GR18A3001	**L**	**T**	**P**	**C**
III Year. I Semester	**3**	**0**	**0**	**3**

Pre-requisite: Strength of Materials, Structural Analysis -I

Course Objectives: The objectives of this Course is to make the students to

1. Analyze the building frames using 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: After completion of this course, students will be able to:

1. Analyze various types of frames with and without sway using 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 carrying capacity of simple beams and frames.

UNIT I

Analysis of building frames- 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 of analysis to continuous beams and Portal frames (up to single bay two storages).

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: Different approaches to matrix methods- analysis using stiffness matrix methods for beams and frames (3 DOF) and flexibility matrix methods for beams and frames (2DOF)

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
2. Indeterminate Structural Analysis - K.U. Muthu, H. Narendra, Maganti *Janardhana,* M. Vijayanand – I K International Publishing House Pvt. Ltd.
3. Structural Analysis 1 and II 4/e – S S Bhavikatti,Vikas Publishing House,
4. Structural Analysis - Vol. 1 and II - R. Vaidyanathan , P. Perumal ,Laxmi Publications; 4/e (2016)

REFERENCE BOOKS:

1. Analysis of structures -T.S.Thandava Moorthy, Oxford University Press.
2. Structural Analysis –Devdas Menon -Alpha Science International Ltd
3. Advanced Structural Analysis - Devdas Menon - Narosa Publishers
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

GEOTECHNICAL ENGINEERING

Course Code: GR18A3002 **L T P C**
III Year I Semester **3 0 0 3**

Course Objectives: The objectives of this Course are to make the students to

1. Educate basic Engineering properties of soil.
2. Provide a strong background in geotechnical engineering in various aspects like permeability and effective stresses.
3. Provide details about basic properties of compaction and stress distribution.
4. Identify the nature and behaviour of soil during consolidation process.
5. Excel in information about shear strength of soil mass.

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

1. Identify basic Engineering properties of soil and classify the soil.
2. Perform and evaluate the experiments to determine the permeability and effective stresses of soil.
3. Identify, formulate and solve various problems in compaction and stresses in soils.
4. Analyse the mechanism and behaviour of soil under consolidation process.
5. Evaluate the behaviour of shear strength of soil mass.

UNIIT I

Introduction - Types of soils, their formation, Scope of soil mechanics, Basic Definitions and Relationships, Soil as three-phase system. Determination of moisture content by oven dry method, pycnometer and sand bath method. Specific gravity by pycnometer method. Unit weight of soil by Core-cutter method and Sand-replacement method. Consistency limits, Consistency indices, Grain size analysis, Indian standard soil classification system. Plasticity of soil

UNIIT II

Permeability of Soil- Darcy's law, validity of Darcy's law. Determination of coefficient of permeability by constant-head method and falling-head method. Field method by pumping- out test. Permeability of stratified soils and factors affecting permeability of soil.

Seepage Analysis - Introduction, characteristics of flow nets, effective stress principle, nature of effective stress, effect of water table, fluctuations of effective stress, effective stress in soils saturated by capillary action, quick sand condition.

UNIIT III

Compaction of Soil-Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Factors affecting compaction. Compaction in field and compaction control.

Stresses in soils – Introduction, stresses due to point load, line load, strip load, uniformly loaded circular area, rectangular loaded area. Pressure bulb and Isobars, Boussinesq's equation, Theory of Newmark's Influence Chart. Appropriate stress distribution methods - equivalent point load method and two to one method.

UNIIT IV

Consolidation of Soil - Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, Terzaghi's theory of consolidation, interpretation of consolidation test results, computation of consolidation settlement and secondary consolidation.

UNIT V

Shear Strength- Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory. Types of shear tests – direct shear test and it merits, tri-axial compression test and its behaviour of UU, CU and CD, Unconfined compression test and vane shear test. Computation of effective shear strength parameters.

TEXT BOOKS

1. Gopal Ranjan and ASR Rao, Basic and Applied Soil Mechanics, New Age International Pvt. Ltd, New Delhi, 2nd edition (2000), Reprint (2014).
2. K.R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers Distributors, Delhi, 5th edition (2000), Reprint (2009).

REFERENCES BOOKS

1. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil Mechanics and Foundations, Laxmi publications Pvt. Ltd., New Delhi, 16th edition, Reprint (2012).
2. C. Venkataramiah, Geotechnical Engineering, New age International publishers (2002), 4th edition (2012).
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), 16th Reprint (2013).
5. Braja M. Das, Advanced Soil Mechanics, Taylor and Francis, 3rd edition (2008).
6. Soil Mechanics by Craig R.F., Chapman & Hall
7. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph B. Peck, andGholamrezaMesri.
8. Geotechnical Engineering: Principles and Practices of Soil Mechanics and FoundationEngineering (Civil and Environmental Engineering) by V.N.S. Murthy

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN OF CONCRETE STRUCTURES-I

Course Code: GR18A3003 **L T P C**
III Year I Semester **3 0 0 3**

Prerequisite: Engineering Mechanics, Strength of Materials and Structural Analysis.

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

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

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

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

UNIT I

Concepts of R.C Design: Study of the strength, behaviour, and design of indeterminate reinforced concrete structures. Loads and stresses, load combinations. Working stress method and limit state approach as per IS-456-2000.

UNIT II

Analysis and Design of Beams: Analysis and design of rectangular and T-sections using limit state method. Beams with reinforcement in compression. 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/REFERENCE BOOKS:

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

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL ENGINEERING

Course Code: GR183004	**L**	**T**	**P**	**C**
III Year. I Semester	**2**	**0**	**0**	**2**

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

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: After completion of this course, students will be able to

1. Design and implement a drinking water supply system for a residential community
2. Identify the cause of outbreak of epidemics and eradicate.
3. Develop drinking water supply and waste water collection system for a town.
4. Identify safe disposal methods for wastewater
5. Design suitable treatment for wastewater.

UNIT I

Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – water demand – factors affecting – fluctuations – fire demand – storage capacity – water quality and testing – drinking water standards.

Sources of water: Comparison from quality, quantity and other considerations – intakes – infiltration galleries.

UNIT II

Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation, flocculation, clarifier design – coagulants – feeding arrangements.

Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation comparison of filters – disinfection – theory of chlorination, chlorine demand, other disinfection practices- Miscellaneous treatment methods.

UNIT III

Distribution systems: requirements – methods and layouts, design procedures- Hardy Cross and equivalent pipe methods service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines – pump house.

UNIT IV

Conservancy and water carriage systems: sewage and storm water estimation – time of concentration – storm water overflows combined flow – characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. – C.O.D. equations. Design of sewers – shapes and materials – sewer appurtenances manholes –inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – components requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming – dilution.

UNIT V

Layout and general outline of various units in a waste water treatment plant – primary treatment design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – biological treatment – trickling filters –standard and high rate.

Construction and design of oxidation ponds - Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

TEXT BOOKS:

1. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia, Ashok Jain &Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi.
2. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers.
3. Water supply and sanitary Engineering by G.S. Birdi, DhanpatRai& Sons Publishers.

REFERENCS:

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

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

HYDROLOGY & WATER RESOURCES ENGINEERING

Course Code: GR18A3005	**L**	**T**	**P**	**C**
III Year I Semester	**3**	**0**	**0**	**3**

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

1. Describe the applications of Hydrology for Rainfall Measurement and Analysis ,Runoff measurement and analysis ,Evaporation and Evapo transpiration measurement and estimation
2. Explain the Hydrographic Analysis of Runoff
3. Explain the processes of groundwater occurrence
4. Explain the types and methods of application of irrigation water and Standards for quality and to explain the soil-water–plant relationship.
5. Explain the various methods of design of irrigation canals and design discharge over a catchment.

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

1. Estimate and process rainfall data, runoff data, evaporation data, Evapo transpiration 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 of irrigation canals and discharge by SCS Curve Number Method and analyze the regional flood frequency.

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 – Evapo transpiration-Penman and Blaney & Criddle Methods -Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices'.

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- 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.

TEXT BOOKS

1. A Text book of Hydrology by P. Jaya Rami Reddy,3rdEdition,USP Publishers
2. Engineering Hydrology by K.Subramanya, Fourth Edition, McGraw Hill Education
3. Irrigation and Water Power Engineering- B.C.Punmia, Pande B.B.Lal, Ashok Kumar Jain, Arun Kumar Jain-Laxmipublications16thedition
4. Irrigation Engineering & Hydraulic Structures- Santosh Kumar Garg

REFERENCES

1. Elementary Hydrology by V.P.Singh, PHI publications
2. Irrigation and Water Resources &Water Power by P. N. Modi, Standard Book House.
3. Irrigation Water Management by D.K. Majumdar, Prentice Hall of India.
4. Applied Hydrology by VenTeChow, David R Maidment, Larry WMays, TataMcGrawHill
5. Introduction to Hydrology by Warren Viessman, Jr.Garyl Lewis
6. NPTEL Web and Video Courses.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

MASONRY STRUCTURES
(PROFESSIONAL ELECTIVE-1)

Course Code: GR18A3006	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

III Year I Semester

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

1. Know about 'Masonry', its use, advantages and disadvantages
2. Have clear knowledge of different types of 'Masonry units', types and grades of 'Mortar' as per IS Code, properties of masonry units and mortar.
3. Know the strength of masonry unit and masonry prism, computation of permissible strength of masonry for different types of masonry structures considering factors like 'Effective height',' Effective length', 'Slenderness ratio' and 'Eccentricity ratio'.
4. Design different types of masonry structures selecting suitable masonry units and mortar using IS 1905 (revised in 2002) and SP 20.
5. Know about the use of (i) Reinforced Masonry, (ii) Composite Masonry (iii) Confined Masonry and (iv) 'In filled frames', their advantages and disadvantages.

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

1. Know about the masonry units and mortar, properties of different masonry units and mortar. Defects and errors in masonry construction will be understood by them. Strength and stability of concentrically loaded masonry walls and factors affecting them will be understood by them. Strength formulae and mechanism of failure of masonry subjected to direct compression will be known to the students.
2. Understand the emerging permissible compressive, tensile and shear stress and factors influencing them for masonry elements. They come to know how to consider loads for masonry walls subjected to axial, eccentric and lateral loads as well as walls with opening and free standing wall.
3. Understand the concept of effective height of walls and columns, effective length, effective thickness of wall and factors affecting them. They also come to know about evaluation of slenderness ratio resultant eccentricity ratio and the concept of load dispersion, arching action and lintels.
4. Know how to design load bearing masonry walls for buildings up to three stories using IS:1905 and SP-20.
5. Understand the concept of reinforced masonry and its applications, and how to bring flexural and compression elements (beams and columns) of reinforced masonry shear walls. They also understand the concept of composite wall beam elements and in filled frames. They will know how to design these masonry structures.

UNIT – I

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

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

Design of load bearing masonry walls for building up to 3storeys using IS 1905 and SP20 Procedure

UNIT-V

Reinforced masonry and its application, flexural and compression elements of reinforced masonry, shear walls. Composite masonry walls, composite wall beam elements, infilled frames.

TEXT BOOKS:

1. Henry,A.W (1990), "Structural masonry", Macmillan Education Ltd.
2. Dayarathnam.P (1987), "Brick and reinforced brick structures", Oxford & IBH Publication.

REFERENCE BOOKS:

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 (1st revision)", BIS, New Delhi

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

URBAN TRANSPORTATION PLANNING

(PROFESSIONAL ELECTIVE-1)

Course Code: GR18A3007	**L**	**T**	**P**	**C**
III Year I Semester	**3**	**0**	**0**	**3**

Pre-requisites: Transportation Engineering

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

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

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

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. Understand and device short term and long term plans

UNIT-I

URBAN TAVEL 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 ANAYSIS

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

Text books:

1. Kadiyali L.R - Traffic Engineering and Transportation Planning -Khanna Publishers, New Delhi.
2. Papacostas C.S. - Fundamentals of Transportation Engineering Prentice Hall of India Pvt. Ltd; NewDelhi.
3. John KhistyC - Transportation Engineering - An Introduction, Prentice Hall, Englewood Cliffs, NewJersey.
4. Nicholas J. Garber, A. Hoel, RajuSarkar, Cengagelearning, Principles of Traffic and Highway Engineering.

Reference books:

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

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL IMPACT ASSESSMENT AND LIFE CYCLE ANALYSIS (PROFESSIONAL ELECTIVE-1)

Course Code: GR18A3008	**L**	**T**	**P**	**C**
III Year I Semester	**3**	**0**	**0**	**3**

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

1. Learn the purpose and role of EIA in the decision-making process.
2. Provide knowledge on the strengths of EIA in regard to 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: After completion of this course, students will be able to

1. Identify elements of community and environment likely to be affected by the proposed developments.
2. Identify the negative impacts and propose the provision of infrastructure or mitigation measures.
3. Develop current EIA methods, assessment methods, environmental monitoring systems and legislation.
4. Assess process of environmental impact modelling and prediction as a design tool.
5. 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, Mathematical models

UNIT III

Prediction and Assessment: Public participation Fault tree analysis, Consequence Analysis; Socioeconomic aspects, measures of 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

TEXTBOOKS

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

REFERENCE BOOKS

1. Environmental Impact Assessment, by Larry Canter, 2nd edition, Mc Graw Hill Publishers
2. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Science,1999
3. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.Katania& SonsPublication., New Delhi.
4. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd,Delhi

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONSTRUCTION EQUIPMENT AND AUTOMATION (PROFESSIONAL ELECTIVE-1)

Course Code: GR18A3009	**L**	**T**	**P**	**C**
III Year I Semester	**3**	**0**	**0**	**3**

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

1. Identify various construction methods and equipment's and associate them with different works in the construction site
2. To 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. To 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: After completion of this course, students will be able to

1. Understand how structures are built and projects are developed on the field
2. Understand modern construction practices
3. Recognize the process and importance of cost estimation, cost budgeting and cost control.
4. Handling various kinds of Construction Equipments involved in Construction industry
5. Optimise construction projects cost based on Equipment Operational and Maintenance costs

UNIT – I

Conventional construction methods Vs 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, 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..

REFERENCE BOOKS:

1. F. Harris, R. McCaffer and F. Edum-Fotwe, Modern construction management, 6 t h ed., Blackwell Publishing, Oxford, 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, 2012.
5. National Building Code of India, Bureau of Indian Standards

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

GEOTECHNICAL ENGINEERING LAB

Course Code: GR18A3010	**L T P C**
III Year I Semester	**0 0 2 1**

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

1. Distinguish various soil properties and its behaviour.
2. Carry out 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 analyze and interpret data.

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

1. Analyze soil behavior and its mechanism.
2. Find role of basic properties of soil in simple and complex applications.
3. Develop a proficiency in handling experimental data.
4. Report the results of a laboratory experiment at a professional standard.
5. Recommend extensive research in geotechnical properties.

List of experiments:

1. Liquid limit and plastic limit
2. Grain size distribution by sieve and hydrometer analysis
3. Field density by core cutter method
4. Field density by sand replacement method
5. Relative density of sands
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)

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL ENGINEERING LAB

Course Code: GR18A3011	**L T P C**
III Year. I Semester	**0 0 2 1**

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

1. Develop the 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. Build the students to excel in experiment research Programme or to succeed in industry
5. Develop problem solving and laboratory skills using modern instrumentation

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

1. Summarize the knowledge of physical, chemical and biological parameters of water and their importance.
2. Develop the social responsibility to eradicate water borne diseases.
3. Identify the methods to control environmental pollution.
4. Classify the water quality parameters in written reports.
5. Improve 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.
5. Determination and Estimation of total solids, organic solids and inorganic solids.
6. Determination of iron.
7. Determination of Dissolved Oxygen.
8. Determination of Nitrogen.
9. Determination of total Phosphorous.
10. Determination of B.O.D
11. Determination of C.O.D
12. Determination of Optimum coagulant dose.
13. Determination of Chlorine demand.
14. Presumptive coliform test.

NOTE: At least 8 of the above experiments are to be conducted.

TEXT BOOKS:

1. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.
2. Standard Methods for Analysis of water and Waste Water – APHA.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONCRETE TECHNOLOGY LAB

Course Code: GR18A3012 **L T P C**
III Year I Semester **0 0 2 1**

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

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 concretetesting.
5. Give good understanding about water to be added to cement for various purposes.

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

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 & LaboratoryTest)
9. Workability test on concrete using slumpCone
10. Workability test on concrete by compaction factortest
11. Workability test on concrete by Vee-BeeTest
12. Young's modulus and compressive strength of concrete
13. Split tensile strength test on concrete

Text Book:

1. Concrete Technology Theory and Practice, Shetty M. S, S.CHAND, Revised edition
2. Concrete Technology: Theory and Practice Gambhir Murari Lal, Mcgraw Hill, fifth edition

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONSTITUTION OF INDIA

Course Code: GR18A2003	**L**	**T**	**P**	**C**
III Year. I Semester	**3**	**0**	**0**	**3**

Course Objectives: The students shall be able to

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: At the end of this course student shall be able to

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. Will know about Secularism, Federalism, Democracy, Liberty, Freedom of Expression, Special Status of States etc.,

Unit I

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

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

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

Unit IV

Local Administration
District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila 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

Books Recommended:

1. 'Indian Polity' by Laxmikanth 5th Edition, McGraw Hill Edition.
2. Indian Constitution by Subhash C. Kashyap, Vision Books Publisher
3. 'Introduction to Indian Constitution' by D.D. Basu, 21st Edition, LexisNexis Publisher

4. 'Indian Administration by avasthi *and avasthi-by lakshmi narain agarwal publication*

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

Economics and Accounting for Engineers

Course Code: GR18A2004	**L**	**T**	**P**	**C**
III Year. II Semester	**3**	**0**	**0**	**3**

Course Objectives: The students will be able to

1. Provide the student with a clear understanding of demand analysis, elasticity of demand and demand forecasting;
2. Provide the insight on theory of production and cost analysis.
3. Describe different types of markets and competition, forms of organization and methods of pricing.
4. Make the students understand various capital budgeting techniques.
5. Describe fundamentals of accounting.

Course Outcomes: After studying this course, students will be in a position to:

1. Scan the economic environment and forecast demand of products through demand forecasting techniques.
2. Plan the production levels in tune with maximum utilization of organizational resources and with maximum profitability and list out various costs associated with production and able to compute breakeven point.
3. Outline the different types markets and competition, forms of business organization and methods of pricing.
4. Analyze the profitability of various projects using capital budgeting techniques
5. Prepare the financial statements.

Unit-1: Introduction & Demand Analysis: ***Definition and Scope:*** Introduction to Economics, Nature and Scope of Managerial Economics. ***Demand Analysis***: Demand Determinants, Law of Demand and its exceptions. ***Elasticity of Demand***: Definition, Types, Measurement and Significance of Elasticity of Demand. ***Demand Forecasting***, Factors governing demand forecasting, methods of demand forecasting.

Unit-2: Production & Cost Analysis: ***Production Function*** – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Laws of Returns, Internal and External Economies of Scale. ***Cost Analysis*****:** Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

Unit-3: Markets and Forms of Business organizations: ***Types of competition and Markets***, Features of Perfect competition, Monopoly and Monopolistic Competition. ***Pricing*****:** Objectives and Policies of Pricing. Methods of Pricing. ***Business:*** Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types.

Unit-4: Capital Budgeting: Capital and its significance, Types of Capital, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value (NPV) Method and Internal Rate of Return (IRR) (simple problems) and Profitability Index (PI)

Unit-5: Introduction to Financial Accounting: ***Accounting Concepts and Conventions*** - Double-Entry Book Keeping. ***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

TRANSPORTATION ENGINEERING

Course Code: GR18A3065 **L T P C**
III Year. II Semester **3 0 0 3**

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

1. Gain a solid understanding of the principles of highway engineering and traffic analysis
2. Develop and interpret design standards for horizontal and vertical geometry.
3. Have a strong analytical and practical knowledge of Planning, Designing and solving transportation problems
4. Understand the type of conflicts that occur at intersection and design the intersection accordingly
5. Gain the knowledge in Railway Engineering and Airport Engineering.

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

1. Apply basic principles of physics in estimating stopping and overtaking sight distance requirements
2. Compute the geometric features of road like horizontal and vertical alignment
3. Analyze the factors influencing road vehicle performance, characteristics and design.
4. Illustrate the basic traffic stream parameters and perform basic traffic signal phasing and timing plan.
5. Demonstrate the role of intersections and other modes of transportation

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.

UNITIII

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 – Accident Data Recording – 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 and Airport Engineering: 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, Nemch and& Bros., 9th edition (2011).
2. Highway Engineering Design – L.R.Kadiyali and Lal- Khanna Publications.
3. Airport Planning and Design- S.K.Khanna and Arora,Nemch and Bros.
4. Railway engineering- A Textbook of Railway Engineering- SubhashC.Saxena,SatyapalArora – DhanpatRai& Sons – (2012)

REFERENCES:

1. Highway Engineering – S. P. Bindra, Dhanpat Rai& Sons. – 4th Edition(1981)
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
4. Air Transportation Planning & design – Virendhra Kumar &StatishChandhra – Gal GotiaPublishers(1999).

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

FOUNDATION ENGINEERING

Course Code: GR18A3066	**L**	**T**	**P**	**C**
III Year II Semester	**3**	**0**	**0**	**3**

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

1. Learn about 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 and analyze bearing capacity of shallow foundations.
5. Analyze bearing capacity deep foundations.

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

1. Identify the various soil exploration techniques and interpret the resulting soil profiles.
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 for soils 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, sampling procedures, 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, and settlement from penetration tests.

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. GopalRanjan and ASR Rao, Basic and Applied Soil Mechanics, New Age International Pvt. Ltd, New Delhi, 2nd edition (2000), Reprint (2014).
2. Braja M. Das, Principles of Foundation Engineering, Cengage Learning, New Delhi, 6th edition (2007), Reprint (2012).
3. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil Mechanics and Foundations, Laxmi publications Pvt. Ltd., New Delhi, 16th edition, Reprint (2012).

REFERENCES

1. VNS Murthy, Soil Mechanics and Foundation Engineering, CBS Publsihers and Distributors.
2. Bowles, J.E., Foundation Analysis and Design, McGraw-Hill Publishing Company, Newyork, 5th edition (1997).
3. A. Singh, Modern Geotechnical Engineering, 3rd Ed., CBS Publishers, New Delhi, 1999.
4. N. Som, Theory and Practice of Foundation Design, Prentice Hall, New Delhi, 2003.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN OF STEEL STRUCTURES

	L	T	P	C
Course Code: GR18A3067				
III Year. II Semester	**3**	**0**	**0**	**3**

Prerequisite: Engineering Mechanics, Strength of Materials and Structural Analysis.

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

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 tension and compression members for the given loads and moments.
4. Design steel beams for the given loads and moments.
5. Design eccentric connections for the given loads and moments.

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

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 tension and compression members for the given loads and moments.
4. Design steel beams for the given loads and moments.
5. Design eccentric connections for the given loads and moments.

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/Reference Books:

1. Design of steel structures – N. Subramanian, Oxford University Press –2009.
2. Limit State Design of steel structures, S.K.Duggal, Tata McGraw – Hill, 2010
3. Design of Steel Structures Vol. 1 & 2 – Ramchandra, Standard Publications.
4. Design of steel structures , S. S. Bhavikatti, IK int Publication House, New Delhi, 2010
5. Design of steel structures, BC Punmia A. K. Jain , Ashok Kumar Jain, Laxmi Publications

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

REINFORCED CONCRETE
(PROFESSIONAL ELECTIVE-II)

Course Code: GR18A3068	**L**	**T**	**P**	**C**
III Year II Semester	**3**	**0**	**0**	**3**

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

1. Understand basics of reinforced concrete
2. Understand basic design concepts of reinforced concrete
3. Understand behaviour of flexure, shear and torsion of reinforced concrete
4. Understand the limit state of design
5. Understand the limit state of design for compression members

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

1. Optimise the reinforced concrete member based on its properties
2. Design of reinforced concrete members using different methods
3. Design of beams and slabs
4. Design of two way slabs
5. Design of columns subjected to uniaxial and biaxial loadings

UNIT-I

Introduction- plain and reinforced concrete- objectives of structural design – structural systems – Basic material properties- cement, aggregate, water, grade of concrete, concrete mix design- Behavior of concrete under uniaxial compression, tension, combined stress, creep, shrinkage and temperature, durability, reinforcing steel.

UNIT-II

Basic design concepts- Working stress method, Ultimate load method, Probability Analysis and design, Limit State method; Behaviour in flexure, analysis at service loads, ultimate limit state,

UNIT-III

Design of beams and slabs for flexure, Design for shear, Torsion, bond

UNIT-IV

Serviceability Limit state: Deflection and cracking; Design of two way slab systems

UNIT-V

Design of compression members – uniaxial and biaxial bending

TEXT BOOKS:

1. Reinforced concrete design, S Unnikrishna Pillai and Devdas Menon,

REFERENCES:

1. IS 456 – 2000 Plain and Reinforced concrete – code of practice
2. Reynolds, C.E.; Reinforced Concrete Design Handbook; 9th Edition; Rupa & Company; Calcutta; 1981
3. Park and Paulay; Reinforced Concrete Structures, John Wiley and Sons

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

ROCK MECHANICS
(PROFESSIONAL ELECTIVE-II)

Course Code: GR18A3069	**L**	**T**	**P**	**C**
III Year II Semeter	**3**	**0**	**0**	**3**

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

1. Introduced to basics of characteristics of rocks.
2. Provide a basic understanding of geology its effect on civil engineering structures.
3. Apply rock mechanics principles in the design of foundations.
4. Study the subsidence and slopes in rocks.
5. Compute and measure state of stress in rock mass.

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

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. Develop understanding on impact of geological features on civil engineering projects
3. Identify the problems associated with different geological features on civil engineering structures and suggest alternatives.
4. Describe the theory and analysis of in situ and induced stresses in a rock mass and structurally controlled failure.
5. Introduced various methods to improving the properties of rock masses.

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, Photo elasticity

TEXT BOOKS:

- Jager. J C & Cook NGW Fundamentals of Rock Mechanics, Blackwell Publishers.
- JumikisAlfreds. R, Rock Mechanics, Trans Tech Publishers.
- Goodman, R.E. (1989), 'Introduction to Rock Mechanics', John Wiley, Chichester.
- Hudson, J.A. and Harrison, J.P. (2000), 'Engineering Rock Mechanics', Pergamon Press, Amsterdam.

REFERENCE BOOKS:

- Peng. Syd. S. Coal Mining Ground Control West Virginia University.
- 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: GR18A3070	**L**	**T**	**P**	**C**
III Year II Semester	**3**	**0**	**0**	**3**

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

1. Introduction to types of open channels and flows
2. Skill of designing type of channel flows and types of channel sections
3. Visualization uniform flows of channel
4. Knowledge about the gradual varied flow and surface profiles
5. Knowledge about the rapid varied flow and surface profiles

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

1. Express 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 G.V.F
5. Apply the knowledge of dynamic equation in R.V.F

UNIT I

Basic Concepts introduction 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, Hydraulic exponent M. morrient in open channel flow — 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' metchod 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. Open Channel Hydraulics — V.T. Chow, McGraw Hill book company
2. Flow in open channels — K. Subramanya TMH Publishing Co. Ltd '

REFERENCES:

1. Flow through open channels — K.G. RangaRaju. THM Publishing Co. Ltd.
2. Qpen Channel Hydraulics — French R.H. McGraw Hill book Company
3. Open Channel Flow –Hanif Chaudhary. M. Printice — Hall of India Pvt. Ltd. , 46.4

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONCRETE TECHNOLOGY
(PROFESSIONAL ELECTIVE-II)

Course Code: GR18A3071	**L**	**T**	**P**	**C**
III Year II Semester	**3**	**0**	**0**	**3**

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

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 behavior 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: After completion of this course, students will be able to

1. Illustrate the physical and chemical properties of concrete ingredients and able to conduct tests on cement and aggregates.
2. Clarify the physical properties of fresh and hardened concrete and also about the manufacturing of concrete.
3. Estimate the creep and shrinkage of concrete and how to conduct the different tests such as compression and tension on hardened concrete and also summarize the quality control of concrete under different conditions.
4. Distinguish the special concretes like Self compacting concrete, Fibre reinforced concrete, Polymer concrete and light weight concrete etc.
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 bydifferenttests–Settingtimesofconcrete–Effectoftimeandtemperatureonworkability– Segregation & bleeding.

Hardened Concrete : Water / Cement ratio – Abram's Law – Gel Space ratio – Nature of strengthofconcrete–Maturityconcept–Strengthintension&compression–Factorsaffecting 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: Light weight aggregates – 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 various methods – BIS method of mix design.

TEXT/REFERENCE BOOKS :

1. Concrete Technology by M. S. Shetty – S. Chand & Co. ;2004
2. Properties of Concrete by A. M. Neville – Low priced Edition – 4thedition
3. Concrete Technology by M.L. Gambhir – Tata Mc. Graw Hill Publishers,NewDelhi.
4. Concrete Technology by A.R. Santha Kumar, Oxford University Press, NewDelhi.
5. Concrete: Microstructure, Properties and materials by P Kumar Mehta, P J M Monteiro, MC Graw Hill Education Publisher, New Delhi.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREEN BUILDING TECHNOLOGY
(OPEN ELECTIVE)

Course Code: GR18A3128	L	T	P	C
III Year II Semester	3	0	0	3

COURSE OBJECTIVES: The objectives of this course is to make the student to

- 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.
- Get a clear understanding of 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.
- 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.
- Describe the principles of sustainable development in green building design.
- Explain the best green building practices adopted along with cost/benefit and life-cycle analysis of green buildings.

COURSE OUTCOMES: After completion of the course the student will be able to -

- Know 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.
- Identify various Renewable and Non-renewable sources of energy along with their carbon foot prints and also comprehend the techniques and benefits of building performance testing such as building modeling and energy analysis, monitoring and metering.
- Recognize the energy efficient green building materials and explain the cost effective Building Technologies, Strategies for Green Building Systems and Energy Conservation Measures and compare cost and performance of building materials with recycled components, non-petroleum based materials, materials with low volatile organic compounds, materials with low embodied energy and salvaged materials and incorporate them into design.
- 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.
- Summarize on the building codes, relevant legislation governing the consumption of resources and emission of environmental pollutants by buildings and be familiar with IGBC green building certification procedure.

UNIT-1

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 , ,Contribution of buildings towards Global Warming. Life cycle cost of buildings, 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 and Green Remodels.

UNIT-III

Green Building Materials: Sustainably managed Materials, Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; Embodied Energy of Materials , 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.

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

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, , Case studies of rated buildings (new and existing)

REFERENCE BOOKS:

1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao – New Age International Publishers
2. Integrated Life Cycle Design of Structures – By AskoSarja – SPON Press
3. Non-conventional Energy Resources – By D S Chauhan and S K Sreevasthava – New Age International Publishers
4. Green Buildings (McGraw hill publication): by Gevorkian
5. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design
6. Understanding Green Building Guidelines: For Students and Young Professionals, Traci Rose Rider ,W. W. Norton & Company Publisher.
7. Understanding Green Building Materials,Traci Rose Rider, W. W. Norton & Company Publisher.

List of free reference guides/resources available on the net:

1. IGBC reference guide/Rating systems
2. Free abridged versions of LEED reference guides
3. ECBC latest version
4. US GBC's Reference Material:

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECCHNOLOGY

Soft Skills and Interpersonal Skills

Course code:GR18A3117 (Open Elective)

III B.Tech II Semester

L	T	P	C
2	1	0	3

Course Objectives: The learner will be able to:

- Know the importance of soft skills
- Identify good leadership skills /qualities
- Recognize the importance of interpersonal skills
- Demonstrate the significance of confidence building
- Define and differentiate between a report and a proposal

Course Outcomes:

After the end of the course the learners will be able to:

- Develop soft skills communication skills, leadership skills etc
- Implement goal setting techniques to build a promising career
- Design formal report and proposals with appropriate formal expressions
- Analyse their own experiences of leading and participating in teams with suitable examples
- Describe team dynamics and exchange ideas about the elements of positive teamwork
- Create healthy workplace environment by treating others with respect and dignity
- Evaluate the power of confidence building and self-esteem with examples

Unit 1: Soft Skills

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

Unit 2: Leadership development

- Qualities of a good leader
- Decision making and problem solving skills
- Strategic management
- Crisis management

Unit3: Confidence building

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

Unit 4: Developing reports and proposals

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

Unit 5: Interpersonal skills

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

Text Books:

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

Reference books:

2. Soft skills for Everyone Jeff Butterfield, CENAGE Learning

3. Soft skills for Interpersonal Communication S. Bala Subramaniam, ORIENT BLACKSWAN

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOUR

(**Open Elective**)

Course Code: GR18A3118 **L/T/P/C: 3/0/0/3**

III Year II Semester

Course Objectives

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

Course Outcomes:

- To familiarize the concepts, techniques and practices of human resource development in the current organizational view and to impart and apprise the capable of applying the principles and techniques as professionals for developing human resources in an organization.
- Develop, implement, and evaluate organizational human resource development strategies aimed at promoting organizational effectiveness in different organizational environments.
- To acquaint the student with the determinants of intra -individual, inter-personnel and inter-group behaviour in organizational setting.
- 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.
- To assess the group behavior in organizations, including communication, leadership, power and politics, conflict, and negotiations in the frame work of organization.

Unit I -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 II-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.

Unit III - 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 IV- 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 V-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.

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.

Reference Books:

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

Syllabus
IV-Year

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ESTIMATING AND COSTING

Course Code: GR18A4001	**L**	**T**	**P**	**C**
IV Year. I Semester	**3**	**1**	**0**	**4**

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

1. Understanding 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: After completion of this course, students will be able to

1. Calculate the quantities of different items in a building and different types of roads and structures.
2. Handle the tendering process for executing any civil engineering work.
3. Assess the value of any property.
4. Recognize the process and importance of cost estimation, cost budgeting and cost control.
5. Estimate the rate per unit of any item of work.

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 –center line method, long wall 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

TEXT BOOKS:

1. Estimating & Costing by B.N.Dutta, UBS publishers
2. Estimating & Costing by G.S.Birdie.
3. Valuation of real properties by S.C. Rangawala, Charotar publishing house.

REFERENCE BOOKS:

1. Estimating, Costing & Specifications by M.Chakraborthi, Laxmi publications.
2. Standard schedule of rates and standard Data Book by Public works department.
3. SP:27, Handbook of method of measurement of building works, Bureau of Indian Standards.
4. IS:1200, Methods of measurements

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROJECT MANAGEMENT & ENTERPRENEURESHIP

Course Code: GR18A4002	**L T P C**
IV Year I Semester	**3 0 0 3**

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

1. Attain knowledge of Project Planning and development of Schedules
2. Monitor the Projects through Critical Path in Networks like CPM and PERT
3. Understand sequence of Construction Activities, Learn Project Quality Planning and Identify Inspection and Testing Plans of Project Works
4. Know and get acquainted with various Construction Equipment and their Management; to identify different Tests for Soils and Concrete.
5. Study the Concept of Entrepreneurship, Main Characteristics of Entrepreneurship and Entrepreneurs; to know the Social Entrepreneurship and Challenges of Social Entrepreneurship.

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

1. Do Project Planning and develop Project Schedules
2. Identify Critical Path in CPM &PERT Networks; Compute Floats and Slacks for Activities & Events respectively to Progress and Complete the Project in Time.
3. Familiar with Method Statements of various Activities and their ITPs with the Knowledge of Project Quality Plans
4. Construction Equipment requirement is known and deploys in best possible manner for better productivity; Conducts Field Tests for Soils at specified frequency.
5. Broaden 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 block work 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.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDUSTRIAL STRUCTURES

(PROFESSIONAL ELECTIVE-3)

Course Code: GR18A4003	**L**	**T**	**P**	**C**
IV Year I Semester	**3**	**0**	**0**	**3**

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

1. Understand different industrial steel buildings
2. Understand design concept of transmission and communication towers, chimney
3. Understand d design of Silos and Bunkers
4. Analyze and design folded plates and cylindrical shell
5. Understand the concept of machine foundations

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

1. Analysis and design of different industrial steel buildings.
2. Carryout analysis and design of transmission and communication towers
3. Carryout analysis and design of silos and bunkers
4. Carryout analysis and design of concrete shell structures
5. Carryout analysis and design 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 behaviour of long and short shells, beam and arch action, analysis and design of cylindrical shell structures, Analysis and design of folded plates;

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. (2008), Design of Steel Structures-Limit State Design, Oxford Universitypress, India.
2. Dunham, (2002), Planning of industrial structures, Tata McGraw Hill
3. Transmission Line Structures - S S Murthy, A R Shanthakumar, Tata McGraw Hill

4. Design of Reinforced Concrete Shells and Folded Plates, P.C. Verghese, PHI

REFERENCES:

1. Krammer., “Earthquake Geotechnical Engineering”.
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. 1979.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

GEOMETRIC DESIGN OF HIGHWAYS

(PROFESSIONAL ELECTIVE-3)

Course Code: GR18A4004	**L**	**T**	**P**	**C**
IV Year I Semester	**3**	**0**	**0**	**3**

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

1. Gain a solid understanding of the principles of highway engineering and traffic analysis
2. Develop and interpret design standards for horizontal and vertical geometry.
3. Have a strong analytical and practical knowledge of Planning, Designing and solving transportation problems by signal phasing and timing plan
4. Understand the type of conflicts that occur at intersection and design the intersection accordingly
5. Gain the knowledge of pedestrian facilities on urban roads.

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

1. Analyze the factors influencing road vehicle performance, characteristics and design.
2. Compute the geometric features of road like horizontal and vertical alignment
3. Organize the basic traffic signal phasing and timing plan
4. Carry out traffic studies and implement traffic regulation and control measures and intersection design
5. Demonstrate the systematic approach where the interaction of humans and the vehicles and their impact on the society and transportation

UNIT-I

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

UNIT-II

Horizontal and Vertical Alignment: Objective of 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 – Objective and 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; Sight Distances – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Importance of Sight Distances for Horizontal and Vertical Curves.

UNIT-III

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

UNIT-IV

Traffic Signs 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

UNIT-V

Miscellaneous Elements: Requirements of Pedestrians; Pedestrian facilities on Urban Roads; Cycle Tracks – Guidelines and Design standards; Bus bays – Types and Guide lines; Design of On-street and Off street Parking facilities – Guidelines for lay out Design.

TEXT/REFERENCE BOOKS:

1. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna Publications
2. Traffic Engineering and Transportation Planning, L.R.Kadiyali, Khanna Publications
3. Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers.
4. IRC Codes for Signs, Markings and Mixed Traffic Control in Urban Areas.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

SURFACE HYDROLOGY
(PROFESSIONAL ELECTIVE-3)

Course Code: GR18A4005	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

III Year II Semester

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

1. Introduction to surface water hydrology
2. Skill of solving problems on infiltration and evaporation
3. Visualization and calculate stream flow and run off
4. Recognize calculate the type of hydrographs
5. Knowledge to forecast the flood estimation

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

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 sito for stream- discharge gauging. Components of Runoff, factors affecting and estimation of runoff, basin yield, flow duration curves, mass curve of a runoff analysis, estimation of reservoir capacity for a given demand, estimation of safe yield from a reservoir of a given capacity.

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. Hydrology by Subramanya K
2. Hydrology by P. Jayaram Reddy

REFERENCE BOOKS:

1. Hydrology by, Rangaraju..
2. Engineering Hydrology by EM Wilson . The Mac million press limited
3. Hydrology H M Raghunath
4. Introduction to Hydrology by W.Viessman Jr. & G L Lewis

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING MATERIALS FOR SUSTAINABILITY

(PROFESSIONAL ELECTIVE-3)

Course Code: GR18A4006	**L**	**T**	**P**	**C**
IV Year I Semester	**3**	**0**	**0**	**3**

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

1. Have an increased awareness among students on issues in area of sustainability
2. Establish a clear understanding 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. Get a clear understanding of 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. Know about Integrated Life cycle design of Materials and Structures

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

1. Understand the different types of environmental factors effecting materials
2. Work in sustainability for research and education
3. Having a 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 cost and performance of building materials with recycled components, non-petroleum-based materials, materials with low volatile organic compounds, materials with low embodied energy and salvaged materials and incorporate them into design.

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

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

UNIT III

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

UNIT IV

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 V

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

TEXT/REFERENCE BOOKS:

1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao – New Age International Publishers
2. Integrated Life Cycle Design of Structures – By AskoSarja – SPON Press
3. Non-conventional Energy Resources – By D S Chauhan and S K Srivastava – New Age International Publishers
4. Green Buildings (McGraw hill publication): by Gevorkian
5. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design
6. Understanding Green Building Guidelines: For Students and Young Professionals, Traci Rose Rider ,W. W. Norton & Company Publisher.
7. Understanding Green Building Materials, Traci Rose Rider, W. W. Norton & Company Publisher.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

EARTHQUAKE ENGINEERING

(PROFESSIONAL ELECTIVE-4)

Course Code: GR18A4007	**L**	**T**	**P**	**C**
IV Year I Semester	**3**	**0**	**0**	**3**

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

1. Introduce students to basics of seismology and basic of earthquake
2. Understand the concept of vibration, SDOF, MDOF
3. Understand the behaviour of structure to earthquake
4. Understand the importance of ductility in earthquake resistant structures
5. Understand the concept of Base Isolation Techniques

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

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

UNIT-I

Introduction– Elements of Seismology; Causes of Earthquake – Geological faults - Tectonic plate theory - Elastic rebound – Epicentre; Hypocentre - Primary, shear and Raleigh waves - Seismogram - Magnitude and intensity of earthquakes - Magnitude and Intensity scales - Spectral Acceleration - Information on some disastrous earthquakes

UNIT-II

Theory of Vibrations; Concept of inertia and damping - Types of Damping - Difference between static forces and dynamic excitation - Degrees of freedom - SDOF idealization - Equations of motion of SDOF system for mass as well as base excitation - Free vibration of SDOF system - Response to harmonic excitation - Impulse and response to unit impulse - Duhamel integral; Multiple Degree of Freedom System; Two degree of freedom system - Normal modes of vibration - Natural frequencies - Mode shapes - Introduction to MDOF systems - Decoupling of equations of motion - Concept of mode superposition;

UNIT-III

Response of Structures to Earthquake; Response and design spectra - Design earthquake - concept of peak acceleration - Site specific response spectrum - Effect of soil properties and damping - Liquefaction of soils

UNIT-IV

Importance of ductility - Methods of introducing ductility into RC structures Design Methodology IS 1893, IS 13920 and IS 4326 - Codal provisions -Design as per the codes

UNIT-V

Introduction of seismic protection system – Energy dissipating devices (Active, Passive, Semi active systems), Basic Isolation system - techniques - Vibration control measures – Important points in

mitigating effects of earthquake on structures

TEXT BOOKS:

1. Manish Shrikhande &Pankaj Agrawal ; Earthquake resistant design of structures, PHI Publication, New Delhi
2. S.K.Duggal; Earthquake resistance design of structures; Oxford University Press, New Delhi.

REFERENCES:

1. A.K.Chopra; Dynamics of structures , Pearson, New Delhi
2. Clough &Penzin; Dynamics of structures
3. Park &Pauly; Behaviour of RC structure
4. IS: 1893 (Part-I)- 2016, Criteria for Earthquake Resistant Design of structures
5. IS: 13920 - 2016, Ductile Design and Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

TRAFFIC ENGINEERING AND MANAGEMENT
(PROFESSIONAL ELECTIVE-4)

Course Code: GR18A4008	**L**	**T**	**P**	**C**
IV Year I Semester	**3**	**0**	**0**	**3**

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

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

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

1. Analyze traffic problems and plan for traffic systems various uses
2. Carryout traffic surveys and plan parking arrangements
3. Carry out 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 (Problems), 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.

UNIT III
GEOMETRIC DESIGN OF INTERSECTIONS
Conflicts at Intersections, Classification of Intersections at Grade, - Chanallised and Unchanallised Intersection - Grade Separators (Concepts only), Principles of Intersection Design, Elements of Intersection Design, Chanallisation and Rotary design (Problems), Grade Separators.

UNIT IV
TRAFFIC CONTROL
Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), 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, 2001.
2. 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 Ministry of Road Transport and Highways, Government of India.
3. SubhashC.Saxena, A Course in Traffic Planning and Design, DhanpatRai Publications, New Delhi, 1989.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

GROUNDWATER

(PROFESSIONAL ELECTIVE-4)

Course Code: GR18A4009	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

IV Year I Semester

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

1. Explain the occurrence of groundwater in various aquifers and describe aquifer parameters
2. Describe the groundwater movement using the differential equation governing groundwater flow in three dimensions using Cartesian and polar coordinates
3. Explain the analysis of pumping test data for steady and unsteady ground water flow
4. Explain the surface and subsurface investigations of groundwater
5. Explain the artificial recharge of groundwater, saline water intrusion in aquifers and ground water basin management.

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

1. Enumeratetheporosity,specificyieldandspecificretentionofaquifer&Calculate the storage coefficient and transmissivity of aquifers and to derive differential equation governing groundwater flow in three dimensions in Cartesian and Polar coordinates
2. Examine the pumping test data in steady and unsteady groundwater flow towards a well in confined and unconfined aquifers using Dupuit's and Theim's equations
3. Appraise surface and subsurface methods of exploration of investigation of ground water
4. Assess the methods of recharge of ground water using GIS and Remote sensing. Assess dynamics of saline water intrusion to manage the ground water basin.
5. Synthesize the overall concepts and procedures necessary for the development and management of ground water resources

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 waterflow equation in polar coordinate system. Ground water flow contours their applications

UNIT III

Analysis of Pumping Test Data–I: Steady flow ground water flow towards a well in confined and unconfined aquifers, Dupit's and Theism's equations, Assumptions, Formation constants, yield of an open well interface and well tests. Analysis of Pumping

Test Data–II: Unsteady flow towards a well, Non equilibrium equations, Thesis solution, Jocob and Chow'ss implifications, Leaky aquifers.

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 Sub surface Investigation.

UNIT V

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.

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. Groundwater Quality -Basic Solute Transport Equation – Methods of Groundwater Quality Improvement. Brief introduction to open source software's to Ground water-MODFLOW and FREEWAT.

TEXT BOOKS:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Ground water by H.M.Raghunath, Wiley Eastern Ltd.

REFERENCE BOOKS

1. Groundwater Hydrology by Bower, John Wiley & son
2. Groundwater System Planning & Management – R. Wills & W. W. G. Yeh, Prentice Hall.
3. Applied Hydrogeology by C. W. Fetta, CBS Publishers & Distributers.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

GEOGRAPHIC INFORMATION SYSTEMS AND SCIENCE

(PROFESSIONAL ELECTIVE-4)

Course Code: GR18A4010	**L**	**T**	**P**	**C**
IV Year I Semester	**3**	**0**	**0**	**3**

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

1. Analyze the basic components of GIS
2. Classify the maps, coordinate systems and projections
3. Process spatial and attribute data and prepare thematic maps
4. Identify and rectify mapping inaccuracies
5. Formulate and solve geospatial problems

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

1. Describe the fundamental concepts of Geographic Information Science and Technology.
2. Understand map creation and design principles, including thematic map display, employment of map projections and cartographic design.
3. Analyze the creation and acquisition of spatial data.
4. Recognize the topo maps prepared by survey of India.
5. Overlay different maps in GIS.

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, Autocad Map, Map Info etc.

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 Modeling – Proximity Analysis, Overlay Analysis, Buffer Analysis, Network Analysis, Spatial Auto Correlation, Gravity Modeling, 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. Remote Sensing and its applications by LRA Narayana, University Press 1999.
2. Principals of Geo physical Information Systems – Peter ABurragh and Rachael A. McDonnell, Oxford Publishers 2004.
3. Remote sensing and image interpretation by Thomas Lillesand, 7th Edition, John Wiley &sons.

REFERENCE BOOKS:

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU Hyderabad 2001, B.S.Publications.
3. Remote sensing of the environment –An earth resource perspective by John R Jensen,Prentice Hall
4. GIS by Kang – tsungchang, TMH Publications & Co.,
5. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
6. Fundamental of GIS by Mechanical designs John Wiley & Sons.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTER APPLICATIONS IN STRUCTURAL ENGINEERING (CASE) LAB

Course Code: GR18A4011	**L T P C**
IV Year I Semester	**0 0 4 2**

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

1. Analyze and Design the RCC beams with different supports and loads.
2. Analyze and Design the RCC multi- storied buildings with different load combinations.
3. Analyze and Desigrounfgn 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: After completion of this course, students will be able to

1. Analyze and Design the various types of Beams for the different loads.
2. Analyze and Design a 2D and 3D frame of Multi-Storied Building.
3. Analyze and Design a RCC Over Head tank.
4. Analyze and Design the different types of Steel Trusses and Industrial Steel Truss
5. Analyze and Design the various types of Steel Beams for the different loads.

List of experiments:

1. Introduction to STAAD Pro Software
2. Design of beams for various supports (SSB,OHB,CT and FX) with PL and UDL
3. Design of beams for various supports (SSB,OHB,CT and FX) with UVL and ML
4. Analysis and Design of multi-storied building (2D frame)
5. Analysis and Design of multi-storied building (3D frame) with DL and LL
6. Analysis and Design of multi-storied building (3D frame) with DL LL and WL
7. Analysis and Design of multi-storied building (3D frame) with DL LL and EL
8. Analysis and Design of multi-storied building (3D frame) with plates
9. Analysis and Design of multi-storied 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 cross sections (I, C, T, L and composite sections)
13. Analysis and Design of various Steel Tubular Trusses
14. Analysis and Design of Industrial buildings with various Trusses
15. Analysis and Design of Steel Over Head Tank

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CYBER LAW AND ETHICS

(**Open Elective**)

Course Code: GR18A3119 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Course Objectives

- To provide the fundamental skill on understanding cyber laws.
- Enables to understand the legal frameworks.
- Helps the student understand different cyber crimes.
- Provides overview on Intellectual Property, copy rights, patents rights etc.
- Discriminate rapid changes in technology and the corresponding changes in crime and the law.

Course Outcomes:

- Identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
- Locate and apply case law and common law to current legal dilemmas in the technology field.
- Apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.
- Will be able understand cybercrime and ethical practices.
- The student will be in position to interface with various issues pertaining to Intellectual Property, copy rights, patents rights etc.

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 Cyberspace

Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace, Access to Internet, Right to Privacy, Right to Data Protection.

Unit –IV Cyber Crimes & Legal Framework

Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act.

Unit –V Intellectual Property Issues in Cyber Space

Interface with Copyright Law, Interface with Patent Law, Trademarks & Domain Names Related issues.

Text books

1. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
2. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012)
3. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)
4. Jonthan Rosenoer, Cyber Law, Springer, New York, (1997).
5. Sudhir Naib, The Information Technology Act, 2005: A Handbook.
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

PRESTRESSED CONCRETE

(PROFESSIONAL ELECTIVE V)

Course Code: GR18A4062	**L**	**T**	**P**	**C**
IV Year II Semester	**3**	**0**	**0**	**3**

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

1. Understand basics of prestressing
2. Understand flexure and shear in prestressed beams
3. Understand deflection in prestressed beams
4. Analyze and design of composite beams
5. Understand the concept of partial prestressing

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

1. Analysis prestressed concrete members
2. Design of prestressed concrete members using IS Code
3. Calculate deflections in prestressed members
4. Analyse and design of composite beams
5. Analyse and design of partial prestressing of members

UNIT-I

Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections – Losses of prestress – Estimation of crack width.

UNIT-II

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on I.S. 1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT-III

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection.
Determination of anchorage zone stresses in post-tensioned beams by Magnel's method, Guyon's method and IS1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

UNIT-IV

Analysis and design of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT-V

Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

TEXT BOOKS:

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.

REFERENCES:

1. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
2. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013
3. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
4. IS 1343:2012, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

GROUND IMPROVEMENT TECHNIQUES
(PROFESSIONAL ELECTIVE V)

Course Code: GR18A4063	**L**	**T**	**P**	**C**
IV Year II Semester	**3**	**0**	**0**	**3**

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

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: After completion of this course, students will be able to

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, 1st edition (1999), Reprint (2013).

REFERENCE BOOKS

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, John Wiley 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

DESIGN OF HYDRAULIC STRUCTURES / IRRIGATION ENGINEERING (PROFESSIONAL ELECTIVE V)

Course Code: GR18A4064	**L**	**T**	**P**	**C**
IV Year II Semester	**3**	**0**	**0**	**3**

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

1. To understand practical applications of problems associated with improper usage and management of water in irrigation engineering.
2. Train the students and bring awareness in them about effective and proper usage of ground water resources and also motivate them for the research of potential natural ground water zones.
3. Train them for the estimation and interpret the data obtained from mass – curve by using Excel tools for estimating the capacity of a reservoir.
4. Train them for the effective and proper design of various types of dams and reservoirs, problems associated with those structures while handling in real scenario.
5. Train them for the design of aqueducts, weir, barrage and other important irrigation structures according to their usage and location of construction.

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

1. To understand different types of irrigation structures along with their designs and analysis by using different evaluation methods.
2. Interpret performance, safety and stability of the gravity dam.
3. Calculate flow through the earthen dams and also corresponding remedial measures to prevent more seepage through dams, various irrigation structures.
4. Design various diversion head works by using Bligh's and Khosla's theory.
5. Design of various hydraulic structures like canal falls and canal regulator works along with their suitability.

UNIT I

Estimation of crop water requirement; 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 lined and unlined channels

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.

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. Spillways: types of spillways, Design principles of Ogee spillways – Spillway gates.

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

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. Design of Type II Aqueduct (Under Tunnel).

TEXT BOOKS:

1. Irrigation Engineering and Hydraulic Structures. S.K.Garg 2014- Khanna Publishers19th edition.

REFERENCE BOOKS:

1. Irrigation and water power engineering. B.C.Punmia, PandeB.B.Lal, Ashok kumarjain, Arunkumarjain- Laxmi publications 16th edition.
2. Irrigation Engineering and Hydraulic structures. S.R.Sahasrabudhe, 2013 S.K.Kataria& sons

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONSTRUCTION PROJECT PLANNING & SYSTEMS
(PROFESSIONAL ELECTIVE V)

Course Code: GR18A4065	**L**	**T**	**P**	**C**
IV Year II Semester	**3**	**0**	**0**	**3**

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

1. Attain knowledge in Primary Construction and Project Planning
2. Identify various construction methods and equipment's and associate them with different works 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. Broaden the career potential of individuals through applied learning experiences in construction, management and technology.

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

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. 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. Put forward ideas and understandings to others with effective communication processes

UNIT 1: Construction Planning and Scheduling

Definition of Projects; Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion. Allocation of Resources-materials, equipment, staff, labour and finance; resource levelling and optimal schedules; Project organisation, documentation and reporting systems.

UNIT 2: 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 3: 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 4: 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 5: 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/REFERENCE BOOKS:

1. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.
2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
3. Chudley, R., Construction Technology, ELBS Publishers, 2007.
4. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015
7. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

BRIDGE ENGINEERING
(PROFESSIONAL ELECTIVE VI)

Course Code: GR18A4066	**L**	**T**	**P**	**C**
IV Year II Semester	**3**	**0**	**0**	**3**

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

1. Familiarize Students with different types of Bridges and IRC standards.
2. Equip student with concepts and design of Slab Bridges
3. Understand concepts and design of T Beam Bridges
4. Understand concepts of design of Plate Girder Bridges
5. Understand concepts of design of substructure, piers and abutments

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

1. Explain different types of Bridges with diagrams and Loading standards
2. Carryout analysis and design of Slab bridges and suggest structural detailing
3. Carryout analysis and design of T Beam bridges and suggest structural detailing
4. Carryout analysis and design of Plate girder bridges
5. Carryout 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. 'Essentials of Bridge Engineering' by Johnson Victor D
2. 'Design of Bridge Structures' by T. R. Jagadeesh, M.A. Jayaram, PHI
3. 'Design of RC Structures' by B. C. Punmai, Jain & Jain, Lakshmi Publications.

REFERENCES:

1. 'Design of Concrete Bridges' by Aswini, Vazirani, Ratwani.
2. 'Design of Steel Structures' by B. C. Punmai, Jain & Jain, Lakshmi Publications.
3. 'Design of Bridges' by Krishna Raju.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

PAVEMENT DESIGN
(PROFESSIONAL ELECTIVE VI)

Course Code: GR18A4067	**L**	**T**	**P**	**C**
IV Year II Semester	**3**	**0**	**0**	**3**

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

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

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

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. Highway Engineering-S.K. Khanna &C.E.G. Justo, Nemchand & Bros.
2. Pavement Analysis and Design – Yang H. Huang
3. Principles of Pavement Design – E. J. Yoder, M. W. Witczak
4. Highway and traffic Engineering-Subash Saxena

REFERENCES:

2. Principles of traffic and highway engineering- Garber & Hoel.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

PHYSICO CHEMICAL PROCESSES FOR WATER AND WASTE WATER TREATMENT (PROFESSIONAL ELECTIVE VI)

Course Code: GR18A4068	**L**	**T**	**P**	**C**
IV Year II Semester	**3**	**0**	**0**	**3**

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

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: After completion of this course, students will be able to

1. Estimate water for domestic and industrial requirement.
2. Determine the quality of generated sludge by treatment of water and waste water 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, Electrodyalisis

TEXT/REFERENCE BOOKS

2. Text book of Water supply and Sanitary Engg. S K Hussain Oxford And IBH
3. Water Supply and Sanitary Engg . G S BirdiDhanpatraj and Sons
4. A text book of Water Supply. V N Gharpure Allied Book House
5. A text book of Sanitary Engg. V N Gharpure Allied Book House
6. Water supply and Sanitary Engg. Vazirani and ChandolaKhanna Publishers
7. Wastewater Engineering, Treatment, Disposal, Reuse Metcalf and Eddy McGraw Hill International Edition.
8. Water supply and Sewerage. E W Steel and Terence J McGhee McGraw Hill BookCompany

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

REPAIRS & REHABILITATION OF STRUCTURES

(PROFESSIONAL ELECTIVE VI)

Course Code: GR18A4069	**L**	**T**	**P**	**C**
IV Year II Semester	**3**	**0**	**0**	**3**

Pre-requisite: Strength of Materials, Structural Analysis -I

Course Objectives: The objectives of this course is to discuss

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: After completion of this course, students will be able to:

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. Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.
2. 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, 2008.
2. Dov Kominetzky.M.S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001
3. Ravishankar.K.,Krishnamoorthy.T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
4. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.
5. Gambhir.M.L., "Concrete Technology", McGraw Hill, 2013

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

TRANSPORTATION ENGINEERING LAB

Course Code: GR18A3072	**L**	**T**	**P**	**C**
IV Year II Semester	**0**	**0**	**2**	**1**

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

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: After completion of this course, students will be able to

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

TEXT/REFERENCE BOOKS:

1. Highway Engineering – S. K. Khanna & C. E. G. Justo. New Chand & Brothers.
2. Highway Material Testing - S. K. Khanna & C. E. G. Justo.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ECONOMIC POLICIES IN INDIA

(Open Elective)

Course Code: GR18A3122 **L/T/P/C: 3/0/0/3**
IV Year II Semester

Course Objectives:

- To analyse the overall business environment and evaluate its various components in business decision making.
- To provide an analysis and examination of significant contemporary ethical issues and challenges.
- To Emphases the manager's social and environmental responsibilities to a wide variety of stakeholders.
- To know the various Government policies governing industry.
- To know economic terms and its scope.

Course Outcomes:

- Familiarize with the nature of business environment and its components.
- Understand the definition of ethics and the importance and role of ethical behaviour in the business world today.
- Explain the effects of government policy on the economic environment.
- Describe how financial information is utilized in business.
- Explain the legal framework that regulates the insurance industry

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. Development-

Unit: 2

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

Unit 3

Planning in India, 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 policy – 1948, 1956, 1977, 1980, 1990, 1991, 2000-2001 Industrial Licensing, Monetary and Fiscal Policy.

Text books

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