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	Basics of Electrical and Electronics Engineering	3	1	0	4	4	30	70	100
3	GR18A2016	Mechanical Engineering	2	0	0	2	2	30	70	100
4	GR18A2017	Surveying & Geomatics	3	0	0	3	3	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**

III YEAR I SEMESTER

S.NO.	Course Code	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1		Structural Analysis II	3	0	0	3	3	30	70	100
2		Geotechnical Engineering	3	0	0	3	3	30	70	100
3		Design of Concrete Structures I	3	0	0	3	3	30	70	100
4		Environmental Engineering	2	0	0	2	2	30	70	100
5		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		Geotechnical Engineering Lab	0	0	2	2	1	30	70	100
8		Environmental Engineering Lab	0	0	2	2	1	30	70	100
9		Concrete Technology Lab	0	0	2	2	1	30	70	100
		Total	**17**	**0**	**6**	**23**	**20**	**270**	**630**	**900**
10		Constitution of India	2	0	0	2	2	30	70	100

III YEAR II SEMESTER

S.NO.	Course Code	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1		Engineering Economics	3	0	0	3	3	30	70	100
2		Transportation Engineering	3	0	0	3	3	30	70	100
3		Foundation Engineering	3	0	0	3	3	30	70	100
4		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		Transportation Engineering Lab	0	0	2	2	1	30	70	100
8		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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IV YEAR I SEMESTER

S.NO.	Course Code	COURSE	Hours			Total Hours	Total Credits	Int	Ext	Marks
			L	T	P					
1		Estimation & Costing	3	1	0	4	4	30	70	100
2		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		Computer Applications in Structural Engineering Lab	0	0	4	4	2	30	70	100
7		Project work (Phase I)	0	0	12	12	6	30	70	100
Total			**15**	**1**	**16**	**32**	**24**	**210**	**490**	**700**

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		Project work (Phase II)	0	0	12	12	6	30	70	100
Total			**9**	**0**	**12**	**21**	**15**	**120**	**280**	**400**

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 – 2 THREADS

S. No.	THREAD 1	THREAD 2
1	Soft Skills and Interpersonal Communication	CSE: 1. E-Commerce 2. Database Management Systems 3. Java Programming
2	Human Resource Development and Organizational Behaviour	IT: 1. Multimedia and Application Development 2. Web Programming 3. Operating Systems
3	Cyber Law and Ethics	EEE: 1.Embedded Systems 2. Control Systems 3. Artificial Intelligence Techniques
4	History of Science	ECE: 1. Principles of Satellite Communications 2. Scientific Computing 3. Wavelets
5	Introduction to Art and Aesthetics	ME: 1.Operations Research 2. Automobile Engineering 3. Robotics
6	Economic Policies in India	CE: 1. Green Building Technology 2.Building Materials and Construction Planning 3. Introduction to Fluid Mechanics

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 orthonormalization 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, (3^{rd} 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 (16^{th} Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4^{th} 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 $e^{ax}, x^n, cosax, sinax,$ $e^{ax}V(x)$ and $x\,V(x)$ where $V(x) \equiv\ cosax\ and\ sinax,$ the method of variation of parameters

LDE with variable coefficients: Cauchy's homogeneous equation, Legendre's homogeneous equations

Unit III: MULTIPLE INTEGRALS

Double integrals: Evaluation of Double Integrals, change of order of integration (only Cartesian form), change of variables (Cartesian and polar coordinates)

Triple Integrals: Evaluation of triple integrals, Change of variables (Cartesian to Spherical and Cylindrical polar coordinates)

Applications: 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

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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 stereochemical 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 anharmonic 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

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTATIONAL MATHEMATICS FOR ENGINEERS

Course Code: 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 their complex 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 Jordan 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,AtextbookofStrengthofmaterials, LaxmiPublications(P)Ltd.,NewDelhi, 5th Edition,2012.
2. BasavrajaiahandMahadevappa,Strengthofmaterials,UniversityPress,Hyderabad,3rdEditio n,2010.
3. Bhavikatti,Strengthofmaterials,VikasPublications,3rd Edition,2008.
4. Ferdinand Beer and others, Mechanics of solid, Tata Mc. Graw Hill Publications, 6th Edition.
5. S.Rama Krishna andR.Narayan,Strengthofmaterials,DhanpatRaiPublications.
6. R.K.Rajput,Strengthofmaterials,S.Chand&Co,NewDelhi,5th Edition,2010.
7. A.R.Basu,Strengthofmaterials,DhanpatRai&Co,NaiSarah,NewDelhi,firstrevised on2005,Re-print2009.
8. L.S.Srinathetal.,Strengthofmaterials,MacmillianIndiaLtd.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Code: GR18A2015 **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

- 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: 3/0/0/3**

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.

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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.