Academic Regulations
Program Structure
and
Detailed Syllabus

Master of Technology
in
Structural Engineering

(Two Year Regular Programme)
(Applicable for Batches admitted from 2020)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Bachupally, Kukatpally, Hyderabad- 500 090

Academic Regulations

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
For all Post Graduate Programmes (M.Tech)
GR20 REGULATIONS

Gokaraju Rangaraju Institute of Engineering & Technology - GR20 Regulations are given here under. These regulations govern all the Post Graduate programmes offered by various departments of Engineering with effect from the students admitted to the programmes in 2020-21 academic year.

1. **Programme Offered:** The Post Graduate programme offered by the department is M.Tech in Structural Engineering, a two-year regular programme in that discipline.
2. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.

3. **Admissions:** Admission into the M.Tech Programme in any discipline shall be made subject to the eligibility and qualifications prescribed by the University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in PGCET conducted by the APSCHE for M. Tech Programmes or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government from time to time.

4. **Programme Pattern:**
    a) A student is introduced to "Choice Based Credit System (CBCS)" for which he/she has to register for the courses at the beginning of each semester as per the procedure.
    b) Each Academic year of study is divided into two semesters.
    c) Minimum number of instruction days in each semester is 90.
    d) The total credits for the Programme is 68.
    e) 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).
    f) A student has a choice of registering for credits from the courses offered in the programme.
    g) All the registered credits will be considered for the calculation of final CGPA.

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

    a) A student shall be declared eligible for the award of M.Tech degree, if he/she pursues the course of study and completes it successfully in not less than two academic years and not more than four academic years.
    b) A Student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the date of admission, shall forfeit his/her seat in M.Tech course.
    c) The Degree of M.Tech shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfill all the 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 each course concerned in the semester.
   b) Condonation of shortage of attendance 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) Students whose attendance is less than 65% in any course are detained and are not eligible to take their end examinations of that course. They may seek re-registration for that course 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 of the College from time to time.

   b) The following is the division of marks between internal and external evaluations.

Particulars	Internal Evaluation	External Evaluation	Total
Theory	**30**	**70**	**100**
Practical	**30**	**70**	**100**
Mini Project	**30**	**70**	**100**
Dissertation	**30**	**70**	**100**

   c) The marks for internal evaluation per semester per theory course are divided as follows:

i.	**Mid Examinations:**	**20 Marks**
ii.	**Tutorials/Assignment:**	**5 Marks**
iii.	**Continuous Assessment:**	**5 Marks**
	Total:	**30 arks**

   d) **Mid Examination:** There shall be two mid examinations during a semester. The first mid examination shall be conducted from the first 50 per cent of the syllabus and the second mid examination shall be conducted from the remaining 50 per cent of the syllabus. The mid examinations shall be evaluated for **20 marks** and average of the marks scored in the two mid examinations shall be taken as the marks scored by each student in the mid examination for that semester.

   e) **Assignment:** Assignments are to be given to the students and marks not exceeding 5 (5%) per semester per paper are to be awarded by the teacher concerned.

   f) **For Internal Evaluation in Practical/Lab Subjects:** The marks for internal evaluation are 30. Internal Evaluation is done by the teacher concerned with the help of the other staff members nominated by Head of the Department. Marks Distribution is as follows:

i.	Internal Exam:	10 Marks
ii.	Record:	05 Marks
iii.	Continuous Assessment:	15 Marks

	Total:	30 Marks

g) **For External Evaluation in Practical/Lab Subjects:** The semester end examination shall be conducted by an external examiner and a staff member of the department nominated by Head of the Department.

h) For approval and evaluating mini project, Dissertation-I and Dissertation-II, a Project Review Committee (PRC) will be constituted by the Head of the Department. The composition of PRC is as follows

i) Head of the Department

ii) One senior faculty relevant to the specialization

iii) Coordinator of the specialization.

i) **Mini Project:** 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.

Internal Evaluation: For internal evaluation,10 Marks are given by PRC based on project reviews and 5 marks for the quality of report and abstract submitted. The supervisor continuously assesses the student performance for 15 marks. Tentative presentation dates and marks distribution of the mini project.

S.No	Date	Review	Marks
Internal Marks (30)			
1	First week of the semester	Abstract submission*	5
2	Mid of the semester	Second review	10
3	Last week of the semester	Last review	15

*Following are the guidelines for the abstract submission

The faculty are requested to check the document submitted in the first review and should contain following

1. Title of the project and Literature review
2. Schematic/Block diagram which gives the broad idea of the entire project
3. Timeline or milestone of the project. It should clearly indicate deliverables/outcomes of the project.
4. Components required with approximate cost
5. References
6. Plagiarism check is compulsory for mini project report as per the plagiarism policy of GRIET.

External Evaluation: (70 Marks)

The mini project report is presented before PRC along with the supervisor and the same is evaluated for 70 marks. At the end of the semester the mini project report is evaluated by PRC.

Guidelines to award 70 marks:

S.No	Date	Review/ PRC report	Marks
External Evaluation Marks (70)			
1	Last week of the semester	Final Presentation and report Submission	10
2	Project report: Project report should be written as per IEEE guidelines.	Verified by PRC	20
3	Project Deliverables • Hardware prototype • Simulation in any authorized software • Submission of research articles in any Scopus Indexed conference /Journal	Verified by PRC	30
4	Results and Discussion	Verified by PRC	10

j) **Dissertation (Phase I & Phase II):**

Internships/Seminars/Dissertation:

i. Dissertation Phase I:

The Dissertation Phase I, the department help the students to do the projects supported by the industry and is evaluated for 100 marks. Out of 100 marks, 30 marks are for internal evaluation and 70 marks are for external evaluation.

Internal Evaluation: For internal evaluation,10 Marks are given by the PRC based on project reviews and 5 marks for the quality of report and abstract submitted. The supervisor continuously assesses the student performance for 15 marks. Tentative presentation dates and marks distribution of the Dissertation Phase I.

S.No	Date	Review	Marks
Internal Marks (30)			
1	lst week of the semester	Abstract submission*	5
2	Mid of the semester	Second review	10
3	Last week of the semester	Last review	15

*Following are the guidelines for the abstract submission

The faculty are requested to check the document submitted in the first review and should contain following

1. Title of the project and the literature review.
2. Schematic/Block diagram which gives the broad idea of the entire project.
3. Time line or mile stone of the project. It should clearly indicate deliverables/outcomes of the project.
4. Components required with approximate cost.
5. Possibility to develop Product.
6. Plagiarism check is compulsory for Dissertation Phase I and Phase II as per the plagiarism policy of GRIET.

External Evaluation: (70 Marks)

The Dissertation Phase I report is presented before PRC along with the supervisor and the same is evaluated for 70 marks. At the end of the semester the Dissertation Phase I report is evaluated by PRC.

Guidelines to award 70 marks:

S.No	Date	Review/ PRC report	Marks
External Evaluation Marks (70)			
1	Last week of the semester	Final Presentation and report Submission	10
2	Project report submission- Project report should be written as per IEEE guidelines.	Verified by PRC	20
3	Project Deliverables • Hardware prototype • Simulations in any authorized software • Submission of research articles in any Scopus indexed conference /Journal • Product development • Industry Support	Verified by PRC	30
4	Results and Discussion	Verified by PRC	10

ii. Dissertation Phase II:

The Dissertation Phase II, the department help the students to do the project a industry and is evaluated for 100marks.Outof100marks, 30 marks are for internal evaluation and 70 marks are for external evaluation. It is expected that along with the project he will be placed in the company.

Internal Evaluation: For internal evaluation, 10 Marks are given by the PRC

based on project reviews and 5 marks for the quality of report and abstract submitted. The supervisor continuously assesses the student performance for 15marks.Tentative presentation dates and marks distribution of the Dissertation Phase II.

S.No	Date	Review	Marks
Internal Marks (30)			
1	1st week of the semester	Abstract submission*	5
2	Mid of the semester	Second review	10
3	Last week of the semester	Last review	15

*Following are the guidelines for the abstract submission

The faculty are requested to check the document submitted in the first review and should contain following

1. Title of the project and the literature review.
2. Schematic/Block diagram which gives the broad idea of the entire project.
3. Timelineormilestoneoftheproject.Itshouldclearlyindicatedeliverables/outcomes of the project.
4. Components required with approximate cost.
5. Possibility to develop Product and IPR.
6. Plagiarism check is compulsory for Dissertation Phase I and Phase II as per the plagiarism policy of GRIET.

External Evaluation: (70 Marks)

The Dissertation Phase II report is presented before PRC along with the supervisor and the same is evaluated for 70 marks. At the end of the semester the Dissertation Phase II report is evaluated by PRC.

Guidelines to award 70 marks:

S.No	Date	Review/ PRC report	Marks
External Evaluation Marks (70)			
1	Last week of the semester	Final Presentation and report Submission	10
2	Project report submission- Project report should be written as per IEEE guidelines.	Verified by PRC and External Examiner	20
3	Project Deliverables • Hardware prototype • Simulations in any authorized software • Submission of research articles in any Scopus indexed conference /Journal • Product development • Industry Support	Verified by PRC and External Examiner	30
4	Results and Discussion	Verified by PRC and External Examiner	10

Rules and regulations related to Internships/Seminars/Mini Project/Dissertation Phase I and II:

The student must work under the guidance of both internal guide (one faculty member of the department) and external guide (from Industry not below the rank of an officer). Internal guide is allotted by the Head of the Department or Program Coordinator, where as external guide is allotted by the industrial organization in which the project is undertaken.

- After approval from the PRC, the final thesis is to be submitted along with ANTI-PLAGIARISM report from the approved agency with a similarity index not more than 24%.
- Two hardcopies and one soft copy of the project work (dissertation) certified by the research supervisors shall be submitted to the College/Institute.
- The thesis shall be adjudicated by one external examiner selected by the Institute out of 3-member panel, submitted by the department.
- In external evaluation, the student shall score at least 40% marks and an aggregate of 50% marks to pass in the project work. If the project report is satisfactory, Viva-voce examination shall be conducted by a Board consisting of the Supervisor, Head and the External Examiner who adjudicated the project work. The Board shall jointly evaluate the student's performance in the project work.

- In case the student doesn't pass through the project work, he/she must reappear for the viva-voce examination, as per the recommendations of the Board. If he fails succeed at the second Viva-voce examination also, he will not be eligible for the award of the degree, unless he is asked to revise and resubmit the Project by the Board. Head of the Department and program coordinator shall coordinate and make arrangements for the conduct of viva-voce examination. When one does get the required minimum marks both in internal and external evaluations the candidate has to revise and resubmit the dissertation in the time frame prescribed by the PRC. If the report of the examiner is unfavorable again, the project shall be summarily rejected.
- If a student gets a chance to work in industry for one year (placement through internship) then he/she should take permission from Principal, Dean of examinations, Dean of Placements, Dean Academics, Department HOD and program coordinator. He/she should complete the credits in 3rd semester in consultation with course instructor and program coordinator.

8. **Recounting of Marks in the End Examination Answer Books:** A student can request for re-counting 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 in an end semester examination can appear for a supplementary examination, as per the schedule announced by the College/Institute.
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:**
    - **a)** A student shall be deemed to have secured the minimum academic requirement in a subject if he / she secures a minimum of 40% of marks in the Semester-end Examination and a minimum aggregate of 50% of the total marks in the Semester-end examination and Internal Evaluation taken together.
    - **b)** A student shall be promoted to the next semester only when he/she satisfies the requirements of all the previous semesters.
    - **c)** In order to qualify for the award of M.Tech Degree, the student shall complete the academic requirements of passing in all the Courses as per the course structure including Seminars and Project if any.
    - **d)** In case a Student does not secure the minimum academic requirement in any course, he/she has to reappear for the Semester-end Examination in the course, or re-register for the same course when next offered or re-register for any other specified course, as may be required. However, one more additional chance may be provided for each student, for improving the internal marks provided the internal marks secured by a student are less than 50% and he/she failed finally in the course concerned. In the event of taking another chance for re-registration, the internal marks obtained in the previous attempt are nullified. In case of re-registration, the student has to pay the re-registration fee for each course, as specified by the College.
    - **e) Grade Points: A 10- point grading system with corresponding letter grades and percentage of marks, as given below, is followed:**

Letter Grade	Grade Points	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 (Above Average)	6	Marks >= 50 and Marks < 60
F (Fail)	0	Marks < 50
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-C. 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 4) 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 a 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.

13. **Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of M. Tech Degree by JNTUH, he/she shall be placed in one of the following four classes:

	Class Awarded	CGPA Secured
13.1	First Class With Distinction	CGPA ≥ 7.75
13.2	First Class	CGPA ≥ 6.75 and CGPA < 7.75
13.3	Second Class	CGPA ≥ 6.00 and CGPA < 6.75

14. **Withholding of Results:** If the student has not paid dues to the Institute/ University, or if any case of indiscipline is pending against him, the result of the student (for that Semester) may be withheld and he will not be allowed to go into the next Semester. The award or issue of the Degree may also be withheld in such cases.
15. **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.
16. **Transitory Regulations:** Students who have discontinued or have been detained for want of attendance, or who have failed after having undergone the PG degree Programme, may be considered eligible for readmission to the same or equivalent subjects as and when they are offered.
17. **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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Bachupally,Kukatpally,Hyderabad-500090,India

STRUCTURAL ENGINEERING
M. Tech (STE) GR20 Course Structure

I YEAR - I SEMESTER

Sl. No	Group	Course Code	Subject	Credits			Total Credits	Total Hours	Int. Marks	Ext. Marks	Total Marks
				L	T	P					
1	PC	GR20D5001	Matrix methods in structural analysis	3	0	0	3	3	30	70	100
2	PC	GR20D5002	Advanced Solid Mechanics	3	0	0	3	3	30	70	100
3	PE I	GR20D5003	1.Theory and Application of Cement Composites	3	0	0	3	3	30	70	100
		GR20D5004	2.Advanced Concrete Technology								
		GR20D5005	3. Theory of Structural Stability								
4	PE II	GR20D5006	1. Analytical and Numerical Methods for Structural Engineering	3	0	0	3	3	30	70	100
		GR20D5007	2.Structural Health Monitoring								
		GR20D5008	3. Structural Optimization								
5	PC	GR20D5009	Structural Design Lab	0	0	2	2	4	30	70	100
6	PC	GR20D5010	Advanced Concrete Lab	0	0	2	2	4	30	70	100
7	BS	GR20D5011	Research Methodology and IPR	2	0	0	2	2	30	70	100
Total				**14**	**0**	**8**	**18**	**22**	**210**	**490**	**700**
8	AC		Audit Course I	2	0	0	2	2	30	70	100

I YEAR - II SEMESTER

Sl. No	Group	Course Code	Subject	Credits			Total Credits	Total Hours	Int. Marks	Ext. Marks	Total Marks
				L	T	P					
1	PC	GR20D5012	FEM in Structural engineering	3	0	0	3	3	30	70	100
2	PC	GR20D5013	Structural Dynamics	3	0	0	3	3	30	70	100
3	PE III	GR20D5014	1. Advanced Steel Design	3	0	0	3	3	30	70	100
		GR20D5015	2. Design of Formwork								
		GR20D5016	3. Principles of Bridge Engineering								
4	PE IV	GR20D5017	1. Design of Advanced Concrete Structures	3	0	0	3	3	30	70	100
		GR20D5018	2. Advanced Design of Foundations								
		GR20D5019	3. Earthquake Resistant Design of Buildings								
5	PC	GR20D5020	Model Testing Lab	0	0	2	2	4	30	70	100
6	PC	GR20D5021	Numerical Analysis Lab	0	0	2	2	4	30	70	100
7	PW	GR20D5143	Mini Project	2	0	0	2	2	30	70	100
Total				**14**	**0**	**8**	**18**	**22**	**210**	**490**	**700**
8	AC		Audit Course II	2	0	0	2	2	30	70	100

II YEAR - I SEMESTER

Sl. No	Group	Course Code	Subject	Credits			Total Credits	Total Hours	Int. Marks	Ext. Marks	Total Marks
				L	T	P					
1	PE V	GR20D5022	1. Design of Prestressed Concrete	3	0	0	3	3	30	70	100
		GR20D5023	2. Analysis of Laminated Composite Plates								
		GR20D5024	3. Analysis and Design of Shells and Folded Plates								
	OE	GR20D5146	1. Cost Management of Engineering Projects	3	0	0	3	3	30	70	100
		GR20D5147	2. Industrial Safety								
		GR20D5148	3. Operations Research								
		GR20D5149	4. Artificial Neural Networks and Fuzzy Systems								
		GR20D5150	5. Cyber Security								
		GR20D5151	6. Internet of Things Architecture and Design Principles								
3	PW	GR20D5144	Dissertation Phase - I	0	0	10	10	20	30	70	100
Total				**6**	**0**	**10**	**16**	**26**	**90**	**210**	**300**

OPEN ELECTIVE				
S. No.	**BOS**	**Group**	**Course Code**	**Course**
1	CE	OE	GR20D5146	Cost Management of Engineering Projects
2	EEE	OE	GR20D5147	Industrial Safety
3	ME	OE	GR20D5148	Operations Research
4	ECE	OE	GR20D5149	Artificial Neural Networks and Fuzzy Systems
5	CS	OE	GR20D5150	Cyber Security
6	IT	OE	GR20D5151	Internet of Things Architecture and Design Principles

II YEAR - II SEMESTER

Sl. No	Group	Course Code	Subject	Credits			Total Credits	Total Hours	Int. Marks	Ext. Marks	Total Marks
				L	T	P					
1	PW	GR20D5145	Dissertation Phase - II	0	0	16	16	32	30	70	100
Total						**16**	**16**	**32**	**30**	**70**	**100**

Audit Courses I & II

1	GR20D5152	English for Research Paper Writing
2	GR20D5153	Disaster Management
3	GR20D5154	Sanskrit for Technical Knowledge
4	GR20D5155	Value Education
5	GR20D5156	Indian Constitution
6	GR20D5157	Pedagogy Studies
7	GR20D5158	Stress Management by Yoga
8	GR20D5159	Personality Development through Life Enlightenment Skills

I YEAR

I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MATRIX METHODS IN STRUCTURAL ANALYSIS

Course Code: GR20D5001 **L/T/P/C: 3/0/0/3**
I Year -I Semester

Prerequisites: Engineering Mechanics, Strength of Materials, Structural Analysis

Course Objectives:

1. To learn how to idealize statically and kinematically determinate and indeterminate Structures and their ill effects.
2. To learn the difference between local and global co-ordinates systems and its role in preparation of stiffness matrix.
3. To understand the effective usage of flexibility matrix method in statically indeterminate structures.
4. To understand the effective usage of stiffness matrix method in kinematically indeterminate structures.
5. To understand about static condensation and sub structuring. To learn about shear walls and their role in multi storied structures.

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

1. Evaluate the static and kinematic indeterminacy and generate stiffness and flexibility matrices.
2. Analyse the skeleton structures using stiffness method under different coordinate system.
3. Use flexibility matrix method to analyse different structures.
4. Use stiffness matrix method to analyse different structures.
5. Analyse various types of structural members using special analysis procedures and shear walls in multi storied constructions.

UNIT I

Introduction to matrix methods of analysis - Static indeterminacy and kinematic indeterminacy - degree of freedom - coordinate system - structure idealization stiffness and flexibility matrices - suitability element stiffness equations - elements flexibility equations - mixed force - displacement equations - for truss element, beam element and tensional element. Transformation of coordinates - element stiffness matrix - and load vector - local and global coordinates.

UNIT II

Stiffness Matrix Assembly of Structures and its Applications to Simple Problems: Direct Stiffness method, Matrix in Global Coordinates, Boundary Conditions, Solution of Stiffness Matrix Equations.

UNIT III

Analysis of Beams, Plane Trusses, Plane Rigid Jointed frames using flexibility method

UNIT IV

Analysis of plane truss - continuous beam - plane frame and grids by stiffness matrix methods.

UNIT V

Special analysis procedures - Static condensation and sub structuring - initial and thermal stresses. Shear walls- Necessity - structural behaviour of large frames with and without shear walls - approximate methods of analysis of shear walls.

TEXT BOOKS:

1. William Weaver J.R and James M.Geve, Matrix Analysis of Frames structures, CBS Publications, Delhi 2004.
2. Ashok.K.Jain, Advanced Structural Analysis, New Channel Brothers, 1996.
3. C.S.Reddy, Structural Analysis, 3rd edition, 2010.

REFERENCES BOOKS:

1. Kanchi, Matrix Structural Analysis, 1995.
2. J.Meek, Matrix Methods of Structural Analysis, 3rd edition, 1980.
3. Ghali and Neyveli, Structural Analysis, 3rd edition, December, 1990.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED SOLID MECHANICS

Course Code: GR20D5002 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Prerequisites: Mathematics and Strength of Materials

Course objectives:

1. To explain the theory, concepts and principles of Elasticity
2. To generalize the equations of elasticity for two-dimensional problems of elasticity in terms of Cartesian and polar coordinates.
3. To demonstrate the equations of elasticity for two-dimensional problems of elasticity in terms of Cartesian and polar coordinates
4. To apply principles of elasticity to analyze the torsion and bending in prismatic bars
5. To extend the principles of stress/strain for plastic deformation to study the modes of failure

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

1. Have a good understanding of the theory, concepts, principles and governing equations of Elasticity principles.
2. Develop equations of equilibrium and draw relations among stress, strain and displacement and utilize the equilibrium equations, compatibility equations and various boundary conditions to analyze elastic problems.
3. Gain the understating of three-dimensional problems of elasticity in Cartesian coordinates system ad able to determine principal stresses and planes of 3D problems.
4. Apply the principles of elasticity to solve torsional problems in prismatic bars and tubes.
5. Use the concepts of stresses and strains for plastic deformation to comprehend the yield criteria of materials.

UNIT I:

Introduction to Elasticity : Notation for forces and stresses - Components of stresses - Components of strain – Hooke's law, Strain and Stress Fields, Stress and strain at a Point, Stress Components on an Arbitrary Plane, Hydrostatic and Deviatoric Components, Saint-Venant's principle.

UNIT II:

Equations of Elasticity in Two-dimensional problems in rectangular and polar coordinates: Equations of Equilibrium, Stress- Strain relations, Strain –Displacement and Compatibility Relations, Boundary conditions, Plane stress and plane strain analysis - stress function -Two dimensional problems in rectangular coordinates - solution by polynomials.

UNIT III:

Analysis of stress and strain in three dimensions in rectangular and polar coordinates - principal stresses - stress ellipsoid-determination of principal stresses - max shear stresses-equations of equilibrium in terms of displacements.

UNIT IV:

Torsion of Prismatic Bars: Saint Venant's Method, Prandtl's Membrane Analogy, Torsion of Rectangular Bar, use of soap films in solving torsion problems, Bending of Prismatic Bars: Stress function - bending of cantilever – circular cross section.

UNIT V:

Concepts of plasticity, Plastic Deformation, Strain Hardening, Idealized Stress- Strain curve, Yield Criterions, Plastic Stress-Strain Relations.

References:

1. Theory of Elasticity, Timoshenko S. and GoodierJ. N., McGraw Hill, 1961.
2. Elasticity, Sadd M.H.,Elsevier,2005.
3. Engineering Solid Mechanics, RagabA.R., BayoumiS.E., CRC Press,1999.
4. Computational Elasticity, AmeenM., Narosa, 2005.
5. Solid Mechanics, KazimiS. M. A., Tata McGraw Hill,1994.
6. Advanced Mechanics of Solids, SrinathL.S., Tata McGraw Hill,2000.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
THEORY AND APPLICATION OF CEMENT COMPOSITES
(Professional Elective I)

Course Code: GR20D5003 **L/T/P/C: 3/0/0/3**
I Year I Semester

Prerequisites: Concrete Technology

Course Objectives

1. To acquire knowledge on classification and characteristics of composite material.
2. To get an adequate knowledge on special concretes.
3. To obtain the practical knowledge on mix design principles, concepts and methods.
4. To determine the mechanical properties of cement composites.
5. To get an adequate knowledge on applications in the diverse construction field.

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

1. Classify and recognize an importance of the composite materials.
2. Identify the type of special concrete.
3. Design the mix proportion of ordinary, standard and high strength concrete by different methods.
4. Determine the mechanical properties of cement composites.
5. Recommend the cement composites for various applications.

Unit I

Cement Composites: Constituent Materials and their Properties - Classification and Characteristics of Composite Materials- Basic Terminology and Advantages. Admixtures – Chemical and Mineral admixtures. Studies on Micro structure of concrete and applications of SEM (Scanned Electronic Microscope).

Unit II

Special Concretes: Fiber reinforced concrete - Self Compacting concrete – Polymer concrete —Reactive Powder concrete – Requirements and Guidelines – Advantages and Applications. Light weight concrete, Bacterial concrete and Geopolymer concrete. High Strength and high performance Concrete – Ultra High Strength Concrete -Use of Nano materials.

Unit III

Concrete Mix Design: Quality Control - Quality assurance - Quality audit- Mix Design method - BIS method, ACI method, DOE method, Mix Design for Blended concretes and Design of HSC Using Erintroy Shaklok Method. High Performance Concrete- Requirements and properties of High Performance Concrete.

Unit IV

Mechanical Properties of Cement Composites: Behavior of Ferrocement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion. Durability tests on concrete - Nondestructive testing of concrete.

Unit V

Application of Cement Composites: FRC and Ferro cement- Housing, Water Storage, Boats and Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behaviour, Constitutive relationship and Elastic Constants.

Reference Books

1 .Mechanics of Composite Materials, Jones R. M,, 2nd Ed., Taylor and Francis, BSP Books, 1998.
2. Ferrocement – Theory and Applications, Pama R. P., IFIC, 1980.
3. New Concrete Materials, Swamy R.N., 1stEd. Blackie, Academic and Professional, Chapman &Hall, 1983.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED CONCRETE TECHNOLOGY
(Professional Elective I)

Course Code: GR20D5004 **L/T/P/C: 3/0/0/3**
I Year I Semester

Prerequisite: Concrete Technology

Course Objectives:

1. To study the physical and chemical properties of cement and admixtures. And also to know about hydration and SEM analysis.
2. To study the properties and conduct the tests on fresh and hardened concrete.
3. To acquire the practical knowledge on mix design principles, concepts and methods.
4. To get an adequate knowledge about the special concretes and their applications in the diverse construction field.
5. To design the forms of different materials for the different types of works under different conditions.

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

1. List out the types of cement, admixture and decide the suitable cement and admixture for specific purpose.
2. Determine the properties of concrete ingredients i.e. cement, fine aggregate and coarse aggregate by conducting different tests such as work ability etc.,
3. Design the mix proportion of ordinary, standard and high strength concrete by using different methods and how the strength of concrete can be modified by changing the proportions.
4. Decide suitable concrete for different structures considering the prevailing weathering conditions and Design economic concrete mix proportion for different exposure conditions and intended purposes with special concrete.
5. Design the forms for a specific work and decide the time of removal of forms for the different elements in different situations.

UNIT I

Concrete Making Materials: Cement- Bogues compounds – Hydration Process – Alkali silica reaction - Admixtures – Chemical and Mineral admixtures. The chemistry of Portland cement manufacture-Hydration of calcium silicate phases-Hydrated aluminates, ferrite and sulphate phases

UNIT II

Fresh and Hardened Concrete: Fresh Concrete - workability tests on Concrete - Segregation and bleeding. Hardened Concrete: Abram's law- Gel space ratios, Maturity Concept–Stress Behavior–Creep and Shrinkage–Durability tests on concrete- Nondestructive testing of concrete. Microstructure and properties of hardened concrete-Microstructure of concrete-Strength

UNIT III

High Strength Concrete –Use of Nano materials – Manufacturing and Properties- Design of HSC Using Erintroy Shaklok Method- Ultra High Strength Concrete. High Performance Concrete - Requirements and properties of High Performance Concrete.

UNIT IV

Special Concretes: Self Compacting concrete – Polymer concrete – Fiber reinforced concrete– Reactive Powder concrete – Geopolymer Concrete - Requirements and Guidelines – Advantages and Applications. Light weight concrete, Bacterial concrete. Concrete mix design: - Mix Design method - BIS method, ACI method, DOE method.

UNIT V

Form work for Concrete – materials – structural requirements – form work systems – connections – specifications – slip forms, permanent form work, latest form work– design of form work – shores – removal of forms – reshoring – failure of form work-case studies.

TEXT BOOKS :

1. A.M.Neville, Properties of Concrete, ELBS publications, 4th pointing DECLO,1996.
2. P Kumar Mehta, Paulo J M Monteiro, "Concrete: Microstructure, Properties, and Materials", 4th edition McGraw Hill Education; 2017
3. A.K. Santhakumar, Concrete Technology, Oxford Press,2002.
4. M.S.Shetty, Concrete Technology, S.Chand& Co,2005.

REFERENCE BOOKS :

1. Rajat Siddique, Special Structural concretes, Galgotia Publications, 3rd edition,1994.
2. N.KrishnaRaju, Design of Concrete Mixes, CBS Publications,2014.
3. P.K.Mehta, Concrete: Micro Structure, ICI, Chennai.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

THEORY OF STRUCTURAL STABILITY

(Professional Elective I)

Course Code: GR20D5005 **L/T/P/C: 3/0/0/3**
I Year I Semester

Prerequisites: Strength of Materials, Structural Analysis

Course Objectives:

1. To impart basics in the theory of structural stability ofdiscrete and continuous Systems.
2. To analyze for stability of columns with axial, flexural, torsional, combined buckling and with and without lateral bracing.
3. To analyze for stability of member buckling and global buckling in frames.
4. To analyze the lateral torsion buckling in beams and the axial flexural buckling, shear flexural buckling, buckling under combined loads in plates.
5. To explain the concepts of inelastic buckling and dynamic stability.

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

1. Comprehend the basics in the theory of structural stability of discrete and continuous Systems.
2. Analyze for stability of columns with axial, flexural, torsional and combined buckling and also investigate for stability of columns with lateral bracing.
3. Evaluate for stability of member buckling and global buckling in frames.
4. Analyze the lateral torsion buckling in beams and for the axial flexural buckling, shear flexural buckling, buckling under combined loads in plates.
5. Explain the concepts of inelastic buckling and dynamic stability.

UNIT I

Criteria for Design of Structures: Stability, Strength, and Stiffness, Classical Concept of Stability of Discrete and Continuous Systems, Linear and nonlinear behaviour.

UNIT II

Stability of Columns: Axial and Flexural Buckling, Lateral Bracing of Columns, Combined Axial, Flexural and Torsion Buckling.

UNIT III

Stability of Frames: Member Buckling versus Global Buckling, Slenderness Ratio of Frame Members.

UNIT IV

Stability of Beams: lateral torsion buckling. Stability of Plates: axial flexural buckling, shear flexural buckling, buckling under combined loads.

UNIT V

Introduction to Inelastic Buckling and Dynamic Stability.

REFERENCE BOOKS:

1. Theory of elastic stability, Timoshenko and Gere, Tata McGraw Hill,1981.
2. Principles of Structural Stability Theory, Alexander Chajes, Prentice Hall, New Jersey.
3. Structural Stability of columns and plates, Iyengar, N. G. R., and Eastern west press Pvt. Ltd.
4. Strength of Metal Structures, Bleich F. Bucking, Tata McGraw Hill, New York.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ANALYTICAL AND NUMERICAL METHODS FOR STRUCTURAL ENGINEERING

(Professional Elective II)

Course Code: GR20D5006 **L/T/P/C: 3/0/0/3**
I Year I Semester

Prerequisites: Fundamentals of Matrices, Mathematics

Course Objectives:

1. To analyse the performance of various interpolation technique and perform error analysis.
2. To develop the skill of solving linear algebraic systems by direct and iteration methods.
3. To compare various numerical differentiation and integration techniques.
4. To explain the various techniques to study Initial and Boundary value problems in Ordinary Differential Equations.
5. To solve a range of problems on applicable software.

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

1. Analyse the performance of various interpolation technique and perform error analysis.
2. Solve linear algebraic system by direct and iteration methods and apply the knowledge of Eigen values and Eigen vectors to some contents in engineering.
3. Apply the knowledge of interpolation and extrapolation of uniform and non-uniform data to certain contents of Civil Engineering.
4. Solve ordinary and partial differential equations in structural mechanics using numerical methods.
5. Apply the knowledge of numerical differentiation and integration to some contents of Civil Engineering.

UNIT I

Fundamentals of Numerical Methods: Error Analysis, Floating-Point Approximation of a Number; Loss of Significance and Error Propagation; Stability in Numerical Computation.
Curve Fitting: Linear Interpolation - Higher Order Interpolation - Lagrange Interpolation Interpolating polynomials using finites differences- Hermite Interpolation -piece-wise and spline Interpolation - Least Square Approximations;

UNIT II

Elements of Matrix Algebra: Solution of Systems of Linear Equations-Direct method – Cramer's rule, Gauss – Elimination Method-Gauss Jordan elimination – Triangulation (LU Decomposition) method – Iterative methods -Jacobi – Iteration method – Gauss – Seidal iteration, Eigen Value Problems- Jacobi method for symmetric matrices- Power method.

UNIT III

Solution of Nonlinear Algebraic and Transcendental Equations

Bisection Method; Fixed-Point Iteration Method; Secant Method; Newton Method ; Rate of Convergences; Solution of a System of Nonlinear Equations; Unconstrained Optimization.

UNIT IV

Numerical Differentiation & Integration: Solution of Ordinary and Partial Differential Equations - Richardson Extrapolation - Numerical Integration – Double integration using Trapezoidal and Simpson's method. Implicit & Explicit scheme - Euler's method – Backward Euler method – Midpoint method – single step method- Taylor's series method- R-K Methods.

UNIT V

Boundary value problems: Boundary value problems by finite difference method.

Computer Algorithms: Numerical Solutions for Different Structural Problems, Applications of Fuzzy Logic and Neural Network in Structural Engineering.

REFERENCE BOOKS :

1. An Introduction to Numerical Analysis, Atkinson K.E., J. Wiley and Sons, 1989.
2. Theory and Problems of Numerical Analysis, Scheid F, McGraw Hill Book Company, (Shaum Series), 1988.
3. Introductory Methods of Numerical Analysis, Sastry S. S, Prentice Hall of India, 1998.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRUCTURAL HEALTH MONITORING

(Professional Elective II)

Course Code: GR20D5007 **L/T/P/C: 3/0/0/3**
I Year I Semester

Prerequisites: Structural Vibrations, Advanced Solid Mechanics, Engineering physics, concrete technology.

Course Objectives:

1. To make the student to understand the Health of the structure.
2. To train the student to diagonise the distress due to various causes & Faults and identify the distress for documentation.
3. To prepare the student to assess the health of structure using static field methods.
4. To prepare the student to assess the health of structure using dynamic field tests.
5. To motivate the student to suggest Repairs, Rehabilitation & Retrofitting of the structure.

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

1. Understand the Health of the structure.
2. Diagonise the distress due to various causes & Faults.
3. Identify the distress and document.
4. Assess the health of structure using static & dynamic field methods.
5. Suggest Repairs, Rehabilitation & Retrofitting of the structure.

UNIT-1
Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance. Structural Health Monitoring: Concepts, Various Measures.

UNIT-II
Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Structural Health Monitoring Procedures.

UNIT-III
Static Field Testing: Types of Static Tests, Simulation and Loading Methods, Static Response Measurement.

UNIT-IV

Dynamic Field Testing: Types of Dynamic Field Test, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

UNIT-V
Introduction to Repairs and Rehabilitations of Structures: piezo–electricmaterials and other smart materialselectro–mechanical impedance (EMI) technique, adaptations of EMI technique.

REFERENCE BOOKS:

1. Structural Health Monitoring, Daniel Balageas, Claus_PeterFritzen, Alfredo Güemes, John Wiley and Sons, 2006
2. Health Monitoring of Structural Materials and Components_Methods with Applications,
3. Douglas E Adams, John Wiley and Sons, 2007.
4. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z.D. Duan, Taylor and Francis Group, London, UK, 2006.
5. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic PressVInc,2007

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRUCTURAL OPTIMIZATION

(Professional elective II)

Course Code: GR20D5008 **L/T/P/C: 3/0/0/3**
I Year -I Semester

Prerequisites: Differential equations and Vector calculus, Engineering mathematics.

Course Objectives:

1. To introduce the concepts of different variables and constraints with classical optimization techniques
2. To understand the formulation of structural optimization problems in linear programming problem.
3. To get familiarized with the application of non-linear programming to structural optimization techniques.
4. Understand the dynamic programming, decision theory and simulations.
5. Apply optimization techniques for simple optimal design of trusses, frames and reinforced concrete framed structures.

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

1. To understand the techniques and theories in structural optimization methods.
2. To determine the linear programming problems by different phases of simplex method.
3. To analyse the different methods of constrained and unconstrained optimization techniques.
4. To comprehend the concepts of multistage decision processes of Dynamic programming.
5. To formulate the optimal design of trusses, frames and reinforced concrete framed structures.

Unit I

Introduction: Design Variables, objective function, constraints, statement of an optimization problem, problem formulation for optimization techniques.

Classical Optimization Techniques: Single Variable optimization, multivariable optimization with no constraints, with equality and inequality constraints**.**

Unit II

Linear Programming: Standard form of linear programming problem, simplex method, pivotal reduction of general systems of equations, simplex algorithm, two phase simplex method.

Unit III

Non-Linear Programming: Unconstrained optimization techniques - Descent methods, gradient of function, steepest descent method, variable metric method (Deviation-Fletcher-Powell method)

Non-Linear Programming: Constrained optimization techniques: penalty function methods, sequential unconstrained minimization techniques, sequential linear programming.

Unit IV

Dynamic Programming: Multistage decision processes, concept of sub optimization and principle of optimality computational procedure.

Unit V

Optimization of Structures: Formulation of constraints and objective function for structural design problems, optimal design of trusses, frames and reinforced concrete framed structures, structural optimization using computer programs like MAT lab, C and C++ .

REFERENCE BOOKS:

1. Rao, S.S. (1984), Optimization: Theory and Applications, Halsted Press, USA.
2. Kirsch, U. (1993), Structural Optimization, Springer-Verlag, Berlin.
3. Bhavikatti, S.S. (2003), Structural Optimisation Using Sequential Linear Programming, Vikas Publishing House Pvt. Ltd., New Delhi

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

RESEARCH METHODOLOGY AND IPR

Course Code: GR20D5011 **L/T/P/C: 2/0/0/2**
I Year I Semester

Course Objectives:

1. To familiarize students with the different aspects of research.
2. To provide an idea of good scientific writing and proper presentation skills.
3. To provide an understanding of philosophical questions behind scientific research.
4. To provide a brief background on the historical legacy of science.
5. To provide an insight of nature of Intellectual Property and new developments in IPR.

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

1. Understand research problem formulation.
2. Analyze research related information and follow research ethics
3. Understand that today‘s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
4. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering.
5. Understand the nature of Intellectual Property and IPR in International scenario.

Unit I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Unit II

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations, Effective literature studies approaches, analysis Plagiarism, Research ethics,

Unit III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Reference Books:

1. Stuart Melville and Wayne Goddard, ‐Research methodology: an introduction for science & engineering students
2. Wayne Goddard and Stuart Melville, ‐Research Methodology: An Introduction
3. Ranjit Kumar, 2nd Edition‐Research Methodology: A Step by Step Guide for beginners
4. Halbert ―Resisting Intellectual Property‖, Taylor & Francis Ltd ,2007.
5. Mayall ‐Industrial Design‖, McGraw Hill,1992.
6. Niebel ‐Product Design‖, McGraw Hill,1974.
7. Asimov ‐Introduction to Design‖, Prentice Hall,1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, ― Intellectual Property in New Technological Age‖,2016. T. Ramappa ,‐Intellectual Property Rights Under WTO‖, S. Chand,2008

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
STRUCTURAL DESIGN LAB

Course Code: GR20D5009 **L/T/P/C: 0/0/2/2**
I Year I Semester

Prerequisites: Design of Reinforced Concrete Structures, Structural Analysis, Foundation Engineering

Course Objectives:

1. To learn the software applications in structural engineering.
2. To learn the analysis of plane, space truss and frames subjected to different types of loadings.
3. To draw the detailing of RCC members and to learn the estimations.
4. To study the design concepts of steel members like truss, beams and columns.
5. To study design requirements for RCC retaining walls.

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

1. Understand the software usages and produce structural drawing for structural members.
2. Design and analyze plane frame and truss subjected to different type of loading.
3. Design, detailing and estimations of RC structural members like beam, column, slab, and Footing
4. Design and analysis of bridge deck slab for different loading conditions
5. Design and analysis of retaining wall for different loading conditions.

List of Experiments

1. Analysis and Design of plane frame using ETABS
2. Analysis and Design of truss using ETABS
3. Design of continuous beam using MS Excel/ ETABS
4. Design of columns using MS Excel/ ETABS
5. Design of one way Slab using MS Excel
6. Design of two way Slab using MS Excel
7. Analysis of Bridge Deck slab
8. Design of Combined Footing using MS Excel
9. Analysis of Multi storeyed space frame using ETABS
10. Analysis of Retaining wall using MS Excel/ETABS

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ADVANCED CONCRETE LAB

Course Code: GR20D5010 **L/T/P/C: 0/0/2/2**
I Year I Semester

Prerequisites: Concrete Technology Theory and Practical.

Course Objectives:

1. Familiarize the students with physical, chemical and mechanical properties of cement concrete constituents and understand the mix design of high grade concrete.
2. Analyze the stress-strain curve of high strength concrete and develop correlation between cube and cylinder of high strength concrete.
3. Determine the mechanical properties of high strength concrete and knowledge on cyclic loading on steel.
4. To conduct Non-Destructive testing methods on existing concrete members and behaviour of beams under flexure.
5. To study the behaviour of self compacting concrete and existing RC structures reinforcement details and corrosion levels.

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

1. Design high grade concrete and identify, carry out laboratory tests related to the use of concrete on site.
2. Develop correlation between cube and cylinder of high strength concrete and analyze the stress-strain curve.
3. Interpret the mechanical properties of high strength concrete and examine the effect of cyclic loading on steel
4. Assess the quality of existing concrete members by Non-Destructive testing methods and study the behaviour of beams under flexure.
5. Analyze the behaviour of Self Compacting Concrete and understanding reinforcement details and corrosion levels in existing RC structures.

List of Experiments/Assignments:

1. Conduct basic tests on cement and aggregates.
2. Design the mix proportions for high strength concrete.
3. Study the stress-strain curve of high strength concrete.
4. Study the correlation between cube and cylinder of high strength concrete.
5. Determine the split tensile strength of high strength concrete

6. Determine the modulus of rupture of high strength concrete.
7. Study the effect of cyclic loading on steel.
8. Determine the compressive strength of existing concrete members by Non-Destructive testing method.
9. Assess the quality of existing concrete members by Non-Destructive testing method.
10. Study the flow properties of self compacting concrete.
11. Evaluation of air content in concrete.
12. Optimization of dosage of super plasticizer in cement.
13. Demonstration on how to locate reinforcement details in any existing RC structures.
14. Demonstration on assessing the level of corrosion in the existing RC structures.

Reference Books:

1. Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall, 2012.

2. Concrete Technology, Shetty M. S., S. Chand and Co., 2006

I YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FEM IN STRUCTURAL ENGINEERING

Course Code: GR20D5012 **L/T/P/C: 3/0/0/3**

I Year II Semester

Prerequisites: Engineering Mechanics, Strength of Materials, Matrix methods in Structural Analysis

Course Objectives:

1. To understand the usage of minimum potential energy principle, weighted residual methods and generating global stiffness matrices.
2. To enable the student should learn to formulate the global load vectors for flexure and axial elements.
3. To understand the effective usage of CST and axi-symmetric element in Finite element method.
4. To introduce of Iso-parametric, rectangular element and estimate error using Numerical method.
5. To understand the non-linear analysis.

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

1. Use minimum potential energy principle ad weighted residual methods in Finite Element Method.
2. Analyse one dimensional elements like beam and truss element using FEM approach.
3. Evaluation of stress and strains in 2D CST and axisymmetric elements.
4. Formulation of rectangular using Isoparametric formulation, Three dimensional element and estimate the error using numerical methods
5. Differentiate various types of non-linear analysis

UNIT I

Introduction: History and Applications. Spring and Bar Elements, Minimum Potential Energy Principle, Direct Stiffness Method, and Nodal Equilibrium equations, Assembly of Global Stiffness Matrix, Element Strain and Stress.

Method of Weighted Residuals: Galerkin Finite Element Method, Application to Structural Elements, Interpolation Functions, Compatibility and Completeness Requirements, polynomial Forms, Applications.

UNIT II

Beam and Truss Elements: Flexure and axial Elements, Element Stiffness Matrix, Element Load Vector and Element stress Vector.

UNIT III

Types: Triangular Elements, Axi-Symmetric Elements,

UNIT IV

Isoparametric Formulation, Rectangular Elements, Three-Dimensional Elements, Numerical Integration, Gaussian Quadrature.

UNIT V

Introduction to non – linear analysis, various methods and their limitations.

TEXT BOOKS :

1. G.S.Krishna Murthy, Finite Element Analysis, theory and programming, 3rd edition, 1994
2. Finite Element Methods in Engineering, Belegundu A.D., Chandrupatla, T.R., Prentice Hall India, 1991.
3. Finite Element Analysis, Seshu P., Prentice-Hall of India, 2005.

REFERENCE BOOKS :

1. Concepts and Applications of Finite Element Analysis, Cook R. D., Wiley J., New York, 1995.
2. Fundamentals of Finite Element Analysis, Hutton David, Mc- Graw Hill, 2004.
3. Finite Element Analysis, Buchanan G.R., McGraw Hill Publications, New York, 1995.
4. Finite Element Method, Zienkiewicz O.C. & Taylor R.L. Vol. I, II & III, Elsevier, 2000

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRUCTURAL DYNAMICS

Course Code: GR20D5013 **L/T/P/C: 3/0/0/3**
I Year II Semester

Course Prerequisites: Physics and Mathematics

Course Objectives:

1. To understand the importance of vibration analysis and modelling of dynamic systems
2. To analyze for dynamic response of Single Degree of Freedom System subjected to different types of loading.
3. To examine the dynamic response of Multiple Degree of Freedom System using lumped mass and distributed mass approach
4. To obtain the dynamic response of structures using numerical methods.
5. To illustrate the dynamic effects of Wind Loads, Moving Loads and Vibrations caused by Traffic, Blasting and Pile Driving

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

1. Comprehend and model the systems subjected to vibrations and dynamic loads
2. Analyze and obtain dynamics response of single degree freedom system using fundamental Theory and equations of motion.
3. Analyze and obtain dynamics response of Multi degree of freedom system idealized as lumped mass systems. Analyze and obtain dynamics response of Multi degree of freedom system idealized as distributed mass systems.
4. Obtain dynamics response of systems using numerical methods.
5. To explain the dynamic effects of Wind Loads, Moving Loads and Vibrations caused by Traffic, Blasting and Pile Driving.

UNIT I

Introduction: Objectives, Importance of Vibration Analysis, Nature of Exciting Forces, Mathematical Modeling of Dynamic Systems. Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion - Vectorial representation of S.H.M. - Free and forced vibrations - undamped and damped vibrations - critical damping - Logarithmic decrement– Phase angle.

UNIT II

Single Degree of Freedom System: Formulation of equations of motion by different methods , Free and Forced Vibration with and without Damping, Response to Harmonic Loading, Response to General Dynamic Loading using Duhamel's Integral, Fourier Analysis for Periodic Loading

UNIT III

Multiple Degree of Freedom System (Lumped parameter): Selection of the degrees of Freedom - Evaluation of structural property matrices - Formulation of the MDOF equations of motion - Undamped free vibrations - Solutions of Eigen value problem for determination of natural frequencies and mode shapes - Inverse Iteration Method for Determination of Natural Frequencies and Mode Shapes, Dynamic Response by Modal Superposition Method, Direct Integration of Equation of Motion.

UNIT IV

Numerical Solution to Response using Stodola method, Holzer method, Newmark Method and Wilson Methods.

Continuous systems**:** Flexural vibrations of beams - Elementary case – Derivation of governing differential equation of motion - Analysis of undamped free vibrations of beams in flexure - Natural frequencies and mode-shapes of simple beams with different end conditions.

UNIT V

Special Topics in Structural Dynamics(Concepts only): Dynamic Effects of Wind Loading, Moving Loads, Vibrations caused by Traffic, Blasting and Pile Driving, Foundations for Industrial Machinery, Excitation by rigid base translation.

Reference Books:

1. Dynamics of Structures, Clough R. W. and Penzien J., McGraw Hill.
2. Structural Dynamics and Introduction to Earthquake Engineering, Chopra A. K.
3. Vibration of Structures - Application in Civil Engineering Design, Smith J. W., Chapman and Hall.
4. Dynamics of Structures, Humar J. L., Prentice Hall.
5. Structural Dynamics - Theory and Computation, Paz Mario, CBS Publication.
6. Dynamics of Structures, Hart and Wong.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED STEEL DESIGN

(Professional Elective III)

Course Code: GR20D5014 **L/T/P/C: 3/0/0/3**

I Year II Semester

Prerequisites: Strength of materials, Structural Analysis and Design of steel Structures.

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

1. Design of Plate girders.
2. Design of Gantry girders.
3. The design of steel truss girder, loads on trusses, analysis and design of purlins and truss members
4. The design of steel bridges.
5. The design and analysis steel bunkers and silos.

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

1. Design Plate girders.
2. Design Gantry girders.
3. The design of steel truss girder, loads on trusses, analysis and design of purlins and truss members
4. The design of steel bridges.
5. Design of steel bunkers and silos

UNIT I

Design of Plate Girder: Introduction, Types of sections, elements of plate girder, general considerations, proportioning of web, proportioning of flanges, flexural strength, shear strength of web, shear buckling design methods, end panel design, stiffeners and curtailment of flanges.

UNIT II

Design of Gantry Girder: Introduction, Loads, fatigue effects, specifications and design procedure.

UNIT III

Analysis and Design of Industrial Buildings: Dead loads, live loads and wind loads on roofs. Design wind speed and pressure, wind pressure on roofs; wind effect on cladding and louvers; Design of angular roof truss, tubular truss, truss for a railway platform. Design of purlins for roofs, stanchions and design of bracings.

UNIT IV

Design of Steel Truss Girder Bridges: Types of truss bridges, component parts of a truss bridge, economic proportions of trusses, self weight of truss girders, design of bridge compression members, tension members; wind load on truss girder bridges; wind effect on top lateral bracing; bottom lateral bracing; portal Bracing; sway bracing.

UNIT V

Design of Steel Bunkers and Silos Introduction – Janseen's Theory – Airy's Theory – Design of Parameters – Design Criteria – Analysis of Bins – Hopper Bottom –Design of Bins.

TEXT BOOKS:

1. S.K. Duggal, Limit State Design of Steel Structures, Mc Graw Hill Education Private Ltd. New Delhi, 2nd Edition, 2010.
2. N. Subramanian, Design of steel structures.

REFERENCE BOOKS :

1. P. Dayaratnam, Design of Steel Structures, Publisher: S. Chand, Edition 2011 – 12.
2. Dr. Ramachandra &Vivendra, Design Steel Structures Volume – II, GehlotScientific Publishes Journals Department, 1st Dec, 2008, 9th Edition.
3. Galyord& Gaylord, Design of Steel Structures, Publisher; Tata Mc Graw Hill, Education. Edition ,2012. 4. Indian Standard Code – IS – 800-2007.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN OF FORMWORK

(Professional Elective III)

Course Code: GR20D5015 **L/T/P/C: 3/0/0/3**
I Year II Semester

Prerequisites: Engineering Mechanics, Solid Mechanics, Structural Analysis.

Course Objectives:

1. To make the student to understand the necessity and types of form work for various structures of Civil Engineering.
2. To prepare the student to select proper type of form work, accessories and materials required.
3. To train the student to carry out the design the form work for various structural elements like beam, slab, column, wall & foundation and for special structures like shells, retaining walls, bridges, bunkers & water tanks.
4. To make the student to understand the working of flying form work like tunnel forms, slip forms and table forms.
5. To motivate the students to Judge the form work failures and to assess the form work issues in multi – storey building construction through case studies.

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

1. Understand the necessity and types of form work for various structures of civil Engineering and select proper type of form work, accessories and materials required.
2. Design the form work for various structural elements like beam, slab, column, wall and foundation.
3. Design the form work for special structures like shells, retaining walls, bridges, Sylos, bunkers & water tank.
4. Understand the working of flying form work like tunnel forms, slip forms and table forms.
5. Judge the form work failures from case studies.

UNIT I

Introduction to formwork: Requirements and Selection of Formwork, Formwork Materials- Timber, Plywood, Steel, Aluminium, Plastic, and Accessories. Form work selection

UNIT II

Formwork Design: Concepts, Formwork Systems and Design for Foundations, Walls, Columns, Slab and Beams.

UNIT III

Formwork Design for Special Structures: Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower and Bridges.

UNIT IV

Flying Formwork: Table Form, Tunnel Form, Slip Form, Formwork for Precast Concrete, Formwork Management Issues –Pre- and Post-Award.

UNIT V

Formwork Failures: Causes and Case studies in Formwork Failure, Formwork Issues in Multi Story Building Construction.

REFERENCE BOOKS & CODES:

1. Formwork for Concrete Structures, Peurify, McGraw Hill India, 2015.
2. Formwork for Concrete Structures, Kumar NeerajJha, Tata McGraw Hill Education, 2012.
3. IS 14687: 1999, False work for Concrete Structures – Guidelines; BIS, New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF BRIDGE ENGINEERING

(Professional Elective III)

Course Code: GR20D5016 **L/T/P/C: 3/0/0/3**
I Year II Semester

Course Prerequisites: Design of Steel and Reinforced Concrete Structures

Course Objectives:

1. Familiarize Students with different types of Bridges and IRC standards.
2. Analysis and design of Solid Slab Bridges and Box Culverts
3. Analysis and design of T Beam bridges
4. Analysis and design of plate girder bridge sand conceptual design principles of others types of bridges.
5. To impart knowledge of different methods of inspection of bridges and their maintenance strategies

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

1. Identify the load transfer mechanism of different types of bridge sand loads acting on the super and sub structure
2. Analyze and design of solid slab bridges and Box culvers
3. Analyze and design of T Beam bridges
4. Analyze and design of Plate girder bridges and understand the design concepts of various other types of bridges.
5. Analyse and design of piers, abutments and bearings. Also able to apply various types of inspections and maintenance techniques.

UNIT I

Road Bridges - History– Components – types of bridges and their load transfer mechanisms and suitability- Planning, Site selection, Soil Exploration investigations- Hydraulic factors in Bridge Design - IRC loadings - Economic span length –General Design requirements for super structures and sub structures.

UNIT II

Analysis and Design of Solid slab bridges: General design features, Effective width method. Simply supported and cantilever Slab Bridge, Design of Kerb; Analysis and Design of Box Culverts.

UNIT III

Analysis and design of T-Beam bridges (up to three girder only) Components – Design of interior slab panel. Pigeaud's method, Calculation of longitudinal moment using Courbon's theory, Design of Longitudinal girders and Cross girders beams.

UNIT IV

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

Introduction to Prestressed Concrete Bridges – Steel trussed bridges –Balanced Cantilever bridges – Continuous bridges- Cable stayed bridges (No detailed designs, only conceptual design principles)

UNIT V

Substructures: Analysis and design concepts of Abutments and pier-detailing; Bridge bearings: types, selection, forces on bearings and design concepts of elastomeric bearings; Bridge foundations (Only Design Concepts), Bridge Foundations- Types and design principles Inspection and Maintenance and Rehabilitation of Bridges: Procedures and methods for inspection – Testing of bridges- Maintenance of Sub Structures and Superstructures- Maintenance of bearings- Repairs and Rehabilitation methods- Case studies.

REFERENCES :

1. Johnson victor D, "Essentials of Bridge Engineering", 7th Edition, Oxford, IBH publishing Co., Ltd, 2006
2. Krishna Raju N., "Design of Bridges", 4th Edition, Oxford and IBH Publishing Co., Ltd., 2008
3. PonnuSwamy, "Bridge Engineering", 4th Edition, McGraw-Hill Publication, 2008.
4. Vazirani, Ratvani & Aswani, "Design of Concrete Bridges", 5th Edition, Khanna Publishers, 2006.
5. Wai-Fah Chen LianDuan, "Bridge Engineering Handbook", CRCPress, USA, 2000.
6. R.M. Barker and J.A. Puckett, "Design of Highway Bridges", JohnWiley& Sons, New York, 1997.
7. P.P. Xanthakos, "Theory and Design of Bridges", John Wiley &Sons, New York, 1994.
8. T.R. Jagadeesh and M.A. Jayaram, "Design of Bridge Structures,"Prentice-Hall of India, New Delhi, 2006.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN OF ADVANCED CONCRETE STRUCTURES

(Professional Elective IV)

Course Code: GR20D5017 **L/T/P/C: 3/0/0/3**

I Year II Semester

Prerequisites: Design of Reinforced concrete structures, Structural analysis, Bridge Engineering

Course Objectives:

1. To acquire knowledge on design of Flat slab
2. To design reinforced concrete elements like deep beams, piles and pile caps.
3. To design and detail the retaining walls and Intze type OHT.
4. To design the shear walls and plain concrete walls.
5. To understand IRC loadings and design of Deck Slab Bridge.

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

1. Structural design of flat slab including direct design method.
2. Design and detailing of pile foundations with pile caps and simply supported and continuous deep beams.
3. Design and detailing of plain concrete walls, shear walls.
4. Design and detailing of Intze type Over Head Tank, understand stability requirements of retaining walls.
5. Knowledge of IRC loading and design of Deck Slab Bridge.

Unit I

Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.

Flat slabs: Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears

Unit II

Design of Deep Beams: Deep beam action, reinforcement requirements, design of simply supported and continuous deep beams and detailing. Reinforcement requirements of pile foundations, design of pile foundation and design of pile cap for a group of piles.

Unit III

Design of Walls: Plain concrete walls – Braced and unbraced walls, slenderness ratio and design of plain concrete walls.

Shear Walls – Classification of shear walls, loads in shear walls and design of shear walls. Retaining Walls – Types of retaining walls, stability requirements of retaining wall and design of counterfort retaining wall.

Unit IV

Design of Intze Tank: Intze type overhead tank parts and approximation of dimensions of various parts, equation for tank capacity; design and detailing Intze type OHT. Design of staging for Intze type OHT.

Unit V

Design of Deck Slab Bridge: RC bridge, IRC loadings- class A, B, C and AA (70R), economic span, effective width and design of Deck Slab Bridge.

References Books

1. Reinforced Concrete Design, Pillai S. U. and Menon D., Tata McGraw-Hill, 3rd Ed, 1999.

2. Illusrate Reinforced Concrete Design, Shah & Karve.

3. Reinforced Concrete Structures, Park R. and PaulayT. , John Wiley & Sons, 1995.

4. Advanced Reinforced Concrete Design, Varghese P. C., Prentice Hall of India, New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED DESIGN OF FOUNDATIONS
(Professional Elective IV)

Course Code: GR20D5018 **L/T/P/C: 3/0/0/3**

I Year II Semester

Prerequisites: Geotechnical Engineering, Foundation engineering, Ground Improvement Techniques

Course Objectives:

1. Identify appropriate soil exploration methods.
2. Assess the requirements of shallow foundations.
3. Recognize the various methods and tests in deep foundations.
4. Provide the information on different tunnels and arching in soils.
5. Identify aspects of design of cofferdams under uplift loads and soil structure interaction.

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

1. Assess the suitability of soil strata for different projects.
2. Evaluate the bearing capacity and settlement of shallow foundations.
3. Analyze and design pile foundations and requirements of well foundation.
4. Distinguish about bracing and deep cuts and compute pressure around tunnels.
5. Analyze and design coffer dams and recognize soil structure interaction.

UNIT I

Planning of soil Exploration for Different Projects, Methods of Subsurface Exploration and Methods of Borings along with Various Penetration Tests.

UNIT II

Shallow Foundations, Requirements for Satisfactory Performance of Foundations, Methods of Estimating Bearing Capacity, Settlements of Footings, Proportioning of Foundations using Field Test Data, Pressure - Settlement Characteristics.

UNIT III

Deep Foundations, Methods of Estimating Load Transfer of Piles, Settlements of Pile Foundations, Pile Group Capacity and Settlement, Laterally Loaded Piles, Pile Load Tests, Lateral and Uplift Capacity of Piles, Well Foundations, IS Code Provisions.

UNIT IV

Tunnels and Arching in Soils, Pressure Computations around Tunnels. Open Cuts, Sheeting and Bracing Systems in Shallow and Deep Open Cuts in Different Soil Types.

UNIT V

Coffer Dams, Various Types, Analysis and Design, Foundations under uplifting loads, Soil structure interaction

TEXT BOOKS :

1. Braja M. Das, Principles of Foundation Engineering, Cengage Learning, New Delhi, 6th edition (2007), Reprint (2012).
2. Bowles, J.E., Foundation Analysis and Design, McGraw-Hill Publishing Company, New york, 5th edition (1997).

REFERENCE BOOKS :

1. Design of foundation system, N.P. Kurian, Narosa Publishing House.
2. Analysis and Design of Substructures, Sawmi Saran, Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

EARTHQUAKE RESISTANT DESIGN OF BUILDINGS

(Professional Elective IV)

Course Code: GR20D5019 **L/T/P/C: 3/0/0/3**
I Year II Semester

Prerequisite: Engineering Mechanics, Engineering Geology, Strength of Materials, Structural Analysis, Design of Reinforced Concrete Structures and Design of Steel.

Course Objectives:

1. To impart knowledge on the seismology and behavior of buildings during earthquakes.
2. Geology of the Earth, Movements of Tectonic Plates, and Effects of Earthquakes
3. Dynamic Behavior of simple structural systems
4. Structural dynamics of simple systems subject to harmonic and random earthquake loading
5. To involve the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.

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

1. To understand the fundamentals of earthquake engineering and seismicity conditions of the country and world.
2. To perform site specific deterministic seismic hazard analysis.
3. To understand the concepts of dynamic equations of motion and perform analysis for dynamic systems in civil engineering applications
4. Capable to correlate information from various engineering and scientific discipline to understand complex behavior of RC structure subjected to seismic forces.
5. Capable to design RC structures in accordance with the provisions of Indian and International Building Codes considering seismic forces

Unit I

Engineering Seismology: Earthquake phenomenon cause of earthquakes, Faults, Platetectonics, Seismic waves, Terms associated with earthquakes Magnitude/Intensity of an earthquake scales, Energy released, Earthquake measuring instruments, Seismoscope, Seismograph, accelerograph, Characteristics of strong ground motions, Seismic zones of India.

Introduction of Functional planning, Continuous load path, Overall form, simplicity andsymmetry, elongated shapes, stiffness and strength. Seismic design requirements, regularand irregular configurations, basic assumptions.

UNIT II

Conceptual Design - Horizontal and Vertical Load Resisting Systems - System and Members for Lateral Loads and High Rise / Tall Structures.Twisting of Buildings – Flexible Building and Rigid Building Systems. Strength and Stiffness – Ductility – Definition – Ductility Relationships – Choice of construction Materials – Unconfined Concrete & Confined Concrete – Masonry, Steel Structures. Design Earthquake Loads – Basic Load Combinations – Permissible Stresses. Seismic Methods of Analysis – Static Method – Equivalent Lateral Force Method. Dynamic Analysis – Response Spectrum Method – Modal Analysis Torsion.

UNIT III

Introduction to Earthquake Resistant Design – Seismic Design Requirements and Methods. RC Buildings – IS Code based Method. - Vertical Irregularities – Mass Irregularity Torsional Irregularity - Plan Configuration Problem - Design Lateral Force, Base Shear Evaluation – Lateral Distribution of Base Shear – Structural Walls Strategies and the Location of Structural Walls – Sectional Shapes – Behaviour of Unreinforced and Reinforced Masonry Walls – Behaviour of Walls Box Action and Bands – Behaviour of infill Walls - Non Structural Elements – Failure Mechanism of Nonstructural Elements – Effects of Nonstructural Elements on Structural System – Analysis – Prevention of Damage to Nonstructural Elements – Isolation of Non-Structures.

UNIT IV

Design of Shear walls: Classification according to Behavior, Loads in Shear walls, Design of Rectangular and Flanged Shear walls, Derivation of Formula for Moment of Resistance of Rectangular Shear walls – Coupled Shear Walls. Introduction to non-linear static Oush Over Analysis.

UNIT V

Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction-Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920.Behavior of beams, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquake- Seismic Evaluation and Retrofitting.

Capacity Based Design: Introduction to Capacity Design, Capacity Design for Beams and

Columns -Case studies.

REFERENCES:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.
3. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons
4. Masory and Timber structures including earthquake Resistant Design –Anand S.Arya, Nemchand& Bros
5. Earthquake –Resistant Design of Masonry Building –MihaTomazevic, Imperial college Press.
6. Design of Reinforced Concrete Structures by N.Subramanian, Oxford University Press.
7. Earthquake Tips – Learning Earthquake Design and Construction C.V.R. Murty

Reference Codes:

1. IS: 1893 (Part-1) -2002. "Criteria for Earthquake Resistant – Design of structures."B.I.S., New Delhi.
2. IS:4326-1993, "Earthquake Resistant Design and Construction of Building", Code of Practice B.I.S., New Delhi.
3. IS:13920-1993, "Ductile detailing of concrete structures subjected to seismic force" – Guidelines, B.I.S., New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MODEL TESTING LAB

Course Code: GR20D5020 **L/T/P/C: 0/0/2/2**
I Year II Semester

Prerequisites: Structural Dynamics, RCC, Earthquake Engineering

Course Objectives:

1. To idealize the effect of structures against extreme loading.
2. To idealize the response of structure under deferent loading.
3. To learn about free and forced vibration.
4. To know the advantage of shear walls.
5. To know the usage of isolation of foundations under vibrations.

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

1. Evaluate the response of structure under Static and Dynamic loading.
2. Generate and analyze the various structure for free and forced vibrations against prepared models using appropriate software's.
3. Develop models and test for Static and Dynamic loading.
4. Develop models and test for force and free vibrations.
5. Check the stability of shear walls against lateral loading.

TASK1

Generate models like shear walls, portal frames etc., and using appropriate software's.

TASK2

Model testing for frames.

TASK3

Modal Testing of plates, shells under static loading.

TASK4

Modal Testing for free and forced vibrations on frames.

TASK5

Evaluation of dynamic modulus for given structure under loading.

TASK6

Assess the capacity of shear walls under lateral loading.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

NUMERICAL ANALYSIS LAB

Course Code: GR20D5021 **L/T/P/C: 0/0/2/2**

I Year II Semester

Prerequisites: Numerical Methods, Mathematics, C programming

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

1. To find Roots of non-linear equations by Bisection method and Newton's method.
2. To do curve fitting by least square approximations.
3. To Solve the system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration/Gauss - Jorden Method.
4. To Integrate Numerically Using Trapezoidal and Simpson's Rules.
5. To find Numerical Solution of Ordinary Differential Equations by Euler's Method, Runge-Kutta Method.

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

1. Find Roots of non-linear equations by Bisection method and Newton's method.
2. Do curve fitting by least square approximations.
3. Solve the system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration/Gauss - Jorden Method.
4. Integrate Numerically Using Trapezoidal and Simpson's Rules.
5. Find Numerical Solution of Ordinary Differential Equations by Euler's Method & Runge- Kutta Method.

TASK1

Find the Roots of Non-Linear Equation Using Bisection Method.

TASK2

Find the Roots of Non-Linear Equation Using Newton's Method.

TASK3

Curve Fitting by Least Square Approximations.

TASK4

Solve the System of Linear Equations Using Gauss - Elimination Method.

TASK5

Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.

TASK6

Solve the System of Linear Equations Using Gauss - Jorden Method.

TASK7

Integrate numerically using Trapezoidal Rule.

TASK8

Integrate numerically using Simpson's Rules.

TASK9

Numerical Solution of Ordinary Differential Equations by Euler's Method.

TASK10

Numerical Solution of Ordinary Differential Equations by Runge - Kutta Method.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MINI PROJECT

Course Code: GR20D5143 **L/T/P/C: 0/0/4/2**

I YEAR II SEMESTER

Course Objectives:

1. To improve the technical presentation skills of the students.
2. To train the students to do literature review.
3. To impart critical thinking abilities for problem solutions.
4. To learn different implementation techniques.
5. To prepare technical reports

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

1. Choose the problem domain in the specialized area under computer science and engineering.
2. Acquire and categorize the solution paradigms with help of case studies
3. Design and code using selected hardware, software and tools.
4. Execute, Implement and demonstrate the problem statement by using the selected hardware, software and tools.
5. Document the thesis and publish the final work in a peer reviewed journal.

Syllabus Contents:

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution. Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the Departmental committee.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECCHNOLOGY

ENGLISH FOR RESEARCH PAPER WRITING

(AUDIT COURSE)

Course Code: GR20D5152 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. To understand that how to improve their writing skills and level of readability
2. To learn about what to write in each section
3. To understand the skills needed when writing a Title and ensure the good quality of paper at very first-time submission
4. To understand the process of research
5. To write quality research papers

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

1. Will have given a view of what writing is all about
2. Will be able to understand Research and its process
3. Will be able to comprehend the steps and methods involved in research process
4. Will have learned various skills necessary that are necessary for doing research
5. Will have learned how to write quality research papers along with other research areas

Unit 1: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit 2: Clarifying Who Did What, Highlighting Your Findings, Hedging and Critiquing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts and writing an Introduction

Unit 3: Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

Unit 4: A. Key skills that are needed when writing a Title, an Abstract, an Introduction, and Review of the Literature,

B. Skills that are needed when writing the Methods, the Results, the Discussion, an the Conclusion

Unit 5: Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Reference Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .
4. Ian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DISASTER MANAGEMENT
(AUDIT COURSE)

Course Code: GR20D5153 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches,
5. Planning and programming in different countries, particularly their home country or the countries they work in.

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

1. Capacity to integrate knowledge and to analyze, evaluate and manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.
2. Capacity to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
3. Capacity to work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery) and relate their interconnections, particularly in the field of the Public Health aspects of the disasters.
4. Capacity to manage the Public Health aspects of the disasters.
5. Capacity to obtain, analyze, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them

Unit 1: **Introduction:** Disaster: Definition, Factors and Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Unit 2: Repercussions of Disasters and Hazards: **Economic Damage**, Loss of Human And Animal Life, Destruction Of Ecosystem. **Natural Disasters**: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Unit 3: Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone To Floods And Droughts, Landslides and Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

Unit 4: Disaster Preparedness and Management: Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental AndCommunity Preparedness.

Unit 5: Risk Assessment: Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co- Operation in Risk Assessment and Warning, People's Participation in RiskAssessment. Strategies for Survival. Concept and Strategies of Disaster Mitigation, Emerging Trendsin Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

References:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal bookCompany
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, NewDelhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., NewDelhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SANSKRIT FOR TECHNICAL KNOWLEDGE

(AUDIT COURSE)

Course Code: GR20D5154 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects
4. Enhancing the memory power
5. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes*:*

1. Understanding basic Sanskrit alphabets and Understand tenses in Sanskrit Language.
2. Enable students to understand roots of Sanskrit language.
3. Students learn engineering fundamentals in Sanskrit.
4. Students can attempt writing sentences in Sanskrit.
5. Ancient Sanskrit literature about science & technology can be understood

Unit 1: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

Unit 2: Order, Introduction of roots, Technical information about Sanskrit Literature

Unit 3: Technical concepts of Engineering-Electrical,Mechanical, Architecture,Mathematics and Applications of OCR for Sanskrit and Indian Languages, Tool and Techniques, Survey

Unit 4: Interactive Sanskrit Teaching Learning Tools: Interactive Sanskrit Learning Tools, Introduction, WhyInteractive Tools for Sanskrit? E-learning, Basics of Multimedia, Web based tools development HTML, Web page etc., Tools and Techniques

Unit 5 : Standard for Indian Languages (Unicode) Unicode Typing in Devanagari Scripts, Typing Tools and Software, Text Processing and Preservation Tools, Text Processing, Preservation, Techniques, Text Processing and Preservation, Tools and Techniques, Survey

Reference Books

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, NewDelhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, RashtriyaSanskrit Sansthanam, New DelhiPublication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., NewDelhi.
4. Bharti A., R. Sangal, V. Chaitanya, "NL, Complexity Theory and Logic" in Foundations of Software Technology and Theoretical Computer Science, Springer,1990.
5. Tools developed by Computational Linguistics Group, Department of Sanskrit,University of Delhi, Delhi-110007 available at: http://sanskrit.du.ac.in
6. Basic concept and issues of multimedia:http://www.newagepublishers.com/samplechapter/001697.pdf
7. Content creation and E-learning in Indian languages: a model:

http://eprints.rclis.org/7189/1/vijayakumarjk_01.pdf

8. HTML Tutorial - W3Schools: www.w3schools.com/html
9. The Unicode Consortium: http://unicode.org/.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
VALUE EDUCATION
(AUDIT COURSE)

Course Code: GR20D5155 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. Understand value of education and self-development
2. Imbibe good values in students
3. Let the should know about the importance of character
4. To understand the significance of human conduct and self-development
5. To enable students to imbibe and internalize the value and Ethical behaviour in personal and professional lives.

Course Outcomes: Students will be able to

1. Knowledge of self-development
2. Learn the importance of Human Values
3. Developing the Professionalism Ethics, Risks, Responsibilities and Life Skills.
4. Student will be able to realize the significance of ethical human conduct and self-development
5. Students will be able to inculcate positive thinking, dignity of labour and religious tolerance.

Unit 1: Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

Unit 2: 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 3: Personality and Behaviour Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

Unit 4: Character and Competence –Holy books vs Blind faith. Self-management and Good health.Science ofreincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind,Self-control. Honesty, Studying effectively

Unit 5: 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.

Reference Books

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi
2. Jagdish Chand, "Value Education"
3. N. Venkataiah, " Value Education", APH Publishing, 1998 - Education

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDIAN CONSTITUTION
(AUDIT COURSE)

Course Code: GR20D5156 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals 'constitutional
3. Role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
4. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.
5. To understand the role and functioning of Election Commission of India.

Course Outcomes: Students will be able to

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of1956.
5. Discuss the significance of Election Commission of India.

Unit 1: History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

Unit 2: Philosophy of the Indian Constitution: Preamble Salient Features

Unit 3: Contours of Constitutional Rights &Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Unit 4: Organs of Governance and composition of judiciary: Parliament- Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, composition of judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit 5: Local Administration and Election Commission: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition,2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis,2015.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PEDAGOGY STUDIES

(AUDIT COURSE)

Course Code: GR20D5157 **L/T/P/C: 2/0/0/2**

Course Objectives:

1. Review existing evidence on the review topic to inform Programme design and policy making
2. Undertaken by the DFID, other agencies and researchers.
3. Identify critical evidence gaps to guide the development.
4. Establishing coordination among people in order to execute pedagogy methods.
5. To study pedagogy as a separate discipline.

Course Outcomes: Students will be able to understand

1. What pedagogical practices are being used by teachers in formal classrooms in developing countries?
2. What pedagogical practices are being used by teachers in informal classrooms in developing countries?
3. Synergy from the work force.
4. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
5. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Unit 1: Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

Unit 2: Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit 3: Evidence on the effectiveness of pedagogical practices, Methodology for the in-depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

Unit 4: Professional development: alignment with classroom practices and follow- up support, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes

Unit 5: Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3):361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London:DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3):272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston:Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read'campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRESS MANAGEMENT AND YOGA

(AUDIT COURSE)

Course Code: GR20D5158 **L/T/P/C: 2/0/0/2**

Course Objective:

1. To achieve overall health of body and mind.
2. To overcome stress.
3. To lower blood pressure and improve heart health.
4. Relaxation and Sleeping aid and to become non-violent and truthfulness.
5. To increase the levels of happiness and to eliminate all types of body pains.

Course Outcomes: Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also improve efficiently.
2. Develop body awareness. Learn how to use their bodies in a healthy way. Perform well in sports and academics.
3. Will balance, flexibility, and stamina, strengthen muscles and connective tissues enabling good posture.
4. Manage stress through breathing, awareness, meditation and healthy movement.
5. Build concentration, confidence and positive self-image

Unit 1: Definitions of Eight parts of yoga. (Ashtanga)

Ashtanga, the eight limbs of yoga, is Patanjali's classification of classical yoga, as set out in his Yoga Sutras. He defined the eight limbs as yama (abstinences), niyama (observances), asana (postures), pranayama (breathing), pratyahara (withdrawal), dharana (concentration), dhyana (meditation) and Samadhi (absorption).

Unit-2. **Orientation to Patanjala Yoga sutra**:

Introduction to Yoga sutra - Nature of Yoga science, Definition of yoga, the nature of seer in pure and modified state, Vrittis - Nature, classification, definition, method to control of chittavrittis. Samprajnata Samadhi and its classification, Iswarapranidhana - a means to attain Samadhi, definition and quality of Iswara. Astanga yoga-Vama, Niyama, Asana, Pranayama, Ratyahara-Bahiranga Yoga, Dharana, Dhyana, Samadhi-Antaranga Yoga, Powers Introduction.

Unit-3. **Orientation of Hath yoga pradipika** :

Hath yoga - Introduction, relationship of Hath yoga and Raja yoga, greatness of Hath yoga, Hath yogi parampara, importance of Hath and its secrecy, place of Hath yoga Practice, Destructives and constructive of yoga, Yama and Niyama, Asana, methods of Hath yoga Practice, Mitahara, Pathya and Apathya. Rules in food taking, Hath yoga achievements. Paranayama - Benefits of Pranayama, Nadishuddi and Pranayama. Duration and time for pranayama practice, Gradation of Pranayama, Sweat and Pranayama, Food during pranayama practice, Yukta and Ayukta pranayama, Nadishuddi, Satkriya-Neti, Dhouti, Basti, Nauli, Trataka, Kapalbhati, Gajakarani, Importance of Pranayama practice. Symtoms of Nadishuddhi, Manonnani, Varieties of Kumbhaka-Methods of practice, Classification of their benefits, Hathayogasiddhilakshanam. Kundalini as base for all yoga, Results of Kundalini prabyodha, Synonyms for Susumna, Mudras Bandhas-classification, benefits and methods of practice, Nadanusandhana.

Unit 4: Yam and Niyam. Do`s and Don'ts in life. Ahinsa, satya, astheya, bramhacharya & aparigraha Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit 5: Asan and Pranayam - Various yoga poses and their benefits for mind & body. Regularization of breathing techniques and its effects-Types of pranayam

Suggested reading

1. 'Yogic Asanas for Group Training - Part-I" : Janardan Swami YogabhyasiMandal,Nagpur
2. "Rajayoga or conquering the Internal Nature" by SwamiVivekananda, AdvaitaAshrama(Publication Department),Kolkata
3. Rajayoga - Swami Vivekananda - Ramakrishna Ashrama Publications.
4. HathayogaPradipika of Swatmarama - Kaivalyadhama, Lonavala
5. The Science of Yoga - Taimini - Theosophical Publishing House, Adyar, Madras.
6. Yogasutras of Patanjali - HariharanandaAranya, University of Calcutta Press, Calcutta.
7. Patanjal Yoga PradeepaOmananda Tirtha- Geeta Press, Gorakhpur.
8. Gherandasamhita - Bihar School of Yoga, Munger, Bihar.
9. Shivayogadipika - Sadashivabrahmendra, Ananda Ashramagranthavali, Choukhamba Press
10. Yoga Darshan : Swami Niranjanananda-Sri PanchadashanamParamahamsaAlakh Bara, Deoghar.
11. Four chapters on Freedom (commentary on the Yoga sutras of Patanjali), Swami Satyananda (1983), Bihar School of Yoga, Munger.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

(AUDIT COURSE)

Course Code: GR20D5159 **L/T/P/C: 2/0/0/2**

Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students
4. To differentiate three types of happiness (Sukham)
5. To describe the character traits of a spiritual devotee

Course Outcomes

1. Study of Shrimad- Bhagwad-Gita wiil help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neethishatakam will help in developing versatile personality of students
4. To develop self-developing attitude towards work without self-aggrandizement and to develop suffering free meditative mind
5. To develop tranquil attitude in all favorable and unfavorable situations and to develop high spiritual intelligence

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

II YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

(Professional Elective V)

Course Code: GR20D5022 **L/T/P/C: 3/0/0/3**
II Year I Semester

Prerequisite: Engineering Mechanics, Strength of Materials, Structural Analysis, Concrete Technology, Design of Reinforced Concrete Structures and Design of Steel.

Course Objectives:

1. To develop an advanced systems of prestressed concrete members.
2. To analyze and design the statically determinate prestressed concrete members.
3. To demonstrate the stresses with anchorage system in prestressed concrete members.
4. To analyze and design the statically indeterminate prestressed concrete members.
5. To analyze and design the composite sections.

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

1. Find out the losses in prestressed concrete and enhance its concepts, which include pre and post tensioning processes.
2. Analyze and Design the statically determinate prestressed concrete members.
3. Design the end blocks of prestressed concrete members.
4. Analyze and Design the statically indeterminate prestressed concrete members.
5. Design the composite structures using prestressed concrete techniques.

UNIT I

Introduction to Prestressed Concrete: Materials - High strength concrete and High tensile steel - Pre-tensioning and Post tensioning methods – Systems of Prestressing.

Losses in Prestress: Losses in Prestress - Analysis of PSC flexural members –Basic concepts-Ultimate strength in flexure –Codal provisions.

UNIT II

Statically Determinate PSC Beams: Design of flexural members for ultimate and serviceability limit states – Analysis and design for Shear and Torsion - Codal provisions.

UNIT III

Design of End Bocks: Transmission of prestress in Pre-tensioned members – Anchorage zone stresses for Post-tensioned members.

UNIT IV

Statically Indeterminate Structures: Analysis and design of continuous beams and frames – Choice of cable profile – Linear transformation and concordancy - Analysis and design of prestressed concrete Pipes and Columns with moments.

UNIT V

Composite Construction: Analysis and design of composite construction with precast PSC beams and cast in situ RC slabs **–** Creep and Shrinkage effects – Partial prestressing principles, analysis and design concepts – Crack width calculations.

TEXT BOOKS:

1. Prestressed Concrete by Krishna Raju; - Tata Mc.Graw Hill Publications.
2. Prestressed Concrete by N.Rajasekharan; - Narosa publications.

REFERENCE BOOKS:

1. Prestressed Concrete by Ramamrutham; Dhanpatrai Publications.
2. Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H. Burns, John Wiley & Sons.
3. Codes: IS 1343 - BIS code of practice for Prestressed concrete.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ANALYSIS OF LAMINATED COMPOSITE PLATES

(Professional Elective V)

Course Code: GR20D5023 **L/T/P/C: 3/0/0/3**
II Year I Semester

Prerequisites: Advanced Solid Mechanics, Fundamentals of FEM

Course Objectives:

1. To analyse the rectangular composite plates using the analytical methods.
2. To understand the governing equations for different boundary conditions.
3. To know the Analytical Solutions for Bending of Rectangular Laminated Plates Using FSDT.
4. To analyse the composite plates using advanced finite element method.
5. To analysis of Rectangular Composite Plates using Analytical Methods.

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

1. Analyse the Displacement Field Approximations for CLPT and FSDT.
2. Analyse the Solutions for Bending of Rectangular Laminated Plates using CLPT.
3. Analyse the Naiver Solutions of Cross-Ply and Angle-Ply Laminated Simply- Supported Plates.
4. Understand the Finite Element Solutions for Bending of Rectangular Laminated Plates using CLPT and FSDT.
5. Develop the computer programs for the analysis of composite plates.

UNIT I

Introduction: Displacement Field Approximations for Classical Laminated Plate Theory (CLPT)and First Order Shear Deformation Theory (FSDT), Analytical Solutions for Bending of Rectangular Laminated Plates using CLPT.

UNIT II

Governing Equations: Naiver Solutions of Cross-Ply and Angle-Ply Laminated Simply-Supported Plates, Determination of Stresses. Levy Solutions for Plates with Other Boundary Conditions, Analytical Solutions for Bending of Rectangular Laminated Plates using FSDT.

UNIT III

Introduction to Finite Element Method: Rectangular Elements, Formation of Stiffness Matrix, Formation of Load Vector, Numerical Integration, Post Computation of Stresses.Finite Element Solutions for Bending of Rectangular Laminated Plates using CLPT.

UNIT IV

Finite Element Solutions for Rectangular Laminated Plates: Finite Element Solutions for Bending of Rectangular Laminated Plates using FSDT. Finite Element Model, C0Element Formulation, Post Computation of Stresses.

UNIT V

Analysis of Rectangular Composite Plates: Analysis of Rectangular Composite Plates using Analytical Methods.

TEXT BOOKS :

1. Mechanics of Laminated Composites Plates and Shells, Reddy J. N., CRC Press.
2. Theory and analysis of elastic plates and shells. J.N Reddy, CRC Press

REFERENCE BOOKS :

1. Laminated Composites Plates and Shells, Jianqiao, Ye, Springer, London

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ANALYSIS AND DESIGN OF SHELLS AND FOLDED PLATES

(Professional Elective-V)

Course Code: GR20D5024 **L/T/P/C: 3/0/0/3**
II Year I Semester

Prerequisites: Solid Mechanics, Theory of Structural stability

Course objectives:

1. Understand different types of shells.
2. Know different theories for analysis of shells.
3. Know procedure to analyze the doubly curved shell structure.
4. Know design procedure for axi-symmetric shells.
5. Know importance of folded plates and their analysis.

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

1. Classify and analyze the shell structure.
2. Understand the different theories for analysis of shells.
3. Analyze and Design shell structures of doubly curved.
4. Analyze and Design axi-symmetric shells.
5. Understand the structural importance of folded plates.

UNIT I

Shells – functional behaviour – examples – structural behaviour of shells, classification of shells Definitions – various methods of analysis of shells – merits and demerits of each method – 2D - Membrane equation. Equations of equilibrium: Derivation of stress resultants – cylindrical shells Flugges simulations equations.

UNIT II

Derivation of the governing differential DKJ equation for bending theory. Schorer's theory, Application to the analysis and design of short and long shells. Beam theory of cylindrical shells: Beam and arch action, Analysis using beam theory.

UNIT III

Introduction to the shells of Double curvatures: Geometry, analysis and design of elliptic paraboloid, conoid and hyperbolic paraboloid shapes and inverted umbrella type.

UNIT IV

Axi- Symmetrical shells: General equation - Analysis and axi-symmetrical by membrane theory. Application to spherical shells and hyperboloid of revolution, cooling towers.

UNIT V

Folded plates – Introduction – Types of folded plates – structural behaviour of folded plates – advantages – Assumptions Whitney method of analysis – Edge shear equation - Analysis of folded plates of Whitney's method. Simpsons method of Analysis of folded plates – moment and stress distribution – no rotation and rotation solutions – continuous folded plates – pre stressed continuous folded plates.

TEXT BOOKS :

1. G.S.Ramaswami, Analysis and design of concrete shell roofs, 3rd Edition, 1994. 2. Chaterjee, Design of concrete shell roofs, 3rd Edition, 1990.

REFERENCE BOOKS :

1. Billington, Design of concrete shell roofs, 3rd Edition, 1990.
2. N.K.Bairagi, Shell Analysis.
3. Dr.N.Krishna Raju, Advanced R.C Design

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COST MANAGEMENT OF ENGINEERING PROJECTS

(Open Elective I)

Course Code: GR20D5146 **L/T/P/C: 3/0/0/3**

II Year I Semester

Prerequisites: Estimation & Costing, Construction Technology and Project management.

Course Objectives:

1. To attain knowledge in Cost Management process and Costing System.
2. Ability to understand the basic concepts of Project planning, execution, and cost control
3. Discuss about Various types of costs and its behaviour along with Quality Management
4. Identify various types of Budgets involved in Cost Management process
5. Broaden the career potential of available techniques and problems available in Cost Management.

Course Outcomes:

1. Discuss various construction costs to manage a construction project.
2. Summarize different construction activities and its application related to cost based on the field requirements.
3. Identify Cost Behaviour of various types of cost and Quality Management
4. Identifying various construction Budgets involved Cost Management process.
5. Discussing various types of Techniques and Problem-solving techniques involved in Construction

UNIT I

Introduction and Overview of the Strategic Cost Management Process, Cost concepts in decision-making; relevant cost, Differential cost, Incremental cost, Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

UNIT II

Project: Meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non- technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

UNIT III

Cost Behaviour and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision- making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value- Chain Analysis.

UNIT IV

Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT V

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

REFERENCE BOOKS

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi.
2. Charles T. Horngren and George Foster, Advanced Management Accounting.
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting.
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher.
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co.Ltd

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDUSTRIAL SAFETY

(Open Elective I)

Course Code: GR20D5147 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objectives

1. To understand the importance of maintaining a safe workplace.
2. To maintain safety standards in compliance with regulatory requirements and within engineering limits understand personal safety and industrial safety.
3. To create a job safety analysis (JSA) for a given work project.
4. To follow safety recordkeeping and management, and the role of the safety manager.
5. To utilize personal proactive equipment.

Course Outcomes

1. Understanding of Safety principles.
2. Analyze different types of exposure and biological effects, exposure guidelines and basic workplace monitoring Ability to do Hazard analysis.
3. Demonstrate an understanding of workplace injury prevention, risk management, and incident investigations.
4. Understand the acute and chronic health effects of exposures to chemical, physical and biological agents in the workplace.
5. Demonstrate knowledge of the types of hazards, planning, organization and training needed to work safely with hazardous materials.

Unit I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravitylubrication,v.Wickfeedlubricationvi.Sidefeedlubrication,vii.Ringlubrication,
Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors,
iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

Reference Books

1. Maintenance Engineering Handbook, Higgins & Morrow, Da InformationServices.
2. Maintenance Engineering, H. P. Garg, S. Chand andCompany.
3. Pump-hydraulic Compressors, Audels, Mcgrew HillPublication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & HallLondon.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATIONS RESEARCH

(Open Elective I)

Course Code: GR20D5148 **L/T/P/C:3/0/0/3**

II Year I Semester

Course Objectives

1. To define and formulate linear and Non-linear programming problems and appreciate their limitations arising from a wide range of applications.
2. To perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change.
3. To distinguish various inventory models and develop proper inventory policies.
4. To solve the scheduling and sequencing models.
5. To understand how to model and solve problems using dynamic programming, Game Theory.

Course Outcomes

1. The student will formulate and solve problems as networks and graphs for optimal allocation of limited resources such as machine, material and money.
2. The student will able to carry out sensitivity analysis.
3. The student will solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
4. The student will able to distinguish various inventory models and develop proper inventory policies.
5. The student will also propose the best strategy using decision making methods under uncertainty and game theory.

Unit I

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex techniques, Sensitivity Analysis, Inventory Control Models

Unit II

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Unit III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem -CPM/PERT

Unit IV

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit V

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

Reference Books

1. H.A. Taha, Operations Research, An Introduction, PHI,2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi,1982.
3. J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi,2008
4. Hitler Libermann Operations Research: McGraw Hill Pub.2009
5. Panner selvam, Operations Research: Prentice Hall of India2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India2010

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ARTIFICIAL NEURAL NETWORKS AND FUZZY SYSTEMS

(Open Elective I)

Course Code: GR20D5149 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objective

1. To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems.
2. To know about feedback networks.
3. To learn about the concept of fuzziness involved in various systems
4. To understand the concept of adequate knowledge about fuzzy set theory.
5. To learn about comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm

Course Outcomes

1. To Expose the students to the concepts of feed forward neural networks
2. To provide adequate knowledge about feedback networks.
3. To teach about the concept of fuzziness involved in various systems.
4. To provide adequate knowledge about fuzzy set theory.
5. To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.

Unit I: INTRODUCTION TO NEURAL NETWORKS

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

Unit II: ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural

Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

FEED FORWARD NEURAL NETWORKS

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications

Unit III: MULTILAYER FEED FORWARD NEURAL NETWORKS

Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

ASSOCIATIVE MEMORIES

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem
Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

Unit IV: SELF-ORGANIZING MAPS (SOM) AND ADAPTIVE RESONANCE THEORY (ART)

Introduction, Competitive Learning, Vector Quantization, Self-Organized Learning Networks, Kohonen Networks, Training Algorithms, Linear Vector Quantization, Stability-Plasticity Dilemma, Feed forward competition, Feedback Competition, Instar, Outstar, ART1, ART2, Applications. **Classical& Fuzzy Sets** Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

Unit V: FUZZY LOGIC SYSTEM COMPONENTS

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods. **Applications**
Neural network applications: Process identification, Function Approximation, control and Process Monitoring, fault diagnosis and load forecasting. **Fuzzy logic applications:** Fuzzy logic control and Fuzzy classification.

Text Books

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.

Reference Books

1. Neural and Fuzzy Systems: Foundation, Architectures and Applications, - N. Yadaiah and S. Bapi Raju, Pearson Education
2. Neural Networks – James A Freeman and Davis Skapura, Pearson, 2002.
3. Neural Networks – Simon Hykins , Pearson Education
4. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
5. Neural Networks and Fuzzy Logic System by Bork Kosko, PHI Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CYBER SECURITY

(Open Elective I)

Course Code: GR20D5150 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives:

1. To understand Cyber security challenges and their threats.
2. To understand Cyber attacks and their vulnerabilities.
3. To understand ethical hacking concepts and social engineering targets.
4. To understand cyber forensic investigation process
5. To recognize cyber laws and ethics

Course Outcomes: after completing this course student able to

1. Understand importance and challenges of Cyber security
2. Investigate cybercrime and collect evidences
3. Identify security risks and take preventive steps
4. Able to use knowledge of forensic tools and software
5. Knowledge about Indian IT act and International law

UNIT I:

Introduction to Cyber Security: Introduction to Cyber Security, Importance and challenges in Cyber Security, Cyberspace, Cyber threats, Cyber warfare, CIA Triad, Cyber Terrorism, Cyber Security of Critical Infrastructure, Cyber security - Organizational Implications.

UNIT II:

Hackers and Cyber Crimes: Types of Hackers, Hackers and Crackers, Cyber-Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses, Backdoors.

UNIT III:

Ethical Hacking and Social Engineering: Ethical Hacking Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modelling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration Testing, Types of Social Engineering, Insider Attack, Preventing Insider Threats, Social Engineering Targets and Defence Strategies.

UNIT IV:

Cyber Forensics and Auditing: Introduction to Cyber Forensics, Computer Equipment and associated storage media, Role of forensics Investigator, Forensics Investigation Process, and Collecting Network based Evidence, Writing Computer Forensics Reports, Auditing, Plan an audit against a set of audit criteria, Information Security Management System Management. Introduction to ISO 27001:2013

UNIT V:

Cyber Ethics and Laws: Introduction to Cyber Laws, E-Commerce and E-Governance, Certifying Authority and Controller, Offences under IT Act, Computer Offences and its penalty under IT Act 2000, Intellectual Property Rights in Cyberspace.

TEXT BOOKS:

1. Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., Enterprise Cybersecurity -How to Build a Successful Cyberdefense Program Against Advanced Threats, A-press .
2. Nina Godbole, SumitBelapure, Cyber Security, Willey
3. Hacking the Hacker, Roger Grimes, Wiley
4. Cyber Law By Bare Act, Govt Of india, It Act 2000.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTERNET OF THINGS ARCHITECTURE AND DESIGN PRINCIPLES

(Open Elective I)

Course Code: GR20D5151 **L/T/P/C: 3/0/0/3**

II Year I Semester

Course Objectives:

1. To assess the vision and introduction of IoT.
2. To Understand Networking & Communication aspects of IOT.
3. To Explore the Application areas of IOT and to analyze the current needs
4. To Understand State of the Art - IoT Architecture.
5. To classify Real World IoT Design Constraints, Industrial Automation in IoT.

Course Outcomes: On successful completion of the course, the student will:

1. Understand the concepts of Internet of Things
2. Analyze basic protocols in wireless sensor network
3. Design IoT applications in different domain and be able to analyze their performance
4. Understand the Hardware concepts of Internet of Things
5. Implement basic IoT applications through python.

UNIT-1

Introduction to IoT :

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network.

UNIT-II

Network & Communication aspects

Connectivity terminologies-IOT Node, LAN,WAN, Gateway, IOT Stack vs. Web Stack, IOT Identification and Data Protocols-IPV4,IPV6,HTTP,MQTT,COAP

UNIT-III

IOT Applications

Smart Homes-Smart Home Origin, Technologies, Implementation, Smart Grids-Characteristics, Benefits,

Architecture, Components, Smart Cities-Characteristics, Frameworks, Challenges,

Industrial IOT- Requirements, Design Considerations, Applications

UNIT-IV

Hardware Platforms

Programming with Arduino-Features of Arduino, Components of Arduino Board, Arduino IDE, Program Elements, Raspberry

UNIT-V

Developing IoTs

Introduction to Python, Introduction to different IoT tools, developing applications through IoT tools, developing sensor based application through embedded system platform, Implementing IoT concepts with python.

Text Books:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Internet of Things, Jeeva Jose, Khanna Publishing, 2018
3. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".

Reference Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1 st Edition, Academic Press, 2014. (ISBN-13: 978-0124076846).
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",1st st Edition, Apress Publications, 2013. (ISBN-13: 978- 1430257.
3. Internet of Things Challenges, Advances and Applications by Quas F.Hassan, Atta Ur Rehaman Khan, and Sajiad A. Madani