ACADEMIC REGULATIONS PROGRAMME STRUCTURE AND DETAILED SYLLABUS

GR22

Master of Technology Structural Engineering

(Effective for the students admitted from the Academic Year 2022-23)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

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INSTITUTE OF ENGINEERING AND TECHNOLOGY

Bachupally, Kukatpally, Hyderabad-500090,Telangana

Tel: +91 7207344440

URL: www.griet.ac.in, E-Mail: info@griet.ac.in

ACADEMIC REGULATIONS
PROGRAMME STRUCTURE
&
DETAILED SYLLABUS

Master of Technology
Structural Engineering

(Two Year Regular Programme)
(Applicable for Batches Admitted from 2022-23)

GOKARAJU RANGARAJU

INSTITUTE OF ENGINEERING AND TECHNOLOGY

Bachupally, Kukatpally, Hyderabad, Telangana, India- 500090

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HYDERABAD

Academic Regulations for M.Tech. (Regular) under GR22

(Applicable for Batches Admitted from 2022-23)

Post Graduate Degree Programme in Engineering and Technology (PG)

Gokaraju Rangaraju Institute of Engineering & Technology (GRIET) offers a 2-year (4 Semesters) Master of Technology (M.Tech.) degree programme. The following programmes are offered in GRIET.

S.No	Department	Programme Code	Programme
1	Civil Engineering	20	M.Tech. Structural Engineering
2	Electrical and Electronics Engineering	43	M.Tech. Power Electronics
3	Mechanical Engineering	52	M.Tech. Design for Manufacturing
4	Electronics and Communication Engineering	57	M.Tech. VLSI
5	Computer Science and Engineering	58	M.Tech. Computer Science and Engineering
6	Information Technology	B0	M.Tech. Data Science

GR22 Regulations shall govern the above programmes offered by the Departments with effect from the students admitted to the programmes in 2022-23 academic year is given below

1. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.
2. **Admission:** 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 GATE, 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.
3. **Programme Pattern:**
   a) Each Academic year of study is divided into two semesters.
   b) Minimum number of instruction days in each semester is 90.
   c) The total credits for the Programme are 68.

d) 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).

e) A student has a choice of registering for credits from the courses offered in the programme.

f) All the registered credits will be considered for the calculation of final CGPA.

g) Each Semester shall have 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) are taken as 'references' for the present set of Regulations. The terms 'SUBJECT' and 'COURSE' imply the same meaning here and refer to 'Theory Subject', or 'Lab Course', or 'Design/Drawing Subject', or 'Mini Project with Seminar', or 'Dissertation', as the case may be.

h) Course Classification: All courses offered for all undergraduate programmes in M.Tech. degree programmes are broadly classified as follows.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	PC	Professional Core	Includes Core Courses related to the parent discipline/department/ branch of Engineering
2	PE	Professional Elective	Includes Elective Courses related to the parent discipline/ department/ branch of Engineering
3	OE	Open Elective	Elective Courses from other technical and/or emerging subjects
4	Audit	Audit Courses	Mandatory non creditable courses
5	PW	Project Work/Dissertation	Mini Project work, Dissertation Phase-I, II.

4. Award of M.Tech. Degree: A student will be declared eligible for the award of the M.Tech. Degree if 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. programme.

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 fulfilled all the requirements for the award of the degree.

5. 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 examination 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.

e) A student shall put in a minimum required attendance in at least three theory subjects (excluding audit (non-credit course) in first Year I semester for promotion to first Year II Semester.

f) A student shall put in a minimum required attendance in at least three theory subjects (excluding audit (non-credit course) in first Year II semester for promotion to second Year I Semester.

6. 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.

S. No	Components	Internal Evaluation	External Evaluation	Total
1	Theory	40	60	100
2	Practical	40	60	100
3	Mini Project	100	--	100
4	Dissertation	50	50	100

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

Assessment Procedure

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Theory	40	Internal Examination & Continuous Evaluation	1) Two mid semester examination shall be conducted for 30 marks each for a duration of 120 minutes. Average of the two mid exams shall be considered **i) Subjective – 20 marks** **ii) Objective – 10 marks** 2) Continuous Evaluation is by conducting Assignments and Quiz exams at the end of each unit **i) Assignment – 5 marks** **ii) Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 5 marks**
		60	Semester end examination	The semester-end examination is for a duration of 3 hours
2	Practical	40	Internal Examination & Continuous Evaluation	One internal lab examination towards the end of course for a duration of 90 minutes with a viva of 5 minutes. **i) Internal Exam-10 marks** **ii) Viva voce – 10 marks** **iii) Continuous Assessment- 10 marks** **iv) G-Lab on Board(G-LOB) (Case study inter threading of all experiments of lab)/ Laboratory Project/Prototype Presentation/App Development - 10 marks**
		60	Semester end examination	The semester-end examination is for a duration of 3 hours. **i) write-up (algorithm/flowchart/procedure) as per the task/experiment/program - 10 marks** **ii) task/experiment/program-15 marks** **iii) evaluation of results -15 marks** **iv) write-up (algorithm/flowchart/procedure) for another task/experiment/program- 10 marks** **v) viva-voce on concerned laboratory course - 10 marks**

d) Project Review Committee: 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.

e) Mini Project: The Mini Project is to be taken up with relevance to Industry and is evaluated for 100 marks. Student shall carryout the mini project in consultation with the mini project supervisor. The Project Review Committee (PRC) along with supervisor will review the progress of the mini project during the internal evaluation for 50 marks. Mini Project Viva Voce will be evaluated by the PRC for another 50 marks before the semester end examinations. The student must secure a minimum of 50% of marks in i) internal evaluation and ii) mini project viva voce, to be declared successful. If he fails to obtain the minimum marks, he/she must reappear for the same as and when scheduled.

Internal Evaluation: Tentative presentation dates and marks distribution of the mini project.

S.No	Date	Review	Marks
Internal Marks (50)			
1	First week of the semester	Abstract submission*	10
2	Fourth week of the semester	First Review	10
2	Mid of the semester	Second Review	10
3	Last week of the semester	Last Review	20

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: (50 Marks) The mini project report is presented before PRC along with the supervisor.

Guidelines to award 50 marks:

S. No	Date	Review/ PRC report	Marks
External Evaluation Marks (50)			
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	10
3	Project Deliverables • Hardware prototype • Simulation in any authorized software • Submission of research articles in any Scopus Indexed conference /Journal	Verified by PRC	20
4	Results and Discussion	Verified by PRC	10

f) Dissertation (Phase I & Phase II): Every candidate shall be required to submit a dissertation on a topic approved by the Project Review Committee (PRC).

- The candidate must present in **Dissertation Work Review - I**, in consultation with his/her Dissertation Supervisor, the title, objective and plan of action of his/her Dissertation work to the PRC for approval ***within four weeks*** from the commencement of **Second year First Semester**. Only after obtaining the approval of the PRC can the student initiate the Dissertation work.
- If a candidate wishes to change his/her supervisor or topic of the Dissertation, he/she can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his/her initial plans of Dissertation proposal. If yes, his/her date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.
- The candidate shall submit his/her Dissertation progress report in two stages at least with a gap of **three** months between them.
- The work on the Dissertation shall be initiated at the beginning of the II year and the duration of the Dissertation is two semesters. A candidate is permitted to submit Dissertation Thesis only after successful completion of all theory and practical courses with the approval of PRC ***not earlier than 40 weeks*** from the date of approval of the Dissertation work. For the approval of PRC, the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.
- **The Dissertation Work Review - II** in II Year I Semester carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and DRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Dissertation Work. A candidate must secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - II. If he/she fails to obtain the minimum required marks, he has to reappear for Dissertation Work Review - II as and when conducted.

- **The Dissertation Work Review - III** in II Year II Sem. carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The PRC will examine the overall progress of the Dissertation Work and decide whether the Dissertation is eligible for final submission. A candidate must secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - III. If he/she fails to obtain the required minimum marks, he/she must reappear for Dissertation Work Review - III as and when conducted. For Dissertation Evaluation (Viva Voce) in II Year II Semester there are external marks of 100 and it is evaluated by the external examiner. The candidate must secure a minimum of 50% marks in Dissertation Evaluation (Viva- Voce) examination.
- Dissertation Work Reviews - II and III shall be conducted in Phase I (Regular) and Phase II (Supplementary). Phase II will be conducted only for unsuccessful students in Phase I. The unsuccessful students in Dissertation Work Review - II (Phase II) shall reappear for it at the time of Dissertation Work Review - III (Phase I). These students shall reappear for Dissertation Work Review- III in the next academic year at the time of Dissertation Work Review - II only after completion of Dissertation Work Review - II, and then Dissertation Work Review - III follows. The unsuccessful students in Dissertation Work Review - III (Phase II) shall reappear for Dissertation Work Review – III in the next academic year only at the time of Dissertation Work Review - II (Phase I).
- A student shall present the progress of the dissertation through Dissertation Reviews II and III with at least a gap of three months between the reviews.
- After approval from the DRC, a soft copy of the thesis should be submitted for ANTI-PLAGIARISM Check from the approved agency with a similarity index not more than 24% and the plagiarism report and be included in the final thesis. If the similarity index has more than the required percentage, the student is advised to modify accordingly and resubmit the soft copy of the thesis after one month. The maximum number of re-submissions of thesis after plagiarism check is limited to ***TWO***. The candidate must register for the Dissertation work and work for two semesters. After three attempts, the admission is liable to be cancelled.
- Three copies of the Dissertation Thesis certified by the supervisor shall be submitted to the Institute, after submission of a research paper related to the Dissertation work in a SCOPUS/Web of Science/UGC approved journal. A copy of the submitted research paper shall be attached to thesis.
- The thesis shall be adjudicated by an external examiner selected by the University. For this, the Principal of the Institute shall submit a panel of **three** examiners from among the list of experts in the relevant specialization as submitted by the supervisor concerned and Head of the Department.
- If the report of the external examiner is unsatisfactory, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unsatisfactory again, the thesis shall be summarily rejected. Subsequent actions for such dissertations may be considered, only on the specific recommendations of the external examiner and /or Dissertation Review Committee. No further correspondence in this matter will be entertained if there is no specific recommendation for resubmission.
- If the report of the examiner is satisfactory, the Head of the Department shall coordinate and decide for the conduct of Dissertation Viva-Voce examination. The Dissertation Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis. The candidate must secure a minimum of 50% of marks in Dissertation Evaluation (Viva-Voce) examination.
- If he/she fails to fulfill the requirements of minimum 50% of marks, he/she will reappear for the Dissertation Viva-Voce examination ***only after three months***. In the reappeared examination also, if he/she fails to fulfill the requirements, he/she will not be eligible for the

award of the degree, unless he/she is asked to revise and resubmit his/her Dissertation Work by the board within a specified time period (within ***four*** years from the date of commencement of his/her first year first semester).

7. **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.
8. **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.
9. **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.
10. **Malpractices in Examinations:** Disciplinary action shall be taken in case of malpractice during Mid/ End-examinations as per the rules framed by the Academic Council.
11. **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 (i.e.,16 marks out of 40 marks) in CIE, 40% of marks (i.e.,24 marks out of 60 marks) in SEE and a minimum aggregate of 50%(i.e.,50 marks out of 100 marks) of the total marks in the Semester-end examination (SEE) and Internal Evaluation (CIE) taken together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 40% (16 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 40% of CIE marks (16 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

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 Dean Admissions of 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-B. 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) $\mathbf{S_k}$ 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.,

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

Where $\mathbf{C_i}$ is the number of credits of the i^{th} course and $\mathbf{G_i}$ 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 $\mathbf{S_k}$, where $k \geq 2$.

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

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

12. **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:

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA ≥ 7.75
2	First Class	CGPA ≥ 6.75 and CGPA < 7.75
3	Second Class	CGPA ≥ 6.00 and CGPA < 6.75

Equivalence of grade to marks

Marks % = (CGPA -0.75)*100

13. **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.

14. **Re-Admission/Re-Registration (Re-Admission for Discontinued Student)**

- A student, who has discontinued the M. Tech. degree programme due to any reason whatsoever, may be considered for 'readmission' into the same degree programme (with the same specialization) with the academic regulations of the batch into which he gets readmitted, with prior permission from the authorities concerned.
- If a student is detained in a subject (s) due to shortage of attendance in any semester, he/she may be

  permitted to re-register for the same subject(s) in the same category (core or elective group) or equivalent subject, if the same subject is not available, as suggested by the Board of Studies of that department, as and when offered in the subsequent semester(s), with the academic regulations of the batch into which he/she seeks re-registration, with prior permission from the authorities concerned

- A candidate shall be given only one-time chance to re-register and attend the classes for a maximum of two subjects in a semester, if the internal marks secured by a candidate are less than 40% and failed in those subjects but fulfilled the attendance requirement. A candidate must re-register for failed subjects within four weeks of commencement of the class work, in the next academic year and secure the required minimum attendance. In the event of the student taking this chance, his Continuous Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stand cancelled.

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.

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M. Tech (STE) - GR22 Course Structure

I M. Tech (STE) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	CE	PC	GR22D5001	Matrix methods in structural analysis	3	0	0	3	3	0	0	3	40	60	100
2	CE	PC	GR22D5002	Advanced Solid Mechanics	3	0	0	3	3	0	0	3	40	60	100
3	CE	PE I		Professional Elective-I	3	0	0	3	3	0	0	3	40	60	100
4	CE	PE II		Professional Elective-II	3	0	0	3	3	0	0	3	40	60	100
5	CE	PC	GR22D5009	Structural Design Lab	0	0	2	2	0	0	4	4	40	60	100
6	CE	PC	GR22D5010	Advanced Concrete Technology Lab	0	0	2	2	0	0	4	4	40	60	100
7	ENG	PC	GR22D5011	Research Methodology and IPR	2	0	0	2	2	0	0	2	40	60	100
TOTAL					**14**	**0**	**4**	**18**	**14**	**0**	**8**	**22**	**280**	**420**	**700**
8		AC		Audit Course I	0	0	0	0	2	0	0	2	40	60	100

PROFESSIONAL ELECTIVE – I				
S. No.	BOS	Group	Course Code	Course
1	CE	PE	GR22D5003	Theory and Application of Cement Composites
2	CE	PE	GR22D5004	Advanced Concrete Technology
3	CE	PE	GR22D5005	Theory of Structural Stability

PROFESSIONAL ELECTIVE – II				
S. No.	BOS	Group	Course Code	Course
1	CE	PE	GR22D5006	Analytical and Numerical Methods for Structural Engineering
2	CE	PE	GR22D5007	Structural Health Monitoring
3	CE	PE	GR22D5008	Structural Optimization

I M. Tech (STE) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	CE	PC	GR22D5012	FEM in Structural engineering	3	0	0	3	3	0	0	3	40	60	100
2	CE	PC	GR22D5013	Structural Dynamics	3	0	0	3	3	0	0	3	40	60	100
3	CE	PE III		Professional Elective-III	3	0	0	3	3	0	0	3	40	60	100
4	CE	PE IV		Professional Elective-IV	3	0	0	3	3	0	0	3	40	60	100
5	CE	PC	GR22D5020	Advanced Structural Engineering Lab	0	0	2	2	0	0	4	4	40	60	100
6	CE	PC	GR22D5021	Numerical Analysis Lab	0	0	2	2	0	0	4	4	40	60	100
7	CE	PW	GR22D5144	Mini Project	0	0	2	2	0	0	4	4	50	50	100
TOTAL					**12**	**0**	**6**	**18**	**12**	**0**	**12**	**24**	**280**	**420**	**700**
8		AC		Audit Course II	0	0	0	0	2	0	0	2	40	60	100

PROFESSIONAL ELECTIVE – III				
S. No.	BOS	Group	Course Code	Course
1	CE	PE	GR22D5014	Advanced Steel Design
2	CE	PE	GR22D5015	Design of Formwork
3	CE	PE	GR22D5016	Principles of Bridge Engineering

PROFESSIONAL ELECTIVE – IV				
S. No.	BOS	Group	Course Code	Course
1	CE	PE	GR22D5017	Design of Advanced ConcreteStructures
2	CE	PE	GR22D5018	Advanced Design of Foundations
3	CE	PE	GR22D5019	Earthquake Resistant Design of Buildings

II M. Tech (STE) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1		PE V		Professional Elective-V	3	0	0	3	3	0	0	3	40	60	100
2		OE		Open Elective	3	0	0	3	3	0	0	3	40	60	100
3	CE	PW	GR22D5145	Dissertation Phase – I	0	0	10	10	0	0	20	20	100		100
TOTAL					**6**	**0**	**10**	**16**	**6**	**0**	**20**	**26**	**180**	**120**	**300**

PROFESSIONAL ELECTIVE – V				
S. No.	BOS	Group	Course Code	Course
1	CE	PE	GR22D5022	Design of Prestressed ConcreteStructures
2	CE	PE	GR22D5023	Analysis of Laminated Composite Plates
3	CE	PE	GR22D5024	Theory of Thin Plates and Shells

OPEN ELECTIVE				
S. No.	BOS	Group	Course Code	Course
1	CE	OE	GR22D5147	Cost Management of Engineering Projects
2	EEE	OE	GR22D5148	Industrial Safety
3	ME	OE	GR22D5149	Operations Research
4	ECE	OE	GR22D5150	Artificial Neural Networks and Fuzzy Systems
5	CSE	OE	GR22D5151	Cyber Security
6	IT	OE	GR22D5152	Internet of Things Architecture andDesign Principles

II M. Tech (STE) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	CE	PW	GR22D5146	Dissertation Phase – II	0	0	16	16	0	0	32	32	100	100	200
TOTAL					**0**	**0**	**16**	**16**	**0**	**0**	**32**	**32**	**100**	**100**	**200**

Audit Courses I & II

1	GR22D5153	English for Research Paper Writing
2	GR22D5154	Disaster Management
3	GR22D5155	Sanskrit for Technical Knowledge
4	GR22D5156	Value Education
5	GR22D5157	Indian Constitution
6	GR22D5158	Pedagogy Studies
7	GR22D5159	Stress Management by Yoga
8	GR22D5160	Personality Development through Life Enlightenment Skills

I YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MATRIX METHODS IN STRUCTURAL ANALYSIS

Course Code: GR22D5001 **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:

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 metho

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 2018.
2. Ashok.K.Jain, Advanced Structural Analysis, Nem Chand & Bros, Third Edition,2015.
3. C.S.Reddy, Basic Structural Analysis, Third edition, 2018.

Reference Books:

1. Kanchi, Matrix Structural Analysis, 1995.
2. J.Meek, Matrix Methods of Structural Analysis, 3rd edition, 1980.
3. Ghali and Neyveli, Structural Analysis-A unified Classical and Matrix approach,7th edition,2018.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ADVANCED SOLID MECHANICS

Course Code: GR22D5002 **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:

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 andtubes.
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.

Text Books:

1. Theory of Elasticity, S.P. Timoshenko and J.N. Goodier, Tata McGraw Hill, 3rd edition, 2017.
2. Advanced Mechanics of Solids, Srinath L.S., Tata McGraw Hill, 2nd edition, 2010.
3. Theory of Elasticity and Plasticity, H. Jane Helena, PHI Learning, 2017

Reference Books:

1. Theory of Elasticity, Sadhu Singh, Khanna Publishers, 2007.
2. Computational Elasticity, Ameen M., Narosa, 2005.
3. Solid Mechanics, Kazimi S. M. A., Tata McGraw Hill,2nd edition,2017.
4. Elasticity, Sadd M.H., Elsevier,3rd edition, 2014.
5. Engineering Solid Mechanics, Ragab A.R., Bayoumi S.E., CRC Press,first edition,1998.
6. Theory of Plasticity, J. Chakrabarty, Butterworth-Heinemann publications,3rd edition, 2006.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

THEORY AND APPLICATION OF CEMENT COMPOSITES

(Professional Elective I)

Course Code: GR22D5003 **L/T/P/C: 3/0/0/3**

I Year I Semester

Prerequisites: Concrete Technology

Course Objectives:

1. Characterization of composite materials
2. Analyse the mechanical behaviour of cement composites
3. Study on various types cement composites
4. Analyse the mechanical properties of cement composites
5. Study on the applications of Cement Composites

Course Outcomes:

1. Formulate constitutive behaviour of composite materials – Ferrocement, SIFCON and Fibre Reinforced Concrete - by understanding their strain- stress behaviour.
2. Classify the materials as per orthotropic and anisotropic behaviour.
3. Estimate strain constants using theories applicable to composite materials.
4. Analyse and design structural elements made of cement composites.
5. Apply the cement composites in various structures

UNIT I

Introduction: Classification and Characteristics of Composite Materials- Basic Terminology, Advantages. Stress-Strain Relations- Orthotropic and Anisotropic Materials, Engineering Constants for Orthotropic Materials, Restrictions on Elastic Constants, Plane Stress Problem, Biaxial Strength, Theories for an Orthotropic Lamina.

UNIT II

Mechanical Behaviour: Mechanics of Materials Approach to Stiffness- Determination of Relations between Elastic Constants, Elasticity Approach to Stiffness- Bounding Techniques of Elasticity, Exact Solutions - Elasticity Solutions with Continuity, Halpin, Tsai Equations,
Comparison of approaches to Stiffness.

UNIT III

Cement Composites: Types of Cement Composites, Terminology, Constituent Materials And their Properties, Construction Techniques for Fibre Reinforced Concrete – Ferro cement, SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing.

UNIT IV

Mechanical Properties of Cement Composites: Behavior of Ferrocement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion.

UNIT V

Application of Cement Composites: FRC and Ferrocement- Housing, Water Storage, Boats and

Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behaviour, Constitutive relationship, Elastic Constants. Analysis and Design of Cement Composite Structural Elements – Ferro cement, SIFCON and Fibre Reinforced Concrete.

Text books

1. Engineering Mechanics of Composite Materials, Isaac M. Daniel , Ori Ishai , Publisher : OUP USA; 2nd edition,2005.
2. Advanced mechanics of materials, Roman Solecki; R. Jay Conant, Oxford University Press, USA, 2003
3. Ferrocement--- B R Paul and R P Pama. Published by International Ferrocement Information Centre. A.I.T.Bangkok, Thailand 2015.

Reference books

1. Fibre Reinforced Cement Composites, P. N. Balaguru and S P Shah, Mc Graw Hill, 2010.
2. Mechanics of Composite Materials, Jones R.M,, 2nd Ed., Taylor and Francis, BSP Books,1998.
3. Ferrocement – Theory and Applications, Pama R. P., IFIC, 1980.
4. New Concrete Materials, Swamy R.N., 1stEd., Blackie, Academic and Professional, Chapman &Hall, 1983.
5. Taylor H.F.W, Cement Chemistry, Thomas telford, 2nd Edition, New York, 1997.
6. Fibre Reinforced Cementitious Composites- Arnon Bentur, Sidney Mindees, CRC Press, 1990.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED CONCRETE TECHNOLOGY

(Professional Elective I)

Course Code: GR22D5004 **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 diverseconstruction field.
5. To design the forms of different materials for the different types of works under different conditions.

Course Outcomes:

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 – Mix design of SCC by Nansu method – 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, Pearson publications, 5th edition,2011.
2. P Kumar Mehta, Paulo J M Monteiro, "Concrete: Microstructure, Properties, and Materials", 4thedition McGraw Hill Education; 2017
3. M.S.Shetty, Concrete Technology, S.Chand& Co publications,2006.

Reference Books:

1. A.R. Santhakumar, Concrete Technology, Oxford Press,2006.
2. Rafat Siddique, Special Structure concretes, Galgotia Publications, 3rd edition,2000.
3. N.KrishnaRaju, Design of Concrete Mixes, CBS Publications,5th edition,2017.
4. P.K.Mehta, Concrete: Micro Structure,properties and materials, ICI, Chennai,4th edition, 2014.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

THEORY OF STRUCTURAL STABILITY
(Professional Elective I)

Course Code: GR22D5005 **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 of discrete 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:

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.

Text Books:

1. WIGGERS S L, Structural Stability And Vibration by , SPRINGER, 2018
2. A.I. Rusakov , Fundamentals of Structural Mechanics Dynamics and Stability, Taylor & Francis, 2020
3. Theory of elastic stability, Timoshenko and Gere, Dover publications,2nd edition,2009.

Reference Books:

1. Principles of Structural Stability Theory, Alexander Chajes, Prentice Hall, New Jersey,1974.
2. Structural Stability of columns and plates, Iyengar, N. G. R., Ellis Horwood Ltd publisher, 1988.
3. Strength of Metal Structures, Bleich F. Bucking, Tata McGraw Hill, New York, 1952.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ANALYTICAL AND NUMERICAL METHODS FOR STRUCTURAL ENGINEERING
(Professional Elective II)

Course Code: GR22D5006 **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 value problems in Ordinary Differential Equations.
5. To solve a range of problems on applicable software.

Course Outcomes:

1. Apply numerical methods to find the roots of a Nonlinear Algebraic and Transcendental equations 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. Apply the knowledge of numerical differentiation and integration to some contents of Civil Engineering.
5. Formulate simple problems into programming models.

UNIT I

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.

Error Analysis: Floating-Point Approximation of a Number; Loss of Significance and Error Propagation; Stability in Numerical Computation.

UNIT II

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

UNIT III

Fundamentals of Numerical Methods: Linear Interpolation - Higher Order Interpolation - Lagrange Interpolation Interpolating polynomials using finites differences- Hermite Interpolation -piece-wise and spline Interpolation.

Curve Fitting: Fitting a straight-line, Second-degree curve, Exponential curve, power curve by method of least squares.

UNIT IV

Numerical Differentiation & Integration: Solution of Ordinary and Partial Differential Equations - Numerical Integration – Double integration using Trapezoidal and Simpson's method. Euler's method – Backward Euler method – Midpoint method – single step method- Taylor's series method- R-K Methods. Boundary value problems. Finite Difference Schemes.

UNIT V

Computer Algorithms: Algorithms – developing an algorithm for simple mathematical problems. Introduction to Fuzzy Logic and Neural Networks - applications in Civil and Structural Engineering.

Text Books:

1. An Introduction to Numerical Analysis, Atkinson K.E., J. Wiley and Sons,2nd edition 1989.
2. Theory and Problems of Numerical Analysis, Scheid F, McGraw Hill Book Company, (Shaum Series), 1988.
3. An Introduction to Numerical Analysis, Atkinson K.E., J. Wiley and Sons,2nd edition 1989

Reference Books:

1. Theory and Problems of Numerical Analysis, Scheid F, McGraw Hill Book Company, (ShaumSeries), 1988.
2. Introductory Methods of Numerical Analysis, Sastry S. S, Prentice Hall of India, 4th edition 2005.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRUCTURAL HEALTH MONITORING

(Professional Elective II)

Course Code: GR22D5007 **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:

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 I

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 techniques: RF/PSTN/GSM/Satellite Communications, Networking of sensor, Data compression technique, Case Studies.

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–electric materials and other smart materials electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

Text Books:

1. Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, Structural Health Monitoring, Wiley publishers ISTE 2nd Edition 2010
2. Duglas E Adams, Health Monitoring of Structural Materials and Components-Methods with Applications, John Wiley and Sons, 2007.
3. Structural Health Monitoring, Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006

Reference Books:

1. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
2. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic PressInc,2007

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRUCTURAL OPTIMIZATION

(Professional elective II)

Course Code: GR22D5008 **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 optimizationtechniques
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 optimizationtechniques.
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:

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++ .

Text Books:

1. Sastry S.S."Introductory Methods of Numerical Analysis", Prentice Hall of India, 2012.
2. Rao S.S., "Engineering Optimization-Theory and Applications", New Age International Publishers,1984.
3. Singiresu S. Rao,("Engineering Optimization (Theory and Practice)"New Age International (P) Ltd, 3rd edition, 2010.

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
STRUCTURAL DESIGN LAB

Course Code: GR22D5009 **L/T/P/C: 0/0/4/2**

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 develop a template for designing of the reinforced concrete members.
3. To learn the analysis of plane, space truss and frames subjected to different types of loadings.
4. To study the static and dynamic analysis, design and detailing of RCC framed structural members.
5. To study the analysis and design of Steel truss members.

Course Outcomes:

1. Understand the software usages and produce structural drawing for structural members.
2. Analyse and design the plane frame and truss subjected to different type of loading.
3. Design and detailing of RC structural members like beam, column, slab, and Footing
4. Analysis and design of RCC framed structures statically for different loading conditions.
5. Analysis and design of RCC framed structures dynamically for different loading conditions

List of Experiments

1. Develop a template for design of one-way slab.
2. Develop a template for design of two-way Slab.
3. Develop a template for design of columns.
4. Develop a template for design of combined footing.
5. Analysis and design of continuous beam.
6. Analysis and design of plane frame.
7. Analysis of multi-storeyed space frame.
8. Static analysis of multi-storeyed structure.
9. Dynamic analysis of multi-storeyed structure.
10. Analysis and design of Steel truss.

Software: Relevant Software

References:

1. IS 456: 2000-Plain and Reinforced Concrete- Code of Practice.
2. IS 1893:2002-Criteria for Earthquake Resistant Design of Structures.
3. IS 875 part 3: 1987- Code of Practice for Wind loads.
4. IS 875 part 4:1987- Code of Practice for design loads (other than Earthquake) for building structures.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED CONCRETE TECHNOLOGY LAB

Course Code: GR22D5010 **L/T/P/C: 0/0/4/2**
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:

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. Determine the compressive strength of existing concrete members by Non-Destructive testing method.

8. Assess the quality of existing concrete members by Non-Destructive testing method.
9. Study the flow properties of self compacting concrete.
10. Evaluation of air content in concrete.
11. Optimization of dosage of super plasticizer in cement.
12. Demonstration on how to locate reinforcement details in any existing RC structures.
13. 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.,5th edition, 2006

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

RESEARCH METHODOLOGY AND IPR

Course Code: GR22D5011 **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:

1. Understand research problem formulation and analyze research related information and follow research ethics.
2. Understand that today‘s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
3. 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.
4. Understand the nature of Intellectual Property and IPR in International scenario.
5. Understand that IPR protection provides an incentive to inventors for further and design the administration of patent system and new Developments in IPR.

UNIT I:

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. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT II:

Effective literature studies approaches, analysis Plagiarism, Research ethics, Citation

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:

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.

Text Books and References:

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 Guidefor 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

I YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FEM IN STRUCTURAL ENGINEERING

Course Code: GR22D5012 **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:

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, MsGraw Hilll India publications, 2nd edition, 2013.
2. Finite Element Methods in Engineering, Belegundu A.D., Chandrupatla, T.R., PrenticeHall India, 3rd edition,2002.
3. Finite Element Analysis, Seshu P., Prentice-Hall of India, 2003.

Reference Books:

1. Concepts and Applications of Finite Element Analysis, Cook R. D., Wiley J., New York, 4th edition,2001.
2. Fundamentals of Finite Element Analysis, Hutton David, Mc- Graw Hill, 2017.
3. Finite Element Analysis, Buchanan G.R., McGraw Hill Publications, New York, 2005.
4. Finite Element Method, Zienkiewicz O.C. & Taylor R.L. Vol. I, II & III, Elsevier,7th edition,2013.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRUCTURAL DYNAMICS

Course Code: GR22D5013 **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:

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.

Text Books:

1. Dynamics of Structures, Clough R. W. and Penzien J., McGraw-Hill Education / Asia; 2nd edition (2003) ISBN-13 : 978-0071132411
2. Dynamics of Structures: Theory and Applications to Earthquake Engineering, Anil K. Chopra, Prentice Hall international series, Pearson, 2017, ISBN 9780134555126
3. Structural Dynamics - Theory and Computation, Paz Mario, CBS Publication, 2nd Edition, 2006

Reference Books:

1. Basics of Structural Dynamics and Aseismic Design, Prentice Hall India Learning Private Limited; 5th Edition, 2009.
2. Vibration of Structures - Application in Civil Engineering Design, Smith J. W., Chapman and Hall, London,1988.
3. Dynamics of Structures, Humar J. L., CRC Press; 2nd edition, 2012.
4. Structural Dynamics for Structural Engineers, Gary C. Hart, John Wiley & Sons, 2000.
5. Structural Dynamics, CRC Press; 1st edition,2016, ISBN-10 : 9780415427326

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED STEEL DESIGN

(Professional Elective III)

Course Code: GR22D5014 **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:

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 trussmembers
4. The design of steel bridges.
5. The design and analysis steel bunkers and silos.

Course Outcomes:

1. Design Plate girders.
2. Design Gantry girders.
3. The design of steel truss girder, loads on trusses, analysis and design of purlins and trussmembers
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 – Designof 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 PrivateLtd. New Delhi, 3rd Edition, 2019.
2. N. Subramanian, Design of steel structures, Oxford University Press,2nd edition, 2016.
3. P. Dayaratnam, Design of Steel Structures, Publisher: S. Chand, first edition 2012.

Reference Books:

1. Dr. Ramachandra &Vivendra, Design Steel Structures Volume – II, Gehlot Scientific Publishes Journals Department, 19th edition, 2016.
2. Galyord & Gaylord, Design of Steel Structures, Publisher; Tata Mc Graw Hill, Education. Edition ,2012.
3. Indian Standard Code – IS: 800-2007.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DESIGN OF FORMWORK
(Professional Elective III)

Course Code: GR22D5015 **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:

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 MultiStory Building Construction.

Text Books:

1. Formwork for Concrete structures by Robert L Peurify and Gerold D Oberlender, Fourth edition,2010.
2. Formwork for Concrete Structures, Kumar Neerajha, Tata McGraw Hill Education,2017.
3. Formwork for Concrete Structures, Peurify, McGraw Hill India, 2015.

Reference Books:

1. 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: GR22D5016 **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 otherstypes of bridges.
5. To impart knowledge of different methods of inspection of bridges and their maintenance strategies

Course Outcomes:

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.

Text Books:

1. Krishna Raju N., “Design of Bridges”, Oxford and IBH Publishing Co., Ltd.,5th edition 2019.
2. Ponnu Swamy, “Bridge Engineering”, McGraw-Hill Publication,3rd edition,2017.
3. Vazirani, Ratvani & Aswani, “Design of Concrete Bridges”, Khanna Publishers, 5th Edition, 2006.

Reference Books:

1. M A. Jagadeesh and T R. Jayaram, “Design of Bridge Structures,” Prentice-Hall of India, New Delhi, 2nd edition, 2009.
2. Johnson victor D, “Essentials of Bridge Engineering”, Oxford, IBH publishing Co., Ltd, 7th Edition, 2019.
3. Wai-Fah Chen LianDuan, "Bridge Engineering Handbook", CRC Press, USA, 2nd edition, 2014.
4. R.M. Barker and J.A. Puckett, “Design of Highway Bridges”, John Wiley& Sons, New York, 4th edition,2021.
5. P.P. Xanthakos, "Theory and Design of Bridges", John Wiley &Sons, New York, 1994.

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

(Professional Elective IV)

Course Code: GR22D5017 **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:

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

Ribbed slabs: 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 strips moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears-Introduction to Equivalent frame method. Limitations of Direct design method, Distribution of moments in column strips and middle strip sketch showing reinforcement details.

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 of Intze type OHT. Design of staging for Intze type overhead tank.

UNIT V

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

Text Books:

1. Illustrated Reinforced Concrete Design, Dr. V.L. Shah & Dr. S. R. Karve, Structures Publications, 6th edition,2010.
2. Reinforced Concrete Design, S. Unnikrishna Pillai and Devdas Menon D., Tata McGraw-Hill, 3rd Ed, 2017.
3. Reinforced Concrete Structures, Park R. and Paulay T., John Wiley & Sons, 1995.

Reference Books:

1. Advanced Reinforced Concrete Design, Varghese P. C., Prentice Hall of India, New Delhi,2nd edition, 2005.
2. Limit State design by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jai, Laxmi publication Pvt. Ltd., New Delhi, first edition,2007.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED DESIGN OF FOUNDATIONS

(Professional Elective IV)

Course Code: GR22D5018 **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:

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, 8th edition,2017.
2. Bowles, J.E., Foundation Analysis and Design, McGraw-Hill Publishing Company, New york, 5th edition, 2001.
3. Design of foundation system, N.P. Kurian, Narosa Publishing House,3rd edition,2005.

Reference Books:

1. Analysis and Design of Substructures, Swami Saran, Oxford and IBH Publishing Co. Pvt. Ltd,New Delhi,2nd edition,2018

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

EARTHQUAKE RESISTANT DESIGN OF BUILDINGS

(Professional Elective IV)

Course Code: GR22D5019 **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:

1. Acquire the fundamentals of earthquake engineering and seismicity conditions of the country and world.
2. Analyze the seismic hazard at specific site.
3. 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. 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, Plate tectonics, 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 and symmetry, elongated shapes, stiffness and strength. Seismic design requirements, regular and 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 Push 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.

Text books:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press,2nd edition,2013.
2. Design of Reinforced Concrete Structures by N.Subramanian, Oxford University Press,2013.
3. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd,2011.

Reference books:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons, first edition,1992.
2. Masonry and Timber structures including earthquake Resistant Design –Anand S. Arya, Nemchand & Bros, first edition,1964.
3. Earthquake –Resistant Design of Masonry Building –Miha Tomazevic, Imperial college Press,1999.
4. C.V.R. Murty, Earthquake Tips – Learning Earthquake Design and Construction,2005.

Reference Codes:

1. IS: 1893 (Part-1) -2016. “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

ADVANCED STRUCTURAL ENGINEERING LAB

Course Code: GR22D5020 **L/T/P/C: 0/0/4/2**

I Year II Semester

Prerequisites: Advanced Concrete Technology

Course Objectives:

1. Familiarize the students with physical, chemical and mechanical properties of concrete.
2. Determine the durability properties of concrete.
3. To study the effect of elevated temperatures on properties of concrete and the effect of Thermal cycles.
4. To conduct Non-Destructive testing methods on existing concrete members
5. To study the behaviour existing RC structures reinforcement details and corrosion levels.

Course Outcomes:

1. Assess the behavior of concrete in terms of strength and Permeability.
2. Interpret the mechanical properties of concrete and examine the effect of water absorption and sorpitivity.
3. Analyse the behaviour of concrete properties due to the effect of Thermal cycles.
4. Assess the quality of existing concrete members by Non-Destructive testing methods.
5. Analyze the behaviour and understanding reinforcement details and corrosion levels in existing RC structures.

List of Experiments:

1. Determination of water permeability of concrete
2. Determination of concrete compressive strength by accelerated curing test.
3. Assess the sorptivity of concrete.
4. Assessment of water absorption of concrete
5. Effect of elevated temperatures on properties of concrete.
6. Effect of thermal cycles on properties of concrete.
7. Assessment of location of rebar in existing RC structures.
8. Assessment of the level of corrosion in existing RC structures.
9. Assess the surface hardness of existing concrete members using rebound hammer test.
10. Assess the quality of existing concrete members using ultrasonic pulse velocity test.
11. Assessment of flexural behaviour of under reinforced R.C. Beam
12. Assessment of flexural behaviour of over reinforced R.C. Beam

References:

1. IS 3085-1965- Method of Test for Permeability of Cement mortar and Concrete.
2. IS 9013-1978- Accelerated Curing Test of concrete
3. IS 1124-1974- Method of Test for determination of Water Absorption, Apparent Specific gravity and Porosity of Natural Building stones.
4. IS 13311 -1992 part 1 & 2- Non Destructive Testing of Concrete-Methods of Test

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

NUMERICAL ANALYSIS LAB

Course Code: GR22D5021 **L/T/P/C: 0/0/4/2**

I Year II Semester

Prerequisites: Numerical Methods, Mathematics, C programming

Course Objectives:

1. Solve a system of non-linear equations.
2. Draw best fit curve for the given data.
3. Solve the system of Linear Equations
4. Integrate Numerically Using Trapezoidal and Simpson's Rules.
5. Determine Numerical Solution of Ordinary Differential Equations

Course Outcomes:

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.

List of Exercises:

1. Find the Roots of Non-Linear Equation Using Bisection Method.
2. Find the Roots of Non-Linear Equation Using Newton's Method.
3. Curve Fitting by Least Square Approximations.
4. Solve the System of Linear Equations Using Gauss - Elimination Method.
5. Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.
6. Solve the System of Linear Equations Using Gauss - Jorden Method.
7. Integrate numerically using Trapezoidal Rule.
8. Integrate numerically using Simpson's Rules.
9. Numerical Solution of Ordinary Differential Equations by Euler's Method.
10. Numerical Solution of Ordinary Differential Equations by Runge- Kutta Method.

Text 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, (ShaumSeries), 1988.
3. Byron, S. Gottfried, "Programming with C", Tata McGraw Hill, 4th edition,2018..

Reference Books:

1. Introductory Methods of Numerical Analysis, Sastry S. S, Prentice Hall of India,4th edition,2005.
2. Computer Based Numerical Analysis, Dr. M. Shanta Kumar, Khanna Book Publishers, New Delhi, first edition,1987.
3. Numerical Methods for Scientific and Engineering Computations, M.K. Jain and S.R.K.Iyengar, New Age International Pvt. Ltd., 2005.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MINI PROJECT

Course Code: GR22D5144 **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:

1. Choose the problem domain in the specialized area under computer scienceand 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 theselected 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 TECHNOLOGY

ENGLISH FOR RESEARCH PAPER WRITING
(AUDIT COURSE)

Course Code: GR22D5153 **L/T/P/C : 2/0/0/0**

Course Objectives:

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

Course Outcomes:

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

UNIT I:

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

UNIT II:

Hedging and Critiquing, Paraphrasing and Plagiarism, Sections of a Paper

UNIT III:

A**:** Abstracts and writing an Introduction, Review of the Literature, Methods and Results

B: Key skills that are needed when writing a Title, an Abstract, an Introduction, and Review of the Literature

UNIT IV:

A. Methods, the Results, Discussion, Conclusions, the Final Check, Clarifying who Did What, Highlighting Your Findings

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

UNIT V:

Useful phrases, how to ensure paper is as good as it could possibly be the first- time **S**ubmission

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: GR22D5154 **L/T/P/C: 2/0/0/0**

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 inspecific 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:

1. Capacity to integrate knowledge and to analyze, evaluate and manage the different public healthaspects 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 fieldof 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 I

Introduction:

Disaster: Definition, Factors and Significance; Difference Between Hazard And Disaster; NaturalAnd Manmade Disasters: Difference, Nature, Types And Magnitude.

UNIT II

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 III

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 IV

Disaster Preparedness and Management: Preparedness: Monitoring Of PhenomenaTriggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V

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 Mitigationand Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Text Books:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company, 2007.
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, NewDelhi, 2004.
3. Goel S. L., ''Disaster Administration And Management Text And Case Studies", Deep &Deep Publication Pvt. Ltd., NewDelhi,2007.

Reference Books:

1. Manual on Natural Disaster Management in India, M C Gupta, NIDM, 2016
2. Disasters in India Studies of grim reality, AnuKapur& others, RawatPublishers, 2005
3. N. G. Dhawan, A. S. Khan, Disaster Management and Preparedness, 1st ed., CBS Publication, 2014.
4. P Kumar, Disaster Management, Oak Bridge Publications, First Edition, 2021

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SANSKRIT FOR TECHNICAL KNOWLEDGE
(AUDIT COURSE)

Course Code: GR22D5155 **L/T/P/C: 2/0/0/0**

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

UNIT II:
Order, Introduction of roots, technical information about Sanskrit Literature

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

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

UNIT V :
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, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.
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/saplechapter/001697.pdf

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

Course Code: GR22D5156 **L/T/P/C: 2/0/0/0**

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:

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 labor and religious tolerance.

UNIT I:

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 II:

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 III:

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 IV:

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

UNIT V:

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.

References:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDIAN CONSTITUTION

(AUDIT COURSE)

Course Code: GR22D5157 **L/T/P/C : 2/0/0/0**

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 theearly years of Indian nationalism.
4. To address the role of socialism in India after the commencement of the Bolshevik Revolution in1917 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:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrivalof 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 I:

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

UNIT II:

Philosophy of the Indian Constitution: Preamble Salient Features

UNIT III:

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 IV:

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 V:

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

Reference Books:

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: GR22D5158 **L/T/P/C : 2/0/0/0**

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:

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 oflearners?
5. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT I:

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 II:

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

UNIT III:

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 IV:

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 V:

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

Reference Books:

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 BY YOGA
(AUDIT COURSE)

Course Code:GR22D5159 **L/T/P/C: 2/0/0/0**

Course Objectives

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:

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 I

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 II

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 chitta vrittis. 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 III

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 IV

Yam and Niyam. Do`s and Don'ts in life. Ahinsa, satya, astheya, bramhacharya & aparigrahaShaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT V

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

Reference Books:

1. 'Yogic Asanas for Group Training - Part-I" : Janardan Swami Yogabhyasi Mandal,Nagpur
2. "Rajayoga or conquering the Internal Nature" by SwamiVivekananda, AdvaitaAshrama (Publication Department),Kolkata
3. Rajayoga - Swami Vivekananda - Ramakrishna Ashrama Publications.
4. Hathayoga Pradipika of Swatmarama - Kaivalyadhama, Lonavala
5. The Science of Yoga - Taimini - Theosophical Publishing House, Adyar, Madras.
6. Yogasutras of Patanjali - Harihara nanda Aranya, University of Calcutta Press, Calcutta.
7. Patanjal Yoga Pradeepa Omananda 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 Panchadashanam Paramahamsa Alakh 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: GR22D5160 **L/T/P/C: 2/0/0/0**

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

Reference Books:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita 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: GR22D5022 **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 system 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:

1. Find out the losses in prestressed concrete and enhance its concepts, which include preand 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, 6th edition,2018.
2. Prestressed Concrete by Ramamrutham; Dhanpatrai Publications,6th edition,2003.
3. Prestressed Concrete by N. Rajasekharan; Narosa publications.

Reference Books:

1. Design of Prestressed concrete structures by T.Y. Lin & Ned H. Burns,John Wiley & Sons, 3rd edition,2010.
2. 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: GR22D5023 **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 develop the governing equations for different boundary conditions.
3. To interpret 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:

1. Identify the Displacement Field Approximations for CLPT and FSDT.
2. Analyze the Solutions for Bending of Rectangular Laminated Plates using CLPT.
3. Make use of Finite Element Solutions for Bending of Rectangular Laminated Plates using CLPT.
4. Create Finite Element models.
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,2nd edition,2003.
2. Theory and analysis of elastic plates and shells. J.N Reddy, CRC Press,2006.
3. Laminated Composites Plates and Shells, Jianqiao, Ye, Springer, London,3rd edition, 2002.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

THEORY OF THIN PLATES AND SHELLS

(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 the basic relations between equilibrium equations and energy principles.
2. Derive the governing differential equations for thin rectangular plates.
3. Derive the governing differential equations for Circular plates and Orthotropic plates.
4. Derive 2D membrane equation for shells.
5. Understand spherical shells and Hyperboloid of Revolution.

Course Outcomes

1. Use analytical methods for the solution of thin long rectangular plates.
2. Use analytical methods for the solution of small deflection theory of rectangular plates.
3. Use analytical methods for the solution of Circular plates and Orthotropic plates.
4. Use analytical methods for the solution of shells.
5. Analyse the Axi- symmetric shells.

UNIT I

Cylindrical Bending: Different kind of plates – Assumptions - Derivation of differential equation for cylindrical bending of long rectangular plates - Analysis of uniformly loaded rectangular plates with edges simply supported and fixed subjected to uniform load.

Pure Bending of Plates: Slope and curvature of slightly bent plates – Relations between moments and curvature - Particular cases of pure bending - Strain energy in pure bending –Energy methods like Ritz and Galerkin Methods to rectangular plates subjected to simple loadings

UNIT II

Small Deflection Theory of Thin Rectangular Plates: Assumptions-Derivation of governing differential equation for thin plates-Boundary conditions- supported plate under simply sinusoidal load- Navier's solution- Application to cases – Levy's solution for various boundary conditions subjected to different loadings like uniform and hydrostatic pressure.

UNIT III

Circular Plates: Symmetrical loading – Relations between slope, deflection, moments and curvature – Governing differential equation – Uniformly loaded plates with clamped and simply supported edges – Central hole – bending by moments and shearing forces uniformly distributed.

Orthotropic Plates: Introduction – Bending of anisotropic plates - Derivation of governing differential equation – Determination of Rigidities in various cases like R.C. slabs, corrugated sheet – Application to the theory of grid works.

UNIT IV

Analysis of Shells

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 Flugge's simulations equations- DKJ Theory.

UNIT V

Shells of Revolution.

Axi- Symmetrical Shells-Governing general equations. Application to spherical shells and hyperboloid of revolution, cooling towers.

Text Books:

1. Timeshanko, Theory of Elasticity, McGrawhill Publications, 3rd edition, 2017.
2. J.Chakarbarthy, Theory of Plasticity, Butterworth Heinemann Publications, 3rd edition,2006.
3. G.S.Ramaswami, Analysis and design of concrete shell roofs,CBS publishers,first edition,2005.

Reference Books:

1. Y.C.Fung Theory of Elasticity, Prentice Hall publications, 1965.
2. Billington, Design of concrete shell roofs, 3rd Edition, 1990.
3. N.K.Bairagi, Shell Analysis, Khanna publications, 1990.
4. Dr.N.Krishna Raju, Advanced R.C Design, CBS publishers and distributors Pvt Ltd, 3rd edition, 2016.
5. Chaterjee,Design of concrete shellroofs, Sponpress,3rdEdition,1990.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COST MANAGEMENT OF ENGINEERING PROJECTS

(Open Elective I)

Course Code: GR22D5147 **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; Project contracts; 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 and Cost-Volume-Profit Analysis (theory only). Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. 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 (theory only).

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 and Assignment problems (theory only), Simulation, Learning Curve theory.

Text Books

1. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting, Pearson publications,3rd edition,1998.
2. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd, 4th edition,2009.
3. Srikant Datar, Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi, 16th edition, 2017.

Reference Books

1. Charles T. Horngren and George Foster, Advanced Management Accounting,prentice Hall,6th edition, 1987.
2. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher,2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDUSTRIAL SAFETY
(OPEN ELECTIVE)

Course Code: GR22D5148 **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. Gravity lubrication, v. Wickfeed lubrication vi. Sidefeed lubrication, vii. Ring lubrication, 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.

TEXT/REFERENCE BOOKS:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATIONS RESEARCH
(OPEN ELECTIVE)

Course Code: GR22D5149 **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 able to carry out sensitivity analysis.
2. The student will solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
3. The student will able to distinguish various inventory models and develop proper inventory policies.
4. 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

TEXT/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. Pannerselvam, 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)

Course Code: GR22D5150 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives:

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 Backpropagation (BP) Training, Summary of Backpropagation 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 StabilityTheorem. 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, membershipfunctions.

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/REFERENCE BOOKS:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHIPublication.
2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House,1997.
3. Neural and Fuzzy Systems: Foundation, Architectures and Applications, - N. YadaiahandS. BapiRaju, PearsonEducation
4. Neural Networks – James A Freeman and Davis Skapura, Pearson,2002.
5. Neural Networks – Simon Hykins , Pearson Education
6. Neural Engineering by C.Eliasmith and CH.Anderson,PHI
7. Neural Networks and Fuzzy Logic System by Bork Kosko, PHIPublications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CYBER SECURITY
(OPEN ELECTIVE)

Course Code: GR22D5151 **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:

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/REFERENCE BOOKS:

1. Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., Enterprise Cybersecurity -How to Build a SuccessfulCyberdefense 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)

Course Code: GR22D5152 **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:

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-I

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


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