ACADEMIC REGULATIONS
COURSE STRUCTURE AND
DETAILED SYLLABUS

M.TECH
STRUCTURAL ENGINEERING

(Applicable for the batches admitted from 2015-16)

VAAGDEVI COLLEGE OF ENGINEERING
(UGC AUTONOMOUS)
Bollikunta, Warangal – 506 005. T.S.

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)
Bollikunta, Warangal-506 005 (T.S)

R 15-ACADEMIC REGULATIONS (CBCS) FOR M.Tech. (REGULAR) DEGREE PROGRAMMES

Applicable for the students of **M. Tech. (Regular) programme from the Academic Year 2015-16 and onwards.** The M. Tech. Degree of the Jawaharalal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

1. ELIGIBILITY FOR ADMISSIONS

Admission to the above programme shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.
Admissions shall be made on the basis of merit/rank obtained by the candidates at the qualifying Entrance Test conducted by the University or on the basis of any other order of merit as approved by the University, subject to reservations as laid down by the Govt. from time to time.

2. AWARD OF M. Tech. DEGREE

2.1 A student shall be declared eligible for the award of the M. Tech. Degree, if he pursues a course of study in not less than two and not more than four academic years. However, he is permitted to write the examinations for two more years after four academic years of course work, failing which he shall forfeit his seat in M. Tech. programme.

2.2 The student shall register for all 88 credits and secure all the 88 credits.

2.3 The minimum instruction days in each semester are 90.

3. DEPARTMENTS OFFERING M.TECH PROGRAMMES WITH SPECIALIZATIONS

Department	Specialization	Shift
Civil Engg.	i. Structural Engineering	1st Shift
EEE	i. Power Electronics	1st & 2nd Shift
	ii. Power Systems Control and Automation	1st & 2nd Shift
ME	i. Thermal Engineering.	1st Shift
ECE	i. VLSI System Design	1st & 2nd Shift
	ii. Wireless and Mobile Communications	1st & 2nd Shift
CSE	i. Computer Networks and Information Security	1st & 2nd Shift
	ii. Computer Science and Engineering	1st & 2nd Shift
	iii. Software Engineering	1st Shift

4. COURSE REGISTRATION

4.1 A 'Faculty Advisor or Counselor' shall be assigned to each student, who will advise him on the Post Graduate Programme (PGP), its Course Structure and

Curriculum, Choice/Option for Subjects/Courses, based on his competence, progress, pre-requisites and interest.

4.2 Academic Section of the College invites 'Registration Forms' from students within 15 days from the commencement of classwork, ensuring 'Date and Time of registration. The Registration requests for any 'Current Semester' shall be completed before the commencement of SEEs (Semester End Examinations) of the 'Preceding Semester'.

4.3 A Student can apply for Registration, only after obtaining the 'Written Approval' from his Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor and the Student).

4.4 If the Student submits ambiguous choices or multiple options or erroneous entries-during Registration for the Subject(s)/Course(s) under a given/ specified Course Group/Category as listed in the Course Structure, only the first mentioned Subject/Course in that Category will be taken into consideration.

4.5 Subject/Course Options exercised through Registration are final and cannot be changed, nor can they be inter-changed; further, alternate choices will also not be considered. However, if the Subject/ Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the first week from the commencement of Class-work for that Semester.

5. ATTENDANCE

5.1 Attendance in all classes (Lectures/Laboratories etc.) is compulsory. The minimum required attendance in each theory / Laboratory etc. is 75% including the days of attendance in sports, games, NCC and NSS activities for appearing for the End Semester examination. A student shall not be permitted to appear for the Semester End Examinations (SEE) if his attendance is less than 75%.

5.2 Condonation of shortage of attendance in each subject up to 10% (65% and above and below 75%) in each semester shall be granted by the College Academic Committee.

5.3 Shortage of Attendance below 65% in each subject shall not be condoned.

5.4 Students whose shortage of attendance is not condoned in any subject are not eligible to write their end semester examination of that subject and their registration shall stand cancelled.

5.5 A prescribed fee shall be payable towards condonation of shortage of attendance.

5.6 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present Semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

6. EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Internal Evaluation and End Semester Examination.

6.1 For the theory subjects 60 marks shall be awarded for the performance in the Semester End Examination and 40 marks shall be awarded for Continuous Internal Evaluation (CIE). The Continuous Internal Evaluation shall be made based on the average of the marks secured in the two Mid Term-Examinations conducted, one in the middle of the Semester and the other, immediately after the completion of Semester instructions. Each mid-term examination shall be conducted for a total duration of 120 minutes with Part A as compulsory question (16 marks) consisting of 4 sub-questions carrying 4 marks each, and Part B with 3 questions to be answered out of 5 questions, each question carrying 8 marks.

The details of the Question Paper pattern for End Examination (Theory) are given below:

- The Semester End Examination will be conducted for 60 marks. It consists of two parts, i).Part-A for 20 marks, ii). Part-B for 40 marks.
- Part-A is a compulsory question consisting of 5 sub questions, one from each unit and carries 4 marks each.
- Part-B to be answered 5 questions carrying 8 marks each. There will be 2 questions from each unit and only one should be answered.

6.2 For practical subjects, 60 marks shall be awarded for performance in the Semester End Examinations and 40 marks shall be awarded for day-to-day performance as Internal Marks.

6.3 For conducting laboratory end examinations of all PG Programmes, one internal examiner and one external examiner are to be appointed by the Head of the Department with the approval of the Principal. The external examiner should be selected from outside the College.

6.4 There shall be two seminar presentations during I year I semester and II semester. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Departmental Academic Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For each seminar there will be only internal evaluation of 50 marks. A candidate has to secure a minimum of 50% of marks to be declared successful. If he fails to fulfill minimum marks, he has to reappear during the supplementary examinations.

6.5 There shall be a Comprehensive Viva-Voce in II year I Semester. The Comprehensive Viva-Voce is intended to assess the students' understanding of various subjects he has studied during the M.Tech. course of study. The Head of the Department shall be associated with the conduct of the Comprehensive Viva-Voce through a Committee. The Committee consisting of Head of the Department, one senior faculty member and an external examiner. The external examiner shall be appointed by the Principal. For this, the Head of the department shall submit a panel of 3 examiners. There are no internal marks for the Comprehensive Viva-Voce and evaluates for maximum of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared

successful. If he fails to fulfill minimum marks, he has to reappear during the supplementary examinations.

6.6 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the Semester End Examination and a minimum aggregate of 50% of the total marks in the Semester End Examination and Continuous Internal Evaluation taken together.

6.7 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 6.6) he has to reappear for the Semester End Examination in that subject.

6.8 A candidate shall be given one chance to re-register for the subjects if the internal marks secured by a candidate is less than 50% and failed in that subject for maximum of two subjects and should register within four weeks of commencement of the class work. In such a case, the candidate must re-register for the subjects and secure the required minimum attendance. The candidate's attendance in the reregistered subject(s) shall be calculated separately to decide upon his eligibility for writing the Semester End Examination in those subjects. In the event of the student taking another chance, his Continuous Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stands cancelled.

6.9 In case the candidate secures less than the required attendance in any subject, he shall not be permitted to write the Semester End Examination in that subject. He shall reregister for the subject when next offered.

7. Examinations and Assessment - The Grading System

7.1 Marks will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practicals, or Seminar, or Project, etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 6 above, and a corresponding Letter Grade shall be given.

7.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured (Class Intervals)	***Letter Grade (UGC Guidelines)***	***Grade Points***
80% and above ($\geq 80\%, \leq 100\%$)	O *(Outstanding)*	*10*
Below 80% but not less than 70% ($\geq 70\%, < 80\%$)	A^+ *(Excellent)*	*9*
Below 70% but not less than 60% ($\geq 60\%, < 70\%$)	A *(Very Good)*	*8*
Below 60% but not less than 55% ($\geq 55\%, < 60\%$)	B^+ *(Good)*	*7*
Below 55% but not less than 50% ($\geq 50\%, < 55\%$)	B *(above Average)*	*6*
Below 50% (< 50%)	F *(FAIL)*	*0*
Absent	**Ab**	***0***

7.3 A student obtaining F Grade in any Subject shall be considered 'failed' and is be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subjects will remain the same as those he obtained earlier.

7.4 A student not appeared for examination then 'Ab' Grade will be allocated in any Subject shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered.

7.5 A Letter Grade does not imply any specific Marks percentage and it will be the range of marks percentage.

7.6 In general, a student shall not be permitted to repeat any Subject/ Course (s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'.

7.7 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/Course. The corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/Course.

Credit Points (CP) = Grade Point (GP) x Credits.... For a Course

7.8 The Student passes the Subject/Course only when he **gets GP ≥ 6 (B Grade or above).**

7.9 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ECP) secured from all Subjects/Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

$$SGPA = \left\{\sum_{i=1}^{N} C_i G_i\right\} \Big/ \left\{\sum_{i=1}^{N} C_i\right\}$$ **.... for each semester,**

where 'i' is the Subject indicator index (takes into account all Subjects in a Semester), 'N' is the no. of Subjects 'Registered' for the Semester (as specifically required and listed under the Course Structure of the parent Department), C_j is the no. of Credits allotted to the i^{th} Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} Subject.

7.10 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in all registered Courses in all Semesters, and the Total Number of Credits registered in all the Semesters. CGPA is rounded off to two Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

$$CGPA = \left\{\sum_{j=1}^{M} C_j G_j\right\} \Big/ \left\{\sum_{j=1}^{M} C_j\right\}$$ …. for all semesters registered

(ie., upto and inclusive of S Semesters, S ≥ 2),

where 'M' is the total no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'Registered' from the 1^{st} Semester onwards upto and inclusive of the Semester S (obviously

M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), C_j is the no. of Credits allotted to the j^{th} Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that j^{th} Subject. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

7.11 For Calculations listed in Item 7.6 - 7.10, performance in failed Subjects/ Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/Courses will also be included in the multiplications and summations.

8. EVALUATION OF PROJECT/DISSERTATION WORK

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

8.1 A Project Review Committee (PRC) shall be constituted with Head of the Department as Chairperson, Project Supervisor and one senior faculty member of the Departments offering the M. Tech. programme.

8.2 Registration of Project Work: A candidate is permitted toregister for the project work after satisfying the attendance requirement of all the subjects, both theory and practical.

8.3 After satisfying 8.2, a candidate has to submit, in consultation with his Project Supervisor, the title, objective and plan of action of hisproject work to the PRC for approval. Only after obtaining the approval of the PRCthe student can initiate the Project work.

8.4 If a candidate wishes to change his supervisor or topic of the project, he 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 initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

8.5 A candidate shall submit his project status report in two stages at least with a gap of 3 months between them.

8.6 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project 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 registration of the project 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.

8.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College.

8.8 For Project work Review-I in II Year I Sem. there is an internal marks of 50, the evaluation should be done by the PRC for 25 marks and Supervisor will evaluate for 25 marks. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain. A candidate has to secure a minimum of 50% of marks to be declared successful for Project Work Review-I. If he fails to fulfill minimum marks, he has to reappear during the supplementary examination.

8.9 For Project work Review-II in II Year II Sem. there is an internal marks of 50,

the evaluation should be done by the PRC for 25 marks and Supervisor will evaluate for 25 marks. The PRC will examine the overall progress of the Project Work and decide the Project is eligible for final submission or not. A candidate has to secure a minimum of 50% of marks to be declared successful for Project Work Review-II. If he fails to fulfill minimum marks, he has to reappear during the supplementary examination.

8.10 For Project Evaluation (Viva-Voce) in II Year II Sem. there is an external marks of 150 and the same evaluated by the External examiner appointed by the University. The candidate has to secure minimum of 50% marks in Project Evaluation (Viva-Voce) examination.

8.11 If he fails to fulfill as specified in 8.10, he will reappear for the Viva-Voce examination only after three months. In the reappeared examination also, fails to fulfill, he will not be eligible for the award of the degree.

8.12 The thesis shall be adjudicated by one examiner selected by the Principal. For this, the Head of the Department shall submit a panel of 3 examiners, eminent in that field, with the help of the guide concerned.

8.13 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unfavourable again, the thesis shall be summarily rejected.

8.14 If the report of the examiner is favourable, Project 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.

8.15 The Head of the Department shall coordinate and make arrangements for the conduct of Project Viva- Voce examination.

9. AWARD OF DEGREE AND CLASS

9.1 A Student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secures the required number of 88 Credits (with CGPA > 6.0), shall be declared to have 'QUALIFIED' for the award of the M.Tech. Degree in the chosen Branch of Engineering and Technology with specialization as he admitted.

9.2 Award of Class

After a student has satisfied the requirements prescribed for the completion of the programme and is eligible for the award of M. Tech. Degree, he shall be placed in one of the following three classes based on the CGPA:

Class Awarded	**CGPA**
First Class with Distinction	$\geq$7.75
First Class	6.75 $\leq$ CGPA <7.75
Second Class	6.00 $\leq$ CGPA <6.75

9.3 A student with final CGPA (at the end of the PGP) < 6.00 will not be eligible for the Award of Degree.

10. WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the College or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

11. TRANSITORY REGULATIONS

11.1 If any candidate is detained due to shortage of attendance in one or more subjects, they are eligible for re-registration to maximum of two earlier or equivalent subjects at a time as and when offered.

11.2 The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per R15 Academic Regulations.

12. GENERAL

12.1 **Credit**: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

12.2 **Credit Point:** It is the product of grade point and number of credits for a course.

12.3 Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her".

12.4 The academic regulation should be read as a whole for the purpose of any interpretation.

12.5 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman, College Academic Council is final.

12.6 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.

* * * *

MALPRACTICES RULES
DISCIPLINARY ACTION FOR/IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	**Punishment**
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the

		academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant - Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.

11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
    (i) A show cause notice shall be issued to the college.
    (ii) Impose a suitable fine on the college.
    (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)
Bollikunta, Warangal – 506 005. T.S.

M. TECH (STRUCTURAL ENGINEERING)

COURSE STRUCTURE AND SYLLABUS

I Year – I Semester

Category	Code	Course Title	L	P	C
Core Course I	A920101	Theory of Elasticity and plasticity	4	--	4
Core Course II	A920102	Theory of Plates	4	--	4
Core Course III	A920103	Advanced Structural Analysis	4	--	4
Core Elective I	A920104	Advanced Concrete Technology	4	--	4
	A920105	Tall Buildings			
	A920106	Advanced Foundation Engineering			
Core Elective II	A920107	Advanced R.C. Design	4	--	4
	A920108	Bridge Engineering			
	A920109	Plastic Analysis & Design			
Open Elective I	A920110	Computer Oriented Numerical Methods	4	--	4
	A920111	Reliability Engineering			
	A920112	Experimental Stress Analysis			
Laboratory I	A920113	Advanced Concrete Lab	--	4	2
Seminar I	A920114	Seminar	--	4	2
		Total Credits	**24**	**8**	**28**

I Year – I Semester

Category	Code	Course Title	L	P	C
Core Course IV	A920201	Finite Element Method	4	--	4
Core Course V	A920202	Structural Dynamics	4	--	4
Core Course VI	A920203	Pre-stressed Concrete	4	--	4
Core Elective III	A920204	Advanced Steel Design	4	--	4
	A920205	Soil Dynamic & Foundation Engineering			
	A920206	Stability of Structures			
Core Elective IV	A920207	Design of shells & folded plates	4	--	4
	A920208	Earthquake Resistant Design of Buildings			
	A920209	Fracture Mechanics			
Open Elective II	A920210	Repair & Rehabilitation of Buildings	4	--	4
	A920211	Composite Materials			
	A920212	Optimisation Techniques			
Laboratory II	A920213	CAD Lab	--	4	2
Seminar II	A920214	Seminar	--	4	2
Total Credits			**24**	**8**	**28**

II Year - I Semester

Code	Course Title	L	P	C
A920301	Comprehensive Viva-Voce	--	--	4
A920302	Project work Review I	--	24	12
Total Credits		--	24	**16**

II Year - II Semester

Code	Course Title	L	P	C
A920401	Project work Review II	--	8	4
A920402	Project Evaluation (Viva-Voce)	--	16	12
Total Credits		**--**	**24**	**16**

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/C**
4/-/- / 4

(A920101)THEORY OF ELASTICITY AND PLASTICITY

Objectives:

- To impart knowledge on the basic concepts of theory of elasticity, and solve the Structural Engineering problems.

UNIT-I

Introduction: Elasticity - notation for forces and stresses - components of stresses - components of strain - Hooks law. Plane stress and plane strain analysis - plane stress - plane strain - differential equations of equilibrium - boundary conditions - compatibility equations - stress function - boundary condition.

UNIT II

Two dimensional problems in rectangular coordinates - solution by polynomials - Saint-Venant's principle - determination of displacements - bending of simple beams - application of corier series for two dimensional problems - gravity loading. Two dimensional problems in polar coordinates - stress distribution symmetrical about an axis - pure bending of curved bars - strain components in polar coordinates - displacements for symmetrical stress distributions - simple symmetric and asymmetric problems - general solution of two-dimensional problem in polar coordinates - application of general solution in polar coordinates.

UNIT III

Analysis of stress and strain in three dimensions - principal stresses - stress ellipsoid - director surface - determination of principal stresses - max shear stresses – homogeneous deformation - principal axes of strain rotation. General Theorems: Differential equations of equilibrium - conditions of compatibility - determination of displacement - equations of equilibrium in terms of displacements - principle of super position - uniqueness of solution - the reciprocal theorem.

UNIT IV

Torsion of Prismatic Bars - torsion of prismatic bars - bars with elliptical cross sections - other elementary solution - membrane analogy - torsion of rectangular bars - solution of torsion problems by energy method - use of soap films in solving torsion problems - hydro dynamical analogies - torsion of shafts, tubes , bars etc. Bending of Prismatic Bars: Stress function - bending of cantilever - circular cross section - elliptical cross section - rectangular cross section - bending problems by soap film method - displacements.

UNIT V

Theory of Plasticity: Introduction - concepts and assumptions - yield criterions.

REFERENCES

1. Theory of Elasticity by Timeshanko, McGrawhill Publications.
2. Theory of Plasticity by J.Chakarbarthy, McGrawhill Publications.
3. Theory of Elasticity by Y.C.Fung.
4. Theory of Elasticity by Gurucharan Singh.

Course outcomes:

- The learner will be able to solve problems of elasticity and plasticity and be able to apply numerical methods to solve continuum problems.

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/C**
4/-/- / 4

(A920102)THEORY OF PLATES

Objectives:

- To impart knowledge on the behavior of plates and to analyse the problems pertaining to beams on elastic foundation.

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 – simply supported plate under sinusoidal load – Navier's solution – Application to different 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

Plates on Elastic Foundations: Governing differential equation – deflection of uniformly loaded simply supported rectangular plate – Navier and Levy type solutions - Large plate loaded at equidistant points by concentrated forces P.

UNIT V

Buckling of Plates: Governing equation for Bending of plate under the combined action of in-plane loading and lateral loads – Buckling of rectangular plates by compressive forces acting in one and two directions in the middle plane of plate

Finite Difference Methods: Introduction - Application to rectangular plates subjected to simple loading.

REFERENCES:

1. Theory of Plates and Shells by Timoshenko, McGraw Hill Book Co., New York.
2. Theory and Analysis of Plates by P. Szilard, Prentice Hall.
3. Theory of Plates by Chandrasekhar, University Press.
4. Plate Analysis by N. K. Bairagi, Khanna Publishers. New Delhi.

Outcomes:

1. The learner will be able to understand the behavior of plates for loadings and boundary conditions.

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/C**
4/-/- / 4

(A920103)ADVANCED STRUCTURAL ANALYSIS

Objectives:

- To impart knowledge on the analysis of indeterminate structures like continuous beams, trusses and portal frames.

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

Assembly of stiffness matrix from element stiffness matrix – direct stiffness method – general procedure – band matrix – semi bandwidth – computer algorithm for assembly by direct stiffness matrix method.

UNIT III

Analysis of plane truss – continuous beam – plane frame and grids by flexibility methods.

UNIT IV

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

UNIT V

Special analysis procedures – static condensation and sub structuring – initial and thermal stresses.

Shear walls- Necessity – structural 20ehavior of large frames with and without shear walls – approximate methods of analysis of shear walls.

REFERENCES:

1. Matrix Analysis of Frames structures by William Weaver J.R and James M.Gere, CBS publications.
2. Advanced Structural Analysis by Ashok.K.Jain, New Channel Brothers.
3. Basic Structural Analysis by C.S.Reddy.
4. Matrix Structural Analysis by Madhu B. Kanchi.
5. Indeterminate Structural Analysis by K.U.Muthu *et al.*,I.K.International Publishng House Pvt. Ltd.
6. Matrix Methods of Structural Analysis by J.Meek.
7. Structural Analysis by Ghali and Neyveli.

Outcomes:

1. The learner will be able to analyse different indeterminate structures using Matrix methods.

***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/C**
4/- /- / 4

(A920104)ADVANCED CONCRETE TECHNOLOGY
(Core Elective – I)

Objectives:

- To impart knowledge on concrete making materials, concrete mix design for proportioning and their testing.

UNIT – I

Concrete Making Materials: Cement- Bogue's compounds – Hydration Process– Types of cement – Aggregates – Gradation Charts – Combined aggregate-Alkali Silica Reaction - Admixtures – Chemical and Mineral admixtures.

UNIT – II

Fresh and Hardened Concrete: Fresh Concrete - workability tests on Concrete Setting times of Fresh Concrete - Segregation and bleeding.

Hardened Concrete : Abram's law- Gel space ratios, Maturity Concept – Stress Behavior – Creep and Shrinkage – Durability tests on concrete - Non destructive testing of concrete.

UNIT - III

High Strength Concrete – Micro structure – Manufacturing and Properties- Design 0s HSC Using Entroy Shaklok Method- Ultra High Strength Concrete.

High Performance Concrete- Requirements and properties of High Performance Concrete- Design Considerations.

UNIT –IV

Special Concrete: Self Compacting concrete – Polymer concrete – Fiber reinforced concrete – Reactive Powder concrete – Requirements and Guidelines – Advantages and Applications. Light weight concrete.

Concrete mix design: Quality Control - Quality assurance - Quality audit- Mix Design method - BIS method, ACI method, DOE method.

UNIT –V

Form work – materials – structural requirements – form work systems – connections – specifications – design of form work – shores – removal for forms – reshoring – failure of form work.

TEXT BOOKS:

1. Properties of Concrete by A.M.Neville, ELBS publications.
2. Concrete: Micro Structure, Properties and Materials by P.K.Mehta, Tata Mc Graw Hill Publishing House Pvt. Ltd
3. Concrete Technology by A.K. Santhakumar, Oxford Press.
4. Concrete Technology by M.S.Shetty, S.Chand & Co.

REFERENCES:

1. Special Structural concretes by Rajat Siddique, Galgotia Publications.
2. Design of Concrete Mixes by N.Krishna Raju, CBS Publications.

Outcomes :

1. The learner will be able to design concrete mixes of different grades and also use the special concretes.

***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/C**
4/- /- / 4

(A920105)TALL BUILDINGS (Core Elective – I)

Objective: To impart knowledge on analysis of tall buildings.

Unit-I

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

Unit-II

Lateral load resisting elements : Frames, Shear walls & Tubes – Shear, Bending & combined modes of deformation – Structural behavior of Rigid frames – Simplified methods of analysis – Substitute frame method, Portal method, Cantilever method, Equivalent frame method –Structural behaviour of Shear walls – Approaches of analysis – Elastic continuum approach & Discrete approach -- Structural behavior of Tubes –Actions.

Unit-III

Choice of System for a Building : Frame building, Shear wall building, Shear walls acting with frames, Single framed tubes – Other structural forms – Staggered Wall-beam system, Tube-in-tube system, Base isolation technique for earthquake resistance. Load distribution in a tall building – Load resisted by different shear walls & frames – Determinate & Indeterminate problems – Equivalent Stiffness method.

Unit-IV

Methods of Analysis : Shear walls without Openings – Estimation of Stiffness by simple Cantilever theory & Deep beam theory – Shear walls with Openings – Equivalent frame for large openings – Muto's method for small openings –Elastic Continuum approach – Coull & Chowdhry's method – Design Charts – Limitations of Continuum approach. Shear wall-Frame Interaction : Sharing of loads between wall & frame - Different methods – comparison - Khan & Sbrounis' method – Design charts - Mac Leod's method - Advantages & limitations - Cooperation of Floor slabs – Equivalent width.

Unit-V

Modern Methods : Analysis of Tall buildings by Stiffness method – Available Softwares for analysis of tall buildings.

REFERENCES

1. Concrete & Composite Design of Tall Buildings by Taranath B., Mc Graw Hill.
2. Reinforced Concrete Design of Tall Buildings by Bungales. Taranath, CRC Press.
3. Analysis of Shear Walled Buildings by S. M. A. Kazimi & R. Chandra, Tor-steel Research Foundation, Calcutta, India.
4. Analysis of Framed Structures by Gere & Weaver
5. Design of Building Structures by Wolfgang Schuller, Prentice Hall.

Outcomes:

1. The learner will be able to analyse and chose a appropriate systems for tall buildings.

***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/C**
4/- /- / 4

(A920106) ADVANCED FOUNDATION ENGINEERING
(Core Elective – I)

Objective: To determine the bearing capacity of shallow and deep foundations and to estimate settlements of structures subjected to external loads, leading to design of foundations resting on soils.

UNIT-I

Soil Exploration: Exploration Methods; Planning the Exploration Program; Boring and Sampling; In Situ Tests: Standard & Cone Penetration Tests, Field Vane, Dilatometer, Pressure meter; Rock Sampling, Core Recovery, RQD; Geophysical Exploration; Preparation of Soil Report, Case Studies.

UNIT-II

Shallow Foundations: **Bearing Capacity:**- Shear Failure; Effect of Water Table; Footings with Eccentric or Inclined Loads, Footings on Layered Soils, Slopes on finite layer with a Rigid Base at Shallow Depth, effect of compressibility of soil, on soils with strength increasing with depth, Plate Load tests, Presumptive bearing capacity.

UNIT-III

Settlement: Components – Immediate, Primary and Secondary Settlements, Consolidation, Stresses and Displacements in Homogeneous, Layered and Anisotropic Soils; Bearing Pressure using SPT, CPT, Dilatometer and Pressure meter; Settlement of foundations on Sands-Schmertmann and Burland & Burbridge methods; Structure Tolerance to Settlement and Differential Settlements, Rotation, Codal Provisions.

UNIT-IV

Deep Foundations: **Single Pile:** Vertically loaded piles, Static capacity- α, β and λ Methods, Dynamic formulae; Wave Equation Analyses; Point Bearing Resistance with SPT and CPT Results; Bearing Resistance of Piles on Rock; Settlement; Pile Load Test; Uplift Resistance; Laterally Loaded Piles -Ultimate Lateral Resistance; Negative Skin Friction; Batter Piles; Under Reamed Piles; Ultimate Capacity of Pile Groups in Compression, Pullout & Lateral Load; Efficiency; Settlements of Pile Groups; Interaction of Axially & Laterally Loaded Pile Groups, Codal Provisions.

UNIT-V

Special Topics of Foundation Engineering

Foundations on Collapsible Soils: Origin and occurrence, Identification, Sampling and Testing, Preventive and Remedial measures.

Foundations on Expansive Soils: The nature, origin and occurrence, Identifying, testing and evaluating expansive soils, typical structural distress patterns and Preventive design & construction measures.

***Introduction to Reliability-Based Design**: Brief introduction of probability and statistics, LRFD for structural strength requirements, LRFD for geotechnical strength requirements, Serviceability requirements

TEXT BOOKS

1. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004)
2. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012. Phi Learning (2008)

REFERENCE BOOKS

1. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
2. Poulos, H. G. & Davis, E. H. - Pile Foundation Analysis and Design john wiley & sons inc (1980-08)
3. Tomlinson, M. J. - Foundation Design and Construction - Prentice Hall (2003).
4. Baecher, G.B. & Christian, J.T. – Reliability and Statistics in Geotechnical Engineering, Wiley Publications (2003)

Outcome:

1. Students should be in a position to design foundations for varieties of structures resting on soil deposits, and appreciate the importance of reliability based design in geotechnical engineering.

***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/C**
4/ - /- / 4

(A920107) ADVANCED REINFORCED CONCRETE DESIGN
(Core Elective – II)

Objectives :

- To impart knowledge on the behavior and design on various reinforced concrete structural elements.

UNIT I

Basic Design Concepts: Behaviour in flexure, Design of singly reinforced rectangular sections, Design of doubly reinforced rectangular sections, Design of flanged beams, Design of shear, Design for Torsion, Limit state of Serviceability: Deflections of Reinforced concrete beams and slabs, short term deflection and long term deflection, estimation of crack width in RCC members, calculation of crack widths.

UNIT II

Limit Analysis of R.C. Structures: Rotation of a plastic hinge, Redistribution of moments, moment rotation characteristics of RC member, I.S. code provisions, applications for fixed and continuous beam. Yield line analysis for slabs: Upper bound and lower bound theorems – yield line criterion – Virtual work and equilibrium methods of analysis for square and circular slabs with simple and continuous end conditions.

UNIT III

Design of Ribbed slabs, Flat 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 strip-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.

UNIT IV

Design of Reinforced Concrete Deep Beams & Corbels: Steps of Designing Deep Beams, Design by IS 456, Checking for Local Failures, Detailing of Deep Beams, Analysis of Forces in a Corbels , Design of Procedure of Corbels, Design of Nibs.

UNIT V

Design of Compression members: Estimation of effective length of a column-Code requirements on Slenderness Limits, Design of Short Columns under Axial Compression, Design of Short Columns with Uniaxial Bending, Design of Short Columns under Biaxial Bending, Design of Slender Columns.

Design of Combined Footings- Distribution of soil Pressure – Geometry of Two Column Combined Footing – Design Considerations in Combined Footing for Two – Columns.

TEXT BOOKS:

1. Reinforced concrete design by S. Unnikrishna Pillai & Menon, Tata Mc. Graw Hill, 2nd Edition, 2004
2. Advanced Reinforced Concrete Design – P.C. Varghese, Prentice Hall of India, 2008
3. Limit state theory and design of reinforced concrete by Dr. S.R. Karve and Dr. V.L. Shah, Standard Publishers, Pune, 3rd Edition, 1994.
4. Principles of Reinforced Concrete Design by Mete A. Sozen, Toshikatsu Ichinose, Santiago Pujol July 14, 2014 CRC Press

REFERENCE BOOKS:

1. Reinforced concrete design by Kennath Leet, Tata Mc. Graw-Hill International, editions, 2nd edition, 1991.
2. Reinforced concrete structural elements – Behaviour, Analysis and design by P.Purushotham, Tata Mc.Graw-Hill, 1994.
3. Design of concrete structures – Arthus H. Nilson, David Darwin, and Chorles W. Dolar, Tata Mc. Graw-Hill, 3rd Edition, 2005.
4. Reinforced concrete structures, Vol.1, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, 2004.
5. Reinforced Concrete Structures – I.C. Syal & A.K. Goel, S. Chand, 2004.

Outcomes :

1. The learner will be able to design the reinforced concrete elements like beams, slabs and compression members.

***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/ C**
4/- /- / 4

(A920108) BRIDGE ENGINEERING
(Core Elective – II)

Objectives:
- To impart knowledge on the behavior and design aspects of various types of bridges.

UNIT I

Concrete Bridges: Introduction-Types of Bridges-Economic span length-Types of loading-Dead load-live load-Impact Effect-Centrifugal force-wind loads-Lateral loads-Longitudinal forces-Seismic loads-Frictional resistance of expansion bearings-Secondary Stresses-Temperature Effect-Erection Forces and effects-Width of roadway and footway-General Design Requirements.

UNIT II

Solid slab Bridges: Introduction-Method of Analysis and Design.

UNIT III

Girder Bridges: Introduction-Method of Analysis and Design-Courbon's Theory, Grillage analogy

UNIT IV

Pre-Stressed Concrete Bridges: Basic principles-General Design requirements-Mild steel reinforcement in prestessed concrete member-Concrete cover and spacing of pre-stressing steel-Slender beams-Composite Section-Propped-Design of Propped Composite Section-Unproped composite section-Two-stage Prestressing-Shrinking stresses-General Design requirements for Road Bridges.

UNIT V

Analysis of Bridge Decks: Harmonic analysis and folded plate theory-Grillage analogy-Finite strip method and FEM. Sub-structure of bridges: Substructure- Beds block-Piers- Pier Dimensions- Design loads for piers- Abutments- Design loads for Abutments.

REFERENCES:

1. Design of Concrete Bridges by M.G.Aswani, V.N.Vazirani and M.M.Ratwani.
2. Essentials of Bridge Engineering by Johnson Victor, Oxford & IBH.
3. Bridge Deck Behaviour by E.C.Hambly.
4. Design of Bridges by N.Krishna Raju, Oxford & IBH.
5. Design of Bridges by V.V.Sastry, Dhanpat Rai & Co
6. Concrete Bridge Design and Practice by V.K.Raina.

Outcomes: The learner will be able to analyze and design of different types of bridges.

***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/C**
4/-/- / 4

(A920109) PLASTIC ANALYSIS AND DESIGN
(Core Elective – II)

Objectives:

- To impart knowledge on the analysis of steel structures like continuous beams, steel frames and connection, using Plastic Analysis.

UNIT – I

Analysis of Structures for Ultimate Load: Fundamental Principles – statical method of Analysis – Mechanism method of analysis – Method of analysis, Moment check – Carry over factor – Moment Balancing Method.

UNIT - II

Design of Continuous Beams: Continuous Beams of uniform section throughout – Continuous Beams with different cross-sections.

UNIT - III

Secondary Design Problems: Introduction – Influence of Axial force on the plastic moment – influence of shear force – local buckling of flanges and webs – lateral buckling – column stability.

UNIT - IV

Design of Connections: Introduction – requirement for connections – straight corner connections – Haunched connection – Interior Beam-Column connections.

UNIT - V

Design of Steel Frames: Introduction – Single bay, single storey frames – simplified procedures for Sinole span frames – Design of Gable frames with Haunched Connection. Ultimate Deflections:

Introduction – Deflection at ultimate load – Deflection at working load – Deflections of Beams and Sinole span frames.

REFERENCES:

1. Plastic Design of Steel Frames, L.S.Beedle.
2. Plastic Analysis, B.G.Neal.
3. Plastic Analysis, Horve.

Outcomes: The learner will be able to design continuous beams and steel frames.

***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/C**
4/-/- / 4

(A920110)COMPUTER ORIENTED NUMERICAL METHODS
(Open Elective – I)

Objectives :

- To impart knowledge about various methods of analysing linear equations and understand the different mathematical techniques.

Unit I

Solutions 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, Successive over –relaxation method.

Eigen values and eigen vectors: Jacobi method for symmetric matrices- Given's method for symmetric matrices-Householder's method for symmetric matrices-Rutishauser method of arbitrary matrices – Power method.

UNIT II

Interpolation: Linear Interpolation - Higher order Interpolation - Lagrange Interpolation – Interpolating polynomials using finites differences- Hermite Interpolation -piece-wise and spline Interpolation.

Unit III

Finite Difference and their Applications: Introduction- Differentiation formulas by Interpolating parabolas – Backward and forward and central differences- Derivation of Differentiation formulae using Taylor series- Boundary conditions- Beam deflection – Solution of characteristic value problems- Richardson's extrapolation- Use of unevenly spaced pivotal points- Integration formulae by interpolating parabolas- Numerical solution to spatial differential equations

UNIT IV

Numerical Differentiation: Difference methods based on undetermined coefficients- optimum choice of step length– Partial differentiation.

Numerical Integration: Method based on interpolation-method based on undetermined coefficient – Gauss – Lagrange interpolation method- Radaua integration method- composite integration method –

Double integration using Trapezoidal and Simpson's method.

UNIT V

Ordinary Differential Equation: Euler's method – Backward Euler method – Mid point method – single step method, Taylor's series method- Boundary value problems.

REFERENCES:

1. Numerical methods for scientific and engineering computations. M.K.Jain-S.R.K.Iyengar – R.K.Jain Willey Eastern Limited.
2. Numerical methods by S.S.Shastry.
3. Applied numerical analysis by – Curtis I.Gerala- Addission Wasley – published campus.
4. Numerical methods for Engineers Stevan C.Chopra, Raymond P.Canal Mc. Graw Hill book company.
5. C Language and Numerical methods by C.Xavier – New age international publisher.
6. Computer based numerical analysis by Dr. M.Shanta Kumar, Khanna Book publishers, New Delhi.

Outcomes :

1. The learner will be able to apply various mathematical techniques to Structural engineering problems.

***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/C**
4/-/- / 4

(A920111) RELIABILITY ENGINEERING
(Open Elective – I)

Objectives:
- To impart knowledge on concepts of reliability, discrete distributions and hierarchical systems.

UNIT I

Basic Concepts of Reliability : Introduction, Reliability and Quality, Failures and Failure Modes, Causes of Failures and Unreliability, Maintainability and Availability, History of Reliability, Reliability Literature.

UNIT II

Design for Reliability : Constraints and Considerations : Reliability Analysis, Mathematical Models and Numerical Evaluation, Designing for Higher Reliability, Redundancy Techniques, Equipment Hierarchy, Reliability and Cost.

UNIT –III

Discrete Distributions : Density and distributions, Continuous Distributions, Numerical Characteristics of Random Variables, Laplace Transform.

UNIT-IV

Maintainability and Availability Concepts : Introduction, Maintainability Function, Availability Function, Frequency of Failure, Two-unit parallel system with Repair, K-out-of M systems, Preventive Maintenance**.**

UNIT-V:

Hierarchical Systems : Introduction, Logic Diagram Approach, Conditional Probability Approach, System Cost, Illustrations and Discussions, Reliability Approximations.

TEXT BOOKS :

1. Reliability Engineering by E. Balagurusamy, McGraw Hill Education(India) Pvt. Ltd.
2. Reliability Evaluation of Engineering Systems by Roy Billinton & Ronald N. Allan, Springer.
3. Reliability of Structures, Second Edition by Andrzej S. Nowak, Kevin R. Collins December 20, 2012 by CRC Press

Outcomes :
- The learner will be able to design a reliable systems and develop and analyse reliability and cost models for hierarchical systems.

***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/C**
4/-/-/ 4

(A920112)EXPERIMENTAL STRESS ANALYSIS (Open Elective – I)

Objectives:

- To impart knowledge on the strain measurement, brittle coating and photo elasticity.

UNIT I

Basic equations and Plane Elasticity Theory: Introduction, Strain equations of Transformation, Compatibility, Stress-Strain Relations-Two dimensional State of Stress. The Plane-Elastic problem, The Plane-Strain Approach, Plane Stress, Airy's Stress function-Cartesian Co-ordinates-Two dimensional problems in Polar Co-ordinates, Polar Components of Stress in terms of Airy's Stress function, Forms.

Principles of Experimental Approach: Merit of Experimental Analysis introduction, uses of experimental stress analysis-Advantages of experimental stress analysis, Different methods, Simplification of problems.

UNIT II

Strain Measurement using Strain Gauges: Definition of strain and its relation to Experimental Determinations, properties of strain-gauge systems, Types of strain gauges, Mechanical and Optical strain gauges. Electrical Strain Gauges - Introduction, LVDT - resistance strain gauge - various types - gauge factor, Materials for adhesion base, etc.

Strain Rosettes: Introduction, The three element rectangular Rosette - The delta rosette - Corrections for Transverse strain effects.

UNIT III

Brittle Coating Method: Introduction, Coating stresses - Failure theories - Brittle coating Crack pattern - Crack detection - Types of Brittle coating - Test procedures for brittle coating analysis - Calibration procedures - Analysis of brittle coating data.

UNIT IV

Theory of Photo Elasticity: Introduction, Temporary double refraction - The stress optic law - Effects of stressed model in a Polaris cope for various arrangements - Fringe sharpening, Brewster stress optic law.

UNIT V

Two Dimensional Photo Elasticity: Introduction, Isochromatic Fringe patterns - Isoclinic fringe patterns, passage of light through plane Polaris cope and circular Polaris cope, Isoclinic fringe pattern - Computation techniques - calibration methods, separation methods, scaling Model to Proto type stress- Materials for photo - elasticity, properties of photo elastic materials.

REFERENCES :

1. Experimental Stress Analysis by J.W.Dally and W.F.Riley
2. Experimental Stress Analysis by Dr. Sadhu Singh
3. Experimental Stress Analysis by Dove and Adams

Outcomes: The learner will be able to understand the properties of strain-gauge systems and the computation techniques.

***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – I Sem. (Structural Engg.) **L/T/P/C**
-/- /4 / 2

(A920113) ADVANCED CONCRETE LABORATORY

Objectives: To impart knowledge on the test on cement and aggregates.

1 Tests on cement - Consistency, Setting times, Soundness, Compressive Strength.
2. Gradation Charts of Aggregates.
3. Aggregate Crushing value
4. Aggregate Impact value.
5. Workability Tests on Fresh self compacting concrete
6. Air Entrainment Test on fresh concrete.
7. Marsh cone test.
8. Permeability of Concrete.
9. Non Destructive Testing of Concrete.
10. Accelerated Curing of Concrete.
11. Influence of W/C ratio on strength and Aggregate / Cement ratio on workability and Strength

Outcomes : The learner will be able to understand the properties of the materials and the behavior of the concrete.

***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
4/- / - /4

(A920201) FINITE ELEMENT METHOD

UNIT I

Introduction: Concepts of FEM - steps involved - merits and demerits - energy principles – discrimination - Raleigh - Ritz method of functional approximation.

Principles of Elasticity: Stress equations - strain displacement relationships in matrix form plane stress, plane strain and axi-symmetric bodies of revolution with axi-symmetric loading.

UNIT II

One dimensional FEM: Stiffness matrix for beam and bar elements - shape functions foe ID elements.

Two dimensional FEM: Different types of elements for plane stress and plane strain analysis - displacement models - generalized coordinates - shape functions - convergent and compatibility requirements - geometric invariance - natural coordinate system - area and volume coordinates - generation of element stiffness and nodal load matrices

UNIT III

Isoparametric formulation: Concept - different isoparametric elements for 2D analysis - formulation of 4-noded and 8-noded isoparametric quadrilateral elements - Lagrange elements - serendipity elements.

Axi Symmetric Analysis: bodies of revolution - axi symmetric modeling - strain displacement relationship - formulation of axi symmetric elements.

Three dimensional FEM: Different 3-D elements-strain-displacement relationship – formulation of hexahedral and isoparametric solid element.

UNIT IV

Introduction to Finite Element Analysis of Plates: basic theory of plate bending - thin plate theory - stress resultants - Mindlin's approximations - formulation of 4-noded isoperimetric quadrilateral plate element – Shell Element.

UNIT V

Introduction to non-linear analysis-basic methods-application to Special structures.

REFERENCES:

1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David S. Malkus and Michael E. Plesha, John Wiley & Sons.
2. Finite element Methods by OC Zienkiewicz
3. Finite element analysis, theory and progarmming by GS Krishna Murthy.
4. Introduction to Finite element Method by Tirupathi Chandra Patila and Belugunudu.
5. Introduction to Finite element Method by JN Reddy

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
4/- / - /4

(A920202) STRUCTURAL DYNAMICS

UNIT I:

Theory of vibrations: Introduction - Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion - Vectorial representation of S.H.M. - Free vibrations of single degree of freedom system - undamped and damped vibrations - critical damping - Logarithmic decrement - Forced vibration of SDOF systems - Harmonic excitation -Dynamic magnification factor – Phase angle – Bandwidth

UNIT II

Introduction to Structural Dynamics : Fundamental objectives of dynamic analysis - Types of prescribed loading - Methods of discretization - Formulation of equations of motion by different methods – Direct equilibration using Newton's law of motion / D'Alembert's principle, Principle of virtual work and Hamilton principle.

Single Degree of Freedom Systems : Formulation and solution of the equation of motion - Free vibration response - Response to Harmonic, Periodic, Impulsive and general dynamic loadings - Duhamel integral.

UNIT III

Multi Degree of Freedom Systems : 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 natural frequencies and mode shapes - Analysis of Dynamic response – Normal co-ordinates - Uncoupled equations of motion - Orthogonal properties of normal modes - Mode superposition procedure.

UNIT IV

Practical Vibration Analysis: Introduction - Stodola method - Fundamental mode analysis - Analysis of second and higher modes - Holzer method - Basic procedure.

Continuous Systems: Introduction - 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 - Principles of application to continuous beams.

UNIT V

Introduction to Earthquake Analysis: Introduction - Excitation by rigid base translation - Lumped mass approach - SDOF and MDOF systems - I. S. Code methods of analysis for obtaining response of multi storeyed buildings.

REFERENCES:

1. Dynamics of Structures by Clough & Penzien, McGraw Hill, New york
2. Structural Dynamics by Mario Paz, C.B.S Publishers, New Delhi.
3. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi.
4. I.S: 1893 - 1984, "Code of practice for Earthquake resistant design of Structures" and latest I.S: 1893 - 2002 (version) Part-1

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
4/- / - /4

(A920203) PRE-STRESSED CONCRETE

UNIT I.

General Principles of Prestressed Concrete : Pre–tensioning and post – tensioning – Prestressing by straight, concentric, eccentric, bent and parabolic tendons – Different methods and systems of prestressing like Hoyer system, Freyssinet system, Magnel Blaton system – Lee-Mc call system.

Losses of Prestress : Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortening of concrete, shrinkage of concrete, creep of concrete, relaxation of steel, slip in anchorage, bending of member and frictional loss – Analysis of sections for flexure.

UNIT II.

Design of Section for Flexure : Allowable stresses – Elastic design of simple beams having rectangular and I-section for flexure – kern lines – cable profile and cable layout.

Design of Sections for Shear : Shear and Principal stresses – Improving shear resistance by different prestressing techniques – horizontal, sloping and vertical prestressing – Analysis of rectangular and I–beam – Design of shear reinforcement – Indian code provisions

UNIT III.

Deflections of Prestressed Concrete Beams : Short term deflections of uncracked members– Prediction of long-time deflections – load – deflection curve for a PSC beam – IS code requirements for max. deflections.

UNIT IV

Transfer of Prestress in Pretensioned Members : Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block – Analysis by approximate Guyon and Magnel methods – Anchorage zone reinforcement.

UNIT V.

Statically Indeterminate Structures : Advantages & disadvantages of continuous PSC beams – Primary and secondary moments – P and C lines – Linear transformation concordant and non-concordant cable profiles – Analysis of continuous beams and simple portal frames (single bay and single story)

REFERENCES :

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co ., New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed concrete by S. Ramamrutham Dhanpat Rai & Sons, Delhi.

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
4/- / - /4

(A920204) ADVANCED STEEL DESIGN (*Core Elective III*)

UNIT-I:

SIMPLE CONNECTIONS –RIVETED, BOLTED PINNED AND WELDED CONNECTIONS:

Riveted connections-Bolted Connections- Load Transfer Mechanism – Failure of Bolted Joints – Specifications for Bolted Joints – Bearing – Type Connections – Tensile Strength of Plate – Strength and Efficiency of the Joint – Combined Shear and Tension – Slip – Critical Connections – Praying Action – Combined Shear and Tension for Slip- Critical Connections. Design of Groove welds- Design of Fillet Welds- Design of Intermittent fillet welds- Failure of Welds.

UNIT –II:

ECCENTRIC AND MOMENT CONNECTIONS:

Introduction – Beams – Column Connections- Connections Subjected to Eccentric Shear – Bolted Framed Connections- Bolted Seat Connections – Bolted Brackete Connections. Bolted Moment Connections – Welded Framed Connections – Welded Brackete Connections - Moment Resistant Connections.

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, design of built up purlins, design of knee braced trusses and stanchions. 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 Soils

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

References:

1. Design of Steel Structures. P. Dayaratnam, Publisher : S. Chand, Edition 2011 – 12.
2. Design Steel Structures Volume – II, Dr. Ramachandra & Vivendra Gehlot Scientitic Publishes Journals Department.
3. Limit State Design of Steel Structures S.K. Duggal Mc Graw Hill Education Private Ltd. New Delhi.
4. Design of Steel Structures Galyord & Gaylord, Publisher ; Tata Mc Graw Hill, Education. Edition 2012.
5. Indian Standard Code – IS – 800-2007.

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
4/- / - /4

(A920205) SOIL DYNAMICS AND FOUNDATION ENGINEERING
(Core Elective III)

UNIT I:
Types of machine foundations – general requirements design – criteria for machine foundations, permissible amplitudes and bearing pressure. Resonance and its effect – free and forced Vibrations with and without damping – constant force and rotating mass type excitation – magnification steady state vibrations – logarithmic decrement.

UNIT II:
Natural frequency of foundation – soil system – Barkan's and I.S. methods of determining natural frequency.

UNIT III:
Elastic properties of soil for dynamical purpose and their experimental determination – Elastic waves and their characteristics – Experimental determination of shear modulus from wave theory.

UNIT IV:
Apparent soil mass – bulb of pressure concept – Pauw's analogy of foundation – soil systems (Concept only) - Theory of elastic half space – lamb and the dynamic Boussinesq's problem – Relsner's solution and its limitations – Quinlan and Sung's modifications – Hsiegh's equations for vertical vibration.

UNIT V:
Principles of design of foundations for reciprocating and impact type of machine – as per I.S. Codes. Vibration isolation – types and methods of isolation – isolating materials and their properties.

REFERENCES:

1. Hand Book of Machine Foundations by S. Srinivasulu and Vaidganathan.
2. Soil Mechanics & Foundation Engineering by B.C. Punmia.
3. Analysis and Design of Foundation and retaining structures-Sham Sher Prakets, Etal.
4. Vibration of Soils & Foundations – Richant Hall & Woods

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
4/- / - /4

(A920206) STABILITY OF STRUCTURES
(Core Elective III)

UNIT – I

Beam Columns: Differential equations for beam columns- beam columns with concentrated loads – continuous lateral loads-couples- beam columns with built in ends – continuous beams with axial load – application of trigonometrically series – Effects of initial curvature on deflections – Determination of allowable stresses.

UNIT - II

Elastic Buckling of bars and frames: Elastic Buckling of straight columns – Effect of shear stress on buckling – Eccentrically and laterally loaded columns- Buckling of frames-large deflections of buckled bars-Energy methods- Buckling of bars on elastic foundations- Buckle line of bar with intermediate compressive forces - Buckling of bars with change in cross-section – Effect of shear force on critical load- built up columns.

UNIT - III

In Elastic Buckling: Buckle line of straight bar- Double modulus theory – Tangent modulus theory, Inelastic lateral Buckling. Experiments and design formulae: Experiments on columns – Critical stress diagram – Empirical formulae for design – various end conditions

UNIT - IV

Torsion Buckling: Pure torsion of thin walled bars of open cross section – Non-uniform torsion of thin walled bars of open cross section- Torsional buckling – Buckling by torsion and flexure.

UNIT – V

Lateral buckling of simply supported Beams: Beams of Rectangular cross-section subjected to pure bending. Buckling of simply supported Rectangular plates: Derivation of equation of plate subjected to constant compression in one and two directions.

REFERENCES

1. Theory of elastic Stability by Timshenko & Gere-Mc Graw Hill
2. Stability of metallic structures by Blunch- Mc Graw Hill
3. Theory of Beam- Columns Vol I by Chem. & Atste Mc. Graw Hill

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
4/- / - /4

(A920207) DESIGN OF SHELLS AND FOLDED PLATES
(Core Elective IV)

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

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

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

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

UNIT V:
Folded plates – Introduction – Types of folded plates – structural behaviour of folded plates – advantages – Assumptions Whitney method of analysis – Edge shear equation - Analysis of folded plates of Whitney's method.

Simpsons method of Analysis of folded plates – moment and stress distribution – no rotation and rotation solutions – continuous folded plates – pre stressed continuous folded plates.

TEXT BOOKS:
1. Analysis and design of concrete shell roofs by G.S.Ramaswami.
2. Design of concrete shell roofs by Chaterjee.

REFERENCES:
1. Design of concrete shell roofs by Billington
2. Shell Analysis by N.K.Bairagi.
3. Advanced R.C Design by Dr.N.Krishna Raju.

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
4/- / - /4

(A920208) EARTHQUAKE RESISTANT DESIGN OF BUILDINGS
(Core Elective IV)

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.

UNIT - II

Conceptual design: Introduction-Functional planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical members-Twisting of buildings-Ductility-definition-ductility relationships-flexible buildings-framing systems-choice of construction materials-unconfined concrete-confined concrete-masonry-reinforcing steel. Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method-dynamic analysis-response spectrum method-Time history method.

UNIT - III

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members-Structural models for frame buildings- Seismic methods of analysis- Seismic deign methods- IS code based methods for seismic design- Seismic evaluation and retrofitting-Vertical irregularities- Plan configuration problems- Lateral load resisting systems-Determination of design lateral forces-Equivalent lateral force procedure- Lateral distribution of base shear. Masonry Buildings: Introduction-Elastic properties of masonry assemblage- Categories of masonry buildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls-Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses-Seismic design requirements- Lateral load analysis of masonry buildings.

UNIT - IV

Structural Walls and Non-Structural Elements: Strategies in the location of structural walls-sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of non-structures- Effects of non-structural elements on structural system-Analysis of non-structural elements-Prevention of non-structural damage- Isolation of non-structures.

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. Behaviour of beams, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquakes.

Capacity Based Design: Introduction to Capacity Design, Capacity Design for Beams and Columns-Case studies.

REFERENCE BOOKS:

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

REFERENCE CODES:

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

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
4/- / - /4

(A920209) FRACTURE MECHANICS
(Core Elective IV)

UNIT-I
Introduction to fracture mechanics of concrete

Structural failure based on material performance; Concepts of linear elastic fracture mechanics; Fracture mechanics of concrete.

UNIT-II
Principles of linear elastic fracture mechanics

Airy stress functions for problems in elasticity; Complex stress function; Elastic stress and displacement fields at crack tip; Stress intensity factors and crack opening displacements for useful geometries; Superposition of stress intensity factors; Plastic zone at crack tip; Griffith's fracture theory; Strain energy release rate for crack propagation; Relationship between stress intensity factor and strain energy release rate; Design based on linear elastic fracture mechanics.

UNIT-III
Principles of non-linear fracture mechanics
Energy principles for crack propagation in non-linear materials; J-integral for nonlinear elastic materials; Fracture resistance (R curve); Crack tip opening displacement.

UNIT-IV
Structure and fracture process of concrete
Constituents and microstructure of concrete; Fracture behaviour and strain localization of concrete; Fracture process zone and toughening mechanisms; Experimental determination of fracture zone; Influence of fracture process zone on fracture behaviour of concrete.

UNIT-V
Fracture behavior of different materials. Test methods. Variation of plastic zone over the thickness, Slip planes in plane strain and plane stress, Experimental evidence, Minimum thickness for fracture toughness specimen based on plastic zone, Fracture testing – early attempts, Fracture toughness as a function of specimen thickness, Requirements of the test, Candidate fracture toughness, Compact tension and three point bend specimens, Chevron notch – visualization exercise.

TEXT BOOKS:

1. Elements of fracture mechanics by Prashant Kumar, Wheeler Publishing, 1999
2. Rock and Other Quasi-Brittle Materials by Surendra P. Shah, Stuart E. Swartz, Chengsheng Ouyang, Publisher : Wiley , 1995.
3. David Broek, Elementary Engineering Fracture Mechanics, 3rd Rev Edition, Springer, June 1982.

REFERNCE BOOKS:

1. Analysis of Concrete Structures by Fracture Mechanics by by L. Elfgren, Publisher**:** Routledge, 1990.
2. Fracture mechanics – Applications to concrete , Edited by Victor C.Li and Z.P.Bazant, ACI SP118.
3. CT Suri and ZH Jin, Fracture Mechanics, 1st Edition, Elsevier Academic Press, 2012.

***

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
4/- / - /4

(A920210) REPAIR & REHABILITATION OF BUILDINGS
(Open Elective II)

UNIT-I:

Introduction

Deterioration of structures with aging; Need for rehabilitation. Effects due to climate , temperature, chemicals , wear and erosion , design and construction errors , corrosion mechanism , Effects of cover thickness and cracking, Method of corrosion production., corrosion inhibitors , corrosion resistant steels, coatings , cathodic production

Distress in concrete /steel structures

Types of damages; Sources or causes for damages; effects of damages; Case studies.

UNIT-II:

Structural Health Monitoring

An overview of Structural Health Monitoring, Structural Health Monitoring and Smart Materials, Structural Health Monitoring versus Non Destructive Testing, A broad overview of smart materials, Overview of Application potential of SHM.

UNIT-III:

Maintenance and Repair Strategies

Definitions: Maintenance, Repair , Rehabilitation, Facets of maintenance , Importance of maintenance, preventive measures on various aspects , assessment procedure for evaluating damaged structure, causes of deterioration – Testing techniques .

UNIT-IV:

Materials and Methods of Repair

Special concrete and mortar , Concrete chemicals , special elements for accelerator , strength gain, expansive cement , polymer concrete , sulphur infiltrated concrete , ferro cement, fibre reinforced concrete. Shortcreting; Grouting; Epoxy-cement mortar injection; Crack ceiling

UNIT-V:

Seismic Retrofitting of reinforced concrete buildings

Introduction; Considerations in retrofitting of structures; Source of weakness in RC frame building – Structural damage due to the discontinuous load path; Structural damage due to lack of deformation; Quality of workmanship and materials; Classification of retrofitting techniques; Retrofitting strategies for RC buildings – Structural level (global) retrofits methods; Member level (local) retrofit methods; Comparative analysis of methods of retrofitting

TEXT BOOKS:

1. Diagnosis and treatment of structures in distress by R.N.Raikar, Published by R&D Centre of Structural Designers & Consultants Pvt.Ltd., Mumbai, 1994.
2. Earthquake resistant design of structures by Pankaj Agarwal and Manish Shrikhande, Prentice-Hall of India, 2006.

REFERENCE BOOKS:

1. Handbook on Repair and Rehabilitation of RCC buildings, Published by CPWD, Delhi, 2002.
2. Denison Campbell, Allen and Harold Roper , Concrete Structures, materials, maintenance and repair, Long man, Scientific and Technical UK 1991.

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
4/- / - /4

(A920211) COMPOSITE MATERIALS
(Open Elective II)

UNIT-I:

Introduction: Requirements of structural materials, influence of nature of materials in structural form, Nature of structural materials- Homogeneous materials, composite materials.

UNIT-II:

Macro mechanical Properties of composite Laminae: Introduction, Assumptions and Idealizations, Stress Strain relationships for composite Laminae- Isotropic, Orthotropic laminae, Strength Characteristics- Basic concepts, Strength hypothesis for isotropic and Orthotropic laminae. Macro mechanical Analysis of composite Laminae: Introduction, Assumptions and Limitations, Stiffness characteristics of glass reinforced laminae- Stress-Strain relationships in continuous, discontinuous fibre laminae, Strength characteristics of glass reinforced laminae- Strengths in continuous discontinuous fibre laminae.

UNIT-III:

Behaviour of Glass Fibre-Reinforced laminates: Introduction, Stiffness characteristics of Laminated composites-Behaviour of Laminated beams and plates, Strength characteristics of Laminated composites- Strength analysis and failure criteria, Effect of inter laminar structures. Glass Reinforced Composites: Introduction, Continuously reinforced laminates-uni-directionally and multi directionally continuously reinforced laminates, Discontinuously reinforced laminates – Stiffness and Strength properties.

UNIT- IV:

GRP properties relevant to structural Design: Introduction, Short-term strength and stiffness-Tensile, Compressive, Flexural and Shearing. Long term strength and stiffness properties, Temperature effects, Effect of fire, Structural joints- Adhesive, mechanical, Combinational, Transformed sections.

UNIT-V:

Design of GRP Box Beams: Introduction, loading, span and cross-sectional shape, Selection of material, Beam manufacture, Beam stresses, Experimental Behaviour, Effect on Beam performance-Modulus of Elasticity, Compressive Strength, I value, prevention of compression buckling failure, Behaviour under long term loading.

Design of Stressed skinned roof structure: Introduction, loading and material properties, preliminary design, and computer analysis.

REFERENCE:

1. GRP in Structural Engineering M.Holmes and D.J.Just.
2. Mechanics of Composite materials and Structures by Manjunath Mukhopadhyay; Universities Press

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
4/- / - /4

(A920212) OPTIMIZATION TECHNIQUES
(Open Elective II)

UNIT I:
Introduction to Optimization: Introduction - Historical developments - Engineering applications of Optimization - Statement of an Optimization problem - Classification of Optimization problems - Optimization Techniques. Optimization by calculus: Introduction - Unconstrained functions of a single variable - Problems involving simple constraints - Unconstrained functions of several variables - treatment of equality constraints - Extension to multiple equality constraints - Optimization with inequality constraints - The generalized Newton-Raphson method.

UNIT II:
Linear Programming: Introduction - Applications of linear programming - standard form of a linear programming problem - Geometry of linear programming problems - Definitions and theorems - Solution of a system of Linear simultaneous equations - Pivotal reduction of a general system of equations - Motivation of the Simplex Method - Simplex Algorithm - Two phases of the simplex method. non-Linear Programming: Introduction - Unimodal Function - Unrestricted search - Exhaustive search - Dichotomous search - Interval Halving method - Fibonacci method - Golden section method - Comparison of elimination methods - Unconstrained optimization techniques - Direct search methods - Random search methos - grid search method - Univariate method - Powell's method - Simplex method - Indirect search methods - Gradient of a function - Steepest descent method - Conjugate gradient - Newton's method.

UNIT III:
Dynamic Programming: Introduction - Multistage decision processes - concept of sub-optimization and the principle of optimality - computational procedure in dynamic programming - example illustrating the Calculus method of solution - example illustrating the Tabular of solution - conversion of a final value problem into an initial value problem - continuous dynamic programming - Additional applications.

UNIT IV:
Network Analysis: Introduction - Elementary graph theory - Network variables and problem types - Minimum-cost route - Network capacity problems - Modification of the directional sense of the network.

UNIT V

Application of Optimization techniques to trusses, Beams and Frames.

REFERENCES

1. Optimization: Theory and Applications by S.S.Rao.
2. Numerical Optimization Techniques for Engineering Design with applications by G.N.Vanderplaats.
3. Elements of Structural Optimization by R.T.Haftka and Z.Gurdal.
4. Optimum Structural Design by U.Kirsch.
5. Optimum Design of Structures by K.I.Majid.
6. Introduction to Optimum Design by J.S.Arora.

****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech – I Year – II Sem. (Structural Engg.) **L/T/P/C**
-/- / 4 /2

(A920213) CAD LAB

1. Program using arrays and functions for matrix manipulation.
2. Programs to draw bending moment and shear force diagrams.
3. Program for design of slabs.
4. Program for design of beams.
5. Program for design of column and footing.
6. Analysis of truss.
7. Analysis of multistoreyed space frame.
8. Analysis of Bridge deck slab.

****