ACADEMIC REGULATIONS FOR
M.Tech. PROGRAMMES

Applicable to the students admitted from the
Academic year 2015-2016

MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING
(Autonomous)

(Approved by AICTE, New Delhi, and permanently affiliated to JNTUK, Kakinada)
Re-Accredited by NBA, Re-accredited by NAAC with 'A' Grade,
Listed u/s 2(f) & 12(B) of UGC Act 1956.
Vijayaram Nagar Campus, Chintalavalasa,
Vizianagaram-535005, Andhra Pradesh

The visionaries

Late Dr. P V G Raju
Raja Saheb of Vizianagaram
Founder Chairman-MANSAS
Ex-Minister for Education and Health, Govt. of AP
Ex Member of Parliament

Dr. P. Anand Gajapathi Raju
Chairman-MANSAS
Ex-Minister for Education and Health
Govt. of AP
Ex Member of Parliament

P. Ashok Gajapathi Raju
Vice Chairman-MANSAS
Union Minister for Civil Aviation,
Govt. of India
Ex-Minister for Finance, Govt. of AP

Vision

Maharaj Vijayaram Gajapathi Raj College of Engineering strives to become a centre par excellence for technical education where aspiring students can be transformed into skilled and well-rounded professionals with strong understanding of fundamentals, a flair for responsible innovation in engineering practical solutions applying the fundamentals, and confidence and poise to meet the challenges in their chosen professional spheres.

Mission

The management believes imparting quality education in an atmosphere that motivates learning as a social obligation which we owe to the students, their parents/guardians and society at large and hence the effort is to leave no stone unturned in providing the same with all sincerity. Towards that end, the management believes special focus has to be on the following areas:

- Have on-board staff with high quality experience and continuously updating themselves with latest research developments and sharing that knowledge with students.
- Having a well stream-lined teaching learning process that is continuously assessed for effectiveness and fine-tuned for improvement.
- Having state-of-the-art lab and general infrastructure that gives students the necessary tools and means to enhance their knowledge and understanding.
- Having a centralized department focused on improving placement opportunities for our students directly on campus and coordinating the training programs for students to complement the curriculum and enhance their career opportunities.
- Having advanced research facilities and more importantly atmosphere to encourage students to pursue self-learning on advanced topics and conduct research.

ABOUT THE INSTITUTION:

Maharajah Alak Narayan Society of Arts and Science (MANSAS) is an Educational Trust founded by Dr. (late) P.V.G Raju, Raja Saheb of Vizianagaram in the hallowed memory of his father Maharajah Alak Narayan Gajapati with a view to confound socio-academic inequalities in the Vizianagaram principality executing a trust deed on 12-11-1958 duly established Maharajah's College and other educational institutions in and around Vizianagaram. The Trust is a charitable one published under Section 6 a (1) of A.P Charitable and Hindu Religious Institutions and Endowment Act 30 of 1987.

The object of the Trust is to manage the properties of educational institutions under it and to promote and advance the cause of education in general, besides awarding scholarships to deserving students enabling them to undergo special training in science and industries in and out of India. The Trust has made an uncompromising contribution to the nation by presenting the stalwarts like Sri V.V. Giri, former President of India, Prof. Swami Gnanananda, a renowned nuclear scientist, Major K. V. Krishna Rao and many more.

Trust offers KG to PG level education in Arts, Sciences, Law, Pharmacy, Humanities Education, Engineering and Management and presently houses 12 Educational Institutions. MVGR College of Engineering is one of the 12 institutes.

Maharaj Vijayaram Gajapathi Raj (MVGR) College of Engineering was established in the year 1997 by Maharaj Alak Narayan Society for Arts and Sciences (MANSAS) to impart quality technical education in north coastal Andhra Pradesh. MVGR College of Engineering is located in lush green, serene and pollution free environment spread over 60 acres of land in Chintalavalasa village situated in the outskirts of Vizianagaram, a fort city in the north coastal region of Andhra Pradesh. MVGR College of Engineering

- Established in 1997
- Re-Accredited for all eligible UG Programs by NBA
- Also Re-accredited with 'A' grade by NAAC of UGC
- Permanently affiliated to JN Technological University-Kakinada, KAKINADA

MVGR College of Engineering is rated as one among the best self-financing colleges in the state of Andhra Pradesh as it sets up highest standards in all areas of curricular, co-curricular and extra-curricular activities and in students' placements. Based on industry and expert's feedback, the college is updating the curriculum from time to time. The college offers many value added add-on courses students and conducts training programs to meet the industries' requirements.

Academic Regulations for M.Tech. Programmes

Applicable to the students admitted from the Academic year 2015-2016 onwards.

1. COURSE PATTERN:

- The program is for 2 academic years with 4 semesters.

2. AWARD OF DEGREE:

A student will be declared eligible for the award of degree if he/she fulfills the following academic regulations.

a) A student shall be declared eligible for the award of the degree, if he/she pursues a course of study for not less than Two academic years and not more than Four academic years.

b) The student shall register for 80 credits and secure all 80 credits.

c) Students who fail to complete their Two Years Course of study within Four years shall forfeit their seat and their admission shall stand cancelled.

3. CERTIFICATION PROGRAMME:

S. No.	Department	Name of the Program
1	MECH	Windchill 10.2 PDM by Adroitec Engineering Solutions Pvt. Ltd., Hyderabad
2	MECH	Creo 2.0 by PTC
3	MECH	Edgecam by Verosoft, UK
4	CHEM	Chemical Process Design and Simulation by Simtech Simulations, Hyderabad
5	ECE	Embedded Systems by ThinkLABS, Mumbai
6	ECE	Labview by National Instruments Systems India Pvt. Ltd.
7	ECE	Unified Technology Learning Program (UTLP) by Wipro Mission 10X
8	CSE, IT	PEGA by Virtusa Corporation
9	CSE, IT	Microsoft technologies by Microsoft Corp.
10	CSE, IT	Ethical Hacking by EC-Council Academia
11	CSE, IT	Java and C by Talent Sprint
12	CSE, IT	Network Analyst (CCNA) by Cisco Systems Inc
13	CSE, IT	Java Programming (OCJP) and DBMS by Oracle
14	EEE	PLC, Drives and Automation by Siemens
15	EEE	PLC by New Dawn Automation
16	Civil	Remote Sensing and GIS by Indian Institute of Remote Sensing

a) The institution shall offer the certification programs by it self or in collaboration with industry/such other institutions deemed to have specialized expertise in the proposed area of training.

b) Only students of the institution shall be eligible to register on payment of prescribed fee.

c) However, subject to availability of resources and the demand the institution may offer the program to external candidates meeting the pre-qualification requirements and in the order of the merit.

d) The duration of the course and design of the content shall be done by the respective departments of the institution by themselves or in collaboration with industry/such other institutions deemed to have specialized expertise in the proposed area of training.

e) The duration under normal condition shall not exceed 50 hours per semester else it can suitably distribute over a number of semesters.

f) Mere enrolment/registration for the program shall not entitle any claim for award of certificate.

g) A candidate shall be deemed eligible for the award of the certificate if he/she

- Attends at least 75% of scheduled training sessions
- Complies to all the requirements of submission of the assignments, presentations, seminars, projects, etc., and also appears for periodic tests
- Shall attain minimum levels of performance as prescribed by the departments successfully
- Shall pay such fee as deemed fit for the certification
- A candidate registered and failed to meet the requirements shall be permitted to repeat the said training one another time after remitting 25% of the fee fixed for the program as re-registration fee

4. COURSES OFFERED:

Name of the Program	Degree
UG Programs (Engineering & Technology)	B.Tech (Chemical) B.Tech.(CSE) B.Tech.(ECE) B. Tech (Mech) B.Tech(IT) B.Tech(EEE) B.Tech(Civil)
PG Programs (Engineering & Technology)	M.Tech.(Machine Design) M.Tech.(CSE) M.Tech.(VLSI) M.Tech.(CN&IS) M.Tech.(Structural Engg.) M. Tech. (Power Systems)
Other PG Programs	MBA
Research Programme	Ph.D

M.Tech.

5. DISTRIBUTION AND WEIGHTAGE OF MARKS:

a) All Theory courses are assessed for 100 marks with a split of 40 marks for internal assessment and 60 marks for semester end external examination.

- Two internal assessments tests (90 min each), for each theory course are conducted over the period of the semester, one in the middle and the other at the end and the performances are averaged for 30 marks.
- An internal assessment test shall have 3 questions each for 10 marks, all questions to be answered.
- A student shall be assessed for two assignments/seminars or a combination each for 5 marks and for a total of 10 marks.
- External examination is for 60 marks (180 min). Question paper contains 7 questions at least 1 question from each unit. Each question carries 12 marks. A student is expected to answer any 5 questions.

b) **Laboratory/Practice:**

All Laboratory/Practice courses are assessed for 100 marks with a split of 40 marks for internal assessment and 60 marks for semester end external examination.

- Continuous assessment for 20 marks for each experimental session finally averaged to 20 marks.
- An internal assessment test conducted at the end of the semester shall be assessed for another 20 marks where a student is expected to perform at least one laboratory test/experiment over duration of 3 hours or project based assessment.
- External examination is for 60 marks (180 min) conducted and assessed by an external and internal examiners.
- Both internal and external examination shall include assessment of the student on
    a) Knowledge of principles/concepts involved
    b) Experimental design
    c) Result interpretation and analysis
    d) Experimental report

c) Drawing/Design/Estimation:

These courses are assessed for 100 marks with a split of 40 marks for internal assessment and 60 marks for semester end external examination.

- Continuous assessment for 20 marks for each unit finally averaged to 20 marks.
- Two internal assessment tests are conducted during the semester which shall be assessed for another 20 marks by taking the average.

d) Project Evaluation:

Duration is TWO semesters -40 weeks are mandatory to submit.

- PRC includes HOD and two other senior faculties, one being the guide.
- To register for project work, a student shall complete all the course work requirements of I and II semesters.
- The progress of the work shall be periodically reviewed by PRC.
- The PRC shall authorise /approve change of guide/topic/title as deemed fit.
- A student shall submit Status Report in line with the recommended project calendar as approved by PRC.
- Student has to submit draft copy of thesis/dissertation to PRC, and also shall make an oral presentation. He/she shall publish the work in journal or international conference of repute and relevance.
- A student shall make 5 copies of PRC approved draft copy of the work and submit.
- Candidates who have successfully passed all the I and II semester courses shall be eligible for submitting the thesis.
- The thesis shall be adjudicated by the internal and external examiners in the presence of Head of the department.
- Student shall be examined for his contributions, knowledge along with the quality of the work through presentations and Viva-voce.
- The assessment of work shall be done on the following lines:

    - Directed study/self study (Pre-requisite) shall be evaluated internally for 50 marks by PRC at the end of III semester
    - Research Methodology shall be evaluated internally for 50 marks by PRC at the end of III semester
    - Comprehensive Viva-Voce shall be evaluated internally for 50 marks by PRC in the III semester
    - Seminar shall be evaluated internally for 50 marks by PRC in the III semester
    - Project phase I which includes Problem definition, Literature survey, tool specific knowledge shall be evaluated internally for 100 marks by PRC at the end of III semester
    - Project phase II shall be evaluated for 300 marks at the end of IV semester. Out of 300 marks, 150 marks shall be evaluated internally by PRC and remaining 150 marks shall be evaluated externally by the internal and external examiner.
    - The evaluation of Project phase II shall be made on the following aspects.

        i) Experimental/methodology design

        ii) Result analysis and interpretations

        iii) Report writing

        iv) Presentation

        v) Viva-voce

6. ATTENDANCE REGULATIONS:

I. A student shall be eligible to appear for end semester examinations, if he or she acquires a minimum of 75% of attendance in aggregate of all the subjects (Theory & Lab.) for the semester.
II. A Student shall not be promoted to the next semester unless he/she fulfills the attendance requirement of the current semester.
III. A student may seek re- admission for that semester when offered a least one week ahead of the commencement of class work.
IV. To appear for end laboratory examination a candidate shall put up a minimum of 75% attendance for regular lab sessions and should have completed all the laboratory experiments/tests along with submission of record complete in all respects.

7. MINIMUM ACADEMIC REQUIREMENTS:

A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted and secures at least 24 marks out of 60 marks at semester end examination and overall 50 marks out of 100 marks put together both internal and semester end examinations.

8. COURSE STRUCTURE:

M.TECH:

The total course will consist of the following components.

a)	Core Mandatory(Theory)	CM	21-27 credits
b)	Core Mandatory(Lab)	CM(L)	02-06 credits
c)	Core Elective (Theory)	CE(T)	15-21 credits
d)	Comprehensive Viva voce	CV	01-03 credits
e)	Self Study(Prerequisite)	SS	01-03 credits
f)	Seminar	SE	01-03 credits
g)	Research methodologies	RM	01-02 credits
h)	Project phase 1	PR	06-12 credits
i)	Project phase 2	PR	09-15 credits

*For all the programs offered, in the list of courses for electives one of the choices would be “MOOCs”. Each department shall short list MOOCs course/(s) meeting the requirements of course duration, credits, etc., from time to time. The same shall be placed in the immediate BoS meeting for ratification.

9. ABOUT GRADING SYSTEM:

Performance of a student is evaluated in terms of earned credit weighed marking system Earned credits are defined as the sum of course credits in which grade points above a certain cut off have been obtained for declaring student pass in that course

• Points earned in a semester:

Σ (course credits earned x Grade points)

Semester Grade Point Average (SGPA) for the current semester which is calculated on the basis of grade points obtained in all courses, except audit courses and courses in which satisfactory or course continuation has been awarded,

SGPA= Σ(course credits earned x Grade points) /
Σ(Total course credits in the semester.

Cumulative Grade Point Average (CGPA) is calculated on the basis of all pass grades obtained in all courses, except audit courses, obtained in all completed semesters

CGPA= Σ (course credits earned x Grade points) over all semesters / Σ (Total course credits in all the semesters.

The UGC recommends a 10-point grading system with the following letter grades as given below:

O	(Outstanding)	10
A+	(Excellent)	9
A	(Very Good)	8
B+	(Good)	7
B	(Above Average)	6
C	(Average)	5
P	(Pass)	4
F	(Fail)	0
Ab	(Absent)	0

- iii. A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

Illustration of Computation of SGPA and CGPA and Format for Transcripts

Computation of SGPA and CGPA

Illustration for SGPA

Course	Credit	Grade Letter	Grade point	Credit Point (Credit x Grade)
Course 1	3	A	8	3 X 8 = 24
Course 2	4	B+	7	4 X 7 = 28
Course 3	3	B	6	3 X 6 = 18
Course 4	3	O	10	3 X 10 = 30
Course 5	3	C	5	3 X 5 = 15
Course 6	4	B	6	4 X 6 = 24
	20			**139**

Thus, **SGPA** =139/20 = 6.95

Illustration for CGPA

Semester 1	Semester 2	Semester 3	Semester 4
Credit: 20	Credit: 22	Credit: 25	Credit: 26
SGPA: 6.9	SGPA: 7.8	SGPA: 5.6	SGPA: 6.0

Thus, **CGPA** = $\frac{20 \times 6.9 + 22 \times 7.8 + 25 \times 5.6 + 26 \times 6.0}{80}$ = **7.57**

10. ELIGIBILITY FOR AWARD OF DEGREE:

A student shall be eligible for award of the degree if he/she fulfills the following conditions:

1) Success fully completes all the courses prescribed for the Program.
2) CGPA greater than or equal to 5.5(Minimum requirement for Pass),
3) Should have cleared all dues.
4) Complied with all the rules and regulations during the period of study governing satisfactory conduct.

11. AWARD OF CLASS:

The candidates who are eligible for the award of M.Tech./MBA Degree shall be placed in one of the following Classes based on CGPA.

Class	CGPA
Distinction	≥ 7.5
First Class	≥ 6.5
Pass Class	≥ 5.5

12. INSTRUCTION DAYS: A semester shall have a minimum period of 90 clear instruction days.

13. SUPPLEMENTARY EXAMINATIONS:

Supplementary examinations shall be conducted along with regular examinations for every semester.

14. WITHHOLDING OF RESULTS: The result of the student will be withheld

- If the student has not paid the dues, if any, to the institution
- If any case of pending of disciplinary action against him,
- Involving in any sort of malpractices etc.

15. TRANSITORY REGULATIONS:

- A candidate joining the institution on transfer from other institutions shall submit a record/history of courses of semesters already completed elsewhere prior to seeking such transfer.
- Board of Studies of the department may accept/reject such request for transfer depending on compatibility of the program.

- For accepted cases, the Board of Studies shall recommend equivalency of courses and also additional equivalent (substitute) courses if any to be taken up for the award of degree for all prospective courses leading to the completion of the program.
- Only candidates who have fulfilled the academic/course work requirements up to the previous semester shall only be considered for admission on transfer.
- Student seeking transfer has to clear all his/her backlog subjects of previous semesters by appearing the supplementary examinations, conducted by the affiliated/other university.
- Admission on transfer may be taken only on the payment of prescribed fee prevailing at the time.

16. AMENDMENTS TO REGULATIONS:

The Academic Council of MVGR College of Engineering (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations, and/ or Syllabi or any other such matter relating to the requirements of the program which are compatible to the contemporary/emerging trends effectively meeting the needs of society/industry/stake holding groups.

17. Guide lines for MALPRACTICES during the conduct of examinations

	Nature of Malpractices/Improper conduct	Punishment
1 (a)	If the candidate 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)	If the candidate 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	If the candidate 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.

		*
3	If the candidate 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/candidate not on rolls, he will be handed over to the police and a case is registered against him. *
4	If the candidate mishandles 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. Also if the answer script is mutilated / damaged disturbing the shape, of the script, answers, the bar code intentionally.	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. He shall be debarred from class work and all examinations and be allowed to reregistered for the next subsequent odd or even semester only. 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.	The same should be brought to the notice of CE who in turn in consultation with malpractice committee makes decision for cancellation of the performance in that subject. *
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any	In case of students of the college, they shall be expelled

	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.	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. 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	Student of the colleges expulsion from the examination hall and

	connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	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. 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. *
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.*

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18. General :

- Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- The academic regulation should be read as a whole for the purpose of any interpretation.
- In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- The University 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 University.

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

- ⇨ **Ragging within or outside any educational institution is prohibited.**
- ⇨ **Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student**

	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	10 Months	+	Rs. 50,000/-

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

LET US MAKE MVGR A RAGGING FREE CAMPUS

Ragging

ABSOLUTELY
NO TO RAGGING

1. **Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.**
2. **Ragging entails heavy fines and/or imprisonment.**
3. **Ragging invokes suspension and dismissal from the College.**
4. **Outsiders are prohibited from entering the College and Hostel without permission.**
5. **Girl students must be in their hostel rooms by 7.00 p.m.**
6. **All the students must carry their Identity Cards and show them when demanded**
7. **The Principal and the Wardens may visit the Hostels and inspect the rooms any time.**

M.Tech (STRUCTURAL ENGINEERING)

Programme Educational Objectives

PEO 1 Impart knowledge to students in the latest technological aspects of Structural Engineering and to provide them with opportunities in taking up advanced topics of the field of study.

PEO 2 Mould the graduate Civil Engineers to undertake safe, economical and sustainable design of civil and other structures.

PEO 3 Broaden and deepen their capabilities in experimental research methods, analysis of data, and drawing relevant conclusions for scholarly writing and presentation.

PEO 4 Create a congenial environment that promotes learning, growth and imparts ability to work with inter-disciplinary teams in professional, industry and research organizations.

Programme Outcomes

a) Ability to Design, analyze, and evaluate systems in Structural Engineering

b) Ability to critically assess the relevant technological issues.

c) Ability to conduct experimental and/or analytical work and analyse results using modern mathematical and scientific methods.

d) Ability to formulate and report relevant research problems and critically assess research of their own and of others.

COURSE STRUCTURE

SEMESTER –I

Sl. No.	Course Code	Subject	Hours/week			Credits
			L	T	P	C
1	A1STT101	Advanced Mathematics	3	0	0	3
2	A1STT102	Theory of Elasticity	3	1	0	4
3	A1STT103	Advanced Reinforced Concrete	3	1	0	4
4	A1STT14	Structural Dynamics and Earthquake Resistant Design	3	1	0	4
5		Elective –I				
	A1STT201	Advanced Structural Analysis	3	0	0	3
	A1STT202	Industrial Structures	3	0	0	3
	A1STT203	Advanced Concrete Technology	3	0	0	3
6		Elective – II				
	A1STT204	Design of Tall Structures	3	0	0	3
	A1STT205	Disaster Management	3	0	0	3
	A1STT206	Theory of Plates and Shells	3	0	0	3
7	A1STL101	Advanced Structural Engineering lab	0	0	3	2
		Total Number of Credits				**23**

SEMESTER –II

Sl. No.	Course Code	Subject	Hours/Week			Credits
			L	T	P	C
1	A1STT105	Substructure Design	3	0	0	3
2	A1STT106	Finite Element method	3	1	0	4
3	A1STT107	Stability of Structures	3	1	0	4
4	A1STT108	Prestressed Concrete	3	1	0	4
5		Elective –III				
	A1STT207	Structural Optimization	3	0	0	3
	A1STT208	Bridge Engineering	3	0	0	3
	A1STT209	Repair and Rehabilitation of Structures	3	0	0	3
6		Elective – IV				
	A1STT210	Structural Reliability	3	0	0	3
	A1STT211	Design of Hydraulic Structures	3	0	0	3
	A1STT212	Plastic analysis and Design of Steel Structures	3	0	0	3
8	A1STL102	Computer Applications in Structural Engineering Laboratory	0	0	3	2
		Total Number of Credits				**23**

SEMESTER – III

Sl. No	Course Code	Subject	L	T	P	Credits
1	A1STT109	Research Methodologies	-	-	-	2
2	A1STV401	Comprehensive Viva	-	-	-	2
3	A1STR401	Pre-requisite Study	-	-	-	2
4	A1STS501	Seminar	-	-	-	2
5	A1STP501	Project Phase - I	-	-	-	8
Total Number of Credits			-	-	-	**16**

SEMESTER – IV

Sl.	Course	Subject	L	T	P	Credits
1	A1STP502	Project Phase - II	-	-	-	18
Total Number of Credits			-	-	-	**18**

SYLLABUS

		L	T	P	C
A1STT101	**ADVANCED MATHEMATICS**	3	0	0	3
	Total Contact Hours – 3(L)/W				
	Prerequisite : Mathematics I,II,III				
COURSE OBJECTIVES					
COB 1	Understand wave equations and solve them analytically				
COB 2	Understand Numerical methods to solve Non-linear simultaneous equations				
COB 2	Impart methods to analyze, estimate and correlate the data by evaluating the coefficients and then testing the hypothesis regarding the variances.				
COB 3	Formulate Linear and Non-linear programming problems and solve them				

UNIT I
APPLIED PARTIAL DIFFERENTIAL EQUATIONS
One-dimensional Wave equation. Two-dimensional wave Equation in Cartesian, and polar coordinates (problems having axi-symmetry) – Analytical solution by separation of variables technique.

UNIT II
NUMERICAL METHODS
Solution of Non linear simultaneous equations –Newton Raphson method. Determination of Eigen values by Iteration method-Rayleigh's Power method. One dimensional Wave Equation in Cartesian coordinates using finite – differences.

UNIT III
APPLIED STATISTICS
Regression and correlation analysis – Method of Least squares – Curve fitting – Curvilinear Regression – Non-linear curves – correlation coefficient – Correlation of grouped bi-variate data – coefficient of determination Multiple Regression – partial Regression coefficients.

UNIT IV
LINEAR PROGRAMMING PROBLEMS
Linear Programming Problem Formation- Graphical Method, Simplex method, artificial variable method –Big M method, Two phase method.

UNIT V
NONLINEAR PROGRAMMING PROBLEMS
Non Linear Programming Problem- Gradient method, Steepest Ascent Descent Methods.

TEXT BOOKS

1. Advanced Engineering Mathematics- Erwin Kreyszig, 9th edition, Wiley India.
2. Solutions of Partial Differential Equations" – Duffy, D.G. CBS Publishers, 1988
3. Introductory Methods of Numerical Analysis – Sastry, S.S. Prentice-Hall, 2nd Edition, 1992
4. Basic Statistics – Agarval, B.L., Wiley 1991, 2nd edition.
5. Optimization Techniques. - S.S.Rao.

REFERENCES

1. Operations Research – Hamdy A, Taha.
2. Advanced Engineering Mathematics- Dennis G.Zill , Michael R. Cullen ,CBS Publishers 2nd edition.
3. Higher Engineering Mathematics – B.S.Grewal, 42nd/edition, Khanna Publishers
4. Strang.G, Introduction to Applied Mathematics, Willey

COURSE OUTCOMES	
CO 1	Ability to solve wave equations analytically
CO 2	Ability to Numerical methods to solve Non-linear simultaneous equations
CO 3	Ability to analyze, estimate and correlate the data by evaluating the coefficients and then testing the hypothesis regarding the variances.
CO 4	Ability to formulate Linear and Non-linear programming problems and solve them
ADVANCED MATHEMATICS	
Course designed by	S & H Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT102	**THEORY OF ELASTICITY**	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisites : Mathematics, Strength of Materials				
COURSE OBJECTIVES					
COB 1	Formulate the conditions of theory of elasticity application and apply them to solve real world problems of linear elasticity using boundary value concept				
COB 2	Develop stress-strain relationships using stress tensor and transformation in elastic state.				
COB 3	Execute a reasonable choice in parameters of the model (geometry, material properties, boundary conditions)				
COB 4	Solve 2D and 3D problems of Elasticity				

UNIT I

ELASTICITY INTRODUCTION

Concept of stress and strain - Notation for forces and stresses - components of stresses and strains - Hooke's Law - Plane Stress – Plane strain – Differential Equations of equilibrium – Boundary conditions

UNIT II

TWO DIMENSIONAL PROBLEMS2D problems in rectangular co-ordinates Solution by Polynomials - Saint Venant's principle - Determination of displacements - Bending of simple beams - Application of Fourier series for two dimensional problems for gravity loading

UNIT III

POLAR COORDINATES

Two dimensional problems in polar co-ordinates - General equations in polar co-ordinates - Stress distribution for problems having symmetrical about an axis - Strain components in polar co-ordinates - Displacements for symmetrical stress distributions –Analysis of Axi-symmetric bodies subjected to axi-symmetric loading.

UNIT IV

ANALYSIS OF STRESS AND STRAIN IN THREE DIMENSIONS

Principal stresses- Stress ellipsoid-Director Surface, Homogenous Deformation, Principal Axis of Strain - Determination of principal stresses - Maximum shear stress

UNIT V

GENERAL THEOREMS

Differential equations of equilibrium - Conditions of compatibility – Equations of equilibrium in terms of displacements - Principle of superposition

TEXT BOOKS:

1. Timoshenko, S. and Goodier J.N., Theory of Elasticity, McGraw Hill Book Co, New york, 1988.

2. Irving H. Shames and James, M. Pitarresi, Introduction to Solid Mechanics, Prentice Hall of India Pvt. Ltd., New Delhi -2002.

REFERENCE BOOKS:

1. Elasticity: Theory, Applications and Numerics - Martin H. Sadd
2. Theory of Elasticity, Sadhu Singh
3. Continuum Mechanics, Dr. P. N Chandramouli

COURSE OUTCOMES	
CO 1	Ability to develop stress-strain relationships using stress tensor and transformation in elastic state.
CO 2	Ability to formulate the conditions of theory of elasticity application and apply them to Solve real world problems of linear elasticity
CO 3	Ability to execute a reasonable choice in parameters of the model (geometry, material properties, boundary conditions)
CO 4	Ability to solve problems of 2D and 3D problems of linear elasticity using boundary value concept
THEORY OF ELASTICITY	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT103	**ADVANCED REINFORCED CONCRETE**	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisite : SM I & II ; DRCS – I & II				
COURSE OBJECTIVES					
COB 1	To be able to estimate the short term and long term deflections in structural elements along with the crack width				
COB 2	Design and carry out the reinforcement detailing of building frames.				
COB 3	To be able to design Reinforced Concrete flat slab elements by different methods				
COB 4	To be able to understand the inelastic analysis of Reinforced Concrete beams, columns and frames				

UNIT I

SERVICEABILITY

Short-term deflection of beams and slabs-Deflection due to imposed loads, Short-term deflection of beams due to applied loads, Calculation of deflection by IS 456: 2000, Deflection of slabs, Comparison of Deflections from Euro and ACICodes.

Estimation of Crack width in Reinforced Concrete Members-Factors affecting crack width in beams, Mechanisms of flexural cracking, Calculation of crack width,-Simple empirical method, Estimation of crack width in beams by IS 456:2000, Shrinkage and thermal cracking.

UNIT II

INELASTIC ANALYSIS OF REINFORCED CONCRETE BEAMS AND FRAMES

Inelastic behavior of reinforced concrete, Stress-strain characteristics of concrete, Stress-strain characteristics of steels, Moment curvature relation (M-Q Curves), Inelastic or non-linear analysis of reinforced concrete beams.

UNIT III

BIAXIAL BENDING OF SLENDER COLUMNS

Definition of slender column, reasons for its increasing importance and popularity, behavior of eccentrically loaded slender columns, braced and un-braced single column or a part of rigid frame, moments due to minimum eccentricities in slender columns, design of slender columns as recommended by IS 456 and charts of SP-16, Development of interaction curves.

UNIT IV

APPROXIMATE ANALYSIS OF GRID FLOORS

Introduction to grid floors-Analysis of rectangular grid floors by Timoshenko's plate theory.Analysis of grid by stiffness matrix method, Analysis of grid floors by equating joint deflections.Detailing.

UNIT V

ANALYSIS AND DESIGN OF FLAT SLABS

Proportioning of flat slabs, Determination of bending moment and shear force, the direct design method, Equivalent frame method, slab reinforcement

TEXT BOOKS:

1. Design of Reinforced concrete structures – N Subramanyam, oxford university press
2. "Reinforced Concrete Design" by UnnikrishnaPillai and DevdasMenon

REFERENCE BOOKS:

1. "Advanced Reinforced Concrete Design"by P.C. Varghese.
2. "Hand Book of Concrete Engineering" Fintel, Mark., Rein Hold New york 1995
3. "Reinforced Concrete Structural elements" Purushothaman ,Tata McGraw Hill 1994

COURSE OUTCOMES	
CO 1	Ability to calculate deflections and crack widths in reinforced concrete elements as per relevant standard codal provisions and design structural elements satisfying serviceability criteria.
CO 2	Ability to determine Moment- Curvature relation for reinforced concrete flexural members
CO 3	Ability to design slender reinforced concrete columns and develop interaction curves
CO 4	Ability to design Grid floors and flat slabs in reinforced concrete structures.
ADVANCED REINFORCED CONCRETE	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT104	**STRUCTURAL DYNAMICS AND EARTHQUAKE RESISTANT DESIGN**	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)				
	Prerequisite : Mathematics ; EG				
COURSE OBJECTIVES					
COB 1	To understand the principles of vibration with regard to Single and Multi degree of freedom system and perform dynamic analysis of structure.				
COB 2	To understand the effect of various irregularities in the structure for earthquake response				
COB 3	To determine the design lateral forces due to earthquake using IS code provisions.				
COB 4	To introduce the concept of ductility and corresponding detailing as per IS code.				
COB 5	Design and ductile detailing of structures for seismic resistance as per Indian Standards				

UNIT I
INTRODUCTION TO STRUCTURAL DYNAMICS
Introduction to Dynamic analysis - Types of loadings - Methods of Discretization - Formulation of the Equations of Motion - Elements of a Vibratory system - Free Vibrations of Single Degree of Freedom (SDOF) systems – Un-damped and Damped Systems - Degrees of Freedom of continuous systems

UNIT II
SINGLE DEGREE OF FREEDOM SYSTEM: (SDOF)
Formulation and Solution of the equation of Motion
Free vibration response - Response to Harmonic - Periodic- Impulsive and general dynamic loadings - Control Measures of SDOF

UNIT III
MULTI DEGREE OF FREEDOM SYSTEM: (MDOF)
Selection of the Degrees of Freedom, Evaluation of Structural Property Matrices, Formulation of the MDOF equations of motion, Un-damped free vibrations, Solution of Eigen value problem for natural frequencies and mode Shapes, Analysis of dynamic response - Normal coordinates.

UNIT IV
EARTH QUAKE ENGINEERING
Introduction- Effect of Irregularities in Structures - Earthquake response analysis of single and multi-storied buildings (seismic coefficient and Response spectrum methods- Base shear calculation). Model participations

UNIT V
CODAL DETAILING PROVISIONS
Review of the Indian Seismic codes IS: 1893, IS 4326 and IS 13920 provisions for ductile detailing of RC buildings- Beams, Columns and Joints – Shear walls detailing.

TEXT BOOKS:

1. Structural Dynamic by Mario Paz, 2nd edition,
2. Dynamics of Structures by Clough &Penzien.
3. PankajAgarwal and Manish Shirkande (2006): Earthquake Resistant Design of Structures, Prentice Hall of India

REFERENCE BOOKS:

1. Dynamics of Structures, "Theory and Applications to Earthquake Engineering" by Anil K. Chopra, Prentice Hall of India.
2. Structural Dynamics by John M. Biggs.
3. Elements of Earthquake Engineering by Jaikrishna and Chandrasekhara Saritha Prakasham, Meerut.

COURSE OUTCOMES	
CO 1	Ability to carry out Dynamic analysis of structures with Single and Multi degree of freedom
CO 2	Ability to plan the structure without irregularities which affect their seismic performance.
CO 3	Ability to calculate the seismic loads on structures and design the structure accordingly.
CO 4	Ability to do the ductile detailing of different members of the structure as per IS 13920.
STRUCTURAL DYNAMICS AND EARTHQUAKE RESISTANT DESIGN	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

A1STT202		L	T	P	C
	INDUSTRIAL STRUCTURES	3	0	0	3
	Total Contact Hours – 46				
	Prerequisite : DRCS ; DSS				

COURSE OBJECTIVES	
COB 1	To impart the knowledge on planning and functional requirement of industrial structures
COB 2	To make the student understand calculation of wind loads and complete design of trusses
COB 3	To impart design aspects of Gantry girder, Bunkers, silos, Chimneys and transmission line towers.

UNIT NO.1

PLANNING AND FUNCTIONAL REQUIREMENTS –Classification of industries and industrial structures - Planning for layout- requirements regarding lighting ventilation and fire safety - protection against noise and Vibrations

UNIT NO.2

TRUSS STRUCTURES: (NON- VIBRATING) - Calculation of Wind loads as per IS875- Analysis and Design of different types of Roof Trusses, Analysis and design of Purlins & bracing systems in industrial sheds. Introducing vibrating trusses and Cold Formed structural steel.

UNIT NO.3

Industrial buildings (Steel) – Design of Gantrygirders, Introduction to PEB (Pre Engineering Building)

UNIT NO.4

Analysis and Design of Bunkers, Silos and Chimneys

UNIT NO.5

POWER TRANSMISSION STRUCTURES: Transmission line towers – tower foundations – testing of towers

TEXT BOOKS

1. Advanced reinforced concrete design-N. Subramaninam, Oxford.
2. Tall Chimneys- Design and construction – S.N. Manohar

Reference Books:

1. Advanced Reinforced Concrete Design – N.KrishnaRaju, CBS Publishers
2. Design of Steel Structures – S.K.Duggal – Tata McGraw-Hill. Publications
3. Space Structures – N.Subrahmanyam

COURSE OUTCOMES	
CO 1	Ability to knowledge plan functional requirement of industrial structures
CO 2	Ability to calculate wind loads and design a trusses
CO 3	Ability to design Gantry girder, Bunkers, silos, Chimneys and transmission line towers.

INDUSTRIAL STRUCTURES	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT203	**ADVANCED CONCRETE TECHNOLOGY**	3	0	0	3
	Total Contact Hours – 46				
	Prerequisite : Concrete Technology				
COURSE OBJECTIVES					
COB 1	To understand the Properties of concrete and use additives and admixtures.				
COB 2	To understand about various special concretes used for special purposes				
COB 3	To understand the significance of NDT evaluation of concrete and various methods for it				

UNIT 1

ANALYSIS OF USING NEW MATERIALS, RECYCLING AND REUSE

Different Types of Materials blended with cement – Pozzolana cement, reaction hydration with supplementary cementious materials, admixtures and additives- Properties effecting the Materials - Chemical Reaction with other materials, IS 10262 Mix design

UNIT 2

SPECIAL CONCRETES

FIBER REINFORCED CONCRETE

Properties of constituent materials- Mix proportions, mixing and casting methods- Mechanical properties of fiber reinforced concrete - Applications of fiber reinforced concretes

LIGHT WEIGHT CONCRETE

Properties of light weight concrete - Design of light weight concrete – Applications of Light weight concrete

No fines concrete- Properties and applications

UNIT 3

HIGH PERFORMANCE CONCRETE

Introduction - Development of high performance concretes - Materials of high performance - Properties of high performance concretes

Self Consolidating concrete

Introduction – Properties – Applications – Mix design of SCC

UNIT 4

NON DESTRUCTIVE EVALUATION

Importance of these Methods – Rebound hammer, Ultrasonic pulse velocity test, Concrete behavior under corrosion - Disintegrated mechanisms - Moisture effects and thermal effects - Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content

UNIT 5

Durability: Factors affecting durability of concrete, tests on durability with special reference to Rapid chloride permeability Test.

TEXT BOOKS

1. R. Santhakumar‘ Concrete Technology’, Oxford University Press 2 P.K Mehta.
2. Concrete technology- Neville & Brooks

REFERENCE BOOKS:

1. Mehta and Monteiro, 'Concrete-Micro structure, Properties and Materials', McGraw Hill Professional
2. Concrete repair and maintenance Illustrated- Peter H Emmons
3. Neville,'Properties of Concrete', Prentice Hall, Newyork
4. John Newman and Ban SengChoo , 'Advanced Concrete Technology', Butterworth-Heinemann Ltd.

COURSE OUTCOMES	
CO 1	Ability to use of new materials in Concretes and understand how they affect the properties of concrete
CO 2	Ability to understand the merits and demerits and manufacturing procedures of various special concretes used for special purposes
CO 3	Appreciate RMC MIX design for special concrete
CO 4	Appreciate need for NDT evaluation of concrete and have knowledge on the working principle of some of the methods.
ADVANCEDCONCRETE TECHNOLOGY	
Course designed by	Civil department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT201	**ADVANCED STRUCTURAL ANALYSIS**	3	0	0	3
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisite : SA- I & II				
COURSE OBJECTIVES					
COB 1	Analyze and evaluate systems in structural engineering using force				
COB 2	Analyze and evaluate systems in structural engineering using displacement method				
COB 3	To Apply Various Methods of approximate analysis of structures				
COB 4	To give an idea of stiffness methods of analysis for different members				

UNIT I

Approximate Methods of Analysis for Vertical and Lateral Loads:

1. Portal Method 2.Cantilever Method 3.Substitute Frame Method

UNIT II

Torsional behavior of Non-Circular Section, Analysis of Open Section, Concept of unsymmetrical Bending and shear centre.

UNIT III

INTRODUCTION TO MATRIX METHODS OF ANALYSIS

Difference between Flexibility and Stiffness method and their suitability for different structures – Element stiffness matrix for truss element, beam element and Torsional element- Element Force displacement equations- Element and Global Stiffness equation – coordinate transformation and global assembly-Structure Stiffness matrix.

UNIT IV

ANALYSIS OF BEAMS AND PLANE FRAMES BY STIFFNESS METHOD

Coordinate Transformation. Example problems (up to degree of Static Indeterminacy)

UNIT V

PLANE TRUSS AND SPACE TRUSS BY STIFFNESS METHOD

Coordinate Transformation Example problems (up to degree of Static Indeterminacy)

TEXT BOOKS:

1. Intermediate Structural Analysis– C. K. Wang
2. Advanced Structural Analysis – Sinha and Gayen

REFERENCE BOOKS:

1. Structural analysis A matrix approach by Pandit& Gupta, TMH Publisher
2. Indeterminate Structures: J.S.Kinney
3. Limit Analysis of Structures: Manikaselvam, DhanpatRai Publishers

COURSE OUTCOMES	
CO 1	Ability to carry out approximate analysis of framed structures.
CO 2	Ability to analyze non circular sections for torsion
CO 3	Ability to choose appropriate method of analysis for given structure
CO 4	Ability to analyze plane frame, plane truss and space truss using stiffness method of analysis

ADVANCED STRUCTURAL ANALYSIS	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT204	**DESIGN OF TALL STRUCTURES**	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisite : DRCS ; DSS				
COURSE OBJECTIVES					
COB 1	Understand and solve, using both analytical and numerical methods, partial differential equations with their physical relevance				
COB 2	Analyze, estimate and correlate the data by evaluating the coefficients and then testing the hypothesis regarding the variances.				
COB 3	Become competent enough to work on multidisciplinary teams and design systems to meet desired needs with in economic, social, safety manufacturability and sustainability constraints.				

UNIT I

Structural systems and concepts.

Design Criteria Philosophy, Materials, Modern concepts.

UNIT II

Loads – IS Code Provision

Gravity Loading – Dead Load, Live Load, Impact Load, Construction load, Sequential loading **IS875 Part1**

Wind Loading – Static and Dynamic approach, Analytical Method, Wind tunnel experimental methods. **IS875 Part2**

Earthquake Loading – Equivalent Lateral load analysis,

Response spectrum method, **IS875 Part3**

Combination of loads

UNIT III

Behavior of Structural Systems

Factors affecting the growth, height and structural form, Behavior of braced frames, Rigid frames, In-filled frames, Shear walls, Coupled shear walls, Wall frames, Tubular, Outrigger braced, hybrid systems

UNIT IV

Analysis and Design

Modeling for Approximate analysis, Accurate analysis and reduction techniques, Analysis of structures as an integral unit, Analysis for member forces, drift and twist. Design for differential movement, Creep and Shrinkage effects, Temperature effects.

UNIT V

Stability Analysis

Overall buckling analysis of frames, Approximate methods, P-Delta effects, simultaneous first order and P-Delta analysis, Introduction Translational instability, Torsional instability. Importance of dampers.

TEXT BOOKS:

1. Bryan Stafford Smith and Alex Coull, “Tall Building Structures – S.K. Ghose.Analysis and Design”, John Wiley and Sons, Inc., 1991.

2. Taranath B.S, “Structural Analysis and Design of Tall Buildings”, McGraw-Hill, 1988.

REFERENCE BOOKS:

1. Tall building structures by B.S.Smith and A.Coull, John Wiley & Sons, 1991.

COURSE OUTCOMES	
CO 1	Ability to understand modern concepts evolved in structural systems.
CO 2	Ability to apply IS codal provisions for various types of loadings for tall structures.
CO 3	Ability to understand and differentiate various types of building frames and shear walls.
CO 4	Ability to analyse using different techniques and design a tall structure for differential movement, Creep and Shrinkage effects, Temperature effects.
CO 5	Ability to analyse a tall structure for its buckling and ability to perform first order and P-Delta analysis.
CO 6	Ability to understand Translational instability, Torsional instability Importance of dampers.

DESIGN OF TALL STRUCTURES	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT205	**DISASTER MANAGEMENT**	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisite : Environmental Science				
COURSE OBJECTIVES					
COB 1	To increase the knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts				
COB 2	To ensure knowledge and skills to design, implement and evaluate research on disasters				
COB 3	To develop an integrated approach to disaster preparedness & awareness.				
COB 4	To understand the requirements of an emergency management program.				

UNIT I

Environmental Hazards and Disasters

Concept of Environmental Hazards, Environmental stress & Environmental Disasters, Approaches & relation with human Ecology, Human ecology & its application, Types of Environmental hazards & Disasters

UNIT II

Disasters

Natures and extent of disasters, Natural calamities, manmade disasters

UNIT III

Emerging approaches in Disaster Management

Natural Disaster Reduction & Management, Relief measures to disaster affected people, Prediction of Hazards & Disasters, Measures of adjustment to natural hazards

UNIT IV

Disaster Management

An integrated approach for disaster preparedness, Mitigation & awareness, Financing relief expenditure, legal aspects, Rescue operations, Casually management, Risk management..

UNIT V

Emergency Management program

Administrative setup and organization, Hazard analysis, Training of personnel, Information management, Emergency facilities and equipment necessary public awareness creation, Preparation and execution of the emergency management

TEXT BOOKS:

1. R.B.Singh (Ed) Environmental Geography, Heritage Publishers New Delhi,1990
2. Savinder Singh Environmental Geography, PrayagPustakBhawan, 1997
3. R.B. Singh (Ed) Disaster Management, Rabat Publication, New Delhi, 2000

REFERENCE BOOKS:

1. H.K. Gupta (Ed) Disaster Management, Universities Press, India, 2003
2. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994

3. Dr. Sat ender , Disaster Management in Hills, Concept Publishing Co., New Delhi, 2003
4. R.K. Bandana An overview on Natural & Manmade Disaster & their Reduction, CSIR, New Delhi

COURSE OUTCOMES	
CO 1	Ability to understand of the disaster phenomenon and its different contextual aspects, impacts
CO 2	Ability to design, implement and evaluate research on disasters
CO 3	Ability to develop an integrated approach to disaster preparedness & awareness.
CO 4	Ability to understand the requirements of an emergency management program.

DISASTER MANAGEMENT	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT206	**THEORY OF PLATES AND SHELLS**	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisite : Mathematics				
COURSE OBJECTIVES					
COB 1	Introduce students to the classical structural mechanics approximations of Membrane, Plate and Shell theories				
COB 2	Use energy formulations to demonstrate the consistent derivation of approximate boundary conditions and edge effects.				
COB 3	Demonstrate the approximation of the classical formulations using numerical approximation techniques.				

UNIT I

Plate equation and behaviour of thin plates in Cartesian - Isotropic and orthotropic plates - Bending and twisting of plates.

UNIT II

Navier's solution and energy method - Rectangular, Circular plates with various end conditions.

UNIT III

Plate Equation and analysis of Polar Coordinates - Circular Plate with Different end Condition

UNIT IV

Introduction to Shells

Single and double curvature- Equations of Equilibrium of Shells - Derivation of stress resultants - Principles of membrane theory and bending theory.

Shell behaviour - shell surfaces and characteristics - classifications of shells - Equilibrium equations in curvilinear coordinates - Force displacement relations.

UNIT V

Principles of membrane Theory and Bending Theory

Membrane analysis and bending theory of shells of revolution - cylindrical shells under different loads - solutions of typical problems

TEXT BOOKS:

1. Theory of Plates and Shells – Timoshenko and Krieger, Tata McGraw-Hill, New Delhi.
2. Theory of Plates, K. ChandraShekhara, University Press, 2001.
3. Design and Construction of Concrete Shell Roofs – Ramaswamy, G.S, McGraw – Hill, New York.

REFERENCE BOOKS:

1. A Text Book of Plate Analysis – Bairagi, K, Khanna Publisher, NewDelhi.

COURSE OUTCOMES	
CO 1	Ability to analyze isotropic and orthotropic plates subjected to bending and twisting.
CO 2	Ability to conceptualize the Navier's solution and energy method to analyze plates with different end conditions.
CO 3	Ability to develop governing differential equation for circular plates and analyze for various loading and boundary conditions.
CO 4	Ability to understand the structural behaviour of different types of shells using membrane theory and bending theory.
CO 5	Ability to analyze isotropic and orthotropic plates subjected to bending and twisting.

THEORY OF PLATES AND SHELLS	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STL101	**ADVANCED STRUCTURAL ENGINEERING LAB**	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisite : SM, CT, CT Lab				

COURSE OBJECTIVES	
COB 1	Aware of flexural and shear behavior of RC beams and their crack pattern
COB 2	Understand the stress-strain behavior of different grades of concrete
COB 3	Know the Mix design and workability tests of self compacting concrete
COB 4	Understand various repair techniques of RC elements
COB 5	To make the student know about various Non Destructive Testing of RC elements

LIST OF EXPERIMENTS:

1. Stress-Strain behavior of different grades of concrete
2. Shear behavior of RC beams for different Shear reinforcements
3. Flexural behavior of RC beams for different amounts flexural reinforcement
4. Preparation and workability tests on self compacting concrete
    - Flow test
    - L-box test
    - V-Funnel test
5. Measurement of Strain in Concrete and Steel using Strain gauges
6. Retrofitting of RC elements
7. Design and testing of RC beam for Capacity, Cracking pattern, Ductility etc.,
8. Non Destructive Testing of concrete using
    - Rebound Hammer
    - Ultra Sonic Pulse Velocity
9. Case study on condition assessment of distressed structures

Note: Any eight exercises have to be conducted

COURSE OUTCOMES	
CO 1	Ability to study flexural and shear behavior of RC beams and their crack pattern
CO 2	Appreciate stress-strain behavior of different grades of concrete
CO 3	Perform Mix design and workability tests of self compacting concrete
CO 4	Skill to apply various repair techniques of RC elements
CO 5	Skill to perform various Non Destructive Testing of RC elements

ADVANCED STRUCTURAL ENGINEERING LAB	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

SEMESTER –II

		L	T	P	C
A1STT105	**SUBSTRUCTURE DESIGN**	3	0	0	3
	Total Contact Hours – 3(L)/W				
	Prerequisite : GTE – I&II				
COURSE OBJECTIVES					
COB 1	To Familiarize Soil exploration techniques and soil sampling				
COB 2	To Understand the determination of bearing capacity of soil and design suitable shallow and Deep foundations				
COB 3	Evaluate the load carrying capacity of pile foundations				
COB 4	Understand the concept of liquefaction of soils				

UNIT I
SOILEXPLORATION
Importance, Terminology, planning - Geophysical methods - Borings, location, spacing and depth - Methods of boring including drilling - Stabilization of boreholes

UNIT II
SOIL SAMPLING
Methods of sampling - Types of samples and samplers cleaning of bore holes - Preservation, labelling and shipment of samples - Design considerations of open drive samplers

UNIT III
BEARING CAPACITY
.General bearing capacity equation - Meyerhof's, Hansen's and Vesic's bearing capacity factors - Bearing capacity of stratified soils -Bearing capacity based on penetration resistance - Safe bearing capacity and allowable bearing pressure

UNIT IV
SHALLOW FOUNDATION
Design considerations - Proportioning of shallow foundations - Isolated and combined footings and mats - Design procedure for mats - Fundamentals of beams on Elastic foundations

UNIT V
PILE FOUNDATIONS
Classification of piles - Factors influencing choice – Load carrying capacity of single - Methods - Pile groups

TEXT BOOKS
1. Principles of Foundation Engineering by Braja M. Das.
2. Soil mechanics and foundation engineering by A.K.Arora.
3. Soil Mechanics in Engineering Practice by Terzagi and Peck

REFERENCES:
1. Analysis and Design of sub structures by Swami Saran
2. Design Aids in Soil Mechanics and Foundation Engineering by Shanbaga R. Kaniraj,Tata Mc. Graw Hill.
3. Foundation Design and Construction by MJ Tomlinson – Longman Scientific

4. Foundation Analysis and Design by J.E. Bowles McGraw Hill Publishing Co.,
5. Foundation Design by Wayne C. Teng, John Wiley & Co.,
6. Relevant IS codes

COURSE OUTCOMES	
CO 1	Know various samples, sampler techniques and borings methods
CO 2	Ability to evaluate bearing capacity for shallow foundations
CO 3	Ability to evaluate the load carrying capacity of pile foundations
SUBSTRUCTURE DESIGN	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT106	**FINITE ELEMENT METHOD**	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisite : SA-II ; Theory of Elasticity				
COURSE OBJECTIVES					
COB 1	To equip the students with the finite element analysis fundamentals				
COB 2	To introduce basic aspects of finite element technology, including domain, Discretization, polynomial interpolation, application of boundary conditions				
COB 3	Perform analysis of 2-D structures using plane stress and plane strain cases				
COB 4	Perform finite element analysis using 2-D triangular and rectangular elements				
COB 5	To enable the students to formulate the design problems into FEA				

UNIT I
BASICS OF FINITE ELEMENT METHOD
Different steps involved in finite element method (FEM) - Different approaches of FEM - Direct method - Variation Principle & Weighted Residual method.

UNIT II
1 DIMENSIONAL AND 2 DIMENSIONAL FEM
Equations of equilibrium - Strain displacement relations - Stress strain relations- Plane stress and Plane strain problem - Boundary Conditions

UNIT III
ELEMENT PROPERTIES
.Displacement models - Shape functions - Stiffness matrices - One dimensional bar element - Two dimensional truss elements - Three dimensional truss elements - Two dimensional beam elements - Three dimensional beam elements - Analysis of framed structures using truss and beam elements - Lagrangian interpolation - Pascal's triangle - Convergence criteria.

UNIT IV
PLANE STRESS AND PLANE STRAIN PROBLEMS
Analysis of plates using triangular CST elements – Rectangular elements - Axi-symmetric elements

UNIT V
ISO PERIMETRIC ELEMENTS
Four node and Eight node elements, Analysis of plates by rectangular elements - Triangular elements and quadrilateral elements, Numerical integration (Gauss Quadrature), Introduction to Non-Linear Analysis by FEM

TEXT BOOKS
1. R. D. Cook, Concepts and Applications of Finite Element Analysis, John Wiley& Sons, New York
2. Logan D.L., A first course in the Finite Element Method, Thomson Asia Pvt. Ltd., Mumbai, 2004.

REFERENCE BOOKS:

1. T. R. Chandrupatla & A. D. Belegundu, Introduction to Finite Elements in Engineering, Prentice Hall of India Pvt. Ltd., New Delhi.
2. Desai, C.S. and Abel, J.F., "Introduction to Finite Element Method", CBS Publishers and Distributors, New Delhi, 1987.
3. C. S. Krishnamoorthy, Finite Element analysis-Theory and Programming, Tata McGraw Hill.

COURSE OUTCOMES	
CO 1	Ability to generate the governing FE equations for different structural elements in 1D, 2D, 3D, Plane stress, Plane strain and Axisymmtric geometries.
CO 2	Ability to adopt different Coordinate systems like Cartesian, Natural, Area, Volume Co-ordinate systems and appreciate their application in FEM
CO 3	Ability to apply Lagrangean and Serendipity methods to obtain Shape functions
CO 4	Ability to formulate Finite Element Equations for Iso-parametric elements
CO 5	Ability to apply FEM to structural mechanics problems with special emphasis on truss, beam, frame, and plate elements

FINITE ELEMENT METHOD	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT106	**STABILITY OF STRUCTURES**	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisite : Mathematics				
COURSE OBJECTIVES					
COB 1	Understand the behavior of Beam – columns with different boundary conditions				
COB 2	To provide a detailed treatment of Elastic and In-elastic buckling characteristics of various structural elements				
COB 3	To present different methods to solve Torsional and lateral buckling of beams				

UNIT I
BEAM COLUMNS
Differential equation for beam columns - Beams column with concentrated loads - Continuous lateral load & couples - Beam column with built in ends - continuous beams with axial load - Determination of allowable stresses.

UNIT II
ELASTIC BUCKLING OF BARS
Elastic buckling of straight columns - Effect of shear stress on buckling - Eccentrically and laterally loaded columns - Energy methods - Buckling of a bar on elastic foundation - Buckling of bar with intermediate compressive forces and distributed axial loads- Effect of shear force on critical load- Built up columns Effect of Initial curvature on bars - Buckling of frames

UNIT III
IN-ELASTIC BUCKLING
Buckling of straight bars - Double modulus theory - Tangent modulus theory-Experiments and design formulae: Experiments on columns - Critical stress diagram - Empirical formulae of design -Various end conditions - Design of columns based on buckling.

UNIT IV
TORSIONAL BUCKLING
Non uniform torsion of thin walled bars of open cross section - Torsional buckling - Buckling of Torsion and Flexure.

UNIT V
LATERAL BUCKLING OF SIMPLY SUPPORTED BEAMS
Beams of rectangular cross section subjected for pure bending - Buckling of I Section subjected to pure bending.

TEXT BOOKS:
1. Theory of Elastic Stability by Timshenko & Geri-McGraw Hill
2. Theory of Stability of Structures by Alexander Chafes.

REFERENCE BOOKS:
1. T.V. Gal ambos , " Guide to Stability Design Criteria for Metal Structures," Wiley, 5th edition 1998.

2. Luis A. Godoy, “Theory of Elastic Stability: Analysis and Sensitivity,” Taylor & Francis Group, 2000.

COURSE OUTCOMES	
CO 1	Ability to analyze Beam – columns with different boundary conditions
CO 2	Ability to study Elastic and In-elastic buckling characteristics of various structural elements
CO 3	Ability to solve Torsional and lateral buckling of beams
STABILITY OF STRUCTURES	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT108	**PRE-STRESSED CONCRETE**	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisite: SM - 1 & 2, DRCS - 1 & 2				
COURSE OBJECTIVES					
COB 1	Understand the terminology related to pre-stressing and pre-stressing systems				
COB 2	Be able to understand the general mechanical behavior of prestressed concrete				
COB 3	Be able to perform analysis and design of prestressed concrete members				
COB 4	Be able to calculate various losses occurs in Pre and Post tension methods of Pre stressing				
COB 5	Analyze and design the anchorage systems for pre-stressing at the construction site				
COB 6	To analyse and design composite sections				

UNIT I
INTRODUCTION
General Principles of Pre-stressing – Pre tensioning and Post tensioning methods – Different systems of Pre-stressing – Analysis of Pre-stress and bending stress – Resultant stress at a section – Pressure line – Concept of Load balancing – Stresses in tendons

UNIT II
LOSSES OF PRE-STRESS (AS PER IS:1343-2012)
Losses of Pre-stress in Pre and Post tensioned members due to various reasons – Elastic shortening of concrete, Shrinkage of concrete, Creep of concrete, Relaxation of steel, Slip in anchorage, differential shrinkage – frictional losses- long term losses

UNIT III
DESIGN OF PRE-STRESSED SECTIONS
Types of flexure failures – code procedures – Shear and Principal stresses – Design of sections for Flexure, Shear, Axial tension, Compression and bending and bond

UNIT IV
DEFLECTIONS OF PRE-STRESSED CONCRETE BEAMS
Importance of control of deflections – Factors influencing deflections – Short term deflection calculations of un-cracked and cracked members – Prediction of Long term deflections Analysis of end blocks by Guyon's and Magnel method – Anchorage zone stresses – Approximate method of design – anchorage zone reinforcement –

UNIT V
COMPOSITE SECTIONS
Introduction – Analysis for stresses – differential shrinkage – general design considerations

TEXT BOOKS:
1. Code Book of IS 1343:2012
2. T. Y. Lin and H. Burns Ned, Design of Prestressed concrete structures, John Willey & Sons, New York-1982.
3. N. Krishnaraju, Prestressed concrete, Tata McGraw Hill, New Delhi-2004.

REFERENCE BOOKS:

1. Y. Guyen, Prestressed concrete Vol-I & Vol.-II, John Willey & Sons, New York-1960
2. S. K. Mallik and A. P. Gupta, Prestressed concrete, Oxford & IBH, New Delhi-1982.
3. E. W. Bennet, Prestressed concrete, Theory & Design, Chapman & Hall, London-1962

COURSE OUTCOMES	
CO 1	Ability to analysis and Design of pre-tensioned as well as post-tensioned concrete beams
CO 2	Ability to analyse and design the anchorage systems for pre-stressing at the construction site
CO 3	Ability to design various pre-stressed structures
CO 4	Ability to predict short term and long term deflections in PSC members
CO 5	Ability to design Composite sections
PRE-STRESSED CONCRETE	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

A1STT207		**L**	**T**	**P**	**C**
	STRUCTURAL OPTIMIZATION	3	0	0	3
	Total Contact Hours – 3(L)				
	Prerequisite :				
COURSE OBJECTIVES					
COB 1	To introduce the concepts of design optimization and review major conventional and modern optimization methods used in structural optimization applications				
COB 2	Apply optimization for minimum weight design of structures				
COB 3	Apply classical optimization techniques in engineering problems				
COB 4	Apply the linear programming techniques in engineering optimization.				
COB 5	Perform plastic analysis of structure and design of structural elements based on minimum weight concept.				

UNIT I

INTRODUCTION: Need and scope for optimization – statements of optimization problems- Objective function and its surface design variables- constraints and constraint surface- Classification of optimization problems (various functions continuous, discontinuous and discrete) and function behaviour (monotonic and uni-modal)

UNIT II

CLASSICAL OPTIMIZATION TECHNIQUES: Differential calculus method, multivariable optimization by method of constrained variation and Lagrange multipliers (generalized problem) Khun-Tucker conditions of optimality.

UNIT III

Fully stressed design and optimality criterion based algorithms introduction, characteristics of fully stressed design theoretical basis examples

UNIT IV

LINEAR PROGRAMMING: Definitions and theorems- Simplex method-Duality in Linear programming, simple applications

UNIT V

MINIMUM WEIGHT DESIGN: Plastic analysis and Minimum weight design and rigid frame

TEXT BOOKS

1. Optimization Theory and Applications – S.S. Rao, Wiley Eastern Limited, New Delh
2. Rackwitz R, Augusti G and Borri A. Reliability and Optimization of Structural Systems, Chapman & Hall, London, UK, 1995.

REFERENCES:

1. Optimization Concepts and Application in Engineering- Belegundu A.D. and Chandrapatla T.R.

COURSE OUTCOMES	
CO 1	Ability to apply the basic ideas in optimization to make the structures as lightly as possible.
CO 2	Ability to apply classical optimization techniques in engineering problems
CO 3	To apply the linear programming techniques in engineering optimization.
CO 4	Ability to perform plastic analysis of structure and design of structural elements based on minimum weight concept.
STRUCTURAL OPTIMIZATION	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT208	**BRIDGE ENGINEERING**	3	1	0	4
	Total Contact Hours – 3(L)				
	Prerequisite :				
COURSE OBJECTIVES					
COB 1	To develop an understanding of and appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality				
COB 2	To understand the load flow mechanism and identify loads on bridges				
COB 3	To carry out a design of bridge starting from conceptual design, selecting suitable bridge, geometry to sizing of its elements				
COB 4	00Understand the concept of planning and investigation for bridges and Analyze and design superstructures for various types of bridges				
COB 5	Analyze and design various types of substructures and foundations				

UNIT I
INTRODUCTION
Introduction to bridge engineering – Components of a bridge, classification – importance of bridges, Historical development, Conceptual bridge design.Standard specifications for road bridges – Indian roads congress bridge code – width of carriageway – clearances – loads – dead load, IRC standards for live load, impact effect. Application of live load on deck slab, Wind load, longitudinal, centrifugal forces, Horizontal forces due to water currents, Buoyancy effect, Earth pressure, temperature effect, seismic effect, deformation, secondary and erection stresses.

UNIT II
SUPER STRUCTURE
Slab bridge- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Pigeaud's method.

UNIT III
PLATE GIRDER BRIDGES
Elements of plate girder and their design-web flange-intermediate stiffener- vertical stiffeners- bearing stiffener design problem

UNIT IV
Design of Pipe culvert, Slab culvert and Box culverts and their reinforcement detailing

UNIT V
SUB STRUCTURE
Abutments – Stability analysis of abutments – piers – Loads on piers- Analysis of piers – Design problem **BEARINGS** – Classification – Design principles

TEXT BOOKS:
1. Essentials of bridge engineering- Jhonson Victor D,.
2. Design of bridges- Krishna Raju

REFERENCE BOOKS:

1.Design of Highway Bridges, Richard M. Barker, Jay A. Puckett / John Wiley & Sons, Inc. 1997

2. Design of Modern Concrete Highway Bridges / Conrad P. Heins, Richard Lawrie / Wiley, 1984

COURSE OUTCOMES	
CO 1	Ability to apply various IRC standards for live load impact effect.
CO 2	Ability to design the interior panel of the deck slab using Pigeaud's method.
CO 3	Ability to design various types of culverts with their reinforcement detailing.
CO 4	Ability to design a bridge with plate girders having end bearing and intermediate stiffeners
CO 5	Ability to analyse the stability of abutments and piers
CO 6	Ability to understand the effect of various loads like wind load, seismic load, horizontal forces due to water currents on bridges.

BRIDGE ENGINEERING	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT209	**REPAIR AND EHABILITATION OF STRUCTURES**	3	1	0	4
	Total Contact Hours – 3(L)				
	Prerequisite : CT				
COURSE OBJECTIVES					
COB 1	To have an understanding of the underlying cause or causes of concrete distress and deterioration				
COB 2	To have knowledge of different materials and techniques for repair				
COB 3	To have knowledge of repair and rehabilitation of deteriorated members				
COB 4	To understand the need and importance of demolition				

UNIT I
MAINTENANCE AND INTENANCE AND REPAIR STRATEGIES
Maintenance, repair and rehabilitation, Facts of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure by NDT, causes of deterioration.

UNIT II
MATERIALS FOR REPAIR
Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete.

UNIT III
TECHNIQUES FOR REPAIR
Repair techniques for distressed concrete members- Rust eliminators and polymers coating for rebars- foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning.

UNIT IV
REHABILITATION AND RETROFITTING OF STRUCTURES
Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion and marine exposure.

UNIT V
DEMOLITION OF STRUCTURES
Need and importance for demolition- outline of various demolition methods and their evaluation, partial and controlled demolition, role of safety measures, temporary support structures in demolition - case studies.

TEXT BOOKS:
1. Denison Campbell, Allen and Harold Roper," Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.
2. R.T.Allen and S.C.Edwards, Repair of Concrete Structures, Blakie and Sons, UK,1987

REFERENCE BOOKS:

1. Santhakumar, A.R., Training Course notes on Damage Assessment and repair in Low Cost Housing , "RHDC-NBO" Anna University, July 1992.
2. Raikar, R.N., Learning from failures - Deficiencies in Design, Construction and Service - R&D Centre (SDCPL), RaikarBhavan, Bombay, 1987.
3. N.Palaniappan, Estate Management, Anna Institute of Management, Chennai, 1992.

COURSE OUTCOMES	
CO 1	Ability to study causes of concrete distress and deterioration
CO 2	Knowledge of different materials and techniques for repair
CO 3	Knowledge of repair and rehabilitation of deteriorated members
CO 4	Appreciate need and importance of demolition
REPAIR AND REHABILIATION OF STRUCTURES	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT210	**STRUCTURAL RELIABILITY**	3	0	0	3
	Total Contact Hours – 3(L)/W				
	Prerequisite :				
COURSE OBJECTIVES					
COB 1	Understand use of general concepts of statistics for probabilistic analysis				
COB 2	Understand the basic concepts related to reliability analysis of structures				
COB 3	Design the structures for various reliability indices				

UNIT I

CONCEPTS OF STRUCTURAL SAFETY: General, Design methods.
Basic Statistics: Introduction, Data reduction, Histograms, Sample correlation..

UNIT II

PROBABILITY THEORY: Introduction, Random events, Random variables, Functions of random variables, Moments and expectation, Common probability distribution, Extremal distribution.

UNIT III

RESISTANCE DISTRIBUTIONS AND PARAMETERS: Introduction, Statistics of properties of concrete, Statistics of properties of steel, Statistics of strength of bricks and mortar, Dimensional variations, Characterization of variables, Allowable stresses based on specified reliability.

UNIT IV

Basic structural reliability, Introduction Reliability methods, Failure surface, Definition of Reliability in standard normal space (Cornell's reliability index), First order reliability method (FORM).

UNIT V

SORM (Second order reliability method, Computation of structural reliability. Monte Carlo Study of Structural Safety: General, Monte Carlo method, Applications

TEXT BOOKS

1. RackwitzR,Augusti G and BorriA. Reliability and Optimization of Structural Systems, Chapman & Hall, London, UK, 1995.
2. L S Srinath Reliability Engineering, East west press, 2005.

REFERENCE BOOKS:

1. Ranganathan R.Structural Reliability Analysis & Design. Jaico Publishing House, Mumbai, India, 1999.
2. "Structural Reliability" by Melchers, R.E.

COURSE OUTCOMES	
CO 1	Ability to use the basic concepts of statistics in probability.
CO 2	Ability to understand the concept of probability and apply it.
CO 3	Able to compute reliability indices for simple structural engineering problems as beams, trusses.
CO 4	Ability to understand basic concepts of structural reliability and reliability based design of structural systems such as trusses and frames.

STRUCTURAL RELIABILITY	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

A1STT211		L	T	P	C
	DESIGN OF HYDRAULIC STRUCTURES	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisite : WRE – I & II				

COURSE OBJECTIVES	
COB 1	Integrate the hydraulics and water resources background by involving the students in water structures design applications
COB 2	To develop understanding of the basic principles and concepts of analysis and design of hydraulic structures

UNIT I

DIVERSION HEAD WORKS: Introductory perspectives- Types of diversion head works – components – Design of weirs and barrages

UNIT II

LOADING -Concepts and criteria, Gravity dam analysis, design features and stability-elementary profile of gravity dam- Concrete for dams – roller compacted concrete gravity dams

UNIT III

DAM OUTLET WORKS: Spillways – Ogee spillway - cavitation on spillway – design feature- design principles and design of spillways – Chute spillways –Energy dissipation – stilling basins

UNIT IV

DROP STRUCTURES: Sarda fall – Glacis fall –Design principles- Cross regulator, head regulator and functions

UNIT V

CROSS DRAINAGE WORKS: Types – Selection – Design of Aqueduct – Siphon aqueduct and Super passage

TEXT BOOKS:

1. Design of minor irrigation and canal structures by C.Satyanarayana Murthy, Wiley
2. Irrigation engineering and Hydraulic structures by S.K.Garg, Standard Book House.
3. Theory &design of irrigation structures: R.S. Varshney, S.C. Gupta, R.L. Gupta.Roorkee, India :Nem Chand & Bros, 1979.

REFERENCE BOOKS:

1. "Hydraulic Structures" by P. Novak, - Unwin Hyman, London

COURSE OUTCOMES	
CO 1	|Ability to design weirs and barrages
CO 2	Ability to design over flow and non over flow gravity dams
CO 3	Ability to design canal regulating structures (canal drops and regulators)
CO 4	Ability to design cross drainage works
CO 5	Ability to design weirs and barrages

DESIGN OF HYDRAULIC STRUCTURES	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STT212	**PLASTIC ANALYSIS AND DESIGN OF STEEL STRUCTURES**	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisite : DSS ; DRCS				

COURSE OBJECTIVES	
COB 1	To understand the concept of plastic moment carrying capacity
COB 2	To make the student familiarize the formation of mechanism and plastic moment
COB 3	To make the student understand minimum weight design of the structures

UNIT I

INTRODUCTION AND BASIC HYPOTHESIS: Concepts of stress and strain –Relation of steel Moment curvature relation- basic difference between elastic and plastic analysis with examples- Yield condition, idealizations, collapse criteria- Virtual work in the elastic-plastic state-Evaluation of fully plastic moment and shape factors for the various practical sections.

UNIT II

METHOD OF LIMIT ANALYSIS: Introduction to limit analysis of simply supported fixed beams and continuous beams, Effect of partial fixity and end, invariance of collapse loads, basic theorems of limit analysis, rectangular portal frames, gable frames, grids, superposition of mechanisms, drawing statistical bending moment diagrams for checks

UNIT III

LIMIT STATE DESIGN PRINCIPLES: Basic principles, limit design theorems, Application of limit design theorems, trial and error method, method of combining mechanisms, plastic moment distribution method, load replacement method, continuous beams and simple frames designs using above principles

UNIT IV

DEFLECTION IN PLASTIC BEAMS AND FRAMES: Load deflection relations for simply supported beams, deflection of simple pin based and fixed based portal frames, method of computing deflections

UNIT V

MINIMUM WEIGHT DESIGN: Introduction to minimum Weight and linear Weight functions- Foulkes theorems and its geometrical analogue and absolute minimum weight design

TEXT BOOKS:

1. Plastic Methods of Structural analysis- B G Neal, Chapman and Rall publications
2. Plastic analysis and Design – C E Messennet, M A Seve

REFERENCE BOOKS:

1. Plastic Analysis and design –Manickselvam

COURSE OUTCOMES	
CO 1	Ability to calculate the concept of plastic moment carrying capacity of structures
CO 2	Ability to formulate mechanism and plastic moment
CO 3	Ability to perform minimum weight design of the structures

PLASTIC ANALYSIS AND DESIGN OF STEEL STRUCTURES	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015

		L	T	P	C
A1STL102	**COMPUTER APPLICATIONS IN STRUCTURAL ENGINEERING LAB**	3	1	0	4
	Total Contact Hours – 3(L) + 1(T)/W				
	Prerequisite :				

COURSE OBJECTIVES	
COB 1	To provide first-hand experience on engineering simulation and design of different structures using commercial FE analysis software (STAAD Pro).
COB 2	To make the student familiar with development of Excel Spread sheets for various components of structures
COB 3	To introduce the ANSYS software and Analysis of Simple beam using ANSYS

LIST OF EXPERIMENTS:

Exercises using Excel

1. Spread sheets for design of Beams using Excel
2. Spread sheets for design of Columns using Excel
3. Spread sheets for design of Spread, combined and Strip footing using Excel

Exercises using STAAD Pro.

1. Analysis and Design of Beams using STAAD Pro.
2. Analysis and Design of Planar Truss STAAD Pro.
3. Analysis and Design of 3D Multistory frame for DL,LL,WL and EQ loads
4. Analysis and Design of Water tank
5. Analysis and Design of Transmission line tower

Exercises using ANSYS

1. Introduction to ANSYS
2. Analysis of 3 D Steel beam using ANSYS

Note: Any eight exercises can be conducted

REFERENCES

1. http://www.bentley.com/en-US/Products/STAAD.Pro/

COURSE OUTCOMES	
CO 1	Ability to design different structures using commercial FE analysis software (STAAD Pro).
CO 2	Ability to develop Excel Spread sheets for various components of structures
CO 3	Ability to Analysis of Simple beams using ANSYS software

COMPUTER APPLICATIONS IN STRUCTURAL ENGINEERING LAB	
Course designed by	CIVIL Department
Approval	Approved by: Meeting of Board of Studies held on 13th June, 2015
	Ratified by: 1st Meeting of Academic Council, 27th June, 2015