

ACADEMIC REGULATIONS & CURRICULUM

M.Tech. (Structural Engineering)

**Applicable to the students admitted from the
Academic year 2019-2020**



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



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



P. Ashok Gajapathi Raju
Chairman-MANSAS
Ex-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:

- M1: Have on-board staff with high quality experience and continuously updating themselves with latest research developments and sharing that knowledge with students.
- M2: Having a well stream-lined teaching learning process that is continuously assessed for effectiveness and fine-tuned for improvement.
- M3: Having state-of-the-art lab and general infrastructure that gives students the necessary tools and means to enhance their knowledge and understanding.
- M4: 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.
- M5: 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-economic 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.

Trust offers KG to PhD level education in Arts, Sciences, Law, Pharmacy, Humanities Education, Engineering and Management and presently houses 13 Educational Institutions. MVGR College of Engineering is one of the 13 Institutes.

Other Institutions under MANSAS

1. M.R. HIGH SCHOOL 1857
2. M.R COLLEGE (**NAAC ACCREDITED**) 1879
3. M.R. COLLEGE OF EDUCATION 1950
4. M.R. WOMENS COLLEGE (**NAAC ACCREDITED**) 1962
5. M.R. GIRLS HIGH SCHOOL 1974
6. M.R. MODEL HIGH SCHOOL 1974
7. M.R. ENGLISH MEDIUM SCHOOL 1979
8. M.R.V.R.G.R LAW COLLEGE 1987
9. M.R. P.G. COLLEGE (**NAAC ACCREDITED**) 1987
10. M.R.SCHOOL OF MANAGEMENT STUDIES 1994
11. M.R.V.R.G.R – II MEMORIAL JR. COLLEGE 1994
12. M.R. COLLEGE OF PHARMACY 2004

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. The Institution 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.

Institution at a glance:

- MVGR is a 22 years old institution, established in 1997
- All eligible UG Programs (CHEMICAL, CIVIL, CSE, ECE, EEE, IT & MECHANICAL) were re-accredited by NBA.
- MBA program was also re-accredited by NBA.
- Had been re-accredited with Grade 'A' by NAAC of UGC
- Has Permanent affiliation with JN Technological University-Kakinada
- Listed under sections 2(f) & 12(b) of UGC act 1956.
- Approved by AICTE-New Delhi
- EIGHT departments are recognized as RESEARCH CENTERS by JNTU-K
- Granted Autonomy by UGC in 2015
- Campus of 60 acre

- Offering 7 UG and 5 M.Tech and MBA program
- About 250 faculty of which 84 Ph.D. Degree holders
- 83 Laboratories with an investment of about 13 crores
- Total built up area of about 7 Lakh sft
- About 42,000 volumes and Access to 8 international online journal packages like IEEE, SPRINGER, etc.
- 1420 Systems & 395 Mbps band width internet facility
- About Rs. 4 crore worth of on-going R&D projects
- Actively involved in civil engineering consultancy work as Third Party Quality Auditor for Vizianagaram Municipality
- WIPRO Recognized technology learning center and MISSION 10X partner institution
- Recognized National Instruments Academy for Training in LabView
- SIRO Recognition by DSIR
- Recognized PTC Centre of Excellence for Creo Training
- Identified by MSME as Business Incubation Centre
- APSSDC-Siemens Technical Skill Development Institute
- Recognized CMs SKILL EXCELLENCY CENTER (SEC)
- Microsoft Ed-vantage Platinum Partner
- Institutional member of IUCEE
- Institutional Member of CII
- Member, Chamber of Commerce, Vizianagaram
- Green Campus award by Govt. of AP

MVGR College of Engineering is rated as one among the best engineering colleges in the state of Andhra Pradesh as it set 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. Program

Applicable to the students admitted from the Academic year 2019-20 onwards.

1. PROGRAM STRUCTURE:

M.TECH:

S.No	Category	Credits
1	Program core courses	16
2	Program Elective courses	19
3	Open Electives	3
4	Research Methodology and IPR	2
5	Mini Project with seminar	2
6	Dissertation / Industrial Project	26
7	Audit courses 2	0
	Total	68

Open Elective

1. Business Analytics
2. Composite Materials
3. Cost Management of Engineering Projects
4. Industrial Safety
5. Operations Research
6. Waste to Energy

Audit course 1 & 2

1. Constitution of India
2. Disaster Management
3. English for Research Paper Writing
4. Pedagogy Studies
5. Personality Development through Life Enlightenment Skills.
6. Sanskrit for Technical Knowledge
7. Stress Management by Yoga
8. Value Education

2. PROGRAM PATTERN:

The program is for 2 academic years - 4 semesters.

3. AWARD OF DEGREE:

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

- 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.

- A student shall register for **68** credits and secure all **68** credits.
- Students who fail to complete Two Years Course of study within Four years shall forfeit their seat and their admission stand cancelled.

4. CERTIFICATION PROGRAMS:

S.No.	Dept	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	MECH	ANSYS Training and Certification by Mechanical Department
5	MECH	AUTOCAD Training and Certification by Mechanical Department
6	MECH	Catia by APSSDC-Dassault Systemes, CM's Center of Excellence
7	MECH	Delmia by APSSDC-Dassault Systemes, CM's Center of Excellence
8	MECH	Simulia by APSSDC-Dassault Systemes, CM's Center of Excellence
9	MECH	2-Wheeler Automobile Certification by APSSDC-SIEMENS
10	MECH	4-Wheeler Automobile Certification by APSSDC-SIEMENS
11	MECH	Welding Certification by APSSDC-SIEMENS
12	MECH	CNC Certification by APSSDC-SIEMENS
13	MECH	Commercial Electrical Certification by APSSDC-SIEMENS
14	MECH	Solid Edge Certification by APSSDC-SIEMENS
15	CHEM	Chemical Process Design and Simulation by Simtech Simulations, Hyderabad
16	ECE	Embedded Systems by ThinkLABS, Mumbai
17	ECE	Labview by National Instruments Systems India Pvt. Ltd.
18	ECE	Unified Technology Learning Program (UTLP) by Wipro Mission 10X
19	CSE, IT	PEGA by Virtusa Corporation
20	CSE, IT	Microsoft technologies by Microsoft Corp.
21	CSE, IT	Ethical Hacking by EC-Council Academia
22	CSE, IT	Java and C by Talent Sprint
23	CSE, IT	Network Analyst (CCNA) by Cisco Systems Inc
24	CSE, IT	Java Programming (OCJP) and DBMS by Oracle
25	EEE	PLC, Drives and Automation by Siemens
26	EEE	PLC by New Dawn Automation
27	EEE	Home Electrical Certification by APSSDC-SIEMENS
28	Civil	Remote Sensing and GIS by Indian Institute of Remote Sensing

- The Institution shall offer the certification programs by itself or in collaboration with industry/such other Institutions deemed to have specialized expertise in the proposed area of training.
- Only students of the Institution shall be eligible to register on payment of prescribed fee.
- 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) If the duration of the course is less than or equal to 40 hours, it can be completed in one semester, otherwise, it can suitably distributed 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 in tests as prescribed.
 - Shall remit 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.

If the student is absent for the periodic tests, the test shall be re-conducted on payment of 10% of fee.

5. COURSES OFFERED:

Name of the Program	Degree
UG Programs (Engineering & Technology)	B.Tech (Civil) B.Tech.(EEE) B.Tech.(Mech.) B.Tech.(ECE) B.Tech.(CSE) B.Tech.(CHEM) B.Tech.(IT)
PG Programs (Engineering & Technology)	M.Tech.(Structural Engineering) M.Tech. (Power Systems) M.Tech.(PDM) M.Tech.(VLSI) M.Tech.(CN&IS)
Other PG Programs	MBA
Research Programs	Ph.D in Civil, EEE, MECH, ECE, CSE, CHEM, MBA and MATHS

6. DISTRIBUTION AND WEIGHTAGE OF MARKS:

All Theory courses will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment:

- **Subjective tests – 30 Marks**
- **Assignments - 10 Marks**
 - Two subjective tests shall be conducted each for 30 Marks.
 - Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 10 marks (No choice).
 - Average of the two subjective tests shall be considered as performance in internals.
 - Assignments shall be assessed for 10 marks.

Semester End Assessment:

- Semester End examination is for 60 marks (180 min). Question paper contains 5 questions (one from each unit with internal choice). Each question carries 12 marks. A student shall answer all 5 questions.

a) LABORATORY/PRACTICE:

All Laboratory/Practice courses are assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for Semester End Examination.

Internal assessment: (40 Marks)

- Continuous assessment: :20 Marks
- Internal test: :20 Marks

Semester End Assessment: (60 Marks)

- Semester End Examination is for 60 marks (180 min) conducted and assessed by both external and internal examiners.
- Both internal and semester end examination shall include assessment of the student on
 - Knowledge of principles/concepts involved
 - Experimental design
 - Result interpretation and analysis
 - Experimental report

b) DRAWING/DESIGN/ESTIMATION:

These courses are assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end 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.

c) Research Methodology & IPR shall be evaluated internally for 50 marks by PRC at the end of I semester

d) Mini Project with Seminar shall be evaluated internally for 50 marks by PRC in the II semester

e) For audit course a student is deemed to satisfy the minimum contact hours, as prescribed by the department and shall also comply with the requirements for submission of assignments/projects. A student shall also opt for MOOCs and submit the certificate after completion of the course.

f) PROJECT EVALUATION:

Duration is TWO semesters –Minimum of 40 weeks period is 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 authorize /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 work and submit.
- Candidates who have successfully passed all theory and lab courses shall be eligible for submitting the thesis.
- The thesis shall be adjudicated by the internal & external examiners and 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:
 - **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, 120 marks shall be evaluated internally by PRC and remaining 180 marks shall be evaluated externally by the internal and external examiner.
- The evaluation of Project phase II shall be made on the following aspects.
 - Experimental/methodology design
 - Result analysis and interpretations
 - Report writing
 - Presentation
 - Viva-voce

7. ATTENDANCE REGULATIONS:

- 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.
- Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the college academic committee.
- Shortage of attendance below 65% in aggregate of all the subjects (Theory & Lab) for the semester shall not be condoned.
- Detained student shall seek re- admission for that semester when offered within 4 weeks from the date of commencement of class work.

8. MINIMUM ACADEMIC REQUIREMENTS:

- A student is deemed to have satisfied the minimum academic requirements for a course on securing at least 24 marks out of 60 marks at semester end examination and overall minimum of 50 marks out of 100 marks including internal assessment.

9. GRADING SYSTEM:

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,

$$\text{SGPA} = \frac{\sum (\text{course credits earned} \times \text{Grade points})}{\sum (\text{Total course credits in the semester})}$$

$$\text{CGPA} = \frac{\sum (\text{course credits earned} \times \text{Grade points}) \text{ up to successfully completed semesters}}{\sum (\text{Total course credits up to successfully completed semesters})}$$

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
P	(Pass)	5
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 : 18	Credit : 18	Credit : 16	Credit : 16
SGPA: 7.9	SGPA: 7.8	SGPA: 7.6	SGPA: 8.0

Thus, **CGPA** = $18 \times 7.9 + 18 \times 7.8 + 16 \times 7.6 + 16 \times 8.0$

$$\frac{142.2+140.4+121.6+128}{68} = 7.83$$

10. ELIGIBILITY FOR AWARD OF DEGREE:

M.Tech.:

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

- 1) Successfully completes all the courses prescribed for the Program.
- 2) CGPA greater than or equal to 5.5 (Minimum requirement for Pass),

11. AWARD OF CLASS:

Eligible candidates for the award of M.Tech. 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 of 90 clear instruction days.

13. TRANSFERS FROM OTHER INSTITUTIONS SHALL NOT BE PERMITTED.

14. SUPPLEMENTARY EXAMINATIONS

Supplementary examinations shall be conducted along with regular examinations.

15. WITHHOLDING OF RESULTS

The result of a student shall be withheld

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

16. TRANSITORY REGULATIONS

A Candidate shall be readmitted from University regulations to A1 regulations or from A1 regulations to A2 regulations as per the guide lines of JNTUK.

17. 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.

18. Regulations 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 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. 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. 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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1. 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.**

PROGRAM STRUCTURE (A2)
M.TECH (STRUCTURAL ENGINEERING)

SEMESTER - I						
S. No	Course Code	Course Title	L	T	P	Credits
1	A2SET101	Advanced Structural Analysis	3	-	-	3
2	A2SET102	Advanced Solid Mechanics	3	-	-	3
3		Program Elective - I	3	-	-	3
	A2SET201	Advanced Reinforced Concrete Structures				
	A2SET202	Theory and Applications of Cement Composites				
4		Program Elective - II	3	-	-	3
	A2SET204	Analytical and Numerical Methods for Structural Engineering				
	A2SET205	Structural Health Monitoring				
	A2SET206	Structural Optimization				
5	A2SEL101	Structural Design Lab	-	-	4	2
6	A2SEL102	Advanced Concrete Lab	-	-	4	2
7	A2SET105	Research Methodology and IPR	2	-	-	2
8	A2ACA5XX	Audit Course-I	2	-	-	0
Total Number of Credits						18

SEMESTER - II						
S. No	Course Code	Course Title	L	T	P	Credits
1	A2SET103	FEM in Structural Engineering	3	-	-	3
2	A2SET104	Structural Dynamics	3	-	-	3
3		Program Elective - III	3	-	-	3
	A2SET207	Advanced Steel Design				
	A2SET208	Design of High Rise Structures				
	A2SET209	Design of Masonry Structures				
4		Program Elective - IV	3	-	-	3
	A2SET210	Design of Advanced Concrete Structures				
	A2SET211	Advance Design of Foundation				
	A2SET212	Design of Industrial Structures				
5	A2SEL103	FEM Laboratory (ANSYS)	-	-	4	2
6	A2SEL104	Numerical Analysis Laboratory	-	-	4	2
7	A2SEP401	Mini Project	2	-	-	2
8	A2ACA5XX	Audit Course-II	2	-	-	0
Total Number of Credits						18

SEMESTER - III							
S. No	Course Code	Course Title	L	T	P	Credits	
1		Program Elective - V	3	-	-		3
	A2SET213	Design of Pre-stressed Concrete Structures					
	A2SET214	Mechanics of Composite Materials					
	A2SET215	Fracture Mechanics					
2		Open Elective	3	-	-		3
	A2OET301	Business Analytics					
	A2OET302	Composite Materials					
	A2OET303	Cost Management of Engineering Projects					
	A2OET304	Industrial Safety					
	A2OET305	Operations Research					
	A2OET306	Waste to Energy					
3	A2SEP402	Dissertation Phase-I		-	20		10
Total Number of Credits							16

SEMESTER - IV							
S. No	Course Code	Course Title	L	T	P	Credits	
1	A2SEP403	Dissertation Phase-II		-	32		16
Total Number of Credits							16

Audit Courses

1	A2ACA501	Constitution of India
2	A2ACA502	Disaster Management
3	A2ACA503	English for Research Paper Writing
4	A2ACA504	Pedagogy Studies
5	A2ACA505	Personality Development through Life Enlightenment Skills
6	A2ACA506	Sanskrit for Technical Knowledge
7	A2ACA507	Stress Management by Yoga
8	A2ACA508	Value Education

A2SET101	SEMESTER - I	L	T	P	C
	Advanced Structural Analysis	3	-	-	3
	Pre-requisite: Structural Analysis	Total Contact Hours – 45			

SYLLABUS

UNIT – I: INTRODUCTION

8 Hrs

Introduction to matrix methods of analysis – static indeterminacy and kinematic indeterminacy – degree of freedom – coordinate system – structure idealization – Element stiffness matrix for truss element, beam element and frame element -- local and global coordinates --Transformation of coordinates – load vector.

UNIT – II: STIFFNESS METHOD

8 Hrs

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 AND CONTINUOUS BEAMS

10 Hrs

Analysis of plane truss – continuous beam (kinematic indeterminacy not more than 3) using stiffness method - Effects of Settlements, Temperature Change and Lack of Fit.

UNIT-IV: ANALYSIS OF PLANE FRAME AND GRIDS

10 Hrs

Analysis of plane frame and grids using stiffness method.

UNIT – V: BOUNDARY VALUE PROBLEMS

9 Hrs

Boundary Value Problems (BVP): Approximate Solution of Boundary Value Problems, Modified Galerkin's Method for One-Dimensional BVP.

TEXT BOOK:

1. Matrix Analysis of Structures, Robert E. Sennet, Waveland Press Inc.
2. The Finite Element Method, Lewis P. E. and Ward J. P., Addison-Wesley Publication Co.

REFERENCES:

1. Matrix Structural Analysis, William Mcguire, Richard H Gallagher, Ronald D. Ziemian
2. Computer Methods in Structural Analysis, Meek J. L., E & FN Spon Publications.

COURSE OUTCOMES:

- CO1. Students will be able to find static and kinematic indeterminacy of the structures and develop stiffness matrix for different types of elements.
- CO2. Students will be able to assemble the element stiffness matrices and form global stiffness for the structure.
- CO3. Student will be able to analyze continuous beams and plane trusses using direct stiffness method.
- CO4. Student will be able to analyze plane frames and grids using direct stiffness method.
- CO5. Student will be able to solve boundary value problems.

Course Designed by:	Department of Civil Engineering
Approval	Approved by: Board of Studies Meeting held on 09.07.2019.
	Ratified by: 5 th Meeting of Academic Council, 13-07-2019.

A2SET102	SEMESTER - I	L	T	P	C
	Advanced Solid Mechanics	3	-	-	3
	Pre-requisite: Mathematics, Strength of Materials				
Total Contact Hours – 46					

SYLLABUS

UNIT – I: CONTINUUM MECHANICS AND STRESS FIELD 8 Hrs

Overview of Continuum mechanics and Theory of elasticity – Differences between elementary theory and theory of elasticity – Assumptions – Applications – Types of forces – Concept of three dimensional stress – General state of stress on an element – Differential equation of equilibrium in a general three dimensional stress system – Stress on a general plane : Direction cosines, Axis Deformation – Stress on oblique plane through a point – Stress transformation – Principal stresses and planes.

UNIT –II: DISPLACEMENT AND STRAIN FIELD, CONSTITUTIVE RELATION 10 Hrs

Introduction – Elementary concept of strain – Strain displacement relation – Strain at a point – Strain components at a given point in any direction – Principle strains and their directions – Strain rosettes – Rectangular , Delta – Mohr’s circle of strain – Response model – 1-D Hooke’s law – Generalized Hooke’s law – Non-isotropic linear elastic behaviour - Stress – strain relation for isotropic, orthographic & transverse isotropic material.

UNIT – III: TWO – DIMENSIONAL PROBLEMS OF ELASTICITY IN CARTESIAN AND POLAR COORDINATE SYSTEM 12 Hrs

Two-dimensional state of stress and strain – Plane stress, strain problems – Equation of compatibility – Airy’s stress functions – Saint – Venant’s principle – Two dimensional problems in Cartesian coordinate – Bending of a beam by uniform load using the stress function as a polynomial.

Two-dimensional differential equation of equilibrium in polar coordinates – Airy’s stress function in polar coordinates – Stress-strain relationship in polar coordinates – Strain displacement relations – Compatibility equation – Stresses due to concentrated loads.

UNIT – IV: TORSION ON PRISMATIC BARS 8 Hrs

Introduction – Saint-Venant’s theory – Torsion of elliptical cross – section – Torsion of equilateral triangle cross section bar.

UNIT-V: PLASTIC DEFORMATION 8 Hrs

Strain Hardening, Idealized Stress – Strain curve, Yield Criteria, von-Mises Yield Criterion, Tresca Yield Criterion, Plastic Stress- Strain Relations, Principle of Normality and Plastic Potential, Isotropic Hardening.

TEXT BOOK:

1. Theory of Elasticity, Timoshenko S. and Goodier J.N., McGraw Hill, 1961.
2. Engineering Solid Mechanics, Ragab A.R., Beyoumi S.E., CRC Press, 1999.

REFERENCES:

1. Theory of Elasticity, Sadhu Singh Khanna Publishers, New Delhi.
2. Continuum Mechanics, Dr. P. N. Chandramouli, Yesdee Publishers.

COURSE OUTCOMES:

Students will have the

CO1. Ability to develop stress-strain relationships using stress tensor and transformation in elastic state.

CO2. Ability to solve simple problems of elasticity understanding the basic concepts.

CO3. Ability to apply numerical methods to solve continuum problems.

CO4. Ability to solve problems of 2D and 3D problems of linear elasticity using boundary value concept.

CO5. Ability to solve simple problems of plasticity understanding the basic concepts.

Course Designed by:	Department of Civil Engineering
Approval	Approved by: Board of Studies Meeting held on 09.07.2019.
	Ratified by: 5 th Meeting of Academic Council, 13-07-2019.

A2SET201	SEMESTER - I	L	T	P	C
	Advanced Reinforced Concrete Structures	3	-	-	3
	Pre-requisite: Basic Design of RC Structures	Total Contact Hours – 45			

SYLLABUS

UNIT – I: DESIGN OF TWO-WAY SLABS

8 Hrs

Behaviour, Design of simply supported two-way slab, design of continuous two-way slab as per IS 456:2000 and detailing of slab reinforcements.

UNIT – II: DESIGN OF STAIRCASES

8 Hrs

General features, types of staircases, loads on staircase, effective span of staircase as per IS 456:2000, distribution of loading on stairs, design and detailing of dog legged staircase with waist slabs.

UNIT-III: DESIGN OF STRIP AND COMBINED FOOTINGS

10 Hrs

Design and detailing of strip footing, design of combined slab and beam footing, design of combined footing with strap beam.

UNIT-IV: LIMIT STATE OF SERVICEABILITY

10 Hrs

Short-term and long-term deflection of beams and slabs by IS 456: 2000. 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 – V: BIAXIAL BENDING OF SLENDER COLUMNS

9 Hrs

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.

TEXT BOOK:

1. N. Subramanian, Design of Reinforced Concrete Structures, Oxford Publishers, 2016

REFERENCES:

1. P. C. Varghese, Advanced Reinforced Concrete Design, PHI publishers.
2. S Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design, Tata McGraw Hill Publishers.

COURSE OUTCOMES:

CO1. Students will be able to design and detail RCC two-way slab.

CO2. Students will be able to design and detail staircases.

CO3. Student will be able to design strip and combined footing.

CO4. Students will be able to find the short-term and long-term deflections and crack width in the beams and slabs.

CO5. Student will be able to analyze and design slender columns as per IS 456:2000.

Course Designed by:	Department of Civil Engineering
Approval	Approved by: Board of Studies Meeting held on 09.07.2019.
	Ratified by: 5 th Meeting of Academic Council, 13-07-2019.

A2SET202	SEMESTER - I	L	T	P	C
	Theory and Applications of Cement Composites	3	-	-	3
	Total Contact Hours – 45				

SYLLABUS

UNIT -I: LATEST MATERIALS

Latest Materials in Concrete: Availability, Chemical composition, sustainability, carbon foot prints, pros and cons of materials - Rate analysis of using new materials- Microstructure

UNIT – II: CEMENT COMPOSITES:

Types of Cement Composites, Terminology, Constituent Materials and their Properties, Construction Techniques for Fiber Reinforced Concrete, SIFCON, Polymer Concretes

UNIT – III: MECHANICAL PROPERTIES OF CEMENT COMPOSITES:

Behavior of cement composites in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion.

UNIT – IV: APPLICATION OF CEMENT COMPOSITES:

FRC and Ferro cement- Housing, Water Storage, Boats and Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behavior, Constitutive relationship, Elastic Constants.

UNIT – V: ANALYSIS AND DESIGN OF CEMENT COMPOSITE STRUCTURAL ELEMENTS

Ferro cement, SIFCON and Fibre Reinforced Concrete.

TEXT BOOKS:

1. R. Santhakumar, Concrete Technology, Oxford University Press.
2. A.A. Neville and J. J. Brooks, Concrete Technology, Prentice Hall, New York.

REFERENCE BOOKS:

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

COURSE OUTCOMES:

- CO1. Students will be able to know about the latest materials being used in concrete.
CO2. Students will be able to understand constituents of cement composites.
CO3. Student will be able to know about the mechanical properties of cement composites.
CO4. Student will be able to know the application of cement composites.
CO5. Student will be able to analyze and design cement composite structural elements.

Course Designed by:	Department of Civil Engineering
Approval	Approved by: Board of Studies Meeting held on 09.07.2019.
	Ratified by: 5 th Meeting of Academic Council, 13-07-2019.

A2SET203	SEMESTER – I	L	T	P	C
		Theory of Structural Stability	3	-	-
Pre-requisites: Strength of Materials		Total Contact Hours – 45			

SYLLABUS

UNIT – I: CRITERIA FOR DESIGN OF STRUCTURES

8 Hrs

Stability of equilibrium -Stable, unstable and neutral equilibrium, Approaches for estimating the critical load of a column – Euler approach, Energy approach, Imperfection approach and Dynamic approach, Linear and Nonlinear behavior.

UNIT – II: STABILITY OF COLUMNS

8 Hrs

Axial and Flexural buckling – Concentrated load, udl throughout its span, several concentrated loads. Lateral bracing of columns, torsional buckling, combined axial, flexural and torsional buckling.

UNIT-III: STABILITY OF BEAMS

10 Hrs

Lateral torsional buckling – Rectangular beams, I beam. Warping torsion, St. Venant torsion, combined twisting and warping torsion.

UNIT-IV: STABILITY OF FRAMES

10 Hrs

Modes of buckling, critical load of a frame using neutral equilibrium, member buckling, global buckling, slenderness ratio, effect of primary bending and plasticity on frame behavior.

UNIT – V: STABILITY OF PLATES

9 Hrs

Axial flexural buckling, shear flexural buckling, buckling under combined loads. Introduction to inelastic buckling and dynamic stability.

TEXT BOOK:

1. Theory of Elastic Stability, Timoshenko and Gere, Tata Mc Graw Hill.

REFERENCES:

1. Principles of structural stability Theory, Alexander Chajes, Prentice Hall, New Jersey.
2. Structural stability of columns and plates, Iyengar, N.G.R, Eastern west press Pvt. Ltd.

COURSE OUTCOMES:

- CO1. Students will be able to use stability criteria and concepts for analyzing discrete and continuous systems.
- CO2. Students will be able to check the stability of columns.
- CO3. Student will be able to check stability of beams.
- CO4. Student will be able to check stability of frames.
- CO5. Student will be able to determine stability of plates.

Course Designed by:	Department of Civil Engineering
Approval	Approved by: Board of Studies Meeting held on 09.07.2019.
	Ratified by: 5 th Meeting of Academic Council. 13-07-2019.

A2SET204	SEMESTER - I	L	T	P	C
	Analytical and Numerical Methods for Structural Engineering	3	-	-	3
	Total Contact Hours – 48				

SYLLABUS

UNIT-I: ERROR ANALYSIS & CURVE FITTING

Approximations and Error Computation: Concepts like accuracy of numbers, significant figures, rounding off, errors, Inherent, rounding, truncation, absolute, relative and percentage errors, errors in approximation of functions errors in series approximation, order of approximation; Curve Fitting: Principle of least squares, Fitting of straight line, fitting second degree parabola, Fitting of power curves, Linearization of nonlinear laws.

UNIT- II: THEORY OF EQUATIONS

Algebraic and transcendental equations, Transformation of equations, reciprocal equations, Concepts like roots, multiplicity of roots, rate of convergence, initial approximations; Methods of solving Algebraic and transcendental equations: Secant method, Iterative method, Newton-Raphson method to calculate single roots, multiple roots and complex roots.

UNIT-III: ADVANCED LINEAR ALGEBRA

Introduction – Methods of Solution - Gauss-Jordan Method –LU Decomposition Method – Iterative Methods to Solve Simultaneous Linear Equations: Gauss-Jacobi Method – Gauss-Seidel Iterative Method – Matrix Eigen Value Problems: Determination of Eigenvalues using Iteration Method – Rayleigh’s Power Method.

UNIT-IV: NUMERICAL DIFFERENTIATION AND INTEGRATION

Introduction – Interpolation – Collection of Data – Extrapolation or Prediction – Differentiation in Equi-spaced Interval: Numerical Differentiation using Newton-Gregory Forward Interpolation and Backward Interpolation formula - Differentiation in Unequal Intervals: Numerical Differentiation by using Newton-Gregory Divided Difference Interpolation Formula – Numerical Integration by utilizing Trapezoidal Rule – Simpson’s One-third Rule – Weddle’s Rule.s.

UNIT-V: NUMERICAL SOLUTION OF ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

Introduction – Solution of Initial Value Problem using Runge-Kutta Fourth Order Method – Classification of Second Order Partial Differential Equations - Finite Difference Representation of Partial Derivatives – Representation of Derivatives by Diagram –Solution of One Dimensional Heat Equation by an Application of Bender-Schmidt Recurrence Formula and Crank-Nicolson Formula – Solution of Hyperbolic equations (One Dimensional Wave Equation) using Finite Difference Methods such as Explicit Schemes.

TEXT BOOKS:

1. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI Pvt. Ltd., 5th Edition.
2. M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International.

REFERENCE BOOKS:

1. Kendall Atkinson, An Introduction to Numerical Analysis, J. Wiley and Sons, 2nd Edition, 1989.
2. Francis Scheid, Theory and Problems of Numerical Analysis, McGraw Hill Book Company.
3. B.S. Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers.

COURSE OUTCOMES:

At the end of the course, students shall be able to:

- CO 1 Find the error that may be present in the solution to a problem, analyze and model experimental or sample data by using statistical tools such as Method of Least Squares.
- CO 2 Solve Nonlinear & Transcendental equations utilizing iteration techniques.
- CO 3 Solving Simultaneous Linear Equations by using numerical and analytical methods and Find the Largest Eigenvector corresponding to the Largest Eigenvalue numerically.
- CO 4 Find Derivatives and Integration of unknown functions using interpolation techniques.
- CO 5 Obtain numerical approximations to the solutions of ordinary and partial differential equations using Finite Difference Schemes, as is required in simulations of physical processes.

Course designed by	DEPARTMENT OF MATHEMATICS
Approval	Approved by: Meeting of Board of Studies held on 06.07.2019
	Ratified by: 5 th Meeting of Academic Council, 13-07-2019.

A2SET205	SEMESTER – I	L	T	P	C
	Structural Health Monitoring	3	-	-	3
	Total Contact Hours – 45				

SYLLABUS

UNIT-I Introduction to Structural Health Monitoring:

Factors affecting Health of Structures, Causes of Distress, Regular Maintenance. Concepts, Various Measures, Structural Safety in Alteration.

UNIT-II Structural Audit:

Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

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

UNIT-IV Dynamic Field Testing:

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

UNIT-V Introduction to Repairs and Rehabilitations of Structures:

Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique

Course Outcomes:

1. Understand the fundamentals of maintenance and repair strategies.
2. Diagnose for serviceability and durability aspects of concrete.
3. Know the materials and techniques used for repair of structures.
4. Decide the appropriate repair, strengthening, rehabilitation and retrofitting technique required for a case study building.
5. Use an appropriate health monitoring technique and demolition technique.

Suggested Reading:

1. Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, Structural Health Monitoring, WileyISTE, 2006.
2. Douglas E Adams, Health Monitoring of Structural Materials and Components-Methods with Applications, John Wiley and Sons, 2007.
3. J.P. Ou, H.Li and Z.D. Duan, Structural Health Monitoring and Intelligent Infrastructure-1, Taylor and Francis Group, London, U.K, 2006.
4. Victor Giurglutiu, Structural Health Monitoring with Wafer Active Sensors, Academic Press Inc, 2007.
5. Smart Materials and Structures, Gandhi and Thompson
6. Structural Health Monitoring: Current Status and Perspectives, Fu Ko Chang

Course Designed by:	Department of Civil Engineering
Approval	Approved by: Board of Studies Meeting held on 09.07.2019.
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2SET206	SEMESTER – I	L	T	P	C
	Structural Optimization	3	-	-	3
	Total Contact Hours – 45				

SYLLABUS

UNIT – I: Introduction

7 hrs

Definitions - Variables - Objective Function - Constraints - Design space - Feasible and infeasible - Convex and Concave - Local and global optima – Classification of Optimization techniques-Formulation of structural optimization problems.

Classical Techniques: Differential calculus - Optimality criteria - Single variable optimization - Multivariable optimization - Lagrange Multiplier method - Khun - Tucker Criteria.

UNIT – II: Linear Programming

8 hrs

Problem formulation - Graphical solution - Analytical method - Standard form - Slack, surplus and artificial variables - Canonical form - Basic feasible solution - Simplex method - Two phase method - Penalty method - Duality theory - Primal - Dual algorithm.

UNIT-III: Nonlinear Programming

10 hrs

Unconstrained Nonlinear Programming: Unidimensional - Unimodal function - Exhaustive and unrestricted search-Unconstrained multivariable function – different methods

Constrained Nonlinear Programming: Direct and indirect methods- Cutting plane method - Method of feasible direction - Interior penalty function - Exterior penalty function method.

UNIT-IV: Geometric, Dynamic, Integer and Stochastic Programming

10hrs

Polynomial - Unconstrained and constrained problems with zero difficulty - Concept of solving problems with one degree of difficulty

Bellman’s principle of optimality - Representation of a multistage decision problem - Concept of sub-optimization problems using classical and tabular methods.

Integer Programming –canonical and standard form –Variants –Examples.

Stochastic Programming – Two stage Problems.

UNIT – V: Structural Engineering Applications

10 hrs

Methods for optimal design of structural elements, continuous beams and single storied frames using plastic theory - Minimum weight design for truss members - Fully stressed design - Optimization principles to design of R.C. structures such as multi-storey buildings, water tanks and bridges. Structural optimization for transient (dynamic) problems.

TEXT BOOK:

- 1) Rao, S.S. (2014), Engineering Optimization: Theory and Practice, New Age International, New Delhi.

REFERENCES:

- 1) Raphael T. Haftka, ZaferGürdal, (2012), Elements of Structural Optimization, Series in Solid Mechanics and its Applications, Vol. 11, Springer Science & Business Media, Netherlands.
- 2) Osvaldo M. Querin, Mariano Victoria, Cristina Alonso Gordo, Rubén Ansola, PascualMartí, (2017), Topology Design Methods for Structural Optimization, Butterworth-Heinemann.
- 3) Andrej Cherkaev, (2012), Variational Methods for Structural Optimization, Vol.140, Applied Mathematical Sciences, Springer Science & Business Media, Netherlands.

COURSE OUTCOMES:

- CO1. Students will be able to Solve the problems using different optimization methodologies.
- CO2. Students will be able to know the importance of classical and modern optimization methodologies
- CO3. Students will be able to apply linear and non-linear programming technique for solving optimization problems
- CO4. Students will be able to higher programming techniques for solving optimization problems.
- CO5. Student will be able to apply Optimization to solve structural Engineering Problems.

Course Designed by:	Department of Civil Engineering
Approval	Approved by: Board of Studies Meeting held on 09.07.2019.
	Ratified by: 5 th Meeting of Academic Council, 13-07-2019.

A2SEL101	SEMESTER - I	L	T	P	C
	Structural Design Lab	-	-	4	2
	Pre-requisite: Structural Analysis, Design of Concrete Structures Total Contact Hours – 45				

SYLLABUS

Design and detailed drawing of complete G+ 3 structures by individual student using any software tools as per relevant IS codes and validate the results with manual calculations and submit a report.

REFERENCES:

1. Illustrated design of reinforced concrete buildings by Dr. S. R. Karve and V.L. Shah
2. Manual for Structural Design Lab, Dept. of Civil Engineering, MVGR College of Engineering

COURSE OUTCOMES:

CO1. Design and Detail all the Structural Components of Frame Buildings.

CO2. Design and Detail complete Multi-Storey Frame Buildings.

Course Designed by:	Department of Civil Engineering
Approval	Approved by: Board of Studies Meeting held on 09.07.2019.
	Ratified by: 5 th Meeting of Academic Council, 13-07-2019.

A2SEL102	SEMESTER - I	L	T	P	C
	Advanced Concrete Lab	-	-	4	2
	Prerequisite: Advanced Concrete Technology	Total Contact Hours – 40			

LIST OF EXPERIMENTS

1. Stress-Strain behaviour of different grades of concrete
2. Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture.
3. Flexural behaviour of RC beams for different flexural reinforcement.
4. Shear behaviour RC beams for different flexural reinforcement.
5. Non-Destructive Testing of Concrete structures using Rebound Hammer, Ultrasonic pulse Velocity
6. Various Workability tests on Self Compacting concrete.
7. Design and testing of RC beams for crack pattern.

REFERENCES:

1. Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall, 2012.
2. Concrete Technology, Shetty M. S., S. Chand and Co., 2006.

COURSE OUTCOMES:

Learners at the end of this course will be able to

- CO1. Understand the stress strain behaviour of different grades of concrete.
- CO2. Perform Non-destructive tests on existing concrete structures.
- CO3. Explain flexural and shear behaviour of RC beams for different flexural reinforcement.
- CO4. Test the workability of self-compacting concrete.

Course Designed by:	Department of Civil Engineering
Approval	Approved by: Board of Studies Meeting held on 09.07.2019.
	Ratified by: 5 th Meeting of Academic Council, 13-07-2019.

A2SET105	SEMESTER - I	L	T	P	C
	Research Methodology & IPR	3	-	-	3
	Total Contact Hours – 45				

SYLLABUS

UNIT I: INTRODUCTION TO RESEARCH

10 Hrs

Meaning of Research, objectives of research, types of research, research problem statement, sources and selection of research problem, Approaches of investigation of solutions for research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, data collection, analysis, interpretation, Necessary instrumentations.

UNIT - II: LITERATURE REVIEW

8 Hrs

Introduction to literature survey, uses of literature review, Effective literature studies approaches, analysis Plagiarism, Research ethics.

UNIT - III: WRITING REPORT

8 Hrs

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

UNIT - IV: INTELLECTUAL PROPERTY RIGHTS

9 Hrs

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

UNIT - V: DEVELOPMENT OF IPR

10 Hrs

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books:

1. C. R. Kothari, "Research Methodology – Methods and Techniques", New Age International Publishers.
2. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners".
3. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd , 2007.

Reference books:

1. Mayall, "Industrial Design", McGraw Hill, 1992.
2. Niebel, "Product Design", McGraw Hill, 1974.
3. Asimov, "Introduction to Design", Prentice Hall, 1962.
4. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
5. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

COURSE OUTCOMES:

- CO1. Students will be able to get acquainted with types of research, identification of problem statement.
- CO2. Student will be able to identify the literature related to research problem and research ethics.
- CO3. Students will get acquainted with technical report writing and thesis write up.
- CO4. Student will be able to know various types of IPR and common procedures to claim IPR.
- CO5. Student will be able to identify and get acquainted with new developments in the field of IPR.

Course designed by	Department of Civil Engineering
Approval	Approved by: Meeting of Board of Studies held on 09.07.2019.
	Ratified by: 5 th Meeting of Academic Council, 13-07-2019.