JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
Draft Academic Regulations of M.Tech. (Full Time/Regular) Programme
(Effective for the students admitted into I year from the Academic Year 2021-22 and onwards)

Jawaharlal Nehru Technological University Anantapur (JNTUA) offers **Two** Years (**Four** Semesters) full-time Master of Technology (M.Tech.) Degree programme, under Choice Based Credit System (CBCS) in different branches of Engineering and Technology with different specializations.

The Jawaharlal Nehru Technological University Anantapur shall confer M. Tech. degree on candidates who are admitted to the programme and fulfill all the requirements for the award of the degree.

1. **Award of the M.Tech. Degree**
   A student will be declared eligible for the award of the M.Tech. degree if he/she fulfils the following:
   1.1 Pursues a course of study for not less than two academic years and not more than four academic years.
   1.2 Registers for 70 credits and secures all 70 credits.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within four academic years from the year of their admission, shall forfeit their seat in M.Tech. course and their admission stands cancelled.

3. **Programme of Study:**
   The following M.Tech. Specializations are offered at present in different branches of Engineering and Technology in non-autonomous affiliated colleges:

S.No.	Discipline	Name of the Specialization	Code
01	Civil Engineering	Structural Engineering	20
		Geotechnical Engineering	12
		Computer Aided Structural Engineering	35
		Construction Planning &Management	21
		Structural Engineering &Construction Management	91
		Highway Engineering	93
02	Electrical and Electronics Engineering	Electrical Power Systems	07
		Power Electronics	43
		Power Electronics & Electrical Drives	54
		Power Systems	82
03	Mechanical Engineering	CAD / CAM	04
		Machine Design	15
		Thermal Science & Energy Systems	11
		Refrigeration & Air- Conditioning	17
		Advanced Manufacturing Systems	87

		Thermal Engineering	88
		Production Engineering &Engineering Design	90
		Production Engineering	94
04	Electronics and Communication Engineering	Digital Electronics & Communication Systems	38
		Electronics & Communication Engineering	70
		Digital Systems & Computer Electronics	06
		Embedded Systems	55
		VLSI Design	57
		VLSI System Design	
		VLSI	
		VLSI & Embedded Systems	68
		Embedded Systems & VLSI	
		VLSI and Embedded Systems Design	85
05	Computer Science and Engineering	Computer Science & Engineering	58
		Software Engineering	25
		Computer Networks	08
		Artificial Intelligence & Machine Learning	98

and any other specializations as approved by AICTE/University from time to time.

4. **Eligibility for Admissions**:
   4.1   Admission to the M. Tech Program shall be made subject to the eligibility, qualification and specialization prescribed by the A.P. State Government/University from time to time.
   4.2   Admissions shall be made either on the basis of either the merit rank or Percentile obtained by the qualified student in the relevant qualifying GATE Examination/ the merit rank obtained by the qualified student in an entrance test conducted by A.P. State Government (APPGECET) for M.Tech. programmes/an entrance test conducted by University/on the basis of any other exams approved by the University, subject to reservations as laid down by the Govt. from time to time.

5. **Programme related terms:**
   5.1   *Credit:* A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

   Credit definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit

   5.2   *Academic Year:* Two consecutive (one odd + one even) semesters constitute one academic year.
   5.3   *Choice Based Credit System (CBCS):* The CBCS provides choice for students to select from the prescribed courses.

6. **Programme Pattern:**

6.1   Total duration of the of M.Tech. programme is two academic years

6.2   Each academic year of study is divided into two semesters.

6.3   Each Semester shall be of 22 weeks duration (inclusive of Examinations), with a minimum of 90 instructional days per semester.

6.4   The student shall not take more than four academic years to fulfill all the academic requirements for the award of M.Tech. degree from the date of commencement of first year first semester, failing which the student shall forfeit the seat in M.Tech. programme.

6.5   The medium of instruction of the programme (including examinations and project reports) will be in English only.

6.6   All subjects/courses offered for the M.Tech. degree programme are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1.	Core Courses	Foundational & Professional Core Courses (PC)	Includes subjects related to the parent discipline/department/branch of Engineering
2.	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline which are of importance in the context of special skill development
3.	Research	Research methodology & IPR	To understand importance and process of creation of patents through research
		Technical Seminar	Ensures preparedness of students to undertake major projects/Dissertation, based on core contents related to specialization
		Cocurricular Activities	Attending conferences, scientific presentations and other scholarly activities
		Dissertation	M.Tech. Project or Major Project
4.	Audit Courses	Mandatory noncredit courses	Covering subjects of developing desired attitude among the learners is on the line of initiatives such as Unnat Bharat Abhiyan, Yoga, Value education etc.

6.7   The college shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.

6.8   A faculty advisor/mentor shall be assigned to each specialization to advise students on the programme, its Course Structure and Curriculum, Choice of Courses, based on his competence, progress, pre-requisites and interest.

6.9   Preferably 25% course work for the theory courses in every semester shall be conducted in the blended mode of learning.

7. Attendance Requirements:

7.1 A student shall be eligible to appear for the University external examinations if he/she acquires i) a minimum of 50% attendance in each course and ii) 75% of attendance in aggregate of all the courses.

7.2 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.

7.3 Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence

7.4 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class.

7.5 A stipulated fee shall be payable towards condonation of shortage of attendance.

7.6 A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek re-admission into that semester when offered next.

7.7 If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

7.8 If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

8. Evaluation – Distribution and Weightage of Marks:

The performance of a student in each semester shall be evaluated subject - wise (irrespective of credits assigned), for a maximum of 100 marks for theory and 100 marks for practical, based on Internal Evaluation and End Semester Examination.

8.1 There shall be five units in each of the theory subjects. For the theory subjects 60 marks will be for the End Examination and 40 marks will be for Internal Evaluation.

8.2 Two Internal Examinations shall be conducted for 30 marks each, one in the middle of the Semester and the other immediately after the completion of instruction. Each midterm examination shall be conducted for a total duration of 120 minutes with 3 questions (without choice) each question for 10 marks. Final Internal marks for a total of 30 marks shall be arrived at by considering the marks secured by the student in both the internal examinations with 80% weightage to the better internal exam and 20% to the other. There shall be an online examination conducted by the college for the remaining 10 marks with 20 objective questions.

8.3 The following pattern shall be followed in the End Examination:

    i.   Five questions shall be set from each of the five units with either/or type for 12 marks each.

    ii.   All the questions have to be answered compulsorily.

    iii.   Each question may consist of one, two or more bits.

8.4   For practical subjects, 60 marks shall be for the End Semester Examinations and 40 marks will be for internal evaluation based on the day-to-day performance.

The internal evaluation based on the day-to-day work-10 marks, record- 10 marks and the remaining 20 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the examiners, with a breakup mark of Procedure-10, Experimentation-25, Results-10, Viva-voce-15.

8.5   There shall be a **Technical Seminar** during I year II semester for internal evaluation of 100 marks. A student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other faculty members of the department. The student has to secure a minimum of 50% of marks, to be declared successful. If he fails to obtain the minimum marks, he has to reappear for the same as and when supplementary examinations are conducted. The Technical seminar shall be conducted anytime during the semester as per the convenience of the Project Review Committee and students. There shall be no external examination for Technical Seminar.

8.6   There shall be Mandatory **Audit courses** for zero credits. There is no external examination for audit courses. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 50% or more in the internal examinations. In case, the student fails, a re-examination shall be conducted for failed candidates for 40 marks every six months/semester satisfying the conditions mentioned in item 1 & 2 of the regulations.

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

8.8   In case the candidate does not secure the minimum academic requirement in any of the subjects he/she has to reappear for the Semester Examination either supplementary or regular in that subject or repeat the course when next offered or do any other specified subject as may be required.

8.9   The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms

and shall be produced to the Committees of the University as and when the same are asked for.

9. **Credit Transfer Policy**

a) As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of 40% of the total courses being offered in a particular Programme in a semester through the Online Learning courses through SWAYAM.

9.1 The University shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses through SWAYAM platform.

9.2 The online learning courses available on the SWAYAM platform will be considered for credit transfer. SWAYAM course credits are as specified in the platform

9.3 Student registration for the MOOCs shall be only through the institution, it is mandatory for the student to share necessary information with the institution

9.4 The institution shall select the courses to be permitted for credit transfer through SWAYAM. However, while selecting courses in the online platform institution would essentially avoid the courses offered through the curriculum in the offline mode.

9.5 The institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer in the forthcoming Semester.

9.6 The institution shall also ensure that the student has to complete the course and produce the course completion certificate as per the academic schedule given for the regular courses in that semester

9.7 The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.

9.8 The university shall ensure no overlap of SWAYAM MOOC exams with that of the university examination schedule. In case of delay in SWAYAM results, the university will re-issue the marks sheet for such students.

9.9 Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.

9.10 The institution shall submit the following to the examination section of the university:

    a) List of students who have passed MOOC courses in the current semester along with the certificates of completion.

    b) Undertaking form filled by the students for credit transfer.

9.11 The university shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

b) Students shall also be permitted to take online courses through other MOOC platforms like Coursera, edX, Udemy etc. as per the guidelines specified in a). Only the courses with evaluation specified in percentage/grades shall be considered. If not specified in the online platform, then following credit equivalence shall be considered:

Courses of 8 weeks duration: 2 Credits

Courses of 10 weeks duration: 3 Credits

10. **Re-registration for Improvement of Internal Evaluation Marks**:

A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and has failed in the end examination

10.1 The candidate should have completed the course work and obtained examinations results for **I, II and III** semesters.

10.2 The candidate should have passed all the subjects for which the Internal Evaluation marks secured are more than 50%.

10.3 Out of the subjects the candidate has failed in the examination due to Internal Evaluation marks secured being less than 50%, the candidate shall be given one chance for each Theory subject and for a maximum of **three** Theory subjects for Improvement of Internal evaluation marks.

10.4 The candidate has to re-register for the chosen subjects and fulfill the academic requirements.

10.5 For reregistration the candidates have to apply to the University through the college by paying the requisite fees and get approval from the University before the start of the semester in which re-registration is required

10.6 In the event of availing the Improvement of Internal evaluation marks, the internal evaluation marks as well as the End Examinations marks secured in the previous attempt(s) for the reregistered subjects stand cancelled.

11. **Evaluation of Project/Dissertation Work:**

The Project work shall be initiated at the beginning of the III Semester and the duration of the Project is of two semesters. Evaluation of Project work is for 300 marks with 200 marks for internal evaluation and 100 marks for external evaluation. Internal evaluation of the Project Work – I & Project work – II in III & IV semesters respectively shall be for 100 marks each. External evaluation of final Project work viva voce in IV semester shall be for 100 marks.

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

11.1 A candidate is permitted to register for the Project Work in III Semester after satisfying the attendance requirement in all the subjects, both theory and laboratory (in I & II semesters).

11.2 A candidate is permitted to submit Project dissertation with the approval of PRC. The candidate has to pass all the theory, practical and other courses before submission of the Thesis.

11.4 Project work shall be carried out under the supervision of teacher in the parent department concerned.

11.5 A candidate shall be permitted to work on the project in an industry/research organization on the recommendation of the Head of the Department. In such cases,one of the teachers from the department concerned would be the internal guide and an expert from the industry/ research organization concerned shall act as co-supervisor/ external guide. It is mandatory for the candidate to make full disclosure of all data/results on which they wish to base their dissertation. They cannot claim confidentiality simply because it would come into conflict with the Industry's or R&D laboratory's own interests. A certificate from the external supervisor is to be included in the dissertation.

11.6 Continuous assessment of Project Work - I and Project Work – II in III & IV semesters respectively will be monitored by the PRC.

11.7 The candidate shall submit status report by giving seminars in three different phases (two in III semester and one in IV semester) during the project work period. These seminar reports must be approved by the PRC before submission of the Project Thesis.

11.8 After registration, a candidate must present in Project Work Review - I, in consultation with his Project Supervisor, the title, objective and plan of action of his Project work to the PRC for approval within four weeks from the commencement of III Semester. Only after obtaining the approval of the PRC can the student initiate the project work.

11.9 The Project Work Review - II in III semester carries internal marks of 100. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Project Work.

11.10 A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review - II. Only after successful completion of Project Work Review – II, candidate shall be permitted for Project Work Review – III in IV Semester. The unsuccessful students in Project Work Review - II shall reappear for it as and when supplementary examinations are conducted.

11.11 The Project Work Review - III in IV semester carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The PRC will examine the overall progress of the Project Work and decide whether or not eligible for final submission. A candidate has to secure a minimum of 50% of marks to be declared successful

in Project Work Review - III. If he fails to obtain the required minimum marks, he has to reappear for Project Work Review - III after a month.

11.12 For the approval of PRC the candidate shall submit the draft copy of dissertation to the Head of the Department and make an oral presentation before the PRC.

11.13 After approval from the PRC, the students are required to submit a report showing that the plagiarism is within 30%. The dissertation report will be accepted only when the plagiarism is within 30%, which shall be submitted along with the dissertation report.

11.14 Research paper related to the Project Work shall be published in conference proceedings/UGC recognized journal. A copy of the published research paper shall be attached to the dissertation.

11.15 After successful plagiarism check and publication of research paper, three copies of the dissertation certified by the supervisor and HOD shall be submitted to the College.

11.16 The dissertation shall be adjudicated by an external examiner selected by the University. For this, the Principal of the College shall submit a panel of three examiners as submitted by the supervisor concerned and department head for each student. However, the dissertation will be adjudicated by one examiner nominated by the University.

11.17 If the report of the examiner is not satisfactory, the candidate shall revise and resubmit the dissertation, in the time frame as decided by the PRC. If report of the examiner is unfavorable again, the thesis shall be summarily rejected. The candidate has to reregister for the project and complete the project within the stipulated time after taking the approval from the University

11.18 If the report of the examiner is satisfactory, the Head of the Department shall coordinate and make arrangements for the conduct of Project Viva voce exam.

11.19 The Project Viva voce examinations shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who has adjudicated the dissertation. For Dissertation Evaluation (Viva voce) in IV Sem. there are external marks of 100 and it is evaluated by external examiner. The candidate has to secure a minimum of 50% marks in Viva voce exam.

11.20 If he fails to fulfill the requirements as specified, he will reappear for the Project Viva voce examination only after three months. In the reappeared examination also, if he fails to fulfill the requirements, he will not be eligible for the award of the degree.

12. Credits for Co-curricular Activities

The credits assigned for co-curricular activities shall be given by the principals of the colleges and the same shall be submitted to the University.

A Student shall earn 02 credits under the head of co-curricular activities, viz., attending Conference, Scientific Presentations and Other Scholarly Activities.

Following are the guidelines for awarding Credits for Co-curricular Activities

Name of the Activity	Maximum Credits / Activity
Participation in National Level Seminar/ Conference / Workshop /Training programs (related to the specialization of the student)	1
Participation in International Level Seminar / Conference / workshop/Training programs held outside India (related to the specialization of the student)	2
Academic Award/Research Award from State Level/National Agencies	1
Academic Award/Research Award from International Agencies	2
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	1
Research / Review Publication in International Journals with Editorial board outside India (Indexed in Scopus / Web of Science)	2

Note:
i) Credit shall be awarded only for the first author. Certificate of attendance and participation in a Conference/Seminar is to be submitted for awarding credit.
ii) Certificate of attendance and participation in workshops and training programs (Internal or External) is to be submitted for awarding credit. The total duration should be at least one week.
iii) Participation in any activity shall be permitted only once for acquiring required credits under cocurricular activities

13. Grading:

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

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the marks in the subject fall	Grade	Grade points Assigned
≥ 90	S (Superior)	10
$\geq 80 < 90$	A (Excellent)	9
$\geq 70 < 80$	B (Very Good)	8
$\geq 60 < 70$	C (Good)	7
$\geq 50 < 60$	D (Pass)	6
< 50	F (Fail)	0
Absent	Ab (Absent)	0

i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.

ii) For noncredit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \Sigma\ (C_i \times G_i)/\Sigma\ C_i$$

where, C_i is the number of credits of the ith subject and G_i is the grade point scored by the student in the ith course.

i) The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \Sigma\ (C_i \times S_i)/\ \Sigma\ C_i$$

where "S_i" is the SGPA of the ith semester and C_i is the total number of credits up to that semester.

ii) Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

iii) While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D and F.

14. **Award of Class:**

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

Class Awarded	Percentage of Marks to be secured
First Class with Distinction	≥70%
First Class	< 70% ≥ 60%
Pass Class	< 60% ≥ 50%

15. **Exit Policy:** The student shall be permitted to exit with a PG Diploma based on his/her request to the university through the respective institution at the end of first year subject to passing all the courses in first year.

    The University shall resolve any issues that may arise in the implementation of this policy from time to time and shall review the policy in the light of periodic changes brought by UGC, AICTE and State government.

16. **Withholding of Results:**

    If the candidate has any case of in-discipline pending against him, the result of the candidate shall be withheld, and he will not be allowed/promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

17. **Transitory Regulations**

    Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

18. **General:**

    17.1 The academic regulations should be read as a whole for purpose of any interpretation.

    17.2 Disciplinary action for Malpractice/improper conduct in examinations is appended.

    17.3 There shall be no places transfer within the constituent colleges and affiliated colleges of Jawaharlal Nehru Technological University   Anantapur.

    17.4 Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

    17.5 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

    17.6 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the University.

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RULES FOR

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

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

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject only.
6.	Refuses to obey the orders of the Chief Superintendent /Assistant - Superintendent /any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. If the candidate physically assaults the invigilator/ officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project

		work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person (s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations, depending on the recommendation of the committee.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

1. Malpractices identified by squad or special invigilators
2. Punishments to the candidates as per the above guidelines.
3. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
4. A show cause notice shall be issued to the college.
5. Impose a suitable fine on the college.
6. Shifting the examination center from the college to another college for a specific period of not less than one year.

Note:

Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he has to register for End Examinations in that subject/subjects consequently and has to fulfil all the norms required for the award of Degree.

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SEMESTER – I

S. No.	Course codes	Course Name	Category	Hours per week			Credits
				L	**T**	**P**	
1.	21D35101	Theory of Elasticity	PC	3	0	0	3
2.	21D20101	Advanced Structural Analysis	PC	3	0	0	3
3.	21D35203b 21D21102a 21DBS105	**Program Elective - I** Theory and Analysis of Plates and Shells Advanced Concrete Technology Advanced Mathematical Methods	PE	3	0	0	3
4.	21D35104b 21D20103a 21D20103b	**Program Elective – II** Design of Prestressed Concrete Maintenance and Rehabilitation of Structures Design of Bridges	PE	3	0	0	3
5.	21D35206	Advanced Concrete Laboratory	PC	0	0	4	2
6.	21D35106	Advanced Structural Engineering Laboratory	PC	0	0	4	2
7.	21DRM101	Research Methodology and IPR	MC	2	0	0	2
8.	21DAC101a 21DAC101b 21DAC101c	**Audit Course – I** English for Research paper writing Disaster Management Sanskrit for Technical Knowledge	AC	2	0	0	0
Total							**18**

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SEMESTER – II

S.No.	Course codes	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	21D35201	Structural Dynamics	PC	3	0	0	3
2.	21D20201	Finite Element Methods for Structural Engineering	PC	3	0	0	3
3.	21D20202a 21D20202b 21D20202c	**Program Elective – III** Design of Reinforced Concrete Foundations Experimental Stress Analysis Stability of Structures	PE	3	0	0	3
4.	21D20203a 21D20203b 21D20203c	**Program Elective – IV** Advanced Steel Design Fracture Mechanics Advanced Reinforced Concrete Design	PE	3	0	0	3
5.	21D20204	Computer Aided Design Laboratory	PC	0	0	4	2
6.	21D20205	Advanced Structural Design Laboratory	PC	0	0	4	2
7.	21D20206	Technical seminar	PR	0	0	4	2
8.	21DAC201a 21DAC201b 21DAC201c	**Audit Course – II** Pedagogy Studies Stress Management for Yoga Personality Development through Life Enlightenment Skills	AC	2	0	0	0
Total							**18**

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SEMSTER - III

S.No.	Course codes	Course Name	Category	Hours per			Credits
				L	**T**	**P**	
1.	21D35301a 21D20301a 21D20301b	**Program Elective – V** Earthquake Resistant Design of Buildings Low-Cost Housing Techniques Building Construction Management	PE	3	0	0	3
2.	21DOE301a 21DOE301b 21DOE301c	**Open Elective** Cost Management of Engineering Project Industrial Safety Business Analytics	OE	3	0	0	3
3.	21D20302	Dissertation Phase – I	PR	0	0	20	10
4.	21D203013	Co-curricular Activities					2
		Total					**18**

SEMESTER - IV

S.No.	Course codes	Course Name	Category	Hours per			Credits
				L	**T**	**P**	
1.	21D20401	Dissertation Phase – II	PR	0	0	32	16
		Total					**16**

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Course Code	THEORY of ELASTICITY	L	T	P	C
21D35101		**3**	**0**	**0**	**3**
	Semester				**I**

Course Objectives: This Course Will Enable Students:	

- To make students understand the principles of elasticity.
- To familiarize students with basic equations of elasticity.
- To expose students to two dimensional problems in Cartesian and polar coordinates.
- 4. To make students understand the principle of torsion of prismatic bars.

Course Outcomes (CO): Student will be able to

- To apply elastic analysis to study the fracture mechanics.
- To apply linear elasticity in the design and analysis of structures such as beams, plates, shells and sandwich composites.
- To apply hyper elasticity to determine the response of elastomer-based objects.
- To analyze the structural sections subjected to torsion.

UNIT - I		Lecture Hrs:10

INTRODUCTION TO PLANE STRESS and PLANE STRAIN ANALYSIS:
Elasticity –Notation for Forces and Stresses-Components of Stresses –Components of Strain – Hooke's Law. Plane Stress-Plane Strain-Differential Equations of Equilibrium- Boundary Conditions- Compatibility Equations-Stress Function-Boundary Conditions.

UNIT - II		Lecture Hrs:10

TWO DIMENSIONAL PROBLEMS in RECTANGULAR COORDINATES:
Solution by Polynomials-Saint Venant's Principle-Determination of Displacements-Bending of Simple Beams-Application of Fourier Series for Two Dimensional Problems - Gravity Loading.

UNIT - III		Lecture Hrs:10

TWO DIMENSIONAL PROBLEMS in POLAR COORDINATES :
General Equation in Polar Co-Ordinates - Stress Distribution Symmetrical About An Axis –Pure Bending of Curved Bars- Strain Components in Polar Coordinates-Displacements for Symmetrical Stress Distributions-Simple Symmetric and Asymmetric Problems-General Solution of Two Dimensional Problem in Polar Coordinates-Application of The General Solution of Two Dimensional Problem in Polar Coordinates-Application of The General Solution in Polar Coordinates.

UNIT - IV		Lecture Hrs:9

ANALYSIS of STRESS and STRAIN in THREE DIMENSIONS: Principle Stress - Ellipsoid and Stress-Director Surface-Determination of Principle Stresses- Maximum Shear Stresses-Homogeneous Deformation-Principle Axis of Strain Rotation.
General Theorems: Balance Laws - Differential Equations of Equilibrium- Conditions of Compatibility - Determination of Displacement-Equations of Equilibrium in Terms of Displacements-Principle of Superposition-Uniqueness of Solution –The Reciprocal Theorem.

UNIT - V		Lecture Hrs:9

TORSION of PRISMATIC BARS:
Torsion of Prismatic Bars- Elliptical Cross Section-Other Elementary Solutions-Membrane Analogy-Torsion of Rectangular Bars-Solution of Torsional Problems by Energy Method-Use of Soap Films in Solving Torsional Problems-Hydra Dynamical Analogies-Torsion of Shafts, Tubes and Bars.

Textbooks:

1. Theory of Elasticity and Plasticity by Timoshenko, S., MC Graw Hill Book company.
2. Advanced Strength of materials by Papoov, MC Graw Hill Book company.
3. Theory of Elasticity and Plasticity by Sadhu Singh. Khanna Publishers.

Reference Books:

1. Plasticity for structural Engineers- Chen, W.F. and Han, D.J., Springer – Verlag, New York.
2. Plasticity theory, Lubliner, J., Mac Millan Publishing Co., New York.
3. Foundations of Solid Mechanics by Y.C.Fung, PHI Publications.
4. Advanced Mechanics of Solids by L.S. Srinath, Tata MC Graw Hill Book company.

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Course Code	ADVANCED STRUCTURAL ANALYSIS	L	T	P	C
21D20101		3	0	0	3
	Semester		I		

Course Objectives: This Course Will Enable Students:
- To understand the static and kinematic indeterminacy of the structures
- To understand the concepts of matrix methods of analysis of structures
- To understand the analysis of continuous beams.
- To understand the analysis of rigid and pin jointed frames

Course Outcomes (CO): Student will be able to
- Distinguish determinate and indeterminate structures.
- Identify the method of analysis for indeterminate structures.
- Apply matrix methods of analysis for continuous beams.
- Apply matrix methods of analysis for rigid and pin jointed frames.

UNIT - I		Lecture Hrs:

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

UNIT - II		Lecture Hrs:

Assembly of stiffness matrix from element stiffness matrix - direct stiffness method - general procedure - banded matrix - semi bandwidth - assembly by direct stiffness matrix method.

UNIT - III		Lecture Hrs:

Analysis of plane truss - continuous beams with and without settlement - plane frame including side sway single storey, single – bay and gable frame by flexibility method using system approach.

UNIT - IV		Lecture Hrs:

Analysis of plane truss - continuous beams with and without settlement - plane frame including sides sway, grids and gable frames by stiffness methods, single bay – two storey, two bay single – storey.

UNIT - V		Lecture Hrs:

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

Textbooks:
1. Matrix Analysis of Frames structures by William Weaver J.R and James M.Gere, CBS publications.
2. Advanced Structural Analysis by Ashok.K.Jain, New Channel Brothers.
3. Matrix method of S.A by Pandit & Gupta

Reference Books:
1. Matrix Structural Analysis by Madhu B. Kanchi.
2. Matrix Methods of Structural Analysis by J.Meek.
3. Structural Analysis by Ghali and Neyveli.
4. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt Ltd.

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Course Code	THEORY and ANALYSIS of		L	T	P	C
21D35203b	PLATES and SHELLS (PE-I)		3	0	0	3
		Semester		I		

Course Objectives: This Course Will Enable Students:
- Introduce with concept of plate theory,the behaviour and analysis
- Knowledge about classification of shell surfaces
- To analyse the plate with different boundary conditions
- To understand the classical theory oh shells based on the kirchoff-love assumptions.

Course Outcomes (CO): Student will be able to
- Assess the strength of plate panels under point,linearly varying and uniformly distributed loads
- Analyze plates under different boundary conditions by various classical methods and approximated methods
- Familiar with classification of shells and classical shell theories and apply them in engineering design
- Exposed to single curved shells, doubly curves shells and cylindrical shells

UNIT - I		Lecture Hrs:10

Introduction: Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory, Displacement Field Approximations, Stress Resultants, Equation of Equilibrium using Principle of Virtual Work, Boundary Conditions.

UNIT - II		Lecture Hrs:10

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

UNIT - III		Lecture Hrs:10

Circular Plates: Differential Equation for symmetrical bending of Laterally loaded circular Plates – Uniformly loaded circular plates –circular plate concentrically loaded – circular plate loaded at center

UNIT - IV		Lecture Hrs:9

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

UNIT - V		Lecture Hrs:9

Introduction to the shells of Double curvatures: Geometry, analysis and design of elliptic paraboloid, conoid and hyperbolic parabolic shapes, inverted umbrella type.
Axi- Symmetrical shells: General equation - Analysis and axi-symmetrical by membrane theory. Application to spherical shell and hyperboloid of revolution cooling towers.

Textbooks:
1. Theory of Plates & Shells –Stephen, P.Timoshenko, S.Woinowsky-Krieger – Tata MC Graw Hill Edition
2. Analysis and design of concrete shell roofs by G.S.Ramaswami. CBS publications.
3. Design of concrete shell roofs by Billington – Tata MC Graw Hill, New York

Reference Books:
1. Shell Analysis by N.K.Bairagi. Khanna Publishers, New Delhi.
2. Design of Shells and Folded Plates by P.C. Varghese, PHI Learning Pvt. Ltd
3. Design of concrete shell roofs by Chaterjee. Oxford and IBH.,

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Course Code	ADVANCED CONCRETE TECHNOLOGY		L	T	P	C
21D21102a	(PE-I)		3	0	0	3
		Semester		I		

Course Objectives: This Course Will Enable Students:
- To study the properties of concrete making materials
- To do mix design
- Famiiar with the methods of concrete
- Knowledge about advance tests on concrete

Course Outcomes (CO): Student will be able to
- To be familiar with the properties of concrete making materials
- Identify the influence and compatibility of chemcial,mineral admixtures in concrete
- Update the knowledge on recent advances in special concretes.
- Know about various methods of concrete
- Analyse the performance of concrete structure through microstructure analysis

UNIT - I		Lecture Hrs:10

Cements and Admixtures: Portland Cement – Chemical Composition - Hydration, Setting and Finenesses of Cement – Structures of Hydrated Cement – Mechanical Strength of Cement Gel - Water Held in Hydrate Cement Paste – Heat of Hydration of Cement – Influence of Compound Composition on Properties of Cement – Tests on Physical Properties of Cement – I.S. Specifications – Different Types of Cements – Admixtures.

UNIT - II		Lecture Hrs:10

Aggregates: Classification of Aggregate – Particle Shape and Texture – Bond Strength and Other Mechanical Properties of Aggregate Specific Gravity, Bulk Density, Porosity, Absorption and Moisture in Aggregate – Soundness of Aggregate – Alkali – Aggregate Reaction, Thermal Properties – Sieve Analysis – Fineness Modulus – Grading Curves – Grading Requirements – Practical Grading – Road Note No.4 Grading of Fine and Coarse Aggregates Gap Graded Aggregate – Maximum Aggregate Size.

UNIT - III		Lecture Hrs:10

Fresh Concrete: Workability – Factors Affecting Workability – Measurement of Workability by Different Tests – Effect of Time and Temperature on Workability – Segregation and Bleeding – Mixing and Vibration of Concrete – Quality of Mixing Water.
Hardened Concrete: Water/Cement Ratio-Abram's Law – Gel Space Ratio – Effective Water in Mix – Nature of Strength of Concrete – Strength in Tension and Compression- Griffith's Hypothesis – Factors Affecting Strength – Autogeneous Healing –Relation Between Compression and Tensile Strength – Curing and Maturity of Concrete Influence of Temperature on Strength – Steam Curing – Testing of Hardened Concrete – Compression Tests – Tension Tests – Factors Affecting Strength – Flexure Tests – Splitting Tests – Non Destructive Testing Methods.

UNIT - IV		Lecture Hrs:9

Elasticity, Shrinkage and Creep: Modulus of Elasticity – Dynamic Modulus of Elasticity – Poisson's Ratio – Early Volume Changes – Swelling – Draying Shrinkage - Mechanism of Shrinkage – Factors Affecting Shrinkage – Differential Shrinkage – Moisture Movement Carbonation Shrinkage-Creep of Concrete – Factors Influencing Creep – Relation Between Creep and Time – Nature of Creep – Effect of Creep.

UNIT - V		Lecture Hrs:9

Mix Design: Proportioning of Concrete Mixes by Various Methods – Fineness Modulus, Trial and Error, Mix Density, Road Note. No. 4, ACI and ISI Code Methods – Factors in The Choice of Mix Proportions – Durability of Concrete – Quality Control of Concrete – Statistical Methods – High Strength Concrete Mix Design.
Special Concretes: Light Weight Concretes –Light Weight Aggregate Concrete- Cellular Concrete - No Fines Concrete – High Density Concrete – Fiber Reinforced Concrete – Different Types of Fibers - Factories Affecting Properties of FRC – Applications Polymer Concrete – Types of Polymer

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Concrete Properties of Polymer Concrete and Applications
Textbooks:
1. Properties of Concrete by A.M.Neville – Pearson Publication – 4th Edition 2. Concrete Technology by M.S.Shetty. – S.Chand & Co. ; 2004 3. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi
Reference Books:
1. Concrete: Micro Structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers 2. Design of Concrete Mix by Krishna Raju, CBS Pubilishers. 3. Concrete Technology by A.M.Neville – Pearson Publication 4. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi 5. Non-Destructive Test and Evaluation of Materials by J.Prasad & C.G.K. Nair , Tata Mcgraw Hill Publishers, New Delhi

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Course Code	ADVANCED MATHEMATICAL METHODS	L	T	P	C
21DBS105	**Common to** **(SE and CM and SE (PEC-I))**	**3**	**0**	**0**	**3**
	Semester		**I**		

Course Objectives: This Course Will Enable Students:

- With calculus of variation, numerical methods of solving ordinary and partial differential equations.
- To impart knowledge in basic concepts of finite element methods and applications.

Course Outcomes (CO): Student will be able to

- Solve functionals using Hamilton's principle .
- Numerically solve ordinary and partial differential equations that are initial value or boundary value problems.
- Apply the concepts of finite element method for 1-D and 2-D problems.

UNIT - I	**Calculus of Variation**	Lecture Hrs: 8

Calculus of Variation – Functionals – Euler's Equation - Solution of Euler's Equation –
Isoperimetric problems – several dependent variables – Functionals involving higher
Order derivatives – Hamilton's principle – Lagrange's Equations.

UNIT - II	**Numerical Solution of ordinary Differential Equations &** **Eigen values and Eigen vectors**	Lecture Hrs: 8

Numerical Methods: Eigen values and Eigen vectors – general method – power
Method, spectral method.
Numerical Solution of ordinary Differential Equations - Taylor Series Method, Picard's method,
Euler's method modified Euler's method & R.K. Method.

UNIT - III	**Numerical solution of partial differential equations**	Lecture Hrs: 10

Numerical solution of partial differential equations –elliptical equations standard five Points
formula, Diagonal five point formula –Solution of Laplace equation by Leibmann's iteration method,
Poisson's equation and its applications.

UNIT - IV	**Numerical Solution of Partial Differential Equations**	Lecture Hrs: 8

Numerical Solution of Partial Differential Equations – Parabolic Equations Bender –Schmidt
Method-Bender - Schmidt Recurrence Equation, Crank-Nicholson Difference Method.

UNIT - V	**Finite Element Method**	Lecture Hrs: 8

Finite Element Method – Weighted residual methods, least square method, Gelarkin's method –
Finite Elements – Interpolating over the whole Domain – one dimensional case, two dimensional
case – Application to Boundary value Problems.

Textbooks:

1. Higher Engineering Mathematics By B.S. Grewal Khanna Publishers.
2. Numerical Methods For Engineers By Steven C.Chapra And Raymond P.Canale –
Mc Graw Hill Book Company.

Reference Books:

1. Applied Numerical Analysis By Curtis. F.Gerald- Addeson Wesely Publishing
Company.
2. C-Language And Numerical Methods By C-Xavier. New Age International
Publishers.

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3. Computational Methods For Partial Differential Equations By M.K.Jain, SKR Lyengar, R.K.Jain.
Online Learning Resources:
After completion of this course the student should be able to :   • Understand the concept and steps of calculus of variation.   • Solve ordinary and partial differential equations numerically.   • Solve the initial and boundary value problems numerically.   • Solve the 1-D and 2-D problems using finite element method.   • Identify, formulate and solve structural engineering problems.

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Course Code	DESIGN of PRESTRESSED CONCRETE	L	T	P	C
21D35104b	(PE-II)	3	0	0	3
		Semester		**I**	

Course Objectives: This Course Will Enable Students:	

- Familiarize students with concrept of prestressing and analysis of prestress
- Design and analysis of pretension and post tensioned concrete memebers
- Determination of deflections of prestressed members
- To calculate the losses of prestress,creep and shrinkage.

Course Outcomes (CO): Student will be able to
- To understand the basic concepts about prestressed concrete and analysis of prestress
- Estimate the effective losses in prestress
- Analyse the effect of prestressing force in the beahviour of beams in flexure
- To design shear, torsion and transmission length in prestressed concrete members
- Design of compression and tension members as per codes of practice

UNIT - I		Lecture Hrs:10

INTRODUCTION: Development of Prestressed Concrete –Advantages and Disadvantages of PSC Over RCC –General Principles of Pre-Stressing-Pre Tensioning and Post Tensioning –Materials Used in PSC-High Strength Concrete –High Tension Steel-Different Types /Methods/Systems of Prestressing.

UNIT - II		Lecture Hrs:10

Losses of Prestress: Estimation of The Loss of Prestress Due To Various Causes Like Elastic Shortening of Concrete ,Creep of Concrete, Shrinkage of Concrete, Relaxation of Steel, Slip in Anchorage and Friction.

UNIT - III		Lecture Hrs:10

Flexure & Deflections: Analysis of Sections for Flexure in Accordance With Elastic Theory-Allowable Stresses-Design Criteria As Per I.S Code of Practice –Elastic Design of Beams (Rectangular, I and T Sections) for Flexure –Introduction To Partial Prestressing. Introduction-Factors Influencing Deflections-Short Term and Long Term Deflections of Un-cracked and Cracked Members.

UNIT - IV		Lecture Hrs:10

Shear, Bond, Bearing and Anchorage: Shear in PSC Beams –Principal Stresses –Conventional Elastic Design for Shear-Transfer of Prestress in Pre-tensioned Members-Transmission Length – Bond Stresses-Bearing At Anchorage –Anchorage Zone Stresses in Post-Tensioned Members-Analysis and Design of End Blocks by Guyon, Magnel and Approximate Methods –Anchorage Zone Reinforcements.

UNIT - V		Lecture Hrs:10

Statistically Indeterminate Structures: Introduction –Advantages and Disadvantages of Continuity –Layouts for Continuous Beams-Primary and Secondary Moments –Elastic Analysis of Continuous Beams-Linear Transformation-Concordant Cable Profile-Design of Continuous Beams.

Textbooks:
1. Prestressed Concrete by N. Krishna Raju, TMH Pubilishers.
2. Prestressed Concrete by K.U.Muthu, I.K. International Publishing House.
3. Prestressed Concrete Design by Praveen Nagarajan, Pearson Pubilications.

Reference Books:
1. Design of Prestressed Concrete Structures, T.Y.Lin, Asian Publishing House, Bombay, 1953.
2. Prestressed Concrete, Vol.I&II, Y.Guyon, Wiley and Sons, 1960.
3. Prestressed Concrete Design and Construction, F.Leohhardt, Wilhelm Ernst and Shon, Berlin, 1964.
4. Reinforced concrete designers hand bood, A view point publication, C.E.Reynolds and J.C. Steedman, 1989.

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5. Prestressed Concrete, Edward P.Nawy, Prentice Hall –.
6. Prestressed Concrete – by Raj Gopal, Narsoa Pubilications.

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Course Code	MAINTENANCE and REHABILITATION of	L	T	P	C
21D20103a	STRUCTURES (PE – II)	3	0	0	3
	Semester			I	

Course Objectives: This Course Will Enable Students:
- To judge the rateof corrosion in various exposure conditions
- To conduct non destructive testing of structural elements
- To selecta sutiable bonding technique
- To judge the effect of fire and earthquake loads on discontinuites

Course Outcomes (CO): Student will be able to
- Estimate the causes for distress and deterioration of structures
- Apply the NDT for condition assessment of structures,identify damages in RC structures
- Select repair material and retrofitting strategy suitable for distress
- Formulate guidelines for repair management of deteriorated structures
- Strengthening of earthquake and fire damaged elements using various techniques.

UNIT - I		Lecture Hrs:10

Influence on Serviceability and Durability:- General : Quality Assurance for Concrete Construction, As Built Concrete Properties, Strength, Permeability, Volume Changes, Thermal Properties, Cracking. Effects Due To Climate, Temperature, Chemicals, Wear and Erosion, Design and Construction Errors, Corrosion Mechanism, Effects of Cover Thickness and Cracking Methods of Corrosion Protection, Inhibitors, Resistant Steels, Coatings Cathodic Protection.

UNIT - II		Lecture Hrs:10

Maintenance and Repair Strategies :- Inspection, Structural Appraisal, Economic Appraisal, Components of Equality Assurance, Conceptual Bases for Quality Assurance Schemes.

UNIT - III		Lecture Hrs:10

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 - IV		Lecture Hrs:9

Techniques for Repair :- Rust Eliminators and Polymers Coating for Rebars During Repair, Foamed Concrete, Mortar and Dry Pack, Vacuum Concrete, Gunite and Shotcrete Epoxy Injection, Mortar Repair for Cracks, Shoring and Underpinning.

UNIT - V		Lecture Hrs:9

Case Studies :- Repairs To Overcome Low Member Strength, Deflection, Cracking, Chemical Disruption, Weathering, Wear, Fire, Leakage, Marine Exposure.

Textbooks:
1. Dension Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical, U.K. 1991.
2. RT.Allen and S.C. Edwards, Repair of Concrete Structures, Blakie and Sons, UK, 1987.
3. MS. Shetty, Concrete Technology – Theory and Practice, S.Chand and Company, New Delhi, 1992.

Reference Books:
1. Santhakumar, A.R.Training Course Notes on Damage Assessment and Repair in Low Cost Housing RHDC-NBO Anna University, Madras, July, 1992.
2. Raikar, R.N.Learning From Failures – Deficiencies in Design, Construction and Service – R&D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.
3. N.Palaniappan, Estate Management, Anna Institute of Management, Madras Sep. 1992.
4. F.K.Garas, J.L.Clarke, GST Armer, Structural Assessment, Butterworths, UK Aporil 1987.

Course Code	DESIGN of BRIDGES	L	T	P	C
21D20103b	**(PE-II)**	**3**	**0**	**0**	**3**
	Semester		**I**		

Course Objectives: This Course Will Enable Students:

- To understand the various types of bridges
- To understand the codal provisions for loading and design standards of bridges
- To design the superstructure of bridge using different methods and loading conditions
- To understand the design of bearings

Course Outcomes (CO): Student will be able to

- Finalize with the usage of codal provisions in the design of bridges
- Analyze and design substructure elements of bridges
- Analyze and design various types of bridges like t-beam bridge,slab bridge ,box culvert.
- To analyze and design of T beam bridge

UNIT - I		Lecture Hrs:10

Introduction – Classification, Investigations and Planning, Choice of Type – Economic Span Length – IRC Specifications for Road Bridges, Standard Live Loads, Other Forces Acting on Bridges, General Design Considerations.

UNIT - II		Lecture Hrs:10

Design of Box Culverts – General Aspects – Design Loads – Design Moments, Shears and Thrusts – Design of Critical Section.
Design of Slab Bridges – Effective Width of Analysis – Workings Stress Design and Detailing of Slab Bridges for IRC Loading.

UNIT - III		Lecture Hrs:10

T-Beam Bridges – Introduction – Wheel Load Analysis – B.M. in Slab – Pigaud's Theory – Analysis of Longitudinal Girders by Courbon's Theory Working Stress Design and Detailing of Reinforced Concrete T-Beam Bridges for IRC Loading.

UNIT - IV		Lecture Hrs:9

Prestressed Concrete Bridges – General Features – Advantages of Prestressed Concrete Bridges – Pre-tensioned Prestressed Concrete Bridges – Post Tensioned Prestressed Concrete Bridge Decks. Design of Post Tensioned Prestressed Concrete Slab Bridge Deck. Bridge Bearings – General Features – Types of Bearings – Forces on Bearings Basis for Selection of Bearings – Design Principles of Steel Rocker and Roller Bearings and Its Design – Design of Elastometric Pad Bearing Detailing of Elastomeric Pot Bearings.

UNIT - V		Lecture Hrs:9

Piers and Abutments – General Features – Bed Block – Materials for Piers and Abutments – Types of Piers – Forces Acting on Piers – Design of Pier – Stability Analysis of Piers – General Features of Abutments – Forces Acting on Abutments – Stability Analysis of Abutments.

Textbooks:

1. Essentials of Bridges Engineering – D.Hohnson Victor Oxford & IBH Publishers Co-Private Ltd.
2. Design of Concrete Bridges MC Aswanin VN Vazrani, MM Ratwani, Khanna Publishers.
3. Bridge Engineering – S.Ponnuswamy.

Reference Books:

1. Concrete Bridge Design, Browe, R.E., C.R.Books Ltd., London, 1962.
2. Reinforced Concrete Bridges, Taylor F.W., Thomson, S.E., and Smulski E., John Wiley and Sons, New York, 1955.
3. An Introduction To Structural Design of Concrete Bridges, Derrick Beckett, Surrey University; Press, Henlely – Thomes, Oxford Shire, 1973
4. Bridge Analysis Simplified, Bakht.B.And Jaegar, L.G. Mc Graw Hill, 1985.
5. Design of Bridges – N.Krishna Raju – Oxford & IBH
6. Design of Bridge Structures – FR Jagadeesh, M.A. Jaya Ram – Eastern Economy Edition.

M.TECH. IN STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED CONCRETE LABORATORY	L	T	P	C
21D35206		0	0	4	2
	Semester		I		

Course Objectives: The students will acquire knowledge about

- To learn the principles of workability in cement concrete.
- To learn the preliminary tests on aggregates like flakiness test, elongation test, specific gravity, bulk density fineness modulus.
- To know the compression test, Young's modulus test procedures
- To learn the mix design procedure

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

- Assess the workability of cement concrete and its suitability, quality of concrete
- Assess the quality of fine and coarse aggregates after testing the aggregates according to IS specifications.
- Test the quality of cement concrete by conducting compressive strength on concrete cubes.
- Design different grades of mix design and also asses the fineness of cement, flash, silica

List of Experiments:

1. Mix Design of Concrete and Casting of Specimen
2. Mix Design of High Strength Concrete Including Casting and Testing of Specimens.
3. Fresh properties of self-compacting concrete
4. Permeability of Hardened concrete
5. Rapid chloride permeability of hardened concrete & Carbonations Studies.
6. Compressive strength split tensile strength & flexural strength of self compacting
7. concrete.
8. Young's Modulus of Concrete
9. Accelerated Curing Test on Concrete Cubes.
10. Non Destructive Tests on Concrete.
11. Mix Design of Concrete using Mineral Admixtures.
12. Bending Test on A RCC Beam Under:
    i. Single Point Load
    ii. Two Point Load

References:

1. Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall, 2012.
2. Concrete Technology, Shetty M. S., S. Chand and Co., 2006.
3. Concrete Technology by A.R. Santha kumar, Oxford University Press.

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M.TECH. IN STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED STRUCTURAL ENGINEERING LABORATORY	L	T	P	C
21D35106		0	0	4	2
	Semester			I	

Course Objectives: The students will acquire knowledge about
- Ddesign of experiments,
- To investigate the performance of structural elements.
- To evaluate the different testing methods and equipments.

Course Outcomes (CO): At the end of the course, students will be able to:
- Achieve Knowledge of design and development of experimenting skills.
- Understand the principles of design of experiments
- Design and develop analytical skills.
- Summerize the testing methods and equipments.

List of Experiments:
1. Load deflection characteristics of under reinforced concrete beam.
2. Load Deflection characteristics of over reinforced concrete beam.
3. Comparison of reinforced concrete beam with and without shear reinforcement.
4. Detection of reinforcement in structural members using profometer.
5. Temperature effects on compressive strength of concrete.
6. Impact strength of concrete beam.
7. Testing of Brick masonry wall.
8. Load deflection characteristics of reinforced concrete beam under cyclic loading using 500kN actuator.
9. Load deflection characteristics of reinforced concrete column under cyclic loading using 1000kN actuator.
10. Load deflection characteristics of reinforced concrete beam under torsion.
11. Ambient Vibration Testing.

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M.TECH. IN STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	RESEARCH METHODOLOGY AND IPR		L	T	P	C
21DRM101			2	0	0	2
		Semester		I		

Course Objectives:
- Identify an appropriate research problem in their interesting domain.
- Understand ethical issues understand the Preparation of a research project thesis report.
- Understand the Preparation of a research project thesis report
- Understand the law of patent and copyrights.
- Understand the Adequate knowledge on IPR

Course Outcomes (CO): Student will be able to
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT - I		Lecture Hrs:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, scope, and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT - II		Lecture Hrs:

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

UNIT - III		Lecture 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 - IV		Lecture Hrs:

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

UNIT - V		Lecture Hrs:

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.

Textbooks:
1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

Reference Books:
1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.

Course Code	STRUCTURAL DYNAMICS	L	T	P	C
21D35201		3	0	0	3
	Semester		**II**		

Course Objectives: This Course Will Enable Students:

- Determine vibration characteristics of structures like frequency,amplitude,impedence and time period
- Differentiate the response of single and multi degree of freedom systems
- Determine the response of structures for pulse excitation like blast load
- Differentiate the response of Multi Degree of Freedom systems

Course Outcomes (CO): Student will be able to

- Write equation of motion for single and multi degree of freedom systems
- Understand the impact of damping on charecterstics of vibrating system
- Gain Knowledge about arbitary and pulse excitation
- Understand applications of Numerical methods in dynamics
- Analyse in various theories of failure and plasticity

UNIT - I		Lecture Hrs:10

Theory of Vibrations: Introduction –Elements of A Vibratory System – Degrees of Freedom-Continuous Systems –Lumped Mass Idealization –Oscillatory Motion –Simple Harmonic Motion – Pictorial Representation of S.H.M - Free Vibrations of Single Degree of Freedom (SDOF) Systems – Undamped and Damped –Critical Damping –Logarithmic Decrement –Forced Vibrations of SDOF Systems-Harmonic Excitation –Dynamic Magnification Factor- Bandwidth.Fundamental Objective of Dynamic Analysis-Types of Prescribed Loading- Methods of Discretization- Formulation of The Equations of Motion.

UNIT - II		Lecture Hrs:10

Single Degree of Freedom System: Formulation and Solutions of The Equation of Motion - Free Vibration Response –Response To Harmonic, Periodic, Impulsive and General Dynamic Loading – Duhamel Integral

UNIT - III		Lecture Hrs:10

Multi Degree of Freedom System: Selection of The Degree of Freedom –Evaluation of Structural Property Matrices-Formulation of The MDOF Equations of Motion –Undamped Free Vibrations-Solution of Eigen Value Problem for Natural Frequencies and Mode Shapes- Analysis of Dynamic Response –Normal Coordinates –Uncoupled Equations of Motion –Orthogonal Properties of Normal Modes-Mode Superposition Procedure

UNIT - IV		Lecture Hrs:9

Practical Vibration Analysis: Stodola Method- Fundamental Mode Analysis –Analysis of Second and Higher Modes –Holzer's Method –Basic Procedure –Transfer Matrix Procedure

UNIT - V		Lecture Hrs:9

Introduction To Earthquake Analysis: Introduction –Excitation by Rigid Base Translation –Lumped Mass Approach -SDOF and MDOF System- I.S Code Methods of Analysis.
Continuous System: Introduction –Flexural Vibrations of Beams- Elementary Case-Equation of Motion –Analysis of Undamped Free Shapes of Simple Beams With Different End Conditions-Principles of Application To Continuous Beams.

Textbooks:
1. Structural Dynamics for Earthquake Engineering,A.K.Chopra,Pearson Pubilications
2. Dynamics of Structures by Clough & Penziem
3. Structural Dynamics by Roy. R. Craig John willy & fours.

Reference Books:
1. Structural Dynamics by Mario Paz
2. I.S:1893(Latest)" Code of Practice for Earthquakes Resistant Design of Stuctures"
3. Fundamentals of Vibration, Anderson R.A, Amerind Pulblishing Co.,1972.

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M.TECH. IN STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	FINITE ELEMENT METHODS for STRUCTURAL		L	T	P	C
21D20201	ENGINEERING		3	0	0	3
		Semester		II		

Course Objectives: This Course Will Enable Students:	

- To provide an overview and basic fundamentals of Finite Element Analysis.
- To introduce basic aspects of finite element theory, including domain discretization, interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.
- To explain the underlying concepts behind variational methods and weighted residual methods in FEM.
- Formulate simple structural problems in to finite elements

Course Outcomes (CO): Student will be able to

- Analyse and build FEA models for various Engineering problems.
- Able to identify information requirements and sources for analysis , design and evaluation
- Use professional-level finite element software to solve engineering problems.
- Interpret results obtained from FEA software solutions, not only in terms of conclusions but also awareness of limitations.

UNIT - I		Lecture Hrs:10

Introduction-Concepts of FEM –Steps Involved –Merits &Demerits –Energy Principles – Discretization –Rayleigh –Ritz Method of Functional Approximation. **Elastic Formulations:** Stress Equations-Strain Displacement Relationships in Matrix Form-Plane Stress, Plane Strain and Axi-Symmetric Bodies of Revolution With Axi Symmetric Loading

UNIT - II		Lecture Hrs:10

One Dimensional FEM-Stiffness Matrix for Beam and Bar Elements Shape Functions for ID Elements –Static Condensation of Global Stiffness Matrix-Solution –Initial Strain and Temperature Effects.

UNIT - III		Lecture Hrs:10

Two Dimensional FEM-Different Types of Elements for Plane Stress and Plane Strain Analysis – Displacement Models –Generalized Coordinates-Shape Functions-Convergent and Compatibility Requirements –Geometric Invariance –Natural Coordinate System-Area and Volume Coordinates-Generation of Element Stiffness and Nodal Load Matrices –Static Condensation.

UNIT - IV		Lecture Hrs:9

Isoparametric Formulation-Concept, Different Isoparametric Elements for 2D Analysis-Formulation of 4-Noded and 8-Noded Isoparametric Quadrilateral Elements –Lagrangian Elements-Serendipity Elements. **Axi Symmetric Analysis** –Bodies of Revolution-Axi Symmetric Modelling – Strain Displacement Relationship-Formulation of Axi Symmetric Elements.

UNIT - V		Lecture Hrs:9

Three Dimensional FEM-Different 3-D Elements, 3D Strain –Displacement Relationship-Formulation of Hexahedral and Isoparametric Solid Element.

Textbooks:

1. Finite Elements Methods in Engineering by Tirupati. R. Chandrnpatla and Ashok D. Belegundu – Pearson Education Publications.
2. Finite Element Analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers
3. Finite Elements Methods in Engineering by Tirupati. R. Chandrnpatla, Universities Press India Ltd. Hyderabad.

Reference Books:

1. Finite Element Method and Its Application by Desai ,2012, Pearson Pubilications.
2. finite Element Methods by Darrel W.Pepper, Vikas Pubilishers

3. Finite Element Analysis and Procedures in Engineering by H.V.Lakshminaryana, 3rd Edition, Universities Press, Hyderabad.
4. Finite Element Analysis in Engineering Design by S.Rajasekharan, S.Chand Publications, New Delhi.
5. Finite Element Analysis by S.S. Bhavakatti-New Age International Publishers
6. Finite Element Analysis by P Seshu-PHI Learning Publications.

M.TECH. IN STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	DESIGN of REINFORCED CONCRETE	L	T	P	C
21D20202a	FOUNDATIONS (PE-III)	3	0	0	3
	Semester		II		

Course Objectives: This Course Will Enable Students:

- To explore and examine a site
- Analyse lateral soil pressures acting on to a wall
- Determine bearing capacity of a soil using different theories at different conditions
- Analyse various dynamic forces
- Design a special foundation for vibrating machinery

Course Outcomes (CO): Student will be able to

- Determine the earthpressures on foundations and retaining structures
- Analyses shallow and deep foundations
- Calculate the bearing capacity of soils and foundation settlements
- Design foundations for different machines
- Assess the influence of vibrations

UNIT - I		Lecture Hrs:10

SHALLOW FOUNDATIONS-I: General Requirements of Foundations. Types of Shallow Foundations and The Factors Governing The Selection of Type of Shallow Foundation. Bearing Capacity of Shallow Foundations by Terzaghi's Theory and Meyerhof's Theory (Derivation of Expressions and Solution To Problems Based on These Theories). Local Shear and General Shear Failure and Their Identification

UNIT - II		Lecture Hrs:10

SHALLOW FOUNDATIONS-II: Bearing Capacity of Isolated Footing Subjected To Eccentric and Inclined Loads. Bearing Capacity of Isolated Footing Resting on Stratified Soils- Button's Theory and Siva Reddy Analysis. Analysis and Structural Design of R.C.C Isolated, Combined and Strap Footings.

UNIT - III		Lecture Hrs:10

DEEP FOUNDATIONS-I: Pile Foundations-Types of Pile Foundations. Estimation of Bearing Capacity of Pile Foundation by Dynamic and Static Formulae. Bearing Capacity and Settlement Analysis of Pile Groups. Negative Skin Friction, Pile Load Tests.Sheet Pile Walls.Cantilever Sheet Piles and Anchored Bulkheads, Earth Pressure Diagram,Determination of Depth of Embedment in Sands and Clays-Timbering of Trenches-Earth Pressure Diagrams-Forces in Struts.

UNIT - IV		Lecture Hrs:9

DEEP FOUNDATIONS-II: Well Foundations-Elements of Well Foundation. Forces Acting on A Well Foundation. Depth and Bearing Capacity of Well Foundation. Design of Individual Components of Well Foundation (Only Forces Acting and Principles of Design). Problems Associated With Well Sinking.

UNIT - V		Lecture Hrs:9

FOUNDATIONS in PROBLEMATIC SOILS: Foundations in Black Cotton Soils-Basic Foundation Problems Associated With Black Cotton Soils. Lime Column Techniques-Principles and Execution. Under Reamed Piles-Principle of Functioning of Under Reamed Pile-Analysis and Structural Design of Under Reamed Pile. Use of Cohesive Non Swelling (CNS) Layer Below Shallow Foundations.

Textbooks:

1. Analysis and Design of Foundations and Retaining Structures-Shamsher Prakash,Gopal Ranjan and Swami Saran.

Reference Books:

1. Analysis and Design of Foundations-J.E.Bowles
2. Foundation Design and Construction-Tomlinson
3. Foundation Design-Teng.
4. Geotechnical Engg – C.Venkatramaiah

Course Code	EXPERIMENTAL STRESS ANALYSIS		L	T	P	C
21D20202b	(PE-III)		3	0	0	3
		Semester		II		

Course Objectives: This Course Will Enable Students:

- To perform NDT test and interpret the results
- To understand the science behind working of strain gauge
- Understand the practical applicationsof strain gauge
- To determine the stress distribution in anacrylic block using the concept of photoelasticity

Course Outcomes (CO): Student will be able to

1. To understand the mechanical properties of strain gaugees andapplications
2. To understand the design and performance of strain gauges
3. To understand the methodsof Non destructive testing
4. To understand the methods of photo elasticity and models

UNIT - I		Lecture Hrs:10

PRINCIPLES of EXPERIMENTAL APPROACH

Merits of Experimental Analysis Introduction, Uses of Experimental Stress Analysis Advantages of Experimental Stress Analysis, Different Methods –Simplification of Problems.

UNIT - II		Lecture Hrs:10

STRAIN MEASUREMENT USING STRAIN GAUGES :-

Definition of Strain and Its Relation of Experimental Determinations Properties of Strain-Gauge Systems-Types of Strain Gauges –Mechanical, Acoustic and Optical Strain Gauges. Introduction To Electrical Strain Gauges - Inductance Strain Gauges – LVDT – Resistance Strain Gauges – Various Types –Gauge Factor – Materials of Adhesion Base.

UNIT - III		Lecture Hrs:10

STRAIN ROSSETTES and NON – DESTRUCTIVE TESTING of CONCRETE:-Introduction – The Three Elements Rectangular Rosette – The Delta Rosette Corrections for Transverse Strain Gauge. Ultrasonic Pulse Velocity Method –Application To Concrete. Hammer Test – Application To Concrete.

UNIT - IV		Lecture Hrs:9

THEORY of PHOTOELASTICITY :-

Introduction –Temporary Double Refraction – The Stress Optic Law –Effects of Stressed Model in A Polariscope for Various Arrangements – Fringe Sharpening. Brewster's Stress Optic Law.

UNIT - V		Lecture Hrs:9

TWO DIMENSIONAL PHOTOELASTICITY :-

Introduction – Isochromatic Fringe Patterns- Isoclinic Fringe Patterns Passage of Light Through Plane Polariscope and Circular Polariscope Isoclinic Fringe Patterns – Compensation Techniques – Calibration Methods – Separation Methods – Scaling Model To Prototype Stresses – Materials for Photoelasticity- Properties of Photoelastic Materials.

Textbooks:

1.Experimental Stress Analysis by J.W.Dally and W.F.Riley, College House
   Enterprises
2. Experimental Stress Analysis by Dr.Sadhu Singh.Khanna Publishers
3. Abdul Mubeen, "Experimental Stress Analysis", DhanpatRai and Sons, 2001.

Reference Books:

1. Experimental Stress Analysis by U.C.Jindal, Pearson Pubilications.
2. Experimental Stress Analysis by L.S.Srinath, MC.Graw Hill Company Publishers.
3. Moire Fringes in Strain Analysis, PS Theocaris, Pergammon Press, 2002.

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M.TECH. IN STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	STABILITY of STRUCTURES	L	T	P	C
21D20202c	(PE-III)	3	0	0	3
	Semester		II		

Course Objectives: This Course Will Enable Students:

- Determine stability of columns and frames
- Determine stability of beams and plates
- Use stability criteria and concepts for analyzing discrete and continuous systems,
- To form differential equations for plate buckling

Course Outcomes (CO): Student will be able to

- Apply the torisonal buckling and platesfor buckling concept
- Apply the inelastic behaviour of materials and analyse the inelastic charecter of column
- Analyse the frame structures
- Analyse the plate structures

UNIT - I		Lecture Hrs:10

Formulations Related To Beam Columns : Concept of Stability, Differential Equation for Beam Columns –Beam Column With Concentrated Loads –Continuous Lateral Load –Couples -Beam Column With Built in Ends –Continuous Beams With Axial Load –Application of Trignometric Series –Determination of Allowable Stresses.

UNIT - II		Lecture Hrs:10

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 A Bar With Intermediate Compressive Forces and Distributed Axial Loads –Buckling of Bars With Change in Cross Section –Effect of Shear Force on Critical Load – Built Up Columns

UNIT - III		Lecture Hrs:10

Inelastic Buckling and Torsional Buckling : Buckling of Straight Bars-Double Modulus Theory – Tangent Modulus Theory. Pure Torsion of Thin Walled Bar of Open Cross Section-Non –Uniform Torsion of Thin Walled Bars of Open Cross Section-Torsional Buckling –Buckling Under Torsion and Flexure.

UNIT - IV		Lecture Hrs:9

Mathematical Treatment of Stability Problems: Buckling Problem Orthogonality Relation –Ritz Method-Timoshenko Method, Galerkin Method

UNIT - V		Lecture Hrs:9

Lateral Buckling of Simply Supported Beams and Rectangular Plates : Beams of Rectangular Cross Section Subjected for Pure Bending. Derivation of Equation of Rectangular Plate Subjected To Constant Compression in Two Directions and One Direction.

Textbooks:

1. Stability of Metalic Structure by Bleich –Mc Graw Hill
2. Theory of Beam Columns Vol I by Chen & Atsuta Mc.Graw Hill
3. Timoshenko, S., and Gere., Theory of Elastic Stability, Mc Graw Hill Book Company, 1973.

Reference Books:

1. Elastic Stability of Structures, Smitses, Prentice Hall,1973.
2. Buckling of Bars Plates and Shells, Brush and Almorth., Mc Graw Hill Book Company ,1975.
3. Principles of Structural Stability Theory, Chajes, A., Prentice Hall,1974
4. Stability Theory of Structures, Ashwini Kumar, TATA Mc Graw Hill Publishing Company Ltd, New Delhi,1985.

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M.TECH. IN STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED STEEL DESIGN		L	T	P	C
21D20203a	**(PE-IV)**		**3**	**0**	**0**	**3**
		Semester		**II**		

Course Objectives: This Course Will Enable Students:

- To understand the relation between structural analysis and design provisions
- Design and analysis of girders under maximum load effects
- Design and analysis of cold formed steels under stiffened and un stiffened conditions
- Design and analysis of industry buildings

Course Outcomes (CO): Student will be able to

- Gain knowledge about plastic analysis of steel structures
- Analyze and design of girders
- Analyze and design of steel tanks and stacks
- Analyze and design of industrial buildings
- Analyze and design of light gauge steel structures

UNIT - I		Lecture Hrs:10

Design of Self Supporting Steel Stacks/Chimneys – Considerations for Preliminary Design (Industrial Requirements – Thermal Requirement – Mechanical Force Requirement – Wind Load and Dead Load Estimation) – Detailed Estimation of Wind; Dead-And Other Accidental – Loads; Analysis; Detailed Design Including Provision of Stakes /Spoilers – Design of Super Structure Only.

UNIT - II		Lecture Hrs:10

Analysis of Multi-Storey Frames Using Approximate Methods and Substitute Frame Method:
Cantilever Method &
Portal Method

UNIT - III		Lecture Hrs:10

Design of Gantry Girder – Introduction – Loads Acting on The Gantry Girder – Permissible Stresses - Types of Gantry Girders and Crane Sails – Crane Data – Maximum Moments and Shears – Design Procedure (Restricted To Electrically Operated Cranes)

UNIT - IV		Lecture Hrs:9

Theorems of Plastic Analysis, Applications To The Cases of Rectangular Portal Frames. Principles of Optimization in Structural Design – Application To Simple – Rectangular Portal Frame – Minimum Weight Design.

UNIT - V		Lecture Hrs:9

General Methods of Plastic Design: Combining Mechanics Methods, Plastic Moment Redistribution Method; Application To Few Cases of Simple Two Storied Rectangular Portal Frames Including Estimation of Deflection.

Textbooks:

1. Plastic Analysis of Structures by B.G.Neal
2. Steel Skeleton V.I and II by Baker
3. Design of Steel Structures by Vazarani and Ratwani

Reference Books:

1. Strength of Materials (Vol-II)) by Timoshenko.
2. Analysis of Steel Structure by Manohar.
3. Analysis of Steel Structure by Pinfold
4. Analysis of Steel Structure by Arya & Azmani
5. Analysis of Steel Structure by Relevant IS Codes.
6. Analysis of Steel Structure by Punmia, B.C.

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M.TECH. IN STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	FRACTURE MECHANICS	L	T	P	C
21D20203b	(PE-IV)	3	0	0	3
	Semester		II		

Course Objectives: This Course Will Enable Students:
- To design based on linear elastic fracture mechanics
- To find out the variation of plastic zone over thickness of various elements
- To know about the plane strain and plane stress in slip planes
- To understand the fracture process of concrete and different materials

Course Outcomes (CO): Student will be able to
- Acquire basic skills in fracture mechanism of brittle materials
- Apply fracture mechanics theory to calculate stress areas
- Calculate the "energy release rate" around crack tips
- Examine crack growth due to fatigue

UNIT - I		Lecture Hrs:10

Summary of Basic Problems and Concepts:
Introduction - A Crack in A Structure - The Stress At A Crack Tip - The Griffith Criterion The Crack Opening Displacement Criterion - Crack Propagation - Closure

UNIT - II		Lecture Hrs:10

The Elastic Crack – Tip Stress Field :
The Airy Stress Function - Complex Stress Functions - Solution To Crack Problems - The Effect of Finite Size - Special Cases - Elliptical Cracks - Some Useful Expressions

UNIT - III		Lecture Hrs:10

The Crack Tip Plastic Zone:
The Irwin Plastic Zone Correction - The Dugdale Approach - The Shape of The Plastic Zone - Plane Stress Versus Plane Strain - Plastic Constraint Factor - The Thickness Effect

UNIT - IV		Lecture Hrs:9

The Energy Principle:
The Energy Release Rate - The Criterion for Crack Growth - The Crack Resistance (R Curve) - Compliance , The J Integral (Definitions Only)
Plane Strain Fracture Toughness:
The Standard Test - Size Requirements - Non-Linearity – Applicability
Plane Stress and Transitional Behaviour:
Introduction - An Engineering Concept of Plane Stress - The R Curve Concept

UNIT - V		Lecture Hrs:9

The Crack Opening Displacement Criterion:
Fracture Beyond General Yield - The Crack Tip Opening Displacement - The Possible Use of The CTOD Criterion
Determination of Stress Intensity Factors:
Introduction - Analytical and Numerical Methods - Finite Element Methods, Experimental Methods (An Ariel Views Only)

Textbooks:
1. Elementary Engineering Fracture Mechanics - David Broek, Battelle, Columbus Laboratories, Columbus, Ohieo, USA
2. Fracture and Fatigue Control in Structures - John M.Barsom, Stanley T.Rolfe, Ross H.Forney
3. Rock and other Quasi-brittle materials - Surender P Shah , Stuart E Swartz,Wiley 1995.

Reference Books:
1. Analysis of Concrete Structures by fracture mechanics, Elfgren L, Routledge,1990
2. Fracture Mechanics- Applications to concrete, Victor C.Li and Z P Bazant , ACI SP118
3. Fracture Mechanics , CT Suri and Zh jin , Elsevier Academic Press,2012

Course Code	ADVANCED REINFORCED CONCRETE DESIGN	L	T	P	C
21D20203c	(PE-IV)	3	0	0	3
	Semester		II		

Course Objectives: This Course Will Enable Students:
- To design of reinforced concrete beam
- To design of reinforced concrete slab
- To analyze and design of multi storey building and Industrial Building
- To design special structures such as Deep beams,Corbels and Grid Floors

Course Outcomes (CO): Student will be able to
- Design the strength and serviceability of reinforced concrete elements
- Design special reinforced concrete elements
- Analyse and design of slabs and grid floor
- Design the inelastic behaviour of concrete beams

UNIT - I		Lecture Hrs:10

Deflection of Reinforced Concrete Beams and Slabs:
Introduction -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 - Calculation of Deflection by BS 8110 - Deflection Calculation by Eurocode – ACI Simplified Method - Deflection of Continuous Beams by IS 456 - Deflection of Cantilevers - Deflection of Slabs

UNIT - II		Lecture Hrs:10

Estimation of Crack Width in Reinforced Concrete Members and Design of
 Deep Beams:
Introduction - Factors Affecting Crack width in Beams - Mechanism of Flexural Cracking Calculation of Crack Widths - Simple Empirical Method - Estimation of Crack width in -Beams by IS 456 of BS 8110 - Shrinkage and Thermal Cracking.
 Deep Beams:
Introduction - Minimum Thickness - Steps of Designing Deep Beams - Design by IS 456 - Design According To British Practice - ACI Procedure for Design of Deep Beams - Checking for Local Failures - Detailing of Deep Beams.

UNIT - III		Lecture Hrs:10

Shear in Flat Slabs and Flat Plates:
Introduction - Checking for One-Way (Wide Beam) Shear - Two-Way (Punching) Shear Permissible Punching Shear - Shear Due To Unbalanced Moment (Torsional Moments) Calculation of J Values - Strengthening of Column Areas for Moment Transfer by Torsion Which Produces Shear - Shear Reinforcement Design - Effect of Openings in Flat Slabs - Recent Revisions in ACI 318 - Shear in Two – Way Slabs With Beams.

UNIT - IV		Lecture Hrs:9

Design of Plain Concrete Walls and Shear Walls:
Introduction - Braced and Unbraced Walls - Slenderness of Walls- Eccentricities of Vertical Loads At Right Angles To Wall - Empirical Design Method for Plane Concrete Walls Carrying Axial Load - Design of Walls for In-Plane Horizontal Forces - Rules for Detailing of Steel in Concrete Walls
Design of Shear Walls:
Introduction - Classification of Shear Walls - Classification According To Behavior - Loads in Shear Walls - Design of Rectangular and Flanged Shear Walls - Derivation of Formula for Moment of Resistance of Rectangular Shear Walls

UNIT - V		Lecture Hrs:9

Design of Reinforced Concrete Members for Fire Resistance : Introduction - ISO 834 Standard Heating Conditions- Grading Or Classification - Effect of High Temperature on Steel and Concrete - Effect of High Temperatures on Different Types of Structural Members - Fire Resistance by Structural Detailing From Tabulated Data - Analystical Determination of The Ultimate Bending Moment Capacity of Reinforced Concrete Beams Under Fire - Other Considerations

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Textbooks:
1. Reinforced Concrete Structural Elements: Behaviour, Analysis and Design, P.Purushothaman, Tata Mcgraw Hill.
2. Reinforced Concrete Desigers Hand Bood, C.E. Reynolds and J.C. Steedman, A View Point Publication.
3. Advanced Reinforced Concrete Design , Varghese PC, Prentice Hall of India,2008
Reference Books:
1. Limit State Design of Reinforced Concrete Structures by P.Dayaratnam, Oxford & Ibh Publishers.
2. Advanced RCC by N.Krishna Raju, Cbs Publishers & Distributors.
3. Reinforced Cement Concrete Structures – Devdas Menon & Unnikrishna Pillai, Tata Mcgraw Hill

Course Code	**COMPUTER AIDED DESIGN LABORATORY**	L	T	P	C
21D20204		**0**	**0**	**4**	**2**
	Semester		**II**		

Course Objectives: The students will acquire knowledge about

- To learn the software applications in structural engineering.
- To learn the analysis of plane, space truss and frames subjected to different types of loadings.
- To draw the detailing of RCC members and to learn the estimations.
- To study the design concepts of steel members like truss, beams and columns.

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

- Understand the software usages for structural members.
- Able to analyse plane, space frames and dynamic response and natural frequency for beams and frames.
- Able to design, detailing and estimations of RC members.
- Able to design the steel members like truss, beams and columns.

List of Experiments:

1. Analysis of Cantilever, Simply Supported Beam, Fixed Beams, Continuous Beams for Different Loading Conditions.
2. Design of R.C.C. Beams, Slabs, Foundations.
3. Design of Steel Tension Members
4. Reinforcement Detailing in Beam Using Graphics.
5. Reinforcement Detailing in Slabs Using Graphics.
6. Reinforcement Detailing in Foundation Using Graphics.

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Course Code	ADVANCED STRUCTURAL DESIGN LAB	L	T	P	C
21D20205		**0**	**0**	**4**	**2**
	Semester		**II**		

Course Objectives: The students will acquire knowledge about

- To develop MATLAB codes for solution of simultaneous linear equations.
- To construct codes for 1D Finite Element problems.
- To identify methods to code for numerical integration techniques & statistical methods.
- To model finite difference methods.

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

- Design and Detail all the Structural Components of Frame Buildings.
- Design and Detail complete Multi-Storey Frame Buildings
- design the frames using Excel sheets
- Design the Shells and folded plates using ETABS

List of Experiments:

1. Static and Dynamic analysis of Building structure using software (ETABS / STAADPRO)
2. Design of RCC and Steel structure using software (ETABS / STAADPRO)
3. Analysis of folded plates and shells using software.
4. Preparation of EXCEL sheets for structural design.

Course Code	EARTHQUAKE RESISTANT DESIGN of BUILDINGS	L	T	P	C
21D35301a	(PE-V)	3	0	0	3
	Semester		III		

Course Objectives: This Course Will Enable Students:

- To understant effects of earthquakes on engineering structures and its measurement
- To apply dynamics loadson various structures
- To design buildings for earthquake loads as per IS Codes
- To understand and implement the concept of ductility in Earthquake Resistant Design

Course Outcomes (CO): Student will be able to

- Illustrate the measurement of earthquakes and their effect on engineering structures
- Analyse the free and forced vibration response of single degree and multi degree of freedom and continuous systems
- Apply the basic principles of conceptual design of Earthquake Resistant buildings
- Learn the various seismic control methods

UNIT - I		Lecture Hrs:10

Engineering Seismology :

Earthquake – Causes of Earthquake – Earthquakes and Seismic Waves – Scale and Intensity of Earthquakes – Seismic Activity – Measurements of Earth Quakes – Seismometer- Strong Motion Accelerograph / Field Observation of Ground Motion – Analysis of Earthquakes Waves – Earth Quake Motion – Amplification of Characteristics of Surface Layers – Earthquake Motion on The Ground Surface

UNIT - II		Lecture Hrs:10

Vibration of Structures Under Ground Motion:

Elastic Vibration of Simple Structures – Modelling of Structures and Equations of Motion – Free vibrations of Simple Structures – Steady State Forced Vibrations – Non Steady State Forced Vibrations – Response Spectrum Representations; Relation Between The Nature of The Ground Motion and Structural Damage.

UNIT - III		Lecture Hrs:10

Lateral Force Procedure Seismic Base Shear – Seismic Design Co-Efficient - Vertical Distribution of Seismic Forces and Horizontal Shear – Twisting Moment - Over Turning Moment – Vertical Seismic Load and Orthogonal Effects Lateral Deflection – P- Δ Characteristics Effect – Soil Structure Interaction. Seismic – Graphs Study, Earthquake Records for Design – Factors Affecting Accelerogram Characteristics - Artificial Accelerogram – Zoning Map. Dynamic – Analysis Procedure: Model Analysis – Inelastic – Time History Analysis Evaluation of the Results.

UNIT - IV		Lecture Hrs:9

Earthquake – Resistant Design of Structural Components and Systems:

Introduction – Monolithic Reinforced – Concrete Structures – Precast Concrete Structures – Prestressed Concrete Structures – Steel Structures – Composite – Structures, Masonry Structures – Timber Structures.

UNIT - V		Lecture Hrs:9

Fundamentals of Seismic Planning: Selection of Materials and Types of Construction Form of Superstructure – Framing Systems and Seismic Units – Devices for Reducing. Earthquake Loads,

Textbooks:

1. Design of Earthquake Resistant Structures by Minoru Wakabayashi.
2. Strucutural Dynamics for Earthquake Engineering", A.K.Chopra,Pearson Pubilications.
3. Dynamics of Structures. R.W.Clough, Mc Graw – Hill, 2nd Edition,

Reference Books:

1. Fundamentals of Earthquake Engineering,N.M Newmark and E.Rosenblueth, Prentice Hall,1971.
2. Earthquake Design Practice for Buildings. David Key," Thomas Telford,London,1988

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3. Earthquake Engg; R.L. Wegel, Prentice Hall 12nd Edition 1989.
4. Design of Multi –Storied Buildings for Earthquake Ground Motions J.A. Blume, N.M. Newmark, L.H. Corning.,', Portland Cement Association, Chicago,1961
5. I.S.Codes No. 1893,4326,13920.
6. Earthquake Resistant Design by Pankaj Agarwal.

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Course Code	LOW COST HOUSING TECHNIQUES	L	T	P	C
21D25301a	(PE- V)	3	0	0	3
	Semester		II		

Course Objectives: This course will enable students:
- To possess comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.
- To focuses on cost effective construction materials and methods.
- To understand on the principles of sustainable housing policies and programmes.
- to adopt the suitable techniques in rural and disaster prone areas by using locally available materials.

Course Outcomes (CO): Student will be able to
- Development of construction technology and innovative techniques as tools to address demand mass construction
- Knowledge of eco friendly material with their application
- Learn the use of locally available material according to their availability and maintenance

UNIT - I		Lecture Hrs:10

Housing Scenario
Introduction - Status of Urban Housing - Status of Rural Housing
Housing Finance:
Introducing - Existing Finance System in India - Government Role As Facilitator - Status At Rural Housing Finance - Impedimently in Housing Finance and Related Issues
Land Use and Physical Planning for Housing
Introduction - Planning of Urban Land - Urban Land Ceiling and Regulation Act - Efficiency of Building Bye Lass - Residential Densities
Housing The Urban Poor
Introduction - Living Conditions in Slums - Approaches and Strategies for Housing Urban Poor

UNIT - II		Lecture Hrs:10

Development and Adoption of Low Cost Housing Technology
Introduction - Adoption of Innovative Cost Effective Construction Techniques - Adoption of Precast Elements in Partial Prefatroices - Adopting of Total Prefactcation of Mass Housing in India- General Remarks on Pre Cast Rooting/Flooring Systems -Economical Wall System - Single Brick Thick Loading Bearing Wall - 19cm Thick Load Bearing Masonry Walls - Half Brick Thick Load Bearing Wall - Flyash Grypsym Thick for Masonry - Stone Block Masonery - Adoption of Precast R.C. Plank and Join System for Roof/Floor in The Building

UNIT - III		Lecture Hrs:10

Alternative Building Materials for Low Cost Housing
Introduction - Substitute for Scarce Materials – Ferrocement - Gypsum Boards - Timber Substitutions - Industrial Wastes - Agricultural Wastes - Fitire Starateru; for ,P,Topm of Alternative Building Maintenance
Low Cost Infrastructure Services:
Introduce - Present Status - Technological Options - Low Cost Sanitation - Domestic Wall - Water Supply, Energy

UNIT - IV		Lecture Hrs:9

Rural Housing:
Introduction Traditional Practice of Rural Housing Continuous - Mud Housing Technology
Mud Roofs - Characteristics of Mud - Fire Treatment for Thatch Roof - Soil Stabilization - Rural Housing Programs

UNIT - V		Lecture Hrs:9

Housing in Disaster Prone Areas:
Introduction – Earthquake - Damages To Houses - Traditional Prone Areas - Type of Damages and

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Railways of Non-Engineered Buildings - Repair and Restore Action of Earthquake Damaged Non-Engineered Buildings Recommendations for Future Constructions. Requirement's of Structural Safety of Thin Precast Roofing Units Against Earthquake Forces, Status of R&D in Earthquake Strengthening Measures - Floods, Cyclone, Future Safety

Textbooks:
1. Building Materials for Low –Income Houses – International Council for Building Research Studies and Documentation.   2. Hand Book of Low Cost Housing by A.K.Lal – Newage International Publishers.   3. Modern Trends in Housing in Developing Countries – A.G. Madhava Rao, D.S. Ramachandra Murthy & G.Annamalai.

Reference Books:
1. Properties of Concrete – Neville A.M. Pitman Publishing Limited, London.   2. Light Weight Concrete, Academic Kiado, Rudhai.G – Publishing Home of Hungarian Academy of Sciences 1963.   3. Low Cost Housing – G.C. Mathur.

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COURSE STRUCTURE & SYLLABI

Course Code	BUILDING CONSTRUCTION MANAGEMENT		L	T	P	C
21D25301b	(PE- V)		3	0	0	3
		Semester		II		

Course Objectives: This Course Will Enable Students:

- To create construction project cost estimates.
- Analyze construction documents for planning and management of construction processes.
- Understand the legal implications of contract, common, and regulatory law to manage a construction project.
- Understand different methods of project delivery and the roles and responsibilities of all constituencies involved in the design and construction process.

Course Outcomes (CO): Student will be able to

- Plan, coordinate and control of a project from beginning to completion.
- Adopting the most effect method for meeting the requirement in order to produce a functionally and financially viable project.
- Implement different methods of project delivery
- Follow the legal provisions implied

UNIT - I		Lecture Hrs:10

Introduction – Types Constructions Public and Private Contract Management – Scrutinizing Tenders and Acceptance of Tenders, Contracted, Changes and Terminating of Contract – Subcontracts Construction Organizations – Organizational Chart-Decentralization Payrolls and Records – Organization Chart of A Construction Company.

UNIT - II		Lecture Hrs:10

Construction Practices – Times Management – Bar Chart, CPM, PERT – Progress Report

UNIT - III		Lecture Hrs:

Resources Management and Inventor- Basic Concepts Equipment Management, Material Management Inventory Control.

UNIT - IV		Lecture Hrs:9

Accounts Management – Basic Concepts, Accounting System and Book Keeping, Depreciation, Balance Sheet, Profit and Loss Account, Internal Auditing. Quality Control by Statistical Methods, Sampling Plan and Control Charts, Safety Requirements.

UNIT - V		Lecture Hrs:9

Cost and Financial Management – Cost Volume Relationship, Cost Control System, Budget Concept of Valuation, Cost of Equity Capital Management Cash. Labor and Industrial; Laws – Payment of Wages Act. Contract Labor, Workmen's Compensation, Insurance, Industrial Disputes Act.

Textbooks:
1. Construction Project Management by Jha ,Pearson Pubilications,New Delhi.
2. Construction Technology by Subir K.Sarkar and Subhajit Saraswati – Oxford Higher Education- Univ.Press, Delhi.

Reference Books:
1. Project Planning and Control With PERT and CPM by Dr.B.C.Punmia, K.K.Khandelwal, Lakshmi Publications New Delhi.
2. Optimal Design of Water Distribution Networks P.R.Bhave, Narosa Publishing House 2003.
3. Total Project Management, The Indian Context- by : P.K.JOY- Mac Millan Publishers India Limited.

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AUDIT COURSE-I

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COURSE STRUCTURE & SYLLABI

Course Code	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P	C
21DAC101a		**2**	**0**	**0**	**0**
	Semester		I		

Course Objectives: This course will enable students:

- Understand the essentials of writing skills and their level of readability
- Learn about what to write in each section
- Ensure qualitative presentation with linguistic accuracy

Course Outcomes (CO): Student will be able to

- Understand the significance of writing skills and the level of readability
- Analyze and write title, abstract, different sections in research paper
- Develop the skills needed while writing a research paper

UNIT - I		Lecture Hrs:10

1Overview of a Research Paper- Planning and Preparation- Word Order- Useful Phrases - Breaking up Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy -Avoiding Ambiguity

UNIT - II		Lecture Hrs:10

Essential Components of a Research Paper- Abstracts- Building Hypothesis-Research Problem - Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cauterization

UNIT - III		Lecture Hrs:10

Introducing Review of the Literature – Methodology - Analysis of the Data-Findings - Discussion-Conclusions-Recommendations.

UNIT - IV		Lecture Hrs:9

Key skills needed for writing a Title, Abstract, and Introduction

UNIT - V		Lecture Hrs:9

Appropriate language to formulate Methodology, incorporate Results, put forth Arguments and draw Conclusions

Suggested Reading

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering & Technology PG Courses [Volume-I]
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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Course Code	DISASTER MANAGEMENT		L	T	P	C
21DAC101b			2	0	0	0
		Semester		I		

Course Objectives: This course will enable students:

- Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives.
- Developanunderstandingofstandardsofhumanitarianresponseandpracticalrelevanceinspecific types of disasters and conflict situations
- Criticallyunderstandthestrengthsandweaknessesofdisastermanagementapproaches,planningand programming in different countries, particularly their home country or the countries they work in

UNIT - I

Introduction:

Disaster:Definition,FactorsandSignificance;DifferenceBetweenHazardandDisaster;Naturaland Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post- Disaster Diseases and Epidemics

UNIT - II

Repercussions of Disasters and Hazards:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes,Volcanisms,Cyclones,Tsunamis,Floods,DroughtsandFamines,Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT - III

Disaster Preparedness and Management:

Preparedness: Monitoring of Phenomena Triggering ADisasteror Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT - IV

Risk Assessment Disaster Risk:

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. TechniquesofRiskAssessment,GlobalCo-OperationinRiskAssessmentand Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT - V

Disaster Mitigation:

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

Suggested Reading

1. R.Nishith,SinghAK,"DisasterManagementinIndia:Perspectives,issuesandstrategies
2. "'New Royal book Company..Sahni,PardeepEt.Al.(Eds.),"DisasterMitigationExperiencesAndReflections",PrenticeHall OfIndia, New Delhi.

3. GoelS.L.,DisasterAdministrationAndManagementTextAndCaseStudies",Deep&Deep Publication Pvt. Ltd., New Delhi

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Course Code	SANSKRITFOR TECHNICAL KNOWLEDGE	L	T	P	C
21DAC101c		**2**	**0**	**0**	**0**
	Semester		**I**		

Course Objectives: This course will enable students:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- LearningofSanskrittodevelopthelogicinmathematics,science&othersubjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge
- Knowledge from ancientliterature

Course Outcomes (CO): Student will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science &technology can be understood
- Being a logical language will help to develop logic in students

UNIT - I		
Alphabets in Sanskrit,		

UNIT - II		
Past/Present/Future Tense, Simple Sentences		

UNIT - III		
Order, Introduction of roots		

UNIT - IV		
Technical information about Sanskrit Literature		

UNIT - V		
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics		

Suggested Reading

1."Abhyaspustakam" –Dr.Vishwas, Sanskrit-Bharti Publication, New Delhi
2."Teach Yourself Sanskrit" Prathama Deeksha- VempatiKutumbshastri, RashtriyaSanskrit Sansthanam, New Delhi Publication
3."India's Glorious ScientificTradition" Suresh Soni, Ocean books (P) Ltd.,New Delhi

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AUDIT COURSE-II

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COURSE STRUCTURE & SYLLABI

Course Code	PEDAGOGY STUDIES		L	T	P	C
21DAC201a			2	0	0	0
		Semester		**II**		

Course Objectives: This course will enable students:

- Reviewexistingevidenceonthereviewtopictoinformprogrammedesignandpolicy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes (CO): Student will be able to

Students will be able to understand:

- Whatpedagogicalpracticesarebeingusedbyteachersinformalandinformalclassrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- Howcanteachereducation(curriculumandpracticum)andtheschoolcurriculumand guidance materials best support effective pedagogy?

UNIT - I

Introduction and Methodology: Aims and rationale, Policy back ground, Conceptual frame work and terminology   Theories   oflearning,Curriculum,Teachereducation.Conceptualframework,Research questions**.** Overview of methodology and Searching.

UNIT - II

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

UNIT - III

Evidence on theeffectivenessofpedagogicalpractices,Methodologyfortheindepthstage:quality assessmen t of included studies. How can teacher education (curriculumandpracticum) andthescho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of th body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT - IV

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacherandthecommunity.Curriculumandassessment,Barrierstolearning:limitedresourcesand large class sizes

UNIT - V

Researchgapsandfuturedirections: Researchdesign**,**Contexts**,**Pedagogy**,**Teachereducation**,** Curriculum and assessment**,** Dissemination and research impact.

Suggested Reading

1. AckersJ,HardmanF(2001)ClassroominteractioninKenyanprimaryschools,Compare, 31 (2): 245-261.
2. AgrawalM(2004)Curricularreforminschools:Theimportanceofevaluation,Journalof
3. Curriculum Studies, 36 (3): 361-379.
4. AkyeampongK(2003) Teacher training in Ghana - does it count? Multi-site teachereducation research project (MUSTER) country report 1. London: DFID.

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5. Akyeampong K, LussierK, PryorJ, Westbrook J (2013)Improving teaching and learning of basic maths and reading in Africa: Does teacherpreparation count?International Journal Educational Development, 33 (3): 272–282.

6. Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
Chavan M (2003)ReadIndia: A mass scale, rapid, 'learning to read'campaign.

7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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COURSE STRUCTURE & SYLLABI

Course Code	STRESSMANAGEMENT BY YOGA	L	T	P	C
21DAC201b		2	0	0	0
	Semester		II		

Course Objectives: This course will enable students:

- To achieve overall health of body and mind
- To overcome stres

Course Outcomes (CO): Student will be able to

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT - I		
Definitions of Eight parts of yog.(Ashtanga)		

UNIT - I

Definitions of Eight parts of yog.(Ashtanga)

UNIT - II

Yam and Niyam.

UNIT - III

Do`sand Don't'sin life.

i) Ahinsa,satya,astheya,bramhacharyaand aparigrahaii)
Shaucha,santosh,tapa,swadhyay,ishwarpranidhan

UNIT - IV

Asan and Pranayam

UNIT - V

i)Variousyogposesand theirbenefitsformind &body

ii)Regularizationofbreathingtechniques and its effects-Types ofpranayam

Suggested Reading

1.'Yogic Asanas forGroupTarining-Part-I": Janardan SwamiYogabhyasiMandal, Nagpur
2."Rajayogaor conquering the Internal Nature" by Swami Vivekananda, Advaita
Ashrama (Publication Department), Kolkata

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COURSE STRUCTURE & SYLLABI

Course Code	PERSONALITY DEVELOPMENT THROUGHLIFE ENLIGHTENMENTSKILLS	L	T	P	C
21DAC201c		2	0	0	0
	Semester		II		

Course Objectives: This course will enable students:	

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes (CO): Student will be able to

- StudyofShrimad-Bhagwad-Geetawillhelpthestudentindevelopinghispersonalityand achieve the highest goal in life
- The person who has studied Geetawilllead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT - I

Neetisatakam- Holistic development of personality

    Verses-19,20,21,22(wisdom)

    Verses-29,31,32(pride &heroism)

    Verses-26,28,63,65(virtue)

UNIT - II

Neetisatakam- Holistic development of personality

    Verses-52,53,59(dont's)

    Verses-71,73,75,78(do's)

UNIT - III

Approach to day to day work and duties.

    ShrimadBhagwadGeeta:Chapter2-Verses41,47,48,

    Chapter3-Verses13,21,27,35,Chapter6-Verses5,13,17,23,35,

    Chapter18-Verses45,46,48.

UNIT - IV

Statements of basic knowledge.

    ShrimadBhagwadGeeta:Chapter2-Verses 56,62,68

    Chapter12 -Verses13,14,15,16,17,18

    Personality of Rolemodel. Shrimad Bhagwad Geeta:

UNIT - V

    Chapter2-Verses 17,Chapter3-Verses36,37,42,

    Chapter4-Verses18,38,39

    Chapter18– Verses37,38,63

Suggested Reading

1."SrimadBhagavadGita"bySwamiSwarupanandaAdvaitaAshram(PublicationDepartment), Kolkata

2.Bhartrihari'sThree Satakam (Niti-sringar-vairagya) by P.Gopinath, RashtriyaSanskrit Sansthanam, New Delhi.

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OPEN ELECTIVE

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M.TECH. IN STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	COST MANAGEMENT OF ENGINEERING PROJECTS	L	T	P	C
21DOE301a		3	0	0	3
	Semester		I		

Course Objectives:

- To explain cost concepts and objectives of costing system and cost management process
- To provide knowledge and explain Cost behaviour in relation to Volume and Profit and pricing decisions.
- To know the concepts of target costing, life cycle costing and activity based cost management in a project or business.
- To discuss on budget and budgetary control , type of budgets in a business to control costs
- To provide knowledge on project, types of projects, stages of project execution, types of project contracts and project cost control.

Course Outcomes (CO): Student will be able to

- Know the cost management process and types of costs
- Learn and apply different costing methods under different project contracts
- To understand relationship of Cost-Volume and Profit and pricing decisions.
- Prepare budgets and measurement of divisional performance.
- Acquires knowledge on various types of project contracts, stages to execute projects and controlling project cost..

UNIT - I		Lecture Hrs:10

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

UNIT - II		Lecture Hrs:12

Cost Behavior and Profit Planning: Marginal Costing- Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems; Pareto Analysis Just-in-time approach, Theory of constraints.; Divisional performance management: - Measurement of Divisional profitability - pricing decisions - transfer pricing.

UNIT - III		Lecture Hrs:10

Target costing- Life Cycle Costing - Activity-Based Cost management:- Activity based costing- Value-Chain Analysis- Bench Marking; Balanced Score Card.

UNIT - IV		Lecture Hrs:10

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

UNIT - V		Lecture Hrs:12

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

Textbooks:

1. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
2. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler

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publisher

Reference Books:
1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd
Online Learning Resources:
https://nptel.ac.in/courses/105/104/105104161/
https://nptel.ac.in/courses/112/102/112102106/

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COURSE STRUCTURE & SYLLABI

Course Code	INDUSTRIAL SAFETY	L	T	P	C
21DOE301b		3	0	0	3
	Semester	III			

Course Objectives:
- To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models
- To understand about fire and explosion, preventive methods, relief and its sizing methods
- To analyse industrial hazards and its risk assessment.

Course Outcomes (CO): Student will be able to
- To list out important legislations related to health, Safety and Environment.
- To list out requirements mentioned in factories act for the prevention of accidents.
- To understand the health and welfare provisions given in factories act.

UNIT - I		Lecture Hrs:

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

UNIT - II		Lecture Hrs:

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

UNIT - III		Lecture Hrs:

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working andapplications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT - IV		Lecture Hrs:

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

UNIT - V		Lecture Hrs:

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

Textbooks:
1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.

Reference Books:
1.Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
2. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

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M.TECH. IN STRUCTURAL ENGINEERING
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Course Code	BUSINESS ANALYTICS		L	T	P	C
21DOE301c			**3**	**0**	**0**	**3**
		Semester		**III**		

Course Objectives:
- The main objective of this course is to give the student a comprehensive understanding of business analytics methods.

Course Outcomes (CO): Student will be able to
- Students will demonstrate knowledge of data analytics.
- Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
- Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
- Students will demonstrate the ability to translate data into clear, actionable insights.

UNIT - I		Lecture Hrs:

Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst. Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.

UNIT - II		Lecture Hrs:

Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.

UNIT - III		Lecture Hrs:

Forming Requirements: Overview of Requirements, Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents. Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling

UNIT - IV		Lecture Hrs:

Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools

UNIT - V		Lecture Hrs:

Recent Trands in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data Journalism.

Textbooks:
1. Business Analysis by James Cadle et al.
2. Project Management: The Managerial Process by Erik Larson and, Clifford Gray

Reference Books:
1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.