Vice-principal (Acad)
MPV
19/12

VL
21/12/23

**Department of Civil Engineering**
**University college of Engineering Kakinada**
**Jawaharlal Nehru Technological University Kakinada**

# M.Tech
## (Soil Mechanics & Foundation Engineering)

## R23 Regulations

**BOS Meeting Held on 8th 9th and 10th September 2023**

# ACADEMIC REGULATIONS (R23)

# COURSE STRUCTURE

# AND

# DETAILED SYLLABUS

For

## M.Tech Two Year Programme

(Applicable for the batches admitted from the **A.Y. 2023-24**)

**UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)**
**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**
**KAKINADA – 533003, ANDHRA PRADESH, INDIA**

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**

**(Established by Andhra Pradesh Act No.30 of 2008)**

**Kakinada – 533 003, Andhra Pradesh (India)**

## ACADEMIC REGULATIONS R23 FOR M. Tech (REGULAR) DEGREE COURSE

Applicable for the students of M. Tech (Regular) Course from the Academic Year 2023-24 onwards. The M. Tech Degree of Jawaharlal Nehru Technological University Kakinada shall be conferred on candidates who are admitted to the program and who fulfill all the requirements for the award of the Degree.

### 1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above program shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.

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

### 2.0 AWARD OF M. Tech DEGREE

**2.1** A student shall be declared eligible for the award of the M. Tech Degree, if he pursues a course of study in not less than two and not more than four academic years.

**2.2 The student shall register for all 68 credits and secure all the 68 credits.**

**2.3** The minimum instruction days in each semester are 90.

### 3.0 A. PROGRAMMES OF STUDY

The following specializations are offered by various departments at present for the M. Tech Programme of study.

| Department | Programme |
|---|---|
| **Civil Engg.** | 1. M.Tech- Structural Engineering<br>2. M. Tech- Soil Mechanics and Foundation Engineering<br>3. M.Tech-Water Resource Engineering (UA) |
| **EEE** | 1. M.Tech- High Voltage Engineering<br>2. M.Tech- Advanced Electrical Power System<br>3. M.Tech- Power Electronics and Drives |

| | |
|---|---|
| **ME** | 1. M.Tech- CAD/CAM<br>2. M.Tech- Machine Design<br>3. M.Tech-Thermal Engineering |
| **ECE** | 1. M.Tech- Computer and Communication<br>2. M.Tech- VLSI and Embedded Systems<br>3. M.Tech- Instrumentation and Control Engineering (UA) |
| **CSE** | 1. M.Tech- Computer Science and Engineering<br>2. M.Tech- Artificial Intelligence and Machine Learning<br>3. M.Tech-Cyber Security |

## 4.0 ATTENDANCE

**4.1** The faculty handling the course will finalise the attendance as per schedule / before the last instructional day of the course and submit to the Principal through the head of the department.

**4.2** A student with less than 75% of consolidated attendance (and/or less than 50% in each and every course ), will not be permitted to appear for the end- semester examinations, irrespective of the reason for the shortfall of the attendance. Further, a student with less than 75% of attendance in Dissertation Phase-2 (IV Semester) will not be permitted to submit his project work.

**4.3** The student is however permitted to avail Academic/Medical Leave/ NCC / NSS / Cultural / Sports/ Minor Medical exigencies etc., up to 10% for attending academic related activities like, Industrial Visits, Seminars, Conferences, Competitions etc., with the prior approval of the HoD. After the event, the student should submit the relevant documents for proof to the HoD for approval of the Academic Leave.

**4.4** Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%, and minimum of 50% in each and every course including laboratory, Dissertation phase-1, Dissertation Phase-2) for a maximum of **ONE time** shall be granted by the College Academic Committee. A prescribed fee shall be payable towards condonation of shortage of attendance.

**4.5** Shortage of Attendance below 65% in aggregate shall not be condoned and not eligible to write their end semester examination of that class.

**4.6** A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next.

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

## 5.0 EVALUATION

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

**5.1** For the theory subjects 60 marks shall be awarded based on the performance in the End Semester Examination and 40 marks shall be awarded based on the Internal Evaluation.

The weightage of Internal marks for 40 consists of Descriptive – 32 and Assignment – 08 (open book exam). Descriptive exam shall be conducted for a total duration of 120 minutes with 4 questions (without choice) each question for 8 marks. The descriptive examination conducted for 32 marks are to be added to the assignment 8 marks for finalizing internal marks for 40. The internal evaluation shall be made based on the average of the marks secured in the two Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction. Semester End Exam Paper contains FIVE mandatory questions (one question from one unit) with internal choice, each carrying 12 marks for a total of 60 marks.

**5.2** For practical subjects, 60 marks shall be awarded based on the performance in the End Semester Examinations and 40 marks shall be awarded as internal marks, 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 marks of Procedure-15, Experimentation-25, Results-10 , Viva-voce-10.

**5.3** For **Mini Project with seminar**, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For Mini Project with seminar, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful. Out of 100 marks, supervisor awards 40% marks and remaining 60% marks are awarded by the project review committee.

**5.4** 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 semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together. For integrated courses, student should secure the minimum academic requirements in both theory and practical together.

**5.5** In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.4) he has to reappear for the End semester Examination in that subject. A candidate shall be given a 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. In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those subject(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt stand cancelled. For re-registration the candidates have to apply to the college by paying the requisite fees before the start of the semester in which re-registration is required.

**5.6** In case the candidate secures less than the required attendance in any re registered subject (s), he shall not be permitted to write the End Examination in that subject. He shall again re-register the subject when next offered.

**5.7** Laboratory examination for M. Tech. programmes must be conducted with two Examiners, one of them being the Laboratory Class Teacher or teacher from the same

department and the second examiner shall be appointed by the Principal from the panel of examiners submitted by the respective HoD.

**5.8** Student is allowed to register for 12 week SWAYAM / NPTEL MOOC courses (recommended by HoD/BoS) and can obtain required credits during II Semester itself. In any case, if a student fails in obtaining credits, he is allowed to repeat the initially opted course / change to another MOOC course or regular course and will be considered as regular candidate only. After successful completion, by end of III/IV Semester, he needs to submit the course certificate (through HoD) to the exam section to perform credit transfer.

**5.9** In addition to credit courses, for completing the programme and obtaining degree, a student needs to complete audit courses. Audit courses will be conducted, evaluated as normal credit courses, and the assessment will be graded as Pass/Fail.

**5.10** Students shall undergo mandatory summer internship (2 credits) for a minimum of eight weeks duration at the end of second semester of the Programme/Summer Break. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the committee. The Committee comprises of Head of the Department and two faculty. The report and the oral presentation shall carry 40% and 60% weightages respectively. For internship, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

## 6.0 EVALUATION OF PROJECT/DISSERTATION (Phase-I and II):

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

**6.1** A Project Review Committee (PRC) shall be constituted with Head of the Department and two other senior faculty members in the department.

**6.2** Registration of Dissertation / Project Work: The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters.

**6.3** A candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work (published base paper(s) / real time project / industry oriented) for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).

**6.4** If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Project Review Committee (PRC). However, the Project Review Committee (PRC) shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

**6.5 A candidate shall present seminar on his project work status in two stages at least with a gap of THREE months between them. If the candidate is absent to any of these two seminars, he should again attend the seminar within two weeks by providing proper evidence to the Project Review Committee regarding his absence.**

**6.6** A candidate is permitted to submit Project Thesis (Dissertation) only after successful

completion of theory and practical course **with the approval of PRC** not earlier than 40 weeks from the date of registration of the project work.

**6.7** Continuous assessment of Dissertation-I and Dissertation-II during the Semester will be monitored by the PRC.

**6.8** There will be pre-submission seminar at the end of academic term. **After the approval the student has to submit the detail report.**

**6.9 The candidate may be allowed to submit the project report if the project work is published or accepted in a reputable national or international journal or conference.**

**6.10** Three copies of the Project Thesis certified by the supervisor shall be submitted to the College along with plagiarism report (<40%).

**6.11** The thesis shall be adjudicated by one examiner selected by the Principal, from the panel of 5 examiners, eminent in that field, submitted by the guide concerned and head of the department.

**6.12** If the report of the examiner is not favorable, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is unfavorable again, the thesis shall be summarily rejected. The candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the Principal.

**6.13** If the report of the examiner is favorable, Viva-Voce examination shall be conducted by a board consisting of the Supervisor/ Internal examiner, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work for a maximum of 100 Marks. **Out of 100 marks, supervisor awards 30 marks and remaining 70 marks are awarded by the board.**

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

**6.15** If the report of the Viva-Voce is unsatisfactory (i.e., <50 marks), the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the Institution.

## 7.0 Cumulative Grade Point Average (CGPA)

| Marks Range (Max – 100) | Letter Grade | Level (G) | Grade Point |
|---|---|---|---|
| ≥ 90 | >90 | Outstanding (O) | 10 |
| ≥80 to <90 | 90-80 | Excellent (S) | 9 |
| ≥70 to <80 | 80-70 | Very Good (A) | 8 |
| ≥60 to <70 | 70-60 | Good (B) | 7 |
| ≥50 to <60 | 60-50 | Fair (C) | 6 |
| <50 | <50 | Fail (F) | 0 |
| | | Absent | 0 |

**Computation of SGPA**

The following procedure is to be adopted to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The **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 (Si) = $\sum$ (Ci X Gi) / $\sum$ Ci**

Where Ci is the number of credits of the $i^{th}$ course and Gi is the grade point scored by the student in the $i^{th}$ course.

**Computation of CGPA**

The **CGPA** is also calculated in the same manner taking into account all the courses undergone by a student over all the semester of a programme, i.e.

**CGPA = $\sum$ (Ci X Si) / $\sum$ Ci**

Where Si is the SGPA of the $i^{th}$ semester and Ci is the total number of credits in that semester. The SGPA and CGPA shall be rounded off to TWO decimal points and reported in the transcripts.

## 8.0 AWARD OF DEGREE AND 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** | **CGPA to be secured** | |
|---|---|---|
| First Class with Distinction | $\geq$ 7.75 without backlog history | **From the CGPA secured from 68 Credits.** |
| First Class | $\geq$ 6.75 | |
| Second Class | $\geq$ 5.75 to < 6.75 | |

The secured grade, grade points, status and credits obtained will be shown separately in the memorandum of marks.

## 8.0 WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

## 9.0 TRANSITORY REGULATIONS

**9.1** Discontinued or detained candidates are eligible for re-admission into same or equivalent subjects at a time as and when offered.

## 10. GENERAL

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

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

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

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

## MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

| | Nature of Malpractices/Improper conduct | Punishment |
|---|---|---|
| | *If the candidate:* | |
| 1. (a) | Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) | Expulsion from the examination hall and cancellation of the performance in that subject only. |
| (b) | Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter. | Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him. |
| 2. | Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. |
| 3. | Impersonates any other candidate in connection with the examination. | The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all External 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 External examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 5. | Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks. | Cancellation of the performance in that subject. |
| 6. | Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination. | In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them. |
| 7. | Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already |

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

* * * * *

## Examination Branch
## Appointment of Subject Expert for QP Setting

**From** **Date: 01.10.2023.**
**Dr U V Ratna Kumari**
**Vice-Principal**

**To**

I am advised to inform you that you are appointed as subject expert to set the question paper(s) as per the details noted below. You are requested to set the question paper(s) in MS word document format and send a soft copy oie1.ucek@jntucek.ac.in. The hard copies of the question paper(s) shall be sent along with the remuneration bill.

You are requested to set the Question Paper(s) by following OBE pattern, as per the revised Bloom's Taxonomy herewith enclosed. Keep this appointment strictly confidential.

1. You are requested to prepare a balanced question paper within the prescribed syllabus covering the entire syllabus. The duration of the examination is **3-hours** and you are requested to prepare the questions in such a way that student must be able to answer each question for about 35-45 minutes time.
2. It is informed that the question paper covering the topics of all FIVE units for 60 marks. Also the question paper shall be set as per the format enclosed, containing ten main questions (two from each unit) over FIVE-units of syllabus with internal choice and **12marks** for each question. The main question shall contain sub questions like 1(a), 1(b) etc.
3. The student has to answer FIVE mandatory questions (One question from one unit).
4. The requirement of data books, codes, graphs etc. may please be indicated on the question paper.
5. You are requested to give the distribution of the marks for each question.
6. **You are requested not to reproduce questions from previous question papers.**
7. Remuneration for setting of one question paper for M.Tech(PG) programme is **Rs. 1,200/-** per set.
8. You are requested to confirm your acceptance through e-mail.

You are requested to reject the offer and intimate the same to the Vice Principal, if any of your relatives are writing the examination or if you are involved in any extra assignment in any tutorial/coaching centers. Please send the question paper in the enclosed model (model is attached for reference).

| Question Paper Details | | R19 OBE Pattern | | | |
|---|---|---|---|---|---|
| **Course** | **M.Tech (PG)** | **Question No.** | **Unit/CO's** | **Bloom's Taxonomy Level** | **Marks** |
| **Name of the Examination** | **I-M.Tech, I-Sem (R23) Regular End Exams, Dec-2023** | **I** | **U1/CO1** | **L2/L3/L4** | **12** |
| **Subjects** | **XXXXXXX** | **II** | **U2/CO2** | **L2/L3/L4** | **12** |
| **Branch** | **XXXXXXXXX** | **III** | **U3/CO3** | **L2/L3/L4** | **12** |
| **No of Question Paper Sets** | **1 (Ono)** | **IV** | **U4/CO4** | **L2/L3/L4** | **12** |
| **Last Date for submission** | **14/11/2023** | **V** | **U5/CO5** | **L2/L3/L4** | **12** |

**Note: U1: Unit 1, CO1: Course Outcome 1**
**L1: Level 1(Bloom's Cognitive Level) L2: Understanding Level; L3: Apply Level; L4: Analyze Level.**

**VICE-PRINCIPAL**

Course Code: **R23**

# University College of Engineering Kakinada (Autonomous)
# Jawaharlal Nehru Technological University Kakinada

( ) B. Tech. ( ) Semester (R23) Regular Examinations, ( )

**COURSE NAME**

**(NAME OF BRACH)**

Time: 3 hrs. Max Marks: 60

**Answer all five questions** **5X12=60**

****

| Q.No | Question | Marks | CO | BL |
|---|---|---|---|---|
| | **UNIT–1** | | | |
| 1(a) | | | | |
| 1(b) | | | | |
| | **(OR)** | | | |
| 2(a) | | | | |
| 2(b) | | | | |
| | **UNIT–2** | | | |
| 3(a) | | | | |
| 3(b) | | | | |
| | **(OR)** | | | |
| 4(a) | | | | |
| 4(b) | | | | |
| | **UNIT–3** | | | |
| 5(a) | | | | |
| 5(b) | | | | |
| | **(OR)** | | | |
| 6(a) | | | | |
| 6(b) | | | | |
| | **UNIT–4** | | | |

| | | | | |
|---|---|---|---|---|
| 7(a) | | | | |
| 7(b) | | | | |
| | (OR) | | | |
| 8(a) | | | | |
| 8(b) | | | | |
| | UNIT–5 | | | |
| 9(a) | | | | |
| 9(b) | | | | |
| | (OR) | | | |
| 10(a) | | | | |
| 10(b) | | | | |

**Note: CO: Course Outcome, BL: Bloom's Cognitive Level;**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA-533003, Andhra Pradesh (India)
For Constituent Colleges and Affiliated Colleges of JNTUK

# Ragging

## Prohibition of ragging in educational institutions Act 26 of 1997

### Salient Features

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

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

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

**LET US MAKE JNTUK A RAGGING FREE UNIVERSITY**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA-533003, Andhra Pradesh (India)
For Constituent Colleges and Affiliated Colleges of JNTUK

# Ragging

# ABSOLUTELY NO TO RAGGING

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

Jawaharlal Nehru Technological University Kakinada
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LET US MAKE JNTUK A RAGGING FREE UNIVERSITY

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
## Meeting: 8th 9th & 10th SEP 2023 (R23)

### SEMESTER I

| S.No | Course No | Category | Course Name | P.Os | L | T | P | C | Marks |
|---|---|---|---|---|---|---|---|---|---|
| 1 | MSFI-1 | Core1 | Advanced Soil Mechanics (Geotechnical Engineering Lab) | | 3 | 0 | 3 | 4.5 | 100 |
| 2 | MSFI-2 | Core2 | Foundation Engineering-I | | 3 | 0 | -- | 3 | 100 |
| 3 | MSFI-3 | Elective I | | | 3 | 0 | -- | 3 | 100 |
| | | | a) Ground Improvement Techniques | | | | | | |
| | | | b) Soil-Structure Interaction | | | | | | |
| | | | c) Critical State Soil Mechanics | | | | | | |
| 4 | MSFI-4 | Elective II | | | 3 | 0 | -- | 3 | 100 |
| | | | a) Applications of Geosynthetics | | | | | | |
| | | | b) Rock Mechanics | | | | | | |
| | | | c) Remote Sensing & Geographical Information Systems | | | | | | |
| 5 | MSFMC | | Research Methodology and IPR | | 2 | 0 | 0 | 2 | 100 |
| 6 | MSFPI-1 | Laboratory 1 | Advanced characterization of Geomaterials Lab | | - | -- | 3 | 1.5 | 100 |
| 7 | MSFA-1 | Audit Course –1 | Audit Course –1 | | 2 | 0 | 0 | 0 | 100 |
| | | | **Total Credits /Marks** | | | | | **17** | **800** |

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
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### SEMESTER II

| S.No. | Course No | Category | Course Name | P.Os | L | T | P | C | Marks |
|---|---|---|---|---|---|---|---|---|---|
| 1 | MSFII-1 | Core 3 | Foundation Engineering-II | | 3 | 0 | -- | 3 | 100 |
| 2 | MSFII-2 | Core 4 | Earth Retaining Structures | | 3 | 0 | -- | 3 | 100 |
| 3 | MSFII-3 | Elective III | | | 3 | 0 | -- | 3 | 100 |
| | | | a) Pavement Analysis Design & Evaluation | | | | | | |
| | | | b) Construction Planning & Methods | | | | | | |
| | | | c) Geotechnical Earthquake Engineering | | | | | | |
| 4 | MSFII-4 | Elective IV | | | 3 | 0 | -- | 3 | 100 |
| | | | a) Earth Dams | | | | | | |
| | | | b) Foundations in Expansive Soils | | | | | | |
| | | | c) Numerical Methods in Geotechnical Engineering | | | | | | |
| 5 | MSFPII-1 | Laboratory 3 | In-Situ Geotechnical Testing | | - | -- | 3 | 1.5 | 100 |
| 6 | MSFPII-2 | Laboratory 4 | Design Studio | | - | -- | 3 | 1.5 | 100 |
| 7 | MSFMP | Core | Mini Project with Seminar | | 0 | 0 | 4 | 2 | 100 |
| 8 | MSFA-2 | Audit Course -2 | Audit Course -2 | | 2 | 0 | 0 | 0 | 100 |
| | | | **Total Credits /Marks** | | | | | **17** | **800** |

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### SEMESTER III **

| S.No | Course No | Category | Course Name | P.Os | L | T | P | C | Marks |
|---|---|---|---|---|---|---|---|---|---|
| 1 | MSFIII-1 | Elective-V | Elective /MOOCS | | 3 | 0 | -- | 3 | 100 |
| | | | a) Geoenvironmental Engineering | | | | | | |
| | | | b) Soil Dynamics & Machine Foundations | | | | | | |
| | | | c) Finite Element Methods | | | | | | |
| 2 | MSFIII-2 | Open Elective | Open Elective / MOOCS | | 3 | 0 | -- | 3 | 100 |
| 3 | DISSERTATION | Core | Dissertation Phase-I / Industrial Project (To be continued and Evaluated next Semester) * | | -- | -- | 20 | 10 | |
| | | | **Total Credits /Marks** | | | | | **16** | **200** |

*** Evaluated and displayed in 4th Semester marks list**
**** Students Going for Industrial Project / Thesis will complete these courses through MOOCS**

### SEMESTER IV

| S No. | Course No | Category | Course Name | P.Os | L | T | P | C | Marks |
|---|---|---|---|---|---|---|---|---|---|
| 1 | DISSERTATION | Core | Dissertation Phase II (Continued from III Semester) | | 0 | 0 | 32 | 16 | 100 |
| | | | **Total Credits /Marks** | | | | | **16** | **100** |

**Total Credits: 17+17+16+16 = 66**

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## Program Outcomes

The graduating student will be able to

| | |
|---|---|
| **PO1** | Study the behavior of Soil under different conditions and different loadings |
| **PO2** | Analyze and design foundations for different structures in different sub soil conditions. |
| **PO3** | Expose to various ground improvement techniques to improve ground in different sub soil conditions by considering the environmental and social aspects. |
| **PO4** | Impart knowledge on geotechnical characterization of soils and research methods to carryout experiments, to analyze and interpret experimental data |
| **PO5** | Apply advanced materials and technologies to mitigate the problems posed by the ground in difficult soil conditions. |

## Program Educational Objectives

| | |
|---|---|
| **PEO1** | To Impart advanced technical knowledge and skills for specialized careers in Geotechnical Engineering and related fields to cater to the Global needs. |
| **PEO2** | To provide expertise in executing complex geotechnical projects by using state - of -art computing, numerical and experimental techniques and to develop |

| | |
|---|---|
| | interdisciplinary research. |
| **PEO3** | To contribute for the development of the geotechnical engineering by effective field practice and quality research. |

## Program Specific Objectives

The graduates must be able to

| | |
|---|---|
| **PSO1** | Analyze field geotechnical problems and solve them through techniques such as geosynthetic reinforcement and reinforced earth |
| **PSO2** | Solve geotechnical problems through numerical modeling |
| **PSO3** | Assess field geotechnical problems through extensive specialized lab/field inestigations. |

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# SEMESTER-I

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### MSFI-1- Advanced Soil Mechanics
### Common for M.Tech.
### (Soil Mechanics & Foundation Engineering and Geotechnical Engineering)

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Acquire complete knowledge on stress components and distribution. |
| CO2 | Acquire the complete knowledge on strain and stress strain relationships. |
| CO3 | Tackle problems on seepage through soils |
| CO4 | Understand consolidation phenomenon and apply it to various Geotechnical Engineering problems |
| CO5 | Understand shear strength behavior of soils and its applications in Geotechnical Engineering |

**Mapping of Course Outcomes with Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 2 | 2 |
| CO2 | 3 | -- | 2 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 2 | 2 |
| CO4 | 3 | 2 | 2 | 1 | 1 |
| CO5 | 3 | 1 | 1 | 2 | 2 |

1. Slightly 2. Moderately 3. Substantially

**Detailed Syllabus:**

**Unit: 1**

Analysis of Stress: Concept of Stress – Body force, Surface force and stress vector – The state of stress at a point – Normal and shear stress components – Rectangular stress components - Stress components on an arbitrary plane – Digression on Ideal fluid – Equality of Cross shears - Cauchy's formula – Equations of Equilibrium – Transformation of coordinates – Plane state of stress. Principal Stresses – Stress Invariants – Particular cases – Mohr's circle for the Three-dimensional state of stress – Mohr's stress plane – Plane of maximum shear – Octahedral stresses – Pure shear decomposition into Hydrostatic and pure shear states.

**Unit: 2**

Analysis of Strain – Deformation – Deformation in the Neighborhood point – Change in length of a linear element – Change in length of a linear element – Linear component – Rectangular strain components – The state of strain at a point – Shear strain components – Change in direction of a linear element - Cubical Dilation – Change in the angle between Two line elements – Principal Axes of strain and principal strains – Plane state of strain – Compatibility condition – Strain deviator and its Invariants, Stress – Strain relations – Stress – Strain relations for isotropic materials – Modules of Rigidity – Bulk modules.

**Unit: 3**

Permeability and Seepage: Darcy's law – Validity of Darcy's Law, Coefficient of Permeability in the Field - Equation of Continuity – Use of Continuity Equation for Solution of Simple flow problems – Flow nets – hydraulic uplift force under structure – Flow nets in anisotropic material – Construction of flow nets for hydraulic structures on non-homogeneous sub soils – Directional variation of permeability in anisotropic medium – Seepage through earth dams – Entrance, discharge and transfer condition of line of seepage through earth dams. Flow net construction for earth dams – filter design.

**Unit: 4**

Consolidation: Mechanism of consolidation – Primary consolidation – Stress history Pre-consolidation pressure – Terzaghi's one-dimensional consolidation theory and equation – Solution by Fourier series and finite difference methods – Determination of coefficient of consolidation – U versus T relationship for different forms of initial excess pore water pressure distribution – Degree of consolidation under time – dependent loading – secondary compression – Radial consolidation.

**Unit: 5**

Shear strength: Principle of effective stress – Measurement of strength parameters - Strength tests based on drainage conditions – Skempton's pore pressure coefficients – Stress paths – Shear strength of cohesionless soils – Strength and deformation behaviour – Dilatancy – Critical void ratio – Liquefaction of soils – Shear strength of saturated cohesive soils – Triaxial testing. Normally and over consolidated clays.

REFERENCES

1. " Advanced soil mechanics" by Braja M. Das., McGraw Hill Co.,
2. "Advanced Solid Mechanics" by L.S. Srinath
3. " Foundations of theoretical soil mechanics" by M.E. Harr., McGraw Hill Co.
4. "Introduction to Geotechnical engineering" by Holtz and Kovacs., Prentice Hall.
5. "Soil Mechanics" by R.F.Craig, Chapman and Hall.
6. "Elements of soil mechanics" by G.N. Smith., B.S.P. Professional Books, Oxford, London.

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### MSFI-2 - Foundation Engineering – I

**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Know the process of the soil exploration and sample collection, preservation and transportation of samples to the laboratory. |
| CO2 | Interpret the results of field tests. |
| CO3 | Determine the bearing capacity of soils for shallow foundations |
| CO4 | Make the choice of foundation based on sub soil conditions. |
| CO5 | Determine the settlement of foundations in different soils. |

**Mapping of Course Outcomes with Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 1 | 3 | 1 | 1 | 2 |
| CO2 | -- | 3 | 1 | -- | -- |
| CO3 | -- | 3 | 1 | -- | 1 |
| CO4 | -- | 3 | 1 | -- | -- |
| CO5 | | | | | |

1. **Slightly 2. Moderately 3. Substantially**

**Detailed Syllabus:**

**Unit: 1**

Soil Exploration – Importance, Terminology, - Geophysical methods. Borings - Location, spacing and depth, Methods of Boring including Drilling, Stabilization of Boreholes, – Methods of sampling -Types of Samples and Samplers- Cleaning of Bore holes, Preservation, Labeling and Shipment of Samples - Design Considerations of Open Drive Samplers.

**Unit: 2**

Field tests - The Standard Penetration Test – its limitations and Corrections – Cone Penetration Test – Field Vane Shear Test – **Borehole** Shear Test – Dilatometer Test – **Pressuremeter** test – Planning of exploration -- Preparation of Soil Report – Bore log.

**Unit: 3**

Shallow Foundations –Bearing capacity – **Terzaghi's**, Meyerhof's, Hansen's and Vesic's Bearing Capacity Theories – IS method of Bearing Capacity - Factors - Bearing Capacity of Stratified Soils - Bearing Capacity Based on Penetration Resistances - Safe Bearing Capacity and Allowable Bearing Pressure

**Unit: 4**

**Types of foundations and the choice of the type of foundations.** Design Considerations including Location and Depth, Proportioning of Shallow Foundations- Isolated and Combined Footings and Mats - Design Procedure for Mats. Floating Foundation- Fundamentals of Beams on Elastic Foundations.

**Unit: 5**

Settlement Analysis – Elastic settlement in granular soils – Meyerhof's, De Beer and Marten's and Schemertmann's equations-Elastic settlements of surface and subsurface **footings** in clays - Skempton and Bjerrum's pseudo three-dimensional approach to consolidation settlement, settlement from in-situ tests. Tolerable settlements.

REFERENCES

1. Principles of Foundation Engineering by Braja M. Das.
2. Soil Mechanics in Engineering Practice by Terzagi and Peck
3. Foundation Design by Wayne C. Teng, John Wiley & Co.,
4. Foundation Analysis and Design by J.E. Bowles McGraw Hill Publishing Co.,
5. Analysis and Design of sub structures by Swami Saran
6. Design Aids in Soil Mechanics and Foundation Engineering by Shanbaga R. Kaniraj, Tata McGraw Hill.
7. Foundation Design and Construction by MJ Tomlinson – Longman Scientific
8. A short course in Foundation Engineering by Simmons and Menzes - ELBS

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## MSFI-3-a) GROUND IMPROVEMENT TECHNIQUES
## (ELECTIVE-I)

**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: Soil Mechanics**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Understand the principles of various ground improvement techniques |
| CO2 | Prefer suitable ground improvement techniques based on the Soil conditions and local available Materials |
| CO3 | Understand the principles and suitability of various stabilization techniques |
| CO4 | Select suitable stabilization techniques based on the Soil conditions and local available materials |
| CO5 | Understand the Principles of dewatering techniques and to apply suitable dewatering technique in the field depending on the requirement |
| CO6 | Understand the grouting technology and its applications by selecting the suitable grout based on the field conditions |

**Mapping of Course Outcomes with Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 1 | -- | 3 | 1 | -- |
| CO2 | 1 | -- | 3 | 1 | 2 |
| CO3 | -- | 1 | 3 | 1 | 2 |
| CO4 | 1 | -- | 3 | 1 | 2 |
| CO5 | -- | -- | 3 | 1 | 1 |
| CO6 | -- | -- | 3 | 1 | -- |

**1. Slightly 2. Moderately 3. Substantially**

**Detailed Syllabus:**

**Unit: 1**

Introduction – Need for Engineering Ground – Classifications of Ground Modification Techniques – Suitability, Feasibility and Desirability.
Densification of cohesionless soils – Deep Compaction – Vibroflobation – Vibro Composer method - Blasting – Densification at Ground. - Vibrocompaction - Heavy Tamping

**Unit: 2**

Improvement of Cohesive soils – Preloading - Soil Replacement – Radial Consolidation – Vertical and Radial Consolidation - Vertical Drains – Sand Drains – Effect of Smear – Sandwicks – Band drains – Dynamic Compaction.

**Unit: 3**

Stabilisation- Mechanical Stabilisation, Lime Stabilisation, Cement Stabilisation, Bitumen Stabilisation, Thermal Stabilisation, Chemical Stabilistion and Stabilisation with Different Admixtures

**Unit: 4**

Dewatering : - Dewatering methods – open sumps and ditches – gravity flow wells – Vacuum dewatering – Electro – kinetic dewatering – Electrosmosis
Grouting: Overview of grouting - Suspension grouts – Solution grouts – Emulsion grouts-Categories of grouting – Grouting Techniques – ascending stage, descending stage and stage grouting – Grouting Plant - Grout control - Grouting applications – Dams, Tunnels, Shafts and drifts, excavations.

**Unit: 5**

Stone Columns – Methods of installation of Stone Columns – Load shared by stone columns and the stabilized ground – uses of stone columns Lime columns and granular trenches – Installation – In situ ground reinforcement – ground anchors – types – Components and applications – uplift capability-Stability of foundation trenches and surrounding structures through soil Nailing, tie backs.

**REFERENCE:**

1. Construction and Geotechnical Methods in Foundation Engineering By R.M. Koerner, McGraw – Hill Book Co.
2. Current Practices in Geotechnical Engineering Vol.1, Alam Singh and Joshi, International Book Traders, Delhi, & Geo-Environ Academia.
3. Foundation Analysis and Design (1V Ed.) By J.E. Bowles, McGraw – Hill Book Co.,
4. Ground Improvement Techniques by P. Purushotham Raj, Laxmi Publications (P) Ltd., New Delhi.
5. Ground Improvement – Edited by M.P. Moseley, Blackie Academic & Professional.
6. Soil Mechanics for Road Engineers, H.M.S.O, Londan.
7. Ground Improvement Techniques by Bergado et al.

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### MSFI-3-b) –Soil Structure Interaction
### (ELECTIVE-I)
**Common for M.Tech.**
**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: Soil Mechanics, Mathematics**
**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Use a stress strain behaviour of Soil in modelling to determine the soil response with the applied loads. |
| CO2 | Apply concepts to analyze and to compute the response of the infinite and finite beams, plates on the soil medium |

**Mapping of Course Outcomes with Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 3 | -- | -- | 1 | 1 |
| CO2 | 1 | 3 | -- | 1 | 1 |

**1. Slightly 2. Moderately 3. Substantially**

**Detailed Syllabus:**

**Unit: 1**
Introduction to Soil – Foundation Interaction Problems – Contact Pressure Distribution – Idealized Soil Behaviour, Foundation Behaviour, Interface Behaviour, Analytical techniques.

**Unit: 2**
Idealized Soil Response Models for the Analysis of Soil – Foundation Interaction – Elastic Models for Soil Behaviour, Cointler model, Elastic Continuous Model, Two –Parametric Elastic Models – Elastic – Plastic and Time Dependent Behaviour of Soil Masses.

**Unit: 3**
Plane Strain Analysis of an Infinite plate and an Infinitely Long. Beam; Bernoulli – Euler Beam Theory and its Modifications – Effect of Shear Deformations.

**Unit: 4**
Finite Beams on a Winkler Medium – Method of Initial Parameters – Method of Super Position – Strain Energy Method.

**Unit: 5**
Analysis of finite plats – Axi Symmetric Leading of a Circular Plate – Circular Plate Resting on a Winkler Medium – Circular Plate Resting on a Two – parameter elastic.

**REFERENCE:**


1. Analytical and computer methods in foundation engineering, JE Bowles, McGraw Hill publications.
2. Foundation analysis and design, JE Bowles, McGraw Hill Publications.
3. Foundation analysis by RF Scott, Printice Hall
4. Hytenyi, Beams on Elastic Foundations – university of Michigan Press.
5. Elastic Analysis of soil – Foundation Interaction. APS Selvadurai – Elsevier

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### MSFI-3-c) - Critical State Soil Mechanics
### (ELECTIVE-I)

Common for M.Tech.

(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)

**Pre-Requisites: Soil Mechanics**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Use a critical state framework to determine soil response |
| CO2 | Use a constitutive model to determine soil response |
| CO3 | Analyze the behaviour of soil under different boundary conditions |

**Mapping of Course Outcomes with Program Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 1 | 2 |
| CO2 | 2 | 1 | -- | 2 | 2 |
| CO3 | 1 | 1 | -- | 3 | 1 |

**1. Slightly 2. Moderately 3. Substantially**

**Detailed Syllabus:**

**Unit: 1**

Stress and strain – Stress and Strain Paths and Invariants – Critical State line – families of Undrained and Drained tests – Undrained and Drained planes – The Roscoe surface – Rosco surface as a state boundary surface.

**Unit: 2**

Behaviour of Over Consolidated Samples – Hvorslev Surface – Critical State Line – Complete State Boundary surface – Volume Changes and Pore Pressure changes – Behaviour of Sands – Effect of Dilation.

**Unit: 3**

Soil behaviour Before failure – Plasticity of Soils – Cam clay - Power in Cam – Clay – Critical States and Yielding of Cam – clay, Compression of Cam – Clay.

**Unit: 4**

Routine Soil Tests and the Critical State Model – Mohr – Coulomb Failure Criterion – One – dimensional compression – Undrained Shear Strength – General states of stress – Pore pressure Parameters – Interpretation of Index Test Data.

**Unit: 5**

Test paths in consolidation and shear testing -- Soil Parameters for Design – Choice of Analysis – Methods – Choice of Strength Parameters.

**REFERENCES:**


1. The Mechanics of Soils by J.H. Atkinson and P.L. Bransby & ELBS McGraw – Hill Book Co.,
2. Critical State Soil Mechanics – A. Sehofield and P. Wroth McGraw Hill Book Co.
3. Guide to soil Mechanics – Bolton seed, Mac millan Press Ltd., London.

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### MSFI-4-a) –Applications of Geosynthetics
### (ELECTIVE-II)

**Common for M.Tech.**
**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Use geosynthetic materials in the field of geotechnical construction works. |
| CO2 | Assess the properties of different materials of Geosynthetics |
| CO3 | Distinguish and describe various manufacturing methods of geotextiles, geogrids, geomembranes and geo-composites |
| CO4 | Understand concepts and design the geosynthetics for the functions of separation, reinforcement, stabilization, filtration, drainage and moisture barriers |
| CO5 | Design reinforced earth retaining walls, gabions, pond liners, covers for reservoirs, canal liners, landfill liners, caps and closures, dams and embankments etc |
| CO6 | Distinguish survivability requirements of geo-composites and design geo-webs, geo-cells, sheet drains, strip drains and moisture barriers etc |
| | |

**Mapping of Course Outcomes with Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | -- | 1 | 3 | 2 | 2 |
| CO2 | -- | 1 | 2 | 3 | 1 |
| CO3 | -- | 1 | 2 | 2 | 1 |
| CO4 | -- | 1 | 2 | 2 | 1 |
| CO5 | -- | 1 | 3 | 1 | 1 |
| CO6 | -- | 1 | 2 | 1 | 1 |

**1. Slightly 2. Moderately 3. Substantially**

**Detailed Syllabus:**

**UNIT-I**

**Geosynthetics and Properties and Testing Methods**: Introduction to Geosynthetics – Basic description – History – Manufacturing methods – Uses and Applications. Properties and Testing methods of Geotextiles – Geogrids – Geomembranes – Geocomposites.

**UNIT-II**

**Geotextiles:** Designing for Separation – Reinforcement – Stabilization – Filtration – Drainage and Moisture barriers.

**UNIT-III**

**Geogrids:** Designing for Reinforcement – Stabilization – Designing Gabions – Construction methods – Design of retaining walls.

**UNIT-IV**

**Geomembranes:** Survivability Requirements – Pond Liners – Covers for Reservoirs – Canal Liners – Landfill Liners – Caps and Closures – Dams and Embankments.

**Unit-V**

**Geocomposites:** Geocomposites – Overview -- An added advantage – Geocomposites in Separation – Reinforcement – Filtration – Geocomposites as Geowebs and Geocells – Sheet drains – Strip drains and Moisture barriers.

**REFERENCE:**

1. "Designing with Geosynthetics" by Robert M. Koerner Prantice Hall, Eaglewood Cliffs, NJ 07632.
2."Construction and Geotechnical Engineering using Synthetic Fabries" by Robert M. Koerner and Josoph P. Welsh. John Willey and Sons, New York.
3."Engineering with Geosynthetics", by G. Venkatappa Rao and GVS Suryanarayana Raju – Tata McGraw Hill Publishing Company Limited, New Delhi.
4."Foundation Analysis and Design" by J.E. Bowles McGraw Hill Publications.

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### MSFI-4-b) - Rock Mechanics
### (ELECTIVE-II)

**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering) Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Classify rock mass based on field investigation data |
| CO2 | Select the rock strength parameters for design |
| CO3 | Suggest suitable tests on rocks for intended purpose |
| CO4 | Design suitable rock important techniques |

**Mapping of Course Outcomes with Program Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | -- | 1 | -- | 1 | 1 |
| CO2 | -- | 2 | -- | 1 | -- |
| CO3 | -- | -- | -- | 2 | -- |
| CO4 | -- | -- | 2 | -- | 1 |

**1.Slightly 2. Moderately 3.Substantially**

**Detailed Syllabus:**

**Unit: 1**

Introduction and Classification of Rocks: Development of Rock Mechanics: Applications of Rock Mechanics – Rock Vs. Soil: Engineering Classification of intact rock and fissured rocks: Classification based on Structural features – Rock quality Designation Number and Velocity Ratio Methods.

**Unit: 2**

Strength and Deformation Behaviour of Rocks and Failure Theories: Typical Stress – Strain Curves – Static and Creep Test; Strength of rock – Unconfined Shear Strength and Triaxial Shear Strength of Rocks; Creep behaviour of Rocks; rock fracture and friction; Coulomb – Navier; Mohr's and Griffith Theory and its Modification ( General discussion only – derivation of equation not included.)

**Unit: 3**

Laboratory Testing of Rock Samples – Factors affecting test results sampling procedure and preparation of specimens; Tensile Tests – Direct, Indirect and Flexural tests; Uniaxial compression test; Unconfined and Triaxial shear tests; Determination of Elastic constants – Pulse generation and Resonant Frequency of a vibrating bar methods.

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**Unit: 4**

In-Situ Testing of Rock masses Plate –bearing test, Pressure Tunnel test; Flat Jack Test; Permeability of Rock and rock masses; Pore water pressure in rocks.

**Unit: 5**

Methods of Improving the Properties of Rock Masses – Pressure Grouting and Rock bolting. -- Design of simple – Openings in competent rocks; laminated rocks and rocks containing planes of weakness. (Distribution of stresses around simple openings discussion only without derivation)

**REFERENCE:**


1. Jaegar, J.C., and Cook, N.G.W. – Fundamentals of Rock Mechanics
2. Stagg, K.C. and Zienkiewicz., O.C – Rock Mechanics in Engineering Practice.
3. Obert, L & Duvall, W.L. – Rock Mechanics and the Design of Structures in Rock.

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
## Meeting: 8th 9th & 10th SEP 2023 (R23)

### MSFI-4-c) - Remote Sensing and Geographical Information System
### (ELECTIVE-II)
**Common for M.Tech.**
**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Familiar with ground, air and satellite based sensor platforms. |
| CO2 | Select and apply appropriate data manipulation and visualization methods for a number of Earth science applications, including Geographical Information Systems (GIS) |
| CO3 | Operate PC- based visualization software effectively |
| CO4 | to plot, map and interpret, Geo-spatial data and present the results in an organised fashion. |

**Mapping of Course Outcomes with Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | -- | -- | -- | -- | 2 |
| CO2 | -- | -- | -- | -- | 2 |
| CO3 | -- | -- | -- | 1 | 2 |
| CO4 | -- | -- | -- | -- | 2 |

**1. Slightly 2. Moderately 3. Substantially**

**Detailed Syllabus:**

**Unit: 1**

Remote Sensing : Definition, Elements involved in Remote Sensing, Ideal Vs Real Remote Sensing, Characteristics of Real Remote Sensing System, Nature of Electromagnetic Radiation. The Electromagnetic Spectrum, Remote Sensing Terminology and Units, Energy Interaction with Earth Features, Vegetation, Soils and Water bodies, Energy interaction in the atmosphere. Spatial Resolution, Spectral Resolution and Radiometric Resolution, Characteristics of Various sensors and satellites: LANDSAT, SPOT, IRS, ERS.

**Unit: 2**

Introduction to GIS: What is GIS , Components of GIS, Overview of GIS, Examples of GIS application for civil engineering, Using a GIS for Decision making under uncertainty, Geo-referenced data.

Data Input/Output: Keyboard entry, Manual Digitizing, Scanning, remotely sensed data, Existing Digital data – Cartographic database, Natural resources data sets, Digital elevation data and census related data sets, Data output devices.

**Unit: 3**

Data Quality: Components of data Quality, Sources of error. Data management: Data Base approach, Three classic data models (Hierarchical network Relational data models), Query languages, Nature of Geographic data.

Spatial data models: Raster and Vector data models. Data bases for GIS managing Spatial and attribute data together – Organizing Geographic Information within a DBMS, Limitations and Practical Approaches.

**Unit: 4**

GIS Analysis functions : Organizing data for analysis, Classification of GIS Analysis function, Maintenance and Analysis of Spatial data – Transformations, Edge matching and editing, Maintenance and analysis of non-spatial attribute data – Editing and query functions.

**Unit: 5**

GIS analysis functions for Integrated analysis of spatial and attribute data: Retrieval and Classification functions, Overlay operations, Neighborhood operations, Connectivity function, Output, Formatting – Map annotation, Text pattern and line styles, Graphic symbols, Cartographic modeling by GIS, analysis procedure with an example.

**TEXT BOOKS:**

1. Principles of Geographic Information Systems by Peter A. Burrough and Rachael A.McDonnell – Oxford University Press.
2. Principles of Remote Sensing by Paul J Curran Geographic Information Systems, - A Management Perspective by STAN ARONOFF, Published by WDL Publications, Ottawa, Canada.
3. Michael Hord. Remote Sensing Methods and Applications, John Wiley.
4. Remote Sensing and Geographical Information Systems – 2nd Edition by M. Anji Reddy.

**REFERENCE BOOKS:**

1. Remote sensing and Image Interpretation by LILESAND and KIEFER, Published by john Wiley and sons.
2. Fundamental of GIS by MICHAEL N DEMERS Published by John Wiley & Sons Inc.

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
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## MSFMC- Research Methodology and IPR

**Common for M.Tech.**
**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre- Requisites: None**

Course Outcomes: **At the end of the course, the student will be able to**

| | |
|---|---|
| **CO1** | Understand research problem formulation. |
| **CO2** | Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruledby ideas, concept, and creativity. |
| **CO3** | 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. |
| **CO4** | Analyze research related information |
| **CO5** | 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. |

Mapping of course outcomes with program outcomes:

| Cousre Outcomes | PO1 | PO2 | PO3 | PO4 | PO 5 | PO 6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | - | - | - | 1 |
| **CO2** | - | - | - | - | - | - | - | 1 |
| **CO3** | - | - | - | - | - | - | - | 1 |
| **CO4** | - | - | - | - | - | - | - | 1 |
| **CO5** | - | - | - | - | - | - | - | 3 |

**1. Slightly** **2. Moderately** **3. Substantially**

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**Syllabus:**

**UNIT-I:**
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:**
Effective literature studies approaches, analysis Plagiarism, Researchethics.

**UNIT-III:**
Effective technical writing, how to write report, Paper Developing aResearch Proposal, Format of research proposal, a presentation and assessment by a review committee.

**UNIT-IV:**

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

**UNIT-V:**
**Patent Rights-** Scope of Patent Rights, Licensing and transfer of technology, Patent information and databases, Geographical Indications, **New Developments in IPR-** Administration of Patent System, IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books:


1. Research methodology: an introduction for science & engineering students, 1st Edition, Stuart Melville, Wayne Goddard, 1996
2. "Research Methodology: An Introduction", Wayne Goddard and Stuart Melville
3. "Research Methodology: A Step by Step Guide for beginners", 2nd Edition, Ranjit Kumar

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
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## Board of Studies (Soil Mechanics & Foundation Engineering)
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### MSFPI-1- Geotechnical Engineering Lab

**common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | conduct various laboratory tests on soils, analyze and the interpretation of results |

Able to.

**Mapping of Course Outcomes with Program Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 2 | -- | -- | 3 | -- |

1. **Slightly 2. Moderately 3. Detailed**

**Syllabus:**

**List of Experiments:**

1. Determination of moisture content and specific gravity of soil
2. **Grain size distribution: sieve analysis and hydrometer analysis**
3. Atterberg limits (liquid limit, plastic limit, shrinkage limit)
4. Field identification tests
5. Vibration test for relative density of sand
6. Standard and modified **Proctor** compaction tests
7. Falling head permeability test and constant head permeability test
8. CBR

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
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### MSFPI-2 - Advanced characterization of Geomaterials Lab

**common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | conduct various laboratory tests on soils, analyze and the interpretation of results |

Able to.

**Mapping of Course Outcomes with Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 2 | -- | -- | 3 | -- |

1. **Slightly 2. Moderately 3. Detailed**

**Syllabus:**

**List of Experiments:**

1. Unconfined compression test
2. Direct shear test
3. Tri-axial compression test-UU,CU,CD tests.
4. Laboratory vane shear test
5. Free swell index test
6. Swell pressure test
7. Consolidation test
8. Field density test (core cutter and sand replacement methods)
9. PH, electrical conductivity, chloride and sulphate in soils

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
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## Board of Studies (Soil Mechanics & Foundation Engineering)
## Meeting: 8th 9th & 10th SEP 2023 (R23)

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### MSFA-1 - CONSTITUTION OF INDIA

**(Audit Course- 1)**

**Common for M.Tech.**
**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

Course Outcomes:

After the completion of the course, student will be able to

| | |
|---|---|
| **CO1** | Discuss the growth of the demand for civil rights in Indiafor the bulk of Indians before the arrival of Gandhi in Indian politics. |
| **CO2** | Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India. |
| **CO3** | Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution. |
| **CO4** | Discuss the passage of the Hindu Code Bill of1956. |

Mapping of course outcomes with program outcomes

| Cousre Outcomes | PO1 | PO2 | PO3 | PO4 | PO 5 | PO 6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | - | - | - | 1 |
| **CO2** | - | - | - | - | - | - | - | 1 |
| **CO3** | - | - | - | - | - | - | - | 1 |
| **CO4** | - | - | - | - | - | - | - | 1 |

**1. Slightly** **2. Moderately** **3. Substantially**

**UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)**
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## Syllabus:

**UNIT – I:**

**History of Making of the Indian Constitution:** History, Drafting Committee, (Composition& Working), **Philosophy of the Indian Constitution:** Preamble, Salient, Features.

**UNIT – II:**

**Contours of Constitutional Rights &Duties:** Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

**UNIT – III:**

**Election Commission:** Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare ofSC/ST/OBC and women.

**UNIT – IV:**

**Organs of Governance:** Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, **Executive:** President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

**UNIT – V:**

**Local Administration:** District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation.Pachayati raj: Introduction, PRI: ZilaPachayat.Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

**TEXT BOOKS:**


1. The Constitution of India, 1950 (Bare Act), Government Publication
2. Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, Dr. S. N. Busi, 2015


**REFERENCES:**


1. Indian Constitution Law, 7th Edn. M. P. Jain, Lexis Nexis, 2014.

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# SEMESTER-II

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
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### MSFII-1 - Foundation Engg. – II

**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: Soil Mechanics, Advanced Soil Mechanics, Foundation Engineering -I**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Understand classification of piles and determine the load carrying capacity of piles by various methods |
| CO2 | Determine the load carrying capacity of pile groups |
| CO3 | Evaluate the pull-out capacity of piles and down drag forces on piles due to negative skin friction |
| CO4 | Determine the load carrying capacity of laterally loaded piles |
| CO5 | Determine the load carrying capacity of piers and caissons |

**Mapping of Course Outcomes with Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 1 | 3 | 1 | 2 | 1 |

**1. Slightly 2. Moderately 3. Detailed**

**Syllabus:**

**Unit: 1**

Pile Foundations-Classification of Piles-Factors influencing - Choice- Load Carrying Capacity of Single Piles in Clays and Sands Using Static Pile Formulae- α - β - and λ - Methods –Dynamic Pile Formulae-Limitations-Monotonic and Cyclic Pile Load Tests.-

**Unit: 2**

Pile groups -Efficiency of Pile Groups- Different Formulae-Load Carrying Capacity of Pile Groups in Clays and Sands – Settlement of Pile Groups in Clays and Sands – Computation of Load on each Pile in a Group.

**Unit: 3**

Pull-out resistance of piles -Meyerhof's, Vesic's equations and Coyle and Castello correlations for piles in sands (Elastic settlement of piles)- Pull out Resistance of piles - Negative skin friction in piles – Typical field situations – Estimation of downdrag - Neutral point – Methods of minimizing downdrag.

**Unit: 4**

Laterally loaded vertical piles - Modulus of subgrade reaction – Piles in granular soils and cohesive soils subjected to lateral loading - Matlock & Reese analysis for piles in sands - Davisson & Gill analysis for piles in clays, Broms' Analysis for piles in sands and clays.

**Unit: 5**

Drilled pier and Caisson Foundations – Types of Drilled piers – Load carrying capacity of piers in clays and sands, Uplift capacity of piers, Caissons – Types – Pneumatic **Caissons** – Well Foundations – Design of components – Design of wells – Lateral stability of well foundations – Terzaghi's analysis.

**REFERENCE**


1. Principles of Foundation Engineering - Braja M. Das
2. Foundation Analysis and Design – J.E. bowles, McGraw – Hill Publishing Co.,
3. Analysis and design of foundations and Earth Retaining Structures. –S. Prakash, Gopal Rajan and Swami Saran – Sarita Prakasan, Merut.
4. Foundation Design and Construction – M.J. Tomlinson, Pitman
5. Soil Mechanics and Foundation Engineering, Vol. II, Foundation Engg., - VNS Murthy
6. Pile Foundation Analysis & Design by Poulos and Davis.

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
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## Board of Studies (Soil Mechanics & Foundation Engineering)
## Meeting: 8th 9th & 10th SEP 2023 (R23)

### MSFII-2- Earth Retaining structures

**Common for M.Tech.**

**(Structural Engineering, Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: Soil Mechanics**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Quantify the lateral earth pressures associated with different earth systems |
| CO2 | Evaluate the mechanical properties of geosynthetics used for soil reinforcement |
| CO3 | Identify the merits and demerits of different earth retaining systems. |
| CO4 | Select the most technically appropriate type of retaining wall for the application from a thorough knowledge of available systems |
| CO5 | Design of retaining structures using appropriate design methods, factors of safety, earth pressure diagrams and field verification methods |
| CO6 | Aware of current guidelines regarding the design of earth retaining structures. |
| CO7 | Design retaining structures considering both external and internal stability aspects |

**Mapping of Course Outcomes with Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 1 | -- | 2 | 3 | 1 |
| CO2 | 1 | -- | 2 | 1 | 1 |
| CO3 | 3 | -- | 1 | 1 | -- |
| CO4 | 1 | 1 | 2 | 2 | 3 |
| CO5 | -- | 2 | 3 | 1 | -- |
| CO6 | -- | 2 | -- | -- | -- |
| CO7 | 1 | 2 | 1 | 2 | 1 |

1. Slightly 2. Moderately 3.Substantially

**Detailed Syllabus:**

**Unit: 1**

**Earth pressures** – Different types and their coefficients- Classical Theories of Earth pressure – Rankine's and Coulomb's Theories for Active and Passive earth pressure- Computation of Lateral Earth Pressure in Homogeneous and Layered soils- Graphical solutions for Coulomb's Theory in active and passive conditions.

**Unit: 2**

**Retaining walls** – different types - Type of Failures of Retaining Walls – Stability requirements – Drainage behind Retaining walls – Provision of Joints – Relief Shells.

**Unit: 3**

**Sheet Pile Structures** – Types of Sheet piles – Cantilever sheet piles in sands and clays – Anchored sheet piles – Free earth and Fixed earth support methods – Rowe's moment reduction method – Location of anchors and Design of Anchorage system.

**Unit: 4**

**Soil reinforcement** – Reinforced earth - Different components – their functions – Design principles of reinforced earth retaining walls.

**Unit: 5**

**Braced cuts and Cofferdams**: Lateral Pressure in Braced cuts – Design of Various Components of a Braced cut – Stability of Braced cuts – Bottom Heave in cuts. – types of cofferdam, suitability, merits and demerits – Design of single – wall cofferdams and their stability aspects – TVA method and Cummins' methods.

**REFERENCES**

1. Principles of Foundation Engineering by Braja M. Das.
2. Foundation analysis and design – Bowles, JE – McGraw Hill
3. Soil Mechanics in Engineering Practice – Terzaghi, K and Rolph, B. peck 2nd Edn. – John Wiley & Co.,
4. Analysis and Design of Foundations and Retaining Structures, Prakash, S – Saritha Prakashan, Mearut.

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
## Meeting: 8th 9th & 10th SEP 2023 (R23)

### MSFII-3 a)- Pavement Analysis, Design and Evaluation
### (Elective-I)
**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Understand the design parameters of pavement design |
| CO2 | Design flexible and rigid pavements for different field conditions |
| CO3 | Compute the stress distribution in different pavement layers |
| CO4 | Evaluate the pavements and design overlay systems |

**Mapping of Course Outcomes with Program Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 1 | -- | -- | 1 | -- |
| CO2 | 1 | 1 | -- | -- | -- |
| CO3 | 1 | 3 | 1 | -- | 1 |

**1.Slightly 2. Moderately 3. Detailed**

**Syllabus:**

**Unit: 1**

Pavement Types, Wheel Loads and Design Factors: Definition of Pavement Types, Comparison of Highway pavements, Wheel Loads, Tyre pressure, Contact pressure, Design Factors: Traffic and Loading, Environment, Materials, Failure criteria, Reliability.

**Unit: 2**

Stresses in Pavements: Layered System Concepts: One Layer System: Boussinesq's Theory. Two Layer Theory: Burmister's Theory. Three Layer System. Stresses in Rigid Pavements. Relative Stiffness of Slabs, Modulus of Subgrade Reaction, Stresses due to Warping, Stresses due to Friction, Stresses due to Load, IRC Recommendations.

**Unit: 3**

Pavement Design: IRC Method of Flexible Pavement Design, AASHTO Method of Flexible Pavement Design, IRC Method for Rigid Pavements, use of Geosynthatics in pavements.

**Unit: 4**

Pavement Inventories: Serviceability Concepts, Visual Rating, Pavement Serviceability Index, Roughness Measurements, Measurement of Distress Modes Cracking, Rutting, Rebound Deflection using Benkleman Beam Deflection Method, Load Man Concept, Skid Resistance Measurement.

**Unit: 5**

Pavement Evaluation: Functional Pavement Performance Evaluation: AASHTO Method, Psycho Physical and Psycho Metric Scaling Techniques, Deduct Value Method.

Structural Conditional Evaluation Technique: Benkelman Beam Deflection Method, Pavement Distress Rating Technique. Design of Overlays by Benkelmen Beam Deflection Methods as per IRC – 81 - 1997 – pavements on problematic soils.

REFERENCES:

1. Yoder and Witzorack, "Principles of Pavement Design", John Willey and Sons.
2. Yang, H. Huang, "Pavement Analysis and Design", Prentice Hall Publication, Englewood Cliffs, New Jersy.
3. Sargious, M.A. Pavements and Surfacings for Highways and Airports – Applied science Publishers limited
4. Ralps Hass and Hudson, W.R. " Pavement Management System" Mc-Graw Hill Book Company.
5. IRC codes of practice.

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
## Meeting: 8th 9th & 10th SEP 2023 (R23)

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### MSFII-3 b)- - Construction Planning and Methods

### (Elective-I)

**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | understand the construction planning |
| CO2 | utilize the various earth moving equipment |
| CO3 | to prepare the Project Budget |

**Mapping of Course Outcomes with Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 1 | 1 | -- | -- | -- |
| CO2 | -- | -- | 2 | -- | 1 |
| CO3 | -- | -- | 2 | -- | -- |

1. **Slightly 2. Moderately 3. Detailed**

**Syllabus:**

**Unit: 1**

Project Management: Planning – Scheduling – Control – Bar chart – Milestone charts – Development of CPM and Pert networks – Time Estimates – Evaluation of Project duration – Cost Analysis – Updating – Crashing and Resource Allocation.

**Unit: 2**

Equipment: Equipment Economics – Cost of Owning and operating – Earth moving equipment – Dozers – Scrapers – graders – shovels – hoes – loaders – clamshell buckets – Draglines – Cranes

**Unit: 3**

Trucks and Handling Equipment: Rear dump trucks – Capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers – quality control – soil stabilization

**Unit: 4**

Aggregate production: Crushers – Jaw Crushers – Gyratory crushers – impact crushers – selection of crushing equipment – screening of aggregate – concrete mixers – mixing and placing concrete – consolidating and finishing.

**Unit: 5**

Project Budgeting: Introduction – Project costs – types of costs – Accuracy and timing of cost estimates – methods of crushing costs – cost control – cost inflation – escalation and contingencies.

**References:**

1.Peurifoy and Schexnayder, " Construction Planning, Equipement and Methods", Tata McGraw Hill Edition, New Delhi.

2.Kraig Knutson, Clifford, J.S, Christine Flori and Rishard E. Mayo, "Construction Management Fundamentals".

Tata McGraw Hill Edition, New Delhi.

3.Chitkara, "Construction Project Management", Tata McGraw Hill Edition, New Delhi.
Timothy.J. Kopprnborg, "Contemporary Project Management", Cenage Lerraning.

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
## Meeting : 3rd & 4th August 2019 (R19)

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### MSFII-3 c) - Geotechnical Earth Quake Engineering

### (Elective-I)

**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Learn the fundamental definitions of earth quake engineering |
| CO2 | Understand earth quake ground motions |
| CO3 | Gain knowledge on dynamic properties of the soil and its estimation |
| CO4 | Understand liquefaction and lateral spreading of soil. |
| CO5 | Do the seismic design of foundations, slopes and retaining structures |

**Mapping of Course Outcomes with Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 1 | -- | -- | 1 | -- |
| CO2 | 2 | 1 | -- | -- | 1 |
| CO3 | -- | -- | -- | 3 | 1 |
| CO4 | 2 | 1 | 2 | -- | 2 |
| CO5 | 1 | 3 | 1 | -- | 2 |

**1.Slightly 2. Moderately 3. Substantially**

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
## Meeting : 3rd & 4th August 2019 (R19)

**Detailed Syllabus:**

**Unit: 1**

**Earthquake Seismology:** Introduction -- Seismic waves - Causes of earth quake - Continual drift and Plate tectonics – Earthquake fault sources – Faults, fault geometry, fault movement - Elastic Rebound Theory – Location of Earth Quakes - Quantification of Earthquakes – Intensity and magnitude – Earthquake Energy.

**Unit: 2**

**Earthquake ground motion:** Seismograph - Characteristics of Ground motion: - Ground motion parameters – Amplitude Parameters – peak acceleration, peak velocity, peak displacement other amplitude parameters – Frequency content parameters – ground response spectra, Fourier spectra, Power spectra, response spectra – spectral parameters – duration. Local site Specification and Code based design

**Unit: 3**

**Dynamic Soil Properties:** Representation of Stress conditions by the Mohr Circle – Measurement of Dynamic properties – field, laboratory, interpretation of observed ground response -- One dimensional response analysis - linear approach, E quivalent linear approach.

**Unit: 4**

**Liquefaction and Lateral Spreading** – Liquefaction Related phenomena - Liquefaction susceptibility – Initiation of Liquefaction – Effects of Liquefaction – Remedies on Seismic hazards – Densification – Reinforcement – Grouting and mixing Techniques – Drainage Techniques

**Unit: 5**

**Seismic Design of Foundation, Slopes and Retaining Structures:** Seismic Design requirements for Foundation – Seismic Bearing capacity - Seismic Settlement -- Internal stability and weakened instability of slopes - Seismic design of retaining walls: Dynamic Response of Retaining walls - Seismic Displacement of Retaining walls - Seismic Design Considerations.

**REFERENCES:**


1. *"Geotechnical Earth Quake Engineering"* by SL Kramer, Pearson Education.
2. *"Earth Quake"* W.H. Freeman, New York

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
## Meeting : 3rd & 4th August 2019 (R19)

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### MSFII-4 a) - Earth Dams

### (Elective-II)

**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Understand the basic concepts of earth-fill dams and rock-fill dams and identify the site topography and foundations conditions |
| CO2 | Identify basic design requirements and causes of failures of dams, distinguish foundation types and the different fill materials |
| CO3 | Estimate seepage through dam sections, foundations and select core and shell materials |
| CO4 | Understand and design the methods to control seepage through different units of dams |
| CO5 | Able to undertake slope stability analysis of dams |
| CO6 | distinguish different types of instruments like piezometers, settlement gauges and inclinometers to install for performance studies of dams |

**Mapping of Course Outcomes with Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 1 | 1 | 1 | 1 | 1 |
| CO2 | 1 | -- | 2 | 2 | 3 |
| CO3 | 1 | 2 | 2 | 2 | 2 |
| CO4 | -- | 1 | -- | 3 | 3 |
| CO5 | 2 | 1 | 1 | 2 | 2 |
| CO6 | -- | 1 | -- | 2 | 3 |

1. **Slightly 2. Moderately 3.Substantially**

**Detailed Syllabus:**

**Unit: 1**

BASIC CONCEPTS AND MISCELLANEOUS TOPICS.: Evolution – Types of Dams – Earthfill Dams – Rockfill Dams – Selection of Type of Dam – Site Topography – Foundation Conditions – Basic Design Requirements – Causes of Failure and Deterioration of Dams – Design Investigations – Fill Material – Foundations – Design Studies .

**Unit: 2**

SEEPAGE THROUGH DAM SECTION AND ITS CONTROL: Estimation of Seepage through Dam Section and foundation – Considerations in selection and design of core and determination of shell material

Drains: – Pervious Downstream Shell – Chimney Drains – Rock Toe and Drains – Use of Geo-textiles as Filter Material.

**Unit: 3**

CONTROL OF SEEPAGE THROUGH FOUNDATIONS: General Considerations – different types of cutoff walls – Provision of d/s aprons – relief wells

SLOPE PROTECTION – Necessity with respect to u/s and d/s slopes – u/s slope protection by Dumped Riprap-Hand-placed Riprap – Soil-Cement Slope Protection – Downstream Slope Protection by providing berms - grass turfing.

**Unit: 4**

STABILITY ANALYSIS OF SLOPES OF EARTH DAMS: Slope stability analysis techniques –Methods of Slices, **Fellenius'** Method, Simplified Bishop method, Taylor's method, Simplified Janbu's Method; Stability of earth dam slopes – u/s slope during sudden drawdown, d/s slope during steady seepage, stability of u/s and d/s slopes during and after construction.

**Unit: 5**

INSTRUMENTATION: – Purpose - Types of Instruments and Brief Description – Installation – piezometers -- Casagrande and Vibration wire -- Settlement gauges – Inclinometers.

REFERENCE:

1. Earth Dams by HD Sharma
2. Earth and Rockfill Dams HD Sharma & Bharat Singh

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
## Meeting : 3rd & 4th August 2019 (R19)

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### MSFII-4 b) - Foundations in Expansive Soils

### (Elective-II)

**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Understand the behaviour of expansive soils |
| CO2 | Assess the foundation practices on expansive soils |
| CO3 | Perform the methods of stabilization expansive soils |
| CO4 | Select additives and the methodology for stabilization |
| CO5 | Apply the gained knowledge for suitable performance |

**Mapping of Course Outcomes with Program Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 2 | -- | 1 | 1 | -- |
| CO2 | -- | 2 | 2 | -- | -- |
| CO3 | -- | -- | 3 | -- | -- |
| CO4 | -- | -- | 3 | 1 | -- |
| CO5 | -- | 1 | 1 | -- | 3 |

**1. Slightly 2. Moderately 3. Substantially**

**Detailed Syllabus:**

**Unit: 1**

Clay mineralogy-Nature of soils-clay mineral structures-cation exchange-soil water-soil structure-soil water interaction.

**Unit: 2**

Swelling characteristics: swelling-factors **affecting** swelling-swell potential-**swelling** pressure-methods of determination – factors affecting **swell** potential and **swelling** pressure – Heave ---factors affecting heave-methods of determination of heave.

**Unit: 3**

Foundation Practices in Expansive Clays – Sand cushion – Belled Piers – CNS layer technique – Under – reamed pile foundations – Construction techniques – design specifications – Load - carrying capacity in compression and uplift of single and multi – under reamed piles in clays and sands – granular pile Anchors.

**Unit: 4**

Lime soil columns and Lime slurry pressure injection – Stabilization with admixtures –Preponding – Vertical and Horizontal Moisture Barriers .

**Unit: 5**

Shear strength of expansive soils-**Katti's** concept of bilinear strength envelope-Stress state variables in partly saturated soils-**Fredlund's** strength parameters-determination of matrix suction by axis translation technique-field suction measurement

**References:**

F.H.Chen, Foundations on Expansive Soils, Eleveir Scientific Publishing Company, Newyork.

J.D.Nelson and D.I. Miller, Expansive soils- Problems and Practice in Foundation and Pavement Engineering by, John Wiley & Sons, Inc.

D.G. Fredlund and H.Rahardjo, Soil Mechanics for Unsaturated Soils, WILEY Inter science Publication, John Wiley & Sons, Inc

D.R. Katti, AR Katti, Behaviour of Saturated Expansive Soils and Control methods, Taylor and Francis Gopal Ranjan and AS Rao, Basic and Applied Soil Mechanics, New Age International Publishers,

NewDelhi. Hand Book on Under reamed and Bored Compaction Pile Foundations – CBRI, Roorkee. IS: 2720(Part XLI) – 1977 Measurement of Swelling Pressure of Soils.

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
## Meeting : 3rd & 4th August 2019 (R19)

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### MSFII-4 c) - - Numerical Methods in Geotechnical Engineering

### (Elective-II)

**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Apply various models to the soil mass to find out the behavior of the soil |
| CO2 | Apply FD solution to homogeneous and layered soils, one, two and three dimensional Consolidation problems |
| CO3 | Apply the FD and FEM solutions for shallow foundations and Deep foundations |

**Mapping of Course Outcomes with Program Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 2 | 1 | -- | -- | 1 |
| CO2 | 1 | 3 | -- | -- | 1 |
| CO3 | 1 | 3 | -- | -- | 1 |

1. **Slightly 2. Moderately 3. Substantially**

**Detailed Syllabus:**

**Unit: 1**

Introduction: Categories of Problems in Geo-technical Engineering, Finite Difference Method, Boundary Corrections for Grids. Accuracy, Convergence and Stability. Idealization of soil behaviour; Linear, Bilinear and multi-linear, Hyperbolic, Spline function, Ramberg – Osgood's Model, Polynomials, Higher order elastic

models, perfect plasticity, frictional. Elastic models of soil behaviour – The winkler – Filenenko-boroditch – Pasternak – Ressiener models.

**Unit: 2**

Seepage: Finite Difference Solution to Laplace equation for Homogeneous and Layered Soils.

**Unit: 3**

Consolidation: Finite Difference Solution for One Dimensional, Two and three dimensional consolidations.

Multi layered systems. Consolidation of Ground for Construction Load and Static Load.

**Unit: 4**

Shallow Foundations: Beams on Elastic foundations, solution by Finite Difference and – Finite Element Method (Direct Approach) Limit analysis, Lower Bound and Upperbound theories Method of Finite difference solution of Raft foundations.

**Unit: 5**

Pile Foundation: Pile Stresses – Static loading – Finite Element Method Solution (Direct approach ) of the pile static pile capacity- wave equation -- Lateral piles by Finite Element Method (Direct Approach) and Finite Difference method.

**REFERENCE:**

1. Numerical methods in Geotechnical Engineering by C.S. Desai and J.T. Christian McGraw Hill publications.
2. Analytical and computer methods in foundation engineering, JE Bowles, McGraw Hill publications.
3. Foundation analysis and design, JE Bowles, McGraw Hill publications
4. Foundation analysis by RF Scott, Printice Hall
5. Hytenyi, Beams on Elastic Foundations – university of Michigan Press.
6. Elastic Analysis of Soil – Foundation Interaction, APS Selvadurai – Elsevier
7. Pile Foundation Analalysis & Design by Poulos and Davis.

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
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### MSFPII-1 - In-Situ Geotechnical Testing Lab

**common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | conduct various laboratory tests on soils, analyze and the interpretation of results |

**Mapping of Course Outcomes with Program Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 2 | -- | -- | 3 | -- |

**1.Slightly 2. Moderately 3. Substantially**

**Detailed Syllabus:**

**List of Experiments:**

1. Auger boring
2. Standard penetration test
3. Dynamic cone penetration test
4. Plate load test
5. Field CBR test
6. Pile load test
7. Electrical resistivity of soil

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## Board of Studies (Soil Mechanics & Foundation Engineering)
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### MSFPII-2 - Design Studio

**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Develop Computer s for solution of various geotechnical Problems |
| CO2 | Use different Geotechnical software to solve various geotechnical s |

**Mapping of Course Outcomes with Program Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 1 | 2 | -- | 1 | 1 |
| CO2 | 1 | 2 | -- | 1 | 1 |

1. **Slightly 2. Moderately 3. Substantially**

**Detailed Syllabus:**

1. Ultimate, Net and Safe Bearing Capacity Using Terzaghi and IS Code Methods.
2. Net Settlement Pressure
3. Hyperbolic Curve Fitting of Tri-axial Compression Data
4. Terzaghi One dimensional consolidation solution by FDM (perform analysis of substructures by packages)
5. Beam on Elastic Foundation by FDM
6. FDM Solution for Raft Foundation
7. Axial Loaded Piles by Direct FEM
8. Laterally Loaded Piles by FDM & FEM
9. Stability Analysis by Bishop theory
10. Stability Analysis by Method of Slices.

The Student Can able to write atleast any Eight Programs listed above.

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**MSFA-2- Value Education**
**(Audit Course- 2)**

**Common for M.Tech.**
**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Course Outcomes:**

After the completion of the course, student will be able to

| | |
|---|---|
| **CO1** | Understand the importance of value based living and value judgments |
| **CO2** | Learn the importance of Human values and Discipline |
| **CO3** | Developing the overall personality and behavior |
| **CO4** | Imbibe good values in student and emerge as responsible citizens with clear conviction to practice values and ethics in life. |
| **CO5** | Developing tolerance towards and understanding of different religious faiths, knowing the importance of character, self-management and contribute in building a healthy nation |

**Mapping of course outcomes with program outcomes**

| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | - | - | - | 2 |
| CO2 | - | 1 | - | 1 | - | 1 |
| CO3 | 1 | 1 | - | - | 2 | 1 |
| CO4 | 1 | - | - | - | 1 | 2 |
| CO5 | - | - | - | - | - | 1 |

**1. Slightly** **2. Moderately** **3. Substantially**

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**Syllabus:**

**UNIT – 1:**

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgments.

**UNIT – 2:**

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance, Confidence, Concentration. Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity Patriotism. Love for nature, Discipline.

**UNIT – 3:**

Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness. Avoid fault Thinking.

**UNIT – 4:**

Free from anger, Dignity of labour, Universal brotherhood and religious tolerance. True friendship, Happiness Vs suffering, love for truth.
Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature.

**UNIT – 5:**

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

**Text Books:**

1. "Values and Ethics for organizations Theory and practice", Chakroborty, S.K, Oxford University Press, New Delhi

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**
**Board of Studies (Soil Mechanics & Foundation Engineering)**
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# SEMESTER-III

# UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
## Meeting : 3rd & 4th August 2019 (R19)

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### MSFIII-1 a) - Geoenvironmental Engineering

### (Elective-V)

**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Understand various ground contaminations, pollution transport phenomena. |
| CO2 | Collect pollutant data |
| CO3 | Apply principles to get the information about the transport through the unsaturated soil |
| CO4 | Develop various models for contamination transport. |

**Mapping of Course Outcomes with Program Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 2 | -- | 1 | -- | 1 |
| CO2 | 1 | -- | 3 | 1 | 1 |
| CO3 | 1 | 1 | 2 | 1 | 2 |
| CO4 | -- | 2 | 2 | 1 | 2 |

1. **Slightly 2. Moderately 3. Substantially**

**Detailed Syllabus:**

**Unit: 1**

Introduction- Ground water contamination, pollutant transport and ground water remediation. Sources and Types of ground water contamination – under ground storage tanks, Land fills, surface impoundments, waste disposal injection wells, Septic system, Agricultural wastes, Land application, radioactive contamination, other sources of contamination.

**Unit: 2**

Data Collection methods: Introduction, Geological data acquisition – Drilling methods – Solid flight auger drilling – Hollow stem auger drilling – Wet rotating drilling – Hand auger soil boring – sample collection – Soil core logging – Cone penetration testing – Geophysical methods; Hydrologic data acquisition – monitoring well construction – well material – Screen interval selection – Installation procedure – Survey specification – Protective casing requirements – Well development procedures; Acquisition of soil and Ground water quality data.

**Unit: 3**

Contaminant Transport Mechanisms: Introduction – Advection process – Diffusion – Dispersion process – Diffusion – Mass transport Equations : Derivation of advection dispersion equation for solute transport; One Dimensional Models – Continuous source in one dimension – Instantaneous source in one dimension – Adsorption effects – Transport in one dimensional with first order decay – Sorption: The concept of sorption.

Factors influencing sorption – Contaminant characteristics, Soil characteristics, Fluid media characteristics. Sorption Isotherm: Linear sorption Isotherm – Freundlich Sorption isotherm – Langmuir Sorption Isotherm, Sorption effects on fate and transport of pollutants.

**Unit: 4**

Flow and Transport of Pollutants in Unsaturated zone: Capillarity, soil-water characteristic curves, Unsaturated Hydraulic conductivity, Governing equation for unsaturated flow, measurement of soil properties.

**Unit: 5**

Non – Aqueous Phase Liquids (NAPLs): Introduction – Comparison of fate of dissolved mass versus NAPL mass- Types of NAPLs – LNAPL – DNAPL; NAPL Transport – general process – NAPL transport at the pore level - Downward Migration of DNAPLs in saturated zone – NAPL movement through Vadose zone – LNAPL behaviour at the water table – NAPL Transport at the site level – LNAPL conceptual models – DNAPL conceptual models, NAPL transport.

TEXT BOOKS:

1.Ground water Contamination (Transport and Remediation) By Philip. B. Bedient, Hanadi, S. Rifai & Charles. J. Newell, Prentice Hall PTR, Upper Saddle River, NJ07458.

REFERENCES

1. Geoenvironmental Engineering by R. Krishna Reddy - John Wiley & Sons, Inc.
2. Geotechnical Engineering by Gulahati, S.K. and Datta, M. – Tata McGraw Hill Publishing Company
3. Geotechnical Engineering Principles and Practices by Coduto – Pearson Education (PHI)
4. Geoenvironmental engineering by Reddy, L.N and Inyang, I.H. – Marcel Drekker, 2000.
5. Environmental geotechniques by Sarsby, R. – Thompson Telford, 2000.Geotechnical Practices for Waste Disposal by Daniel, D.E., 1993

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# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
## Board of Studies (Soil Mechanics & Foundation Engineering)
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### MSFIII-1 b) - Soil Dynamics & Machine Foundations

### (Elective-V)

**Common for M.Tech.**

**(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Use theory of vibrations to find the behavior of soil under dynamic loading |
| CO2 | Design machine foundations under different loads and soil conditions |
| CO3 | Understand the liquefaction phenomena |
| CO4 | Conduct various laboratory and filed tests to determine the dynamic soil prosperities and its Interpretation |
| CO5 | Design vibration isolators under any vibratory machines |

**Mapping of Course Outcomes with Program Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | 3 | 2 | -- | 2 | 2 |
| CO2 | 1 | 3 | 1 | 2 | 2 |
| CO3 | 2 | 1 | 1 | -- | 1 |
| CO4 | -- | 1 | -- | 3 | -- |
| CO5 | 1 | 1 | 1 | 1 | 2 |

**1. Slightly 2. Moderately 3. Substantially**

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**Detailed Syllabus:**

**Unit: 1**

Introduction: Types of motion- SHM- Fundamental definitions- SDOF systems- Free and forced vibration with and without damping- Types of damping-Equivalent stiffness of springs in series and parallel- Principles of vibration measuring devices- Introduction to two and multi degree freedom systems

**Unit: 2**

Theories of Vibration Analysis- EHS Theory and lumped parameter model- Different modes of vibration- Natural frequency of foundation soil system – Barkan and IS methods – Pressure bulb concept – Reisner Theory – Limitations of Reisner theory – Sung's solutions -- Pauw's Analogy – Heigh's Theory.

**Unit: 3**

Dynamic properties of soils, Determination of E, G and Poisons ratio from field and laboratory tests, recommendations of Indian codes- Stress waves in bounded elastic medium- Use of wave theory in the determination of elastic properties, Elastic coefficients of soils and their determination- damping factor from free and forced vibration tests.

**Unit: 4**

Machine Foundations: Classification based on the type of dynamic force and structural form, design data, design criteria, foundations for reciprocating, impact and high speed machined like turbo generators- IS code provisions for the design of the same

**Unit: 5**

Vibration Isolation and Special Topics: Transmissibility, Principles of isolation- Methods of isolation- Vibration isolators- Types and their characterizes - Liquefaction of soils, Dynamic bearing capacity, Earth retaining structures under dynamic loads-Pile foundations

**REFERENCES:**


1. Vibrations of Soils and Foundations – Richart Hall and Woods
2. Vibration Analysis and Foundation Dynamics, NSV Kameswara Rao, Wheeler Publishing, New Delhi.
3. Foundations of Machines- Analysis and Design- Prakash and Puri
4. Analysis and design of Foundations for Vibrations- P J Moore
5. Fundamentals of Soil Dynamics- B M Das
6. Dynamics of bases and Foundations- D D Barkar

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### MSFIII-1 c) - Finite Element Methods

### (Elective-V)

**Common for M.Tech.**

**(Structural Engineering, Soil Mechanics & Foundation Engineering and Geotechnical Engineering)**

**Pre-Requisites: None**

**Course Outcomes:** At the end of the course, the student will be able to

| | |
|---|---|
| CO1 | Develop finite element formulations of 1 degree of freedom problems and solve them |
| CO2 | Understand any Finite Element software to perform stress, thermal and modal analysis |
| CO3 | Compute the stiffness matrices of different elements and system |
| CO4 | Interpret displacements, strains and stress resultants |

**Mapping of Course Outcomes with Program Outcomes:**

| Course Out Comes | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | -- | 2 | -- | -- | 1 |
| CO2 | -- | 2 | -- | -- | 1 |
| CO3 | -- | 2 | -- | -- | 1 |
| CO4 | -- | 2 | -- | -- | 1 |

1. **Slightly 2. Moderately 3. Substantially**

**Detailed Syllabus:**

**Unit: 1**

Introduction: Review of stiffness method- Principle of Stationary potential energy-Potential energy of an elastic body- Rayleigh-Ritz method of functional approximation - variational approaches -weighted residual methods

**Unit: 2**

Finite Element formulation of truss element: Stiffness matrix- properties of stiffness matrix –Selection of approximate displacement functions- solution of a plane truss- transformation matrix and stiffness matrix for a 3-D truss- Inclined and skewed supports- Galerkin's method for 1-D truss – Computation of stress in a truss element.

**Unit: 3**

Finite element formulation of Beam elements: Beam stiffness- assemblage of beam stiffness matrix- Examples of beam analysis for concentrated and distributed loading- Galerkin's method - 2-D Arbitrarily oriented beam element – inclined and skewed supports –rigid plane frame examples

**Unit: 4**

Finite element formulation for plane stress, plane strain and axi-symmetric problems- Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces-Finite Element solution for plane stress and axi-symmetric problems- comparison of CST and LST elements –convergence of solution-interpretation of stresses.

**Unit: 5**

Iso-parametric Formulation: An iso-parametric bar element- plane bilinear iso-parametric element – quadratic plane element - shape functions, evaluation of stiffness matrix, consistent nodal load vector - Gauss quadrature- appropriate order of quadrature – element and mesh instabilities – spurious zero energy modes, stress computation- patch test.

REFERENCES:

1. Concepts and applications of Finite Element Analysis – Robert D. Cook, Michael E Plesha, John Wiley & sons Publications
2. A first course in the Finite Element Method – Daryl L. Logan, Thomson Publications.
3. Introduction to Finite Elements in Engineering- Tirupati R. Chandrupatla, Ashok D. Belgunda, PHI publications.