ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

M.TECH
GEOTECHNICAL ENGINEERING

(Applicable for the batches admitted from 2013-14)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
KUKATPALLY, HYDERABAD – 500 085.

ACADEMIC REGULATIONS R13 FOR M. TECH. (REGULAR) DEGREE COURSE

Applicable for the students of M. Tech. (Regular) Course from the Academic Year 2013-14 and onwards

The M. Tech. Degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the program and who fulfil 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. However, he is permitted to write the examinations for two more years after four academic years of course work.

2.2 A student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the year of his admission, shall forfeit his seat in M. Tech. course.

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

2.4 The minimum instruction days in each semester are 90.

3.0 A. COURSES OF STUDY

The following specializations are offered at present for the M. Tech. course of study.

1. Advanced Manufacturing Systems
2. Aerospace Engineering/ Aeronautical Engineering
3. Automation
4. Biomedical Signal Processing and Instrumentation
5. Bio-Technology
6. CAD/CAM
7. Chemical Engineering
8. Communication Systems
9. Computer Networks
10. Computer Networks and Information Security
11. Computer Science
12. Computer Science and Engineering
13. Computers and Communication Engineering.
14. Construction Management
15. Control Engineering
16. Control Systems
17. Cyber Forensic / Cyber Security & Information Technology
18. Design for Manufacturing/ Design and Manufacturing
19. Digital Electronics and Communication Engineering.
20. Digital Electronics and Communication Systems
21. Digital Systems and Computer Electronics
22. Electrical Power Engineering
23. Electrical Power Systems
24. Electronics & Instrumentation

25. Electronics and Communication Engineering
26. Embedded Systems
27. Embedded Systems and VLSI Design
28. Energy Systems
29. Engineering Design
30. Environmental Engineering
31. Geoinformatics and Surveying Technology
32. Geotechnical Engineering.
33. Heating Ventilation & Air Conditioning.
34. Highway Engineering
35. Image Processing
36. Industrial Engineering and Management
37. Information Technology
38. Infrastructure Engineering
39. Machine Design
40. Mechatronics.
41. Microwave & Radar Engineering
42. Nano Technology
43. Neural Networks
44. Parallel Computing
45. Power and Industrial Drives
46. Power Electronics
47. Power Electronics and Electrical Drives
48. Power Engineering and Energy Systems
49. Power Plant Engineering & Energy Management
50. Power System Control and Automation
51. Power System with Emphasis H.V. Engineering / H.V. Engineering
52. Production Engineering.
53. Real Time Systems
54. Software Engineering
55. Structural Engineering
56. Systems & Signal Processing
57. Thermal Engineering.
58. Transportation Engineering
59. VLSI
60. VLSI and Embedded System/ Electronics Design Technology
61. VLSI Design
62. VLSI System Design
63. Web Technologies
64. Wireless and Mobile Communication

and any other course as approved by the University from time to time.

3.0 B. Departments offering M. Tech. Programmes with specializations are noted below:

Civil Engg.	Construction Management Environmental Engineering Geoinformatics and Surveying Technology Geotechnical Engineering Highway Engineering Infrastructure Engineering Structural Engineering Transportation Engineering
EEE	Control Engineering Control Systems Electrical Power Engineering Electrical Power Systems Power and Industrial Drives Power Electronics Power Electronics and Electrical Drives Power Engineering and Energy Systems Power Plant Engineering & Energy Management Power System Control and Automation Power System with Emphasis H.V. Engineering / H.V. Engineering
ME	Advanced Manufacturing Systems Automation CAD/CAM Design for Manufacturing/ Design and Manufacturing Energy Systems Engineering Design Heating Ventilation & Air Conditioning Industrial Engineering and Management Machine Design Mechatronics. Power Plant Engineering & Energy Management Production Engineering Thermal Engineering.
ECE	Biomedical Signal Processing and Instrumentation Communication Systems Computers and Communication Engineering. Digital Electronics and Communication Engineering. Digital Electronics and Communication Systems Digital Systems and Computer Electronics Electronics & Instrumentation Electronics and Communication Engineering Embedded Systems Embedded Systems and VLSI Design

	Microwave & Radar Engineering Systems & Signal Processing VLSI VLSI and Embedded System/ Electronics Design Technology VLSI Design VLSI System Design Wireless and Mobile Communication
CSE	Computer Networks Computer Networks and Information Security Computer Science Computer Science and Engineering Cyber Forensic / Cyber Security & Information Technology Image Processing Information Technology Neural Networks Parallel Computing Real Time Systems Software Engineering Web Technologies
Aeronautical Engg.	Aerospace Engineering / Aeronautical Engineering
Bio-technology	Bio-Technology
Chemical Engg.	Chemical Engineering
Nano Technology	Nano Technology

4.0 ATTENDANCE

The programs are offered on a unit basis with each subject being considered a unit.

4.1 A student shall be eligible to write University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

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

4.3 Shortage of Attendance below 65% in aggregate shall not be condoned.

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

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

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

4.7 A candidate shall put in a minimum required attendance at least in three (3) theory subjects in the present semester to get promoted to the next semester. In order to qualify for the award of the M. Tech. Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.

4.8 A student shall not be promoted to the next semester unless he satisfies the attendance requirements of the previous semester including the days of attendance in sports, games, NCC and NSS activities.

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 practicals, 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 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. Each mid term examination shall be conducted for a total duration of 120 minutes with Part A as compulsory question (16 marks) which consists of four sub-questions and carries 4 marks each and Part B with 3 questions to be answered out of 5 questions each question for 8 marks. If any candidate is absent from any subject of a mid-term examination, an on-line test will be conducted for him by the University. The details of the Question Paper pattern for End Examination (Theory) is given below:

- The End semesters Examination will be conducted for 60 marks which consists of two parts viz. i).Part-A for 20 marks, ii). Part –B for 40 marks.
- Part-A is compulsory question where it consists of five questions one from each unit and carries four marks each. This will be treated as Question 1.
- Part-B consists of five Questions (numbered from 2 to 6) carries 8 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer only one question)

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 based on the day-to-day performance as Internal Marks.

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

5.4 There shall be a Comprehensive Viva-Voce in II year I Semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the students' understanding of various subjects he has studied during the M. Tech. course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voce.

5.5 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.

5.6 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.5) he has to reappear for the End semester Examination in that subject. A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and so 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.

5.7 In case the candidate secures less than the required attendance in any subject, he shall not be permitted to write the End Examination in that subject. He shall re-register the subject when next

offered.

5.8 Laboratory examination for M. Tech. courses must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the second examiner shall be another Laboratory Teacher.

6.0 EVALUATION OF PROJECT/DISSERTATION WORK

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

6.1 A Project Review Committee (PRC) shall be constituted with Principal as Chairperson, Heads of all the Departments offering the M. Tech. programs and two other senior faculty members.

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

6.3 After satisfying 6.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work to the Departmental Academic Committee for approval. Only after obtaining the approval of the Departmental Academic Committee can the student initiate the Project work.

6.4 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Departmental Academic Committee. However, the Departmental Academic Committee 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 submit his status report in a bound-form in two stages at least with a gap of 3 months between them.

6.6 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of theory and practical course with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Principal through Head of the Department and make an oral presentation before the PRC.

6.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College/ School/Institute.

6.8 The thesis shall be adjudicated by one examiner selected by the University. For this, the Principal of the College shall submit a panel of 5 examiners, eminent in that field, with the help of the guide concerned and head of the department.

6.9 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is unfavourable again, the thesis shall be summarily rejected.

6.10 If the report of the examiner is favourable, Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work as one of the following:

A. Excellent

B. Good

C. Satisfactory

D. Unsatisfactory

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

If the report of the Viva-Voce is unsatisfactory, 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, he will not be eligible for the award of the degree.

7.0 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	% of marks to be secured
First Class with Distinction	70% and above
First Class	Below 70% but not less than 60%
Second Class	Below 60% but not less than 50%
Pass Class	Below 50% but not less than 40%

The marks in internal evaluation and end examination shall be shown separately in the memorandum of marks.

8.0 WITHHOLDING OF RESULTS

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

9.0 TRANSITORY REGULATIONS

9.1 Discontinued, detained, or failed candidates are eligible for admission to two earlier or equivalent subjects at a time as and when offered.

9.2 The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per R13 academic regulations.

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

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

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

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

8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

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

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.TECH - GEOTECHNICAL ENGINEERING

COURSE STRUCTURE AND SYLLABUS

I Year I Semester

Code	Group	Subject	L	P	Credits
		Advanced Soil Mechanics	3	-	3
		Advanced Foundation Engineering	3	-	3
		Soil Dynamics and Machine Foundations	3	-	3
		Engineering of Ground	3	-	3
	Elective – I	Numerical Methods for Geotechnical Engineers Groundwater Hydrology Geo-Environmental Engineering	3	-	3
	Elective – II	Environment and Ecology Groundwater Contamination and Remediation Finite Element Methods for Geotechnical Engineers	3	-	3
		Advanced Geotechnical Engg. Lab-I	-	3	2
		Seminar	-	-	2
		Total Credits	**18**	**3**	**22**

I Year II Semester

Code	Group	Subject	L	P	Credits
		Retaining Structures	3	-	3
		Earth & Rock Fill Dams and Slope Stability	3	-	3
		Geosynthetics & Soil Reinforcement	3	-	3
		Soil - Structure Interaction	3	-	3
	Elective– III	Geotechnical Earthquake Engineering Rock Mechanics and Engineering Theoretical Soil Mechanics	3	-	3
	Elective–IV	Pavement Analysis and Design Environmental Impact Assessment and Management Geographical Information Systems	3	-	3
		Advanced Geotechnical Engg Lab-II	-	3	2
		Seminar	-	-	2
		Total Credits	**18**	**3**	**22**

II Year - I Semester

Code	Group	Subject	L	P	Credits
		Comprehensive Viva	-	-	2
		Project Seminar	-	3	2
		Project work	-	-	18
		Total Credits	**-**	**3**	**22**

II Year - II Semester

Code	Group	Subject	L	P	Credits
		Project work and Seminar	-	-	22
		Total Credits	**-**	**-**	**22**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Geotechnical Engineering)

ADVANCED SOIL MECHANICS

Unit-I

Geostatic Stresses & Stress Paths: Stresses within a soil mass: Concept of stress for a particulate system, Effective stress principle, Geostatic stresses, Soil water hydraulics: Principal stresses and Mohr's circle of stress, Stress paths; At Rest earth pressure, Stress paths for different practical situations.

Unit-II

Flow through Soils: Permeability, seepage, mathematical analysis – Finite difference formulae for steady state and transient flows – flow nets – computation of seepage – uplift pressure, and critical hydraulic gradient.

Unit-III

Compressibility and Consolidation: One dimensional compression, Oedometer test, parameters – coefficient of volume change, constrained modulus, compression index, swell or unloading, maximum past consolidation stress, Overconsolidation ratio, Primary and secondary compression, consolidation -One, two and three dimensional problems, Consolidation of partially saturated soils, Creep/Secondary Compression in soils.

Unit-IV

Stress-Strain-Strength Behaviour of Soils: Shear strength of soils; Failure criteria, drained and undrained shear strength of soils. Significance of pore pressure parameters; Determination of shear strength; Drained, Consolidated Undrained and Undrained tests; Interpretation of triaxial test results. Behaviour of sands; Critical void ratio; dilation in soils;

Unit-V

Critical State Soil Mechanics: Critical state parameters; Critical state for normally consolidated and overconsolidated soil; Significance of Roscoe and Hvorslev state boundary surfaces; Yielding, Bounding Surfaces.

TEXT BOOKS

1. Das, B. M.- Advanced Soil Mechanics, Taylor and Francis. 3rd edition(2008).
2. Mitchell J.K. - Fundamentals of soil behaviour - John Wiley and Sons, Inc., New York. (third edition) 2005.

REFERENCES:

1. Atkinson J. H. - An Introduction to the Mechanics of Soils and Foundation - through critical state soil mechanics, McGraw- Hill Co. (1993).
2. Wood, D.M.- Soil Behavior and Critical State Soil Mechanics.cambridge university press (1991).
3. J A Knappett and R F Craig – Craig's Soil Mechanics, Eighth Edition, Spon Press Taylor & Francis (2012).
4. Lambe, T. W. and Whitman, R. V.- Soil Mechanics SI version , John Wiley & Sons.(2011).
5. Muniram Budhu.- Soil Mechanics and Foundations, John Wiley & Sons, Inc.(2007).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Geotechnical Engineering)

ADVANCED FOUNDATION ENGINEERING

Unit-I

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

Unit-II

Shallow Foundations: **Bearing Capacity:**- General Formulae; Effect of Water Table; Footings with Eccentric or Inclined Loads, Footings on Layered Soils, on slope and on top of the slopes, on finite layer with a Rigid Base at Shallow Depth, effect of compressibility of soil, on soils with strength increasing with depth.

Unit-III

Settlement: Components – Immediate, Consolidation & Creep, Stresses and Displacements in Homogeneous, Layered and Anisotropic Soils; Consolidation Settlement; One, Two & Three Dimensional Consolidation; Secondary Compression Settlement; Bearing Pressure using SPT, CPT, Dilatometer and Pressuremeter; Settlement of foundations on Sands-Schmertmann and Burland & Busbridge methods; Structure Tolerance to Settlement and Differential Settlements, Rotation of Tall Structures.

Unit-IV

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

Unit-V

Special Topics of Foundation Engineering

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

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

Introduction to Reliability-Based Design: Methods, LRFD for structural strength requirements, LRFD for geotechnical strength requirements, Serviceability requirements

TEXT BOOKS

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

REFERENCE BOOKS

1. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996).
2. Poulos, H. G. & Davis, E. H. - Pile Foundation Analysis and Design john wiley & sons inc (1980-08).

3. Reese, L. C. & Van Impe, W. F. - Single Piles and Pile Groups under Lateral Loading -Taylor & Francis Group (Jan 2000).
4. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Hand Book -Springer (2001).
5. Tomlinson, M. J. - Foundation Design and Construction - Prentice Hall (2003).
6. Lymon C. Reese, William M. Isenhower, Shin-Tower Wang- Analysis and Design of Shallow and Deep Foundations (2006).
7. Salgado, R. - The Engineering of Foundations McGraw-Hill, Boston (2008).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Geotechnical Engineering)

SOIL DYNAMICS AND MACHINE FOUNDATIONS

Unit-I

Fundamentals of Vibration: Definitions, Simple harmonic motion, Response of SDOF systems of Free and Forced vibrations with and without viscous damping, Frequency dependent excitation, Systems under transient loads, Rayleigh's method of fundamental frequency, Logarithmic decrement, Determination of viscous damping, Transmissibility, Systems with Two and Multiple degrees of freedom, Vibration measuring instruments.

Unit-II

Wave Propagation and Dynamic Soil Properties: Propagation of seismic waves in soil deposits - Attenuation of stress waves, Stress-strain behaviour of cyclically loaded soils, Strength of cyclically loaded soils, Dynamic soil properties - Laboratory and field testing techniques, Elastic constants of soils, Correlations for shear modulus and damping ratio in sand, gravels, clays and lightly cemented sand. Liquefaction of soils: An introduction and evaluation using simple methods.

Unit-III

Vibration Analyses: Types, General Requirements, Permissible amplitude, Allowable soil pressure, Modes of vibration of a rigid foundation block, Methods of analysis, Lumped Mass models, elastic half space method, elasto-dynamics, effect of footing shape on vibratory response, dynamic response of embedded block foundation, Vibration isolation.

Unit-IV

Design of Machine Foundations: Analysis and design of block foundations for reciprocating engines, Dynamic analysis and design procedure for a hammer foundation, IS code of practice design procedure for foundations of reciprocating and impact type machines. Vibration isolation and absorption techniques.

Unit-V

Machine Foundations on Piles: Introduction, Analysis of piles under vertical vibrations, Analysis of piles under translation and rocking, Analysis of piles under torsion, Design procedure for a pile supported machine foundation.

TEXT BOOKS:

1. Swami Saran - Soil Dynamics and Machine Foundation, Galgotia Publications Pvt. Ltd. (2010).
2. Prakash, S. - Soil Dynamics, McGraw Hill Book Company (1981).

REFERENCES:

1. I.Cshowdhary and S P Dasgupta - Dynamics of Structures and Foundation, 2009.
2. Arya, S. D, O'Neil, M. and Pincus, G.- Design of Structures and Foundations for Vibrating Machines, Gulf Publishing Co., 1979.
3. Prakash, S. and Puri, V. K. - Foundation for Machines: Analysis and Design, John Wiley & Sons, 1998.
4. Kameswara Rao, N. S. V. - Vibration Analysis and Foundation Dynamics, Wheeler Publication Ltd., 1998.
5. Richart, F. E. Hall J. R and Woods R. D.-Vibrations of Soils and Foundations, Prentice Hall Inc., 1970.
6. Das, B. M. - Principles of Soil Dynamics, PWS KENT publishing Company, Boston.2002.
7. Bharat Bhushan Prasad – Advanced Soil Dynamics and Earthquake Engineering, PHI Learning Pvt. Limited, New Delhi, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Geotechnical Engineering)

ENGINEERING OF GROUND

Unit-I

Introduction to Engineering Ground Modification: Need and objectives, Identification of soil types, In-situ and laboratory tests to characterize problematic soils; Mechanical, Hydraulic, Physico-chemical, Electrical, Thermal methods, etc. and their applications.

Unit-II

Mechanical Modification – Principles of soil densification – Properties of Compacted soil, Compaction control tests, Specification of compaction requirements, Blasting, Vibrocompaction, Dynamic Tamping and Compaction piles.

Unit-III

Hydraulic Modification – Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Filtration, Drainage and seepage control with Geosynthetics, Preloading and vertical drains, Electro-kinetic dewatering.

Unit-IV

Physical and Chemical Modification – Modification by admixtures, Shotcreting and Guniting Technology, Modification at depth by grouting, Crack Grouting and compaction grouting, Jet grouting, Thermal Modification, Ground freezing.

Unit-V

Modification by Inclusions and Confinement - Soil reinforcement, reinforcement with strip, bar, mesh, sheet and grid reinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

Text Books

1. M.P. Moseley and K. Krisch (2006) – Ground Improvement, II edition, Taylor and Francis.
2. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey.
3. Purushotham Raj.

References:

1. Hausmann, M. R. (1990) – Engineering Principles of Ground Modifications, McGraw Hill publications.
2. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
3. Xianthakos, Abreimson and Bruce - Ground Control and Improvement.
4. K. Krisch & F.Krisch (2010) –Ground Control and Improvement, John Wiley & Sons, 1994.
5. Donald P Coduto – Foundation Design principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Geotechnical Engineering)

NUMERICAL METHODS FOR GEOTECHNICAL ENGINEERS

(Elective-I)

Unit-I

Approximations and Errors in Numerical Methods; Solutions of Algebraic and Transcendental Equations, Bisection, False Position, Secant & Iterative Methods, Aitken's $?^2$, Newton-Raphson, Horner's and Muller's Methods; Comparison of Iterative Methods; Simultaneous Linear Algebraic Equations – methods of solution using inverse of the matrix, method of successive elimination, Iterative methods – Gauss-Siedel method, Relaxation method; Applications.

Unit-II

Matrix Inversion and Eigenvalue Problems – Power, Jacobi Methods; Calculus of Finite Differences – Differences, Difference Formulae, Difference Table, Factorial Notation; Interpolation – Lagrange's, Newton's, Hermite's, Spline, Inverse Interpolation; Applications.

Unit-III

Numerical Differentiation – Derivatives, Maxima and Minima of a Tabulated Function; Numerical Integration – Quadrature, Romberg's, Euler-Maclaurin, Double Integration; Applications.

Unit-IV

Numerical Solution of Ordinary Differential Equations - Modified Euler's, Runge-Kutta's, Predictor-Corrector, Milne's Methods; Partial Differential Equations - Finite Difference Approximations, Elliptic, Laplace, Parabolic, Hyperbolic Equations; Applications.

Unit-V

Soft Computing -Linear Programming - Simplex Method; Artificial Variable Techniques M Method, Two Phase Method; Applications; ANN, Fuzzy Logic, etc.

Text Book:

1. Grewal, B. S. - Numerical Methods in Engineering & Science, Khanna Publishers, 1999.

References:

1. Chapra, S. C. & Canade, R. P. - Numerical Methods for Engineers, McGraw Hill publications, 2011.
2. by Joe D Hoffman, Hoffman D Hoffman, Steven Frankel, Numerical Methods For Engineers and Scientists Second Edition, 2001.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Geotechnical Engineering)

GROUNDWATER HYDROLOGY

(Elective-I)

Unit-I

Groundwater: Groundwater hydrologic cycle. Origin of groundwater, quality of groundwater, vertical distribution of groundwater-zone of aeration and zone of saturation; Geologic formations as aquifers; types of aquifers, porosity, specific yield, specific retention; Permeability, Darcy's law, storage coefficient, Transmissibility.

Unit-II

Groundwater flow: Groundwater flow in one, two and three- dimensions; Groundwater flow contours and their applications; Steady groundwater flow towards a well in confined and unconfined aquifers- Dupuits' and Theism's equations, Formation constants, yield of an open well, interference and well tests; Unsteady flow towards a well – Non-Equilibrium equations – Theis's solution- Jacob and Chow's simplifications, Leaky aquifers.

Unit-III

Modelling and Analysis of Aquifer Systems: Need, model calibration, single and multi-cell models, Inverse problems, estimation of regional aquifer problems; aquifer management; linear and non-linear programming methods.

Unit-IV

Investigations: Surface methods of exploration - Electrical resistivity and seismic refraction methods. Subsurface methods; Geophysical logging and resistivity logging; hydrologic maps; groundwater balance; contamination.

Unit-V

Artificial Recharge of Groundwater: Concept of artificial recharge and recharge methods, relative merits, Saline water intrusion, Ghyben-Hergberg relation, shape of interface, control of sea water intrusion.

Text Books:

1. David K. Todd - Groundwater Hydrology, John Wiley & Sons. New York, 1998.
2. Bear, J. - Hydraulics of Groundwater, McGrawHill, New York, 1979.

References:

1. Raghunath, H. M. Groundwater, Wiley Eastern Ltd., 1990.
2. Bauer, Groundwater, John Wiley & Sons, 1992.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Geotechnical Engineering)

GEOENVIRONMENTAL ENGINEERING

(Elective-I)

Unit-I

Sources and Site Characterization: Scope of Geoenvironmental Engineering, Various Sources of Contaminations, Need for contaminated site characterization; and Characterisation methods.

Unit-II

Solid and Hazardous Waste Management: Classification of waste, Characterisation solid wastes, Environmental Concerns with waste, waste management strategies.

Unit-III

Contaminant Transport: Transport process, Mass-transfer process, Modeling, Bioremediation, Phytoremediation.

Unit-IV

Remediation Techniques: Objectives of site remediation, various active and passive methods, remediation NAPL sites, Emerging Remediation Technologies.

Unit-V

Landfills: Types of landfills, Site Selection, Waste Containment Liners, Leachate collection system, Cover system, Gas collection system.

Text Books:

1. Phillip B. Bedient, Refai, H. S. & Newell C. J. - Ground Water Contamination - Prentice Hall Publications, 4th Edition, 2008.
2. Sharma, H. D. and Reddy, K. R. - Geoenvironmental Engineering, John Wiley & Sons (2004).

References:

1. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Handbook, Kluwer Academic, 2001.
2. Reddi, L. N. and Inyang, H. I. - Geoenvironmental Engineering Principles and Applications, Marcel. Dekker, Inc., New York (2000).
3. LaGrega, M. D., Buckingham, P. L. and Evans, J. C. - Hazardous Waste Management, New York: McGraw-Hill, 2001.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Geotechnical Engineering)

ENVIRONMENT AND ECOLOGY

(Elective-I)

Unit-I

Environment, Ecology and Sustaining the Earth; Nature and Humans: Earth, population, environment.

Unit-II

Ecosystems; Ecosystems, ecology of populations, human population dynamics – growth and urbanization; environmental economics and politics.

Unit-III

Hazards, Risk and Health.

Unit-IV

Matter and Energy Resources; Energy flow in ecosystems; bio-geochemical systems, Air, Water and Soil Resources**:** Air Resources, pollution, global warning, ozone depletion; water resources – surface and groundwater, sources of pollution; soil resources – conservation, contamination, salt water intrusion, hazardous wastes.

Unit-V

Living Resources Food resources, pesticides, pest control: land resources – forests, wetlands, wilderness, national parks; wild plants and animal resources, Energy and Mineral Exploitation: perpetual and renewable energy; non-renewable energy; non-renewable mineral resources, solid and hazardous wastes.

Text Books

1. Environmental Science by Tyley Miller.
2. Concepts of Ecology by E.J.Kormondy.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Geotechnical Engineering)

GROUND WATER CONTAMINATION AND REMEDIATION

(Elective-I)

Unit-I

Introduction: Sources and types of groundwater contamination, Characterisation of contaminated site, Contaminant transport mechanisms.

Unit-II

Sorption and Other Chemical Reactions: Introduction, concept of sorption, factors influencing sorption, sorption isotherms, hydrophobic theory for organic contaminants, sorption effects on fate and transport of pollutants, Estimation of sorption.

Unit-III

Flow and Transport in the Unsaturated Zone: Capillarity, soil-water characteristics curves, unsaturated hydraulic conductivity, governing equation for unsaturated flow, measurement of soil properties.

Unit-IV

Non-Aqueous Phase Liquids: Introduction, Types of NAPLs, NAPL transport- General processes, NAPL transport- computational methods- Fate of NAPLs in the subsurface, characterizing NAPLs at remediation sites.

Unit-V

Groundwater Remediation Technologies – Methods of remediation of contaminated ground - pump and treat, in-situ flushing, permeable reactive treatment walls, air sparging, soil vapour extraction, natural attenuation, bioremediation and phytoremediation.

Text Book:

1. Phillip B. Bedient, Refai, H. S. & Newell C. J. - Ground Water Contamination - Prentice Hall Publications, 4th Edition, 2008.

References:

1. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Hand Book -Springer (2001).
2. Sharma, H. D. and Reddy, K. R. - Geoenvironmental Engineering, John Wiley & Sons (2004).
3. Reddi, L. N. and Inyang, H. I. - Geoenvironmental Engineering Principles and Applications, Marcel. Dekker, Inc., New York (2000).
4. Daniel, D. E. - Geotechnical Practice for Waste Disposal.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Geotechnical Engineering)

FINITE ELEMENT METHODS FOR GEOTECHNICAL ENGINEERS

(Elective-I)

Unit-I

Introduction: Concepts of FEM, Steps involved in Finite Element Analysis Procedure, Merits and Demerits. Principles of Elasticity: Stress equations, Strain-Displacement relationships in matrix form, Plane stress, Plane strain and axi-symmetric bodies of revolution with axi-symmetric loading.

Unit-II

Element Properties: Concept of an element, various element shapes, Displacement models, Generalized coordinates, Shape functions, Convergent and Compatibility requirements, Geometric invariance, Natural coordinate system - area and volume coordinates.

Unit-III

Generation of Element Stiffness and Nodal Load Matrices, Isoparametric Formulation: Concept, Different isoparametric elements for 2D analysis, formulation of 4-noded and 8-noded isoparametric quadrilateral elements, Lagrangian elements, Serendipity elements.

Unit-IV

Assemblage of Elements: Discretization of a structure, numbering systems, Aspect ratio its effects, Assemblage, Direct Stiffness method.

Unit-V

Geotechnical Applications Sequential construction, Excavations and embankments, Bearing capacity and Settlement analysis.

Text Book:

1. Desai, C. S. and J.F. , Abel, Introduction to the Finite. Element MethodVan Nostrand Reinhold Company (1972).

References:

1. J. N. Reddy - Introduction to the Finite Element Method - McGraw-Hill Publishers, 1993.
2. Krishna Murthy, C. S. - Finite element analysis - Theory and programming, Tata McGraw-Hill,1994.
3. Zienkiewicz, O. C. - Finite element Methods, McGraw-Hill Publishers, 1971.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Geotechnical Engineering)

ADVANCED GEOTECHNICAL ENGINEERING LABORATORY – I

1. Grain size analysis –Sieve and Hydrometer Analysis
2. Consistency Limits-Cone Test for Liquid Limit
3. Proctor Compaction Test
4. Permeability of Clay Soils.
5. Free Swell, Swell Potential, Swell Pressure Test
6. Oedometer Test
7. Triaxial Tests
8. Standard Penetration Test
9. Cone Penetration Test
10. Electrical Resistivity Test
11. Test for Cation Exchange Capacity
12. Wave Propagation Tests.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Geotechnical Engineering)

RETAINING STRUCTURES

Unit-I

Earth Pressure Theories: Rankine's and Coulomb's Earth pressure theories for cohesive and cohesionless soils, stresses due to compaction and surcharge loads.

Unit-II

Conventional Retaining Wall: Types of retaining walls, Stability (sliding, overturning, bearing capacity & overall) of gravity and cantilever walls, Proportioning of retaining walls, Backfill material and drainage.

Unit-III

Flexible Walls: Sheet pile walls, Construction methods**-** Cantilever and Anchored sheet pile wall.

Unit-IV

Reinforced Soil Walls/Mechanically Stabilised Earth: - Failure mechanisms-bond and rupture failures, Analysis methods, Limit equilibrium method- Internal and external stability, Static and seismic analyses.

Unit-V

Braced Cuts: Lateral earth pressure in braced cuts, Design of various components, Stability of braced cuts, base heave and stability, yielding and settlement of ground surrounding excavation.

Text Books:

1. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004).
2. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996).

References:

1. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Hand Book -Springer (2001).
2. Hans Friedrich Winterkorn, Hsai-Yang Fang - Foundation Engineering Handbook, Van Nostrand Reinhold, 1975.
3. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Geotechnical Engineering)

EARTH & ROCKFILL DAMS AND SLOPE STABILITY

Unit-I

Earth and Rockfill Dams: General features, Selection of site; Merits and demerits of the earth and rock fill dams, Classification of earth dams, Materials of construction and requirements, Causes of failure, Safe design criteria. Instrumentation in earth dams: Pore pressure measurements, Settlement gauges, Inclinometers, Stress measurements, Seismic measurements.

Unit-II

Failures, Damages and Protection of Earth Dams: Nature and importance of failure, Piping through embankment and foundations, Methods of seepage control through embankments and foundations, Design Criteria for filters, Treatment of upstream and down stream of slopes, Drainage control, Filter design.

Unit-III

Slope Stability Analysis: Types of Failure: Failure surfaces - Planar surfaces, Circular surfaces, Non-circular surfaces, Limit equilibrium methods, Total stress analysis versus effective Stress analysis, Use of Bishop's pore pressure parameters, Short term and Long term stability in slopes.

Unit-IV

Methods of Slope Stability: Taylor Charts, Method of Slices, Effect of Tension Cracks, Vertical Cuts. Bishop's Analysis, Bishop and Morgenstern Analysis, Non-circular Failure Surfaces: Morgenstern and Price Analysis, Janbu Analysis, Spencer Analysis, Sliding Block Analysis, Seismic stability, Stabilization of slopes: Drainage measures, Soil reinforcement (geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime/thermal treatment), surface protection (vegetation/erosion control mats/shotcrete).

Unit-V

Rockfill Dams: Requirements of compacted rockfill, Shear strength of rockfill, Rockfill mixtures, Rockfill embankments, Earth-core Rockfill dams, Stability, Upstream & Downstream slopes.

Text Book:

1. Sherard, Woodward, Gizienski and Clevenger. Earth and Earth-Rock Dams. John Wiley &. Sons. 1963.

References:

1. Bharat Singh and Sharma, H. D. – Earth and Rockfill Dams, 1999.
2. Sowers, G. F. and Salley, H. I. – Earth and Rockfill Dams, Willams, R.C., and Willace, T.S. 1965.
3. Abramson, L. W., Lee, T. S. and Sharma, S. - Slope Stability and Stabilisation methods – John Wiley & sons. (2002).
4. Bromhead, E. N. (1992). The Stability of Slopes, Blackie academic and professional, London.
5. Christian, Earth & Rockfill Dams – Principles of Design and Construction, Kutzner Published Oxford and IBH.
6. Ortiago, J. A. R. and Sayao, A. S. F. J. - Handbook of Slope Stabilisation, 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Geotechnical Engineering)

GEOSYNTHETICS AND SOIL REINFORCEMENT

Unit-I

An Overview of Geosynthetics: Classification of Geosynthetics, Functions and applications, Properties of geotextiles, Geogrids and Geomembranes.

Unit-II

Soil Reinforcement: Mechanism, improvement of Bearing capacity, Embankments on soft ground, Soil Nailing.

Unit-III

Reinforced Embankments and Reinforced soil walls –Internal and External Stability

Unit-IV

Geosynthetics for Highways: Roadway Reinforcement, applications for Separation, Filtration, Drainage, Reinforcement, Moisture Barrier, Membrane encapsulation.

Landfills: Geosynthetic applications for land fill liners, covers and other components

Unit-V

Dewatering Systems: Sand drains, Prefabricated Vertical drains (PVD), French Drains.

Text Books:

1. Koerner, R. M. - Designing with Geosynthetics, Prentice Hall; 2nd edition, (1991).
2. Rao, G. V. & Raju G. V. S. S. - Engineering with Geosynthetics, Tata-McGraw Hill Publication, New Delhi. (2004.)

References:

1. Hausmann, M. R. - Engineering Principles of Ground Modifications, McGraw Hill Pub Co, 1989.
2. Xianthakos, Abreimson and Bruce - Ground Control and Improvement, John Wiley & Sons, 1994.
3. M. P. Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis.
4. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
5. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Geotechnical Engineering)

SOIL STRUCTURE INTERACTION

Unit-I

Soil-Foundation Interaction: Introduction to soil-foundation interaction problems, Soil behaviour, Foundation behaviour, Interface behaviour, Scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic-plastic behaviour, Time dependent behaviour.

Unit-II

Beam on Elastic Foundation- Soil Models: Infinite beam, Two-parameters models, Isotropic elastic halfspace model, Analysis of beams of finite length, combined footings.

Unit-III

Plates on Elastic Continuum: Thin and thick rafts, Analysis of finite plates, Numerical analysis of finite plates.

Unit-IV

Analysis of Axially and Laterally Loaded Piles and Pile Groups: Elastic analysis of single pile, Theoretical solutions for settlement and load distributions, Analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap, Load deflection prediction for laterally loaded piles, Subgrade reaction and elastic analysis, Interaction analysis, Pile-raft system,

Unit-V

Ground-Foundation-Structure Interaction: Effect of structure on ground-foundation interaction, Static and dynamic loads.

Text Books:

1. Selvadurai, A. P. S. - Elastic Analysis of Soil-Foundation Interaction, 1979.
2. Rolando P. Orense, Nawawi Chouw & Michael J. Pender - Soil-Foundation-Structure Interaction, CRC Press, 2010 Taylor & Francis Group, London, UK.

References:

1. Soil Structure Interaction – The real behaviour of structures, the institution of structural engineers, London, March 1989.
2. Poulos, H. G., and Davis, E. H. - Pile Foundation Analysis and Design, 1980.
3. Scott, R. F. - Foundation Analysis, Prentice Hall, Englewood Cliffs, 1981.
4. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996).
5. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Geotechnical Engineering)

GEOTECHNICAL EARTHQUAKE ENGINEERING

(Elective-II)

Unit-I

Earthquake Seismology – Causes of earthquake, Plate tectonics, Earthquake fault sources, Seismic waves, Elastic rebound theory, Quantification of earthquake, Intensity and magnitudes, Earthquake source models.

Unit-II

Earthquake Ground Motion – Seismograph, Characteristics of ground motion, Effect of local site conditions on ground motions, Design earthquake, Design spectra, Development of site specification and code-based design.

Unit-III

Ground Response Analysis – One-dimensional ground response analysis: Linear approach, Nonlinear approach, Comparison of one dimensional ground response analyses. Two-dimensional ground response analysis: Dynamic finite element analysis, Equivalent linear approach, Nonlinear approach, Comparison of two dimensional ground response analyses.

Unit-IV

Liquefaction and Lateral Spreading - Liquefaction related phenomena, Liquefaction susceptibility: Historical, Geological, Compositional and State criteria. Evaluation of liquefaction by cyclic stress and cyclic strain approaches, Lateral deformation and spreading, Criteria for mapping liquefaction hazard zones. Soil improvement for remediation of seismic hazards.

Unit-V

Seismic Design of Foundations, Retaining Walls & Slopes - Seismic design requirements for foundation, Seismic bearing capacity, Seismic settlement, Design loads. Seismic slope stability analysis - Internal stability and weakening instability, Seismic design of retaining walls: Dynamic response of retaining walls, Seismic displacement of retaining walls, Seismic design consideration.

Text Books:

1. Kramer S. L - Geotechnical Earthquake Engineering, Prentice Hall, 1996.
2. Bharat Bushan Prasad- Advanced Soil Dynamics and Earthquake Engineering, PHI Learning Pvt. Ltd., New Delhi, 2011.

References:

1. R. W. Day - Geotechnical Earthquake Engineering Handbook, McGraw-Hill, 2002.
2. Naeim, F. - The Seismic Design Handbook, Kluwer Academic Publication, 2nd Edition, 2001.
3. Bolt, B. A. - Earthquakes, W. H. Freeman and Company, 4th Edition, 1999.
4. Lourie, W. - Fundamentals of Geophysics, Cambridge University press, 1997.
5. Kamalesh Kumar - Basic Geotechnical Earthquake Engineering – New Age International Publishers, 1st Edition, 2008.
6. Dowrick - Earthquake Resistant Design, John Wiley & Sons.(2009).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Geotechnical Engineering)

ROCK MECHANICS AND ENGINEERING

(Elective-II)

Unit-I

Engineering Classification of Rocks: Classification of intact rocks, Rock mass classifications, Rock Quality Designation (RQD), Rock Structure Rating (RSR), Rock Mass Rating (RMR), Norwegian Geotechnical Classification (Q-system), Strength and modulus from classifications, Classification based on strength & modulus and strength and fracture strain, Geoengineering classification.

Unit-II

Laboratory and In-Situ Testing of Rocks: Physical properties, Compressive strength, Tensile strength, Direct shear test, Triaxial shear test, Slake durability test, Schmidt rebound hardness test, Sound velocity test, In-Situ Tests: Seismic methods, Electrical resistivity method, In situ stresses, Plate loading test, Goodman jack test, Plate jacking test, In-situ shear test, Field permeability test.

Unit-III

Strength, Modulus and Stresses-Strain Responses of Rocks: Factors influencing rock response, Strength criteria for isotropic intact rocks, Modulus of intact rocks, effect of confining pressure, Uniaxial Compressive strength, Strength criteria for intact rocks, Strength due to induced anisotropy in rocks,. Stress Strain Models: Constitutive relationships, Elastic, Elasto-plastic, Visco-elastic, Elasto-viscoplastic stress-strain models.

Unit-IV

Stability of Rock Slopes and Foundations on Rocks: Rock slopes, Modes of failure, Rotational failure, Plane failure, Design charts, Wedge method of analysis, Buckling failure, Toppling failure, Improvement of slope stability and protection. Foundations on Rock: Introduction, Estimation of bearing capacity, Stress distribution, Sliding stability of dam foundations, strengthening measures, Settlements in rocks, Bearing capacity of pile/pier in rock, Remedial measures, Foundations located on edge of jointed slope.

Unit-V

Underground and Open Excavations: Blasting operational planning, Explosive products, Blast Design, Underground blast design, Controlled blasting techniques, blasting damage and control, Safe practice with explosives and shots.

Text Books:

1. Goodman – Introduction to Rock mechanics, Willey International (1980).
2. Ramamurthy, T. - Engineering in Rocks for slopes, foundations and tunnels, Prenice Hall of India.(2007).

References:

1. Jaeger, J. C. and Cook, N. G. W. – Fundamentals of Rock Mechanics, Chapman and Hall, London.(1979).
2. Hoek, E. and Brown, E. T. - Underground Excavation in Rock, Institution of Mining and Metallurgy, 1982.
3. Brady, B. H. G. and Brown, E. T. - Rock Mechanics for Underground Mining, Chapman & Hall, 1993.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Geotechnical Engineering)

THEORETICAL SOIL MECHANICS

(Elective-II)

Unit-I

Theory of Elasticity: Basic concepts, definitions and notations of stress & strain components – Generalized Hooke's Law, Equilibrium and Compatible conditions in Cartesian, Polar coordinates – Principal stresses and strains – octahedral stresses – stress invariants.

Unit-II

Theory of Plasticity: Ideal Plastic substance strain hardening – yield criteria – Tresca, & Van Mises, Mohr & Coulomb, Drucker-Prager theories, Critical State Soil Mechanics, – applications to soil mechanics problems.

Unit-III

Stresses and Displacements due to Surface and Subsurface Loads – Boussinesq, Cerutti, Mindlin Solutions, Stresses and Displacements in Finite Layer & Multi-Layered Systems and Anisotropic and Non-homogeneous Elastic Mass. Stress-path methods; Rigid Loaded areas, Rotation of Foundations.

Unit-IV

Deep Foundations: Axially loaded single incompressible, compressible floating and end-bearing piles, pile groups; Laterally Loaded Single and Group of Piles.

Unit-V

Underground Structures: Stresses and Displacements around Underground Openings unlined and lined tunnels.

Text books:

1. Poulos, H. G. & Davis, E. H. – "Elastic Solutions for Soil and Rock Mechanics, John Wiley and Sons, New York, 1974.
2. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004).

Reference:

1. Das, B. M. – Theoretical Soil Mechanics Nelson Engineering (2004).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Geotechnical Engineering)

PAVEMENT ANALYSIS AND DESIGN

(Elective-II)

Unit-I

Introduction: Types and component parts of pavements, Factors affecting design and performance of pavements. Highway and airport pavements.

Unit-II

Stresses and strains in flexible pavements: Stresses and strains in an infinite elastic half space use of Boussinesq's equations - Burmister's two layer and three layer theories; Wheel load stresses, various factors in traffic wheel loads; Equivalent single wheel load of multiple wheels. Repeated loads and EWL factors.

Unit-III

Flexible pavement design methods for highways and airports: Empirical, semi-empirical and theoretical approaches; Development, principle, design steps of the different pavement design methods including AASHTO, Asphalt Institute, Shell Methods. IRC method of pavement design.

Unit-IV

Stresses in rigid pavements: Types of stresses and causes; Introduction to Westergaard's equations for calculation of stresses in rigid pavement due to the influence of traffic and temperature; Considerations in rigid pavement analysis, EWL; wheel load stresses, warping stresses, frictional stresses, combined stresses.

Unit-V

Rigid pavement design: Design of cement concrete pavement for highways and runways; Design of joints, reinforcements, tie bars, dowel bars. IRC method of design; Design of continuously reinforced concrete pavements.

Text Books:

1. Yang H Huang - Pavement Analysis and Design, 2nd Edition, Pearson Education.
2. Khanna & Justo – Highway Engineering, Khanna Publishers.
3. Srinivasa kumar R – Pavement design , University press(India) Pvt.Ltd 2013.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Geotechnical Engineering)

ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

(Elective-II)

Unit-I

Basic concept of EIA: Initial environmental Examination, Elements of EIA,- factors affecting EIA IMPACT evaluation and analysis, preparation of Environmental Base maps, Classification of environmental parameters.

Unit-II

E I A Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, Benefit Analysis.

Unit-III

Impact of Development Activities and Land use: Introduction, Methodology for the assessment of soil and ground water, Delineation of study area, Identification of activities, Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measure.

Unit-IV

E I A an surfaced water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact, Assessment of Impact on development Activities of Vegetation and wildlife, environmental Impact of Deforestation –Courses and effects of deforestation.

Unit-V

Environmental Audit & Environmental legislation: Objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, on-site activities, evaluation of Audit data and preparation of Audit report, Post Audit activities, The Environmental pollution Act, The water Act, The Air (Prevention & Control of pollution Act.). EIA Report preparation and Case studies

Text Book:

1. Anjaneyulu, Y. - Environmental Impact Assessment Methodologies, B. S. Publication, Sultan Bazar, Hyderabad.

References:

1. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers, 1999.
2. Suresh K. Dhaneja - Environmental Science and Engineering, S.K.,Katania & Sons Publication., New Delhi.
3. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication(P) Ltd, Delhi, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Geotechnical Engineering)

GEOGRAPHICAL INFORMATION SYSTEMS

(Elective-II)

Unit-I

Introduction: Electromagnetic spectrum, energy sources and Radiation principle, Energy interactions in the atmosphere, energy interactions with earth surface features – Vegetation, Soil and water.

Unit-II

Data Acquisition: Platforms – sensors used for the remote sensing data acquisition. Data processing – Radiometric, Geometric corrections.

Unit-III

Digital Image Processing: Image enhancement – linear, non-linear spatial filtering; edge enhancement. Classification – supervised, unsupervised classification.

Unit-IV

Geographical Information System (GIS): Definition data input and output; Topology, Digital elevation data; Data management – relational data model. Spatial data models – Raster and Vector data Models. GIS analysis – Classification, overlay operation.

Unit-V

Land use/Land cover Analysis: Classification principles and systems; Applications of soil, water resources, environmental, earthquakes, landslides. Software scenario – watershed modelling, watershed management, environmental modelling.

Text Books:

1. Lilles and Kiefer – Remote Sensing Principles and Interpretation – John Willey and Sons. America, 2000.
2. Anji Reddy, M. – Remote Sensing and GIS – BS Publications, 2004.

References:

1. F.F. Sabins Jr., - Remote Sensing Principles and Interpretations – W.H. Freeman & Co., 1987.
2. Paul J. Gibson & Clare H. Power – Introductory Remote Sensing – British Library, London. 1st Published, 2000.
3. Stan Arnoff – Geographic Information Systems – A management perspective, Canada, 1995.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (Geotechnical Engineering)

ADVANCED GEOTECHNICAL ENGINEERING LABORATORY - II

1. Preparation of Rock Specimen (Drilling, Cutting, Polishing)
2. Slake Durability Test.
3. Brazilian Test.
4. Point Load Test.
5. Unconfined Compression Test.
6. Interface Shear Behavior of Soils with Geosynthetics.
7. Cone Drop Test on Geotextile.
8. Tensile Tests (Wide Width, Narrow Width, etc. on Geotextiles).
9. CBR Push Through on Geotextiles.
10. In-Plane and Cross-Plane Permeability of Geotextiles.