

KAMLA NEHRU INSTITUTE OF TECHNOLOGY

SULTANPUR (U.P.)

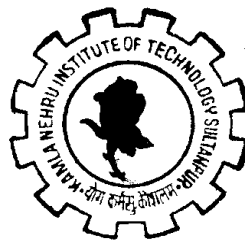
SYLLABUS

FOR

M.TECH. (PART-TIME)

IN

GEOTECHNICAL ENGINEERING



**DEPARTMENT OF CIVIL ENGINEERING
K.N.I.T., SULTANPUR(U.P.)**

(Affiliated to U.P.T.U. ,LUCKNOW)

M. TECH. (Part - Time) Geotechnical Engineering
SEMESTER - I

Sr.No.	Course Code	Subject	Periods		Evaluation Scheme					Subject Total
					Sessional				Examination	
		Theory	L	Tut./Pra	CT	Attendance	TA	Total	ESE	
1.	SP - 11	Numerical Methods and Computer Programming	3	1	30	10	10	50	100	150
2,	SP - 12	Theory of Elasticity	3	1	30	10	10	50	100	150
3.	SP - 13*	Elective I	3	2	30*	10	10	50	100	150
		Total	9	4				150	300	450

* 15 Marks are for class test and 15 marks are for lab if any otherwise 30 marks are for class tests

SEMESTER - II

Sr.No.	Course Code	Subject	Periods		Evaluation Scheme					Subject Total
					Sessional				Examination	
		Theory	L	Tut./Pra	CT	Attendance	TA	Total	ESE	
1.	SP - 21	Soil Exploration and Testing	3	1	30	10	10	50	100	150
2,	SP - 22	Advance Soil Mechanics	3	1	30	10	10	50	100	150
3.	SP - 23*	Elective II	3	2	30*	10	10	50	100	150
		Total	9	4				150	300	450

* 15 Marks are for class test and 15 marks are for lab if any otherwise 30marks are for class tests

SEMESTER - III

Sr.No.	Course Code	Subject	Periods		Evaluation Scheme					Subject Total
					Sessional				Examination	
		Theory	L	Tut./Pra	CT	Attendance	TA	Total	ESE	
1.	SP - 31	Pavement Material & Design	4/3	2	30	10	10	50	100	150
2,	SP - 32	Advance Foundation & Engg.	4/3	2	30	10	10	50	100	150
		Total	8/6	4				100	200	300

SEMESTER - IV

Sr.No.	Course Code	Subject	Periods		Evaluation Scheme					Subject Total
					Sessional				Examination	
		Theory	L	Tut./Pra	CT	Attendance	TA	Total	ESE	
1.	SP - 41	Elective III	4/3	2	30	10	10	50	100	150
2,	SP - 42	Elective IV	4/3	2	30	10	10	50	100	150
		Total	8/6	4				100	200	300

SEMESTER - V

Sr.No.	Course Code	Subject	Periods		Evaluation Scheme					Subject Total
					Sessional				Examination	
		Theory	L	Tut./Pra	CT	Attendance	TA	Total	ESE	
1.	--	Seminar	--	2	--	--	--	100	--	100
2,	DP - 1	Dissertation	--	10	--	--	--	100	--	100
		Total	--	12				200	--	200

SEMESTER - VI

Sr.No.	Course Code	Subject	Periods		Evaluation Scheme					Subject Total
					Sessional				Examination	
		Theory	L	Tut./Pra	CT	Attendance	TA	Total	ESE	
1,	DP - 2	Dissertation	--	12	--	--	--	100	200	300
		Total	--	12				100	--	300

GRAND TOTAL 2000

Numerical Methods and Computer Programming (SP-11) L 3 T 1 P 0

Unit 1: Significance of Numerical Methods: An introduction to Mathematical Modeling and Engineering problem solving.

Problem involving Error Analysis: Sources of errors, Truncation errors, Round off errors, Taylor Series expansion.

Problems involving value of a parameter satisfying a single non-linear equation: Bracketing Methods, Open Methods, Roots of Polynomials.

Unit 2: Multi-component Problems: Gauss elimination, Gauss Seidel, Lu decomposition and Matrix Inversion.

Problems involving trend analysis and Hypothesis testing: Least squares Regression, Interpolation, Fourier Approximation.

Problems involving differentiation and Integration: Newton-Cotes Integration Formulas, Integration of Equations, Numerical Differentiation.

Unit 3: Problems involving solution to Differential Equations: Runge-Kutta Method, Boundary value problems, Eigen value problems, Stiffness Methods.

Problems involving steady-state systems and propagation: Finite Differences, Elliptic Equations and Parabolic Equations.

Unit 4: C++ Programming Basics

Basic Program Construction, Program Statements, Output using cout, Preprocessor Directives, Variables, Input using cin, Manipulators, Operators.

Loops and Decision

Relational Operators

Loops: The For loop, The While loop, The do loop.

Decisions: The if statement, The if...else statement, The else...if statement, The switch statement, Conditional operators.

Logical Operators: Logical AND, Logical OR, Logical NOT

Unit 5: Structures

A simple structure, Specifying the structure, Defining a structure variable, Accessing structure members, Other structure features.

Functions

Simple Functions: The function declaration, Calling the function, The function definition, Eliminating the declaration.

Passing Arguments to Functions: Passing constants, Passing variables, Passing by value.

Returning values from functions, The Return statement.

Nb.: Case studies pertaining specifically to Civil Engineering applications are to be considered in this course.

Suggested Reference Books:

1. "Numerical Methods for Engineers", Steven C Chapra and Raymond P Canale, Tata McGraw Hill.
2. "Introductory Methods of Numerical Analysis", S. S. Shastri, PHI
3. "Numerical Methods for Engineers and Scientists", Joe D Hoffman, McGraw Hill
4. "Object Oriented Programming in Turbo C++", Robert Lafore, Galgotia Publications.
5. "Programming in C++", Nell Dale, Chip Weems,

THEORY OF ELASTICITY (SP-12) L-3, T-1,P-0

Analysis of stress, Components of Stress Invariant Principal stresses, Equations of equilibrium Stress Transformation formulae.

Analysis of Strain, Components of strain, Strain-displacement relationship, Strain invariant. Principal strains, Strain transformation formula, Compatibility Equations.

Stress – strain relations of elasticity, Basic assumptions, Isotropy, Homogeneity, Continuity, Generalized Hooke's law formulation of elasticity problems, Existence and Uniqueness of Solutions, Saint Venant's principle, Strain energy.

Plane Stress and Plane Strain problems, Airy's stress functions, Governing differential equations. Problems in rectangular coordinates, Bending of beams, comparison with Solution with Saint Venant's principle, strain energy.

Suggested Reference Books:

1. C.T. Wang, Applied Elasticity, McGraw Hill, December 1953.
2. Timoshenko and Goodier, Theory of Elasticity, 3rd Edition, McGraw Hill, 2010.

SOIL EXPLORATION & TESTING (SP- 21) L-3, T-1, P-0

Location, spacing and depth of boring. Types of samples and their requirements sampling method Handling of samples in field and laboratory.

Borings, stabilization of bore holes, methods of boring wash boring. Auger boring, core boring. Test pits, bore hole records, disturbance of soil during driving and sampling, various tests of samplers principle, of design, collection of data and preparation of foundations engg. report surface sampling, drive, advance and block sampling.

Geophysical methods of sub surface exploration. Sounding methods.

Piezometric installations, types of tips, Hydraulic and electrical piezometers and their installations in embankments, Measurement of settlement of dam foundations. Field permeability test in bore hole.

Soil Testing Field identification of soils, Atterberg's limits, hydrometer testing of clays, standard penetration test Static & dynamic compression test, consolidation testing. Tri-axial testing, Bearing capacity by plat load tests, Flow set by electrical analogy method: Vane shear tests.

Soil Instrumentation Transducers, strain – gauges, stress and strain measurement in laboratory and in fields. Precision measurements, errors, and their distribution.

Suggested Reference Books:

1. Basic & Applied Soil Mechanics , Gopal Ranjan & A.S.R. Rao, New Age International Publishers
2. Geotechnical Engineering, P. Purushotama Raj, Tata McGraw – Hill Publishing
3. Geotechnical Engineering: Principles & Practices of Soil Mechanics and Foundation Engineering , V.N.S. Murthy, C.R.C. Press
4. Soil Mechanics & Foundation Engineering, K. R.Arora, Standard Publishers
5. Geotechnical Engineering, C. Venkat Ramaah, New Age International
6. Principal of Geotechnical Engineering, Braja M. Das, Cengage Learning

ADVANCED SOIL MECHANICS (SP - 22) L-3, T-1, P-0

Clay mineralogy & soil structure Clay minerals. Atomic & modular bonds, single grained structure flocculent & Honey comb structure. Seepage analysis; Three dimensional Consolidation Introduction, Equation, vertical & sand drain, effect of Peripheral shear Compaction, Methods of compaction Factor affecting compaction. Stabilization – introduction & different methods. Shear strength & Failure theories, introduction, Pore pressure parameter & theories Stability of slopes: Stability analysis of finite & infinite slopes, Bishop's method. Stability Number.

Suggested Reference Books:

1. Basic & Applied Soil Mechanics , Gopal Ranjan & A.S.R. Rao, New Age International Publishers
2. Geotechnical Engineering, P. Purushotama Raj, Tata McGraw – Hill Publishing
3. Geotechnical Engineering: Principles & Practices of Soil Mechanics and Foundation Engineering , V.N.S. Murthy, C.R.C. Press
4. Soil Mechanics & Foundation Engineering, K. R.Arora, Standard Publishers
5. Geotechnical Engineering, C. Venkat Ramaah, New Age International
6. Principal of Geotechnical Engineering, Braja M. Das, Cengage Learning
7. Principal of foundation Engineering, Braja M. Das, Cenage Learning
8. Foundation Engineering, P.C. Yerghese, PHI Learning Pvt. Ltd.
9. Foundation Design: Principal & Practices, Donald P. Cudoto, Prentice Hall

PAVEMENT MATERIAL & DESIGN (SP- 31)**L-3, T-1, P-0**

Introduction, Types of pavements, Road pavement and Airport pavement, Design factors. Design of Flexible pavements, Empirical, Semi empirical and theoretical methods, practical approach, design of Rigid pavements including reinforced concrete pavement.

Pavement Evaluation and strengthening., pavements failures, Evaluation of existing pavements and then strengthening for future use.

Suggested Reference Books:

1. Yang H Huang - Pavement Analysis and Design, 2nd Edition, Pearson Education 2004
2. Khanna & Justo – Highway Engineering, Khanna Publishers.
3. Srinivasa kumar R – Pavement design , University press(India) Pvt.Ltd 2013
4. Kadiyali, L. R., Traffic Engineering and Transportation Planning, Khanna Publishers, 2011.
5. Khisty, C. J., and Lall, B. K., Transportation Engineering, Prentice Hall of India Pvt. Ltd., 2002.
6. Mallick, R. B., and El-Korchi, T., Pavement Engineering - Principles and Practice, CRC Press, Taylor and Francis Group, Florida, USA, 2009.
7. Papagiannakis, A. T., and Masad, E. A., Pavement Design and Materials, John Wiley and Sons, New Jersey, USA, 2008.
8. Yoder, E. J., and Witzcak, M. W., Principles of Pavement Design, 2nd Edition, John Wiley and Sons, New York, USA, 1975.
9. IRC 37 – 2001 “Guidelines for Design of Flexible Pavements”, Indian Roads Congress, New Delhi.
10. IRC 58 – 2002 “Guidelines for Design of Rigid Pavements”, Indian Roads Congress, New Delhi.

ADVANCED FOUNDATION ENGINEERING (SP - 32)**L-3, T-1, P-0**

Role of soil properties in foundation Engineering, Earth pressure, classical earth pressure theories and graphical construction. Design principles of retaining walls. Settlement and consolidation, shallow foundation, History and development, Method of estimating, bearing capacity, Settlement of footings. Footings in earthquake zones, footings subjected to eccentric inclined loads, proportioning of foundation. Pile foundation, History and development, type of piles, bearing capacity, Settlement of piles, group action in piles, laterally loaded piles. Piles subjected to eccentric loading batters piles. Piles in earthquake zones Coefficient of sub grade soil/pile reactions.

Well foundation Component parts. Stability analysis, bearing capacity and skin friction, Shirts & tilts.

Retaining walls-tyden and stability analysis. Sheet piles and bulk heads design methods. Machine foundation

Underpinning of foundations.

Suggested Reference 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)
3. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
4. Poulos, H. G. & Davis, E. H. - Pile Foundation Analysis and Design john wiley & sons inc (1980-08)
5. Reese, L. C. & Van Impe, W. F. - Single Piles and Pile Groups under Lateral Loading -Taylor & Francis Group (Jan 2000)
6. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Hand Book -Springer (2001)
7. Tomlinson, M. J. - Foundation Design and Construction - Prentice Hall (2003)
8. Lymon C. Reese, William M. Isenhower, Shin-Tower Wang- Analysis and Design of Shallow and Deep Foundations (2006)
9. Salgado, R. - The Engineering of Foundations McGraw-Hill, Boston (2008)
10. IS: 6403 “Code of Practice for Determination of Bearing Capacity of Shallow Foundations”, Bureau of Indian Standards, New Delhi.
11. IS: 2911 (Part 1) Section 1 to 4 “Code of Practice for Design and Construction of Pile Foundations”, Bureau of Indian Standards, New Delhi.
12. IS: 2911 (Part 4) “Code of Practice for Design and Construction of Pile Foundations – Load Test on Piles”, Bureau of Indian Standards, New Delhi.
13. IS: 8009 (Part I & II) “Code of Practice for Calculation of Settlements of Foundations”, Bureau of Indian Standards, New Delhi.
14. K. R. Arora – Soil Mechanics & Foundation Engineering.
15. Alam Singh – Modern Geotechnical Engineering.
16. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics
17. V. N. S. Murthy – Soil Mechanics and Foundation Engineering.

**M. TECH. (PART – TIME) CIVIL ENGG.
IN
GEOTECHNICAL ENGINEERING**

1. Stability of Slopes
2. Applied Geology
3. Advanced Structural Design
4. Design of Foundation Engg.
5. Rigid Pavement Design
6. Pile Foundation
7. Earth Retaining Structures
8. Advanced Structural Mechanics
9. Transportation Engineering
10. Advance Irrigation
11. Water Power Engg.
12. Design of Earth dam
13. Reinforced & Pre-stressed Concrete Structure
14. Finite Element Analysis
15. Geo-technical Processes
16. Photo-interpretation and Remote Sensing
17. Ground Water Engineering.

1. STABILITY OF SLOPES (Elective)

L-3, T-2,P-0

1. Introduction: Natural and man made slopes, types of slope pavements & land slides, Nature of soil & rock Progressive failure of slopes.
2. Limit equilibrium Methods: Planar Failure Surface.
3. Limit Equilibrium Methods: Slip surface of arbitrary slope.
4. Natural slope analysis considering initial stresses.
5. Some special types of slope analysis, i.e. Earthquakes, Creep, Anisotropy.
6. Probabilistic approach in slope analysis.
7. Centrifuge Model Testing.

Suggested Reference Books:

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.
7. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Hand Book -Springer (2001)
8. Hans Friedrich Winterkorn, Hsai-Yang Fang - Foundation Engineering Handbook, Van Nostrand Reinhold, 1975
9. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.
10. Bowels, Joseph E., Foundation Analysis and Design, McGraw Hill Book Co., 1997.
11. Das, B. M., Foundation Engineering, Cengage Learning, 2007.
12. Gulhati, Shashi K. and Datta Manoj, Geotechnical Engineering, McGraw Hill Book Co., 2005.

2. APPLIED GEOLOGY (Elective)

L-3, T-2,P-0

Type of mountains, The Himalayas, classification of Himalayan range, Origin of Himalayas, structure of Himalayas, other mountain ranges of India.

Tunneling in geologically weak and structurally disturbed media, Methods of tunnel excavation in rock, over break tunnel hazards.

Geological considerations in stability and safety of spillways, Dams and powerhouses and remedial measures.

Problems posed by adverse geological features in alignment of hill channels and their remedial measures.

Geological aspects of highway planning.

Foundations of bridge piers on rocks.

Stability of hill slopes and cuttings, landslides and subsidence, Types, causes significance of geological factors and control of landslides.

Earthquakes, geological considerations for seismic design of structures, seismic zones of India, elements of earthquake forecasting.

Blasting, drilling and quarrying.

Classification of rocks, engineering properties and behavior of rocks, laboratory tests, insitu measurement techniques and instrumentation for stress strain, creep deformation fracture of rocks. Shear strength of rocks, rocks belts and dowels, Application of principles of rock mechanics to tunnel, apexing draft tube and pen stock cavities.

Suggested Reference Books:

1. Watham, T. “Foundations of Engineering Geology”, Spon Press,2009

2. Defreitas, M. and Defreitas, M.H., “Engineering Geology: Principles and Practices” Springer Verlag , 2008
3. Bell, F.G., “Engineering Geology” Butterworth and Heinemann, 2007
4. Wyllie, D.C., “Foundations on Rock” Routledge, 1999
5. Singh, B.and Goel, R.K. .”Rock Mass Classification: A Practical Approach in Civil Engineering”; Elsevier, 1999
6. Wyllie, D.C. and Mah, C.W. “Rock Slope Engineering: Civil and Mining”; Taylor and Francis, 2004

3. ADVANCED STRUCTURAL DESIGN (Elective)

L-3, T-2,P-0

Limit state concepts, design philosophy, statistical basis for loads and strengths, deterministic, probabilistic, semi probabilistic, stochastic models, various limit states, for RC, PC and metal structures. Analysis of sections, stress-strain relations under monotonically increasing and cyclic loading, moment of resistance, combination of flexure, shear, and axial force, moment curvature relations, behavior of steel and R.C. cross-sections.

Deflections in determinate structures, crack widths, behavior of elements, yield and cracking zones, plastic hinge concept, limited rotational capacity for concrete hinges, behavior of joints.

Indeterminate beams and frames, ultimate load analysis, plastic moment distribution, lower and upper bounds, application to R.C. frames and beams, instability effects,

Yield line theory for slabs, yield line mechanisms, equilibrium and virtual work methods, special aspects, hillerborg’s strip method.

Structural failures-case histories.

Suggested Reference Books:

1. Reinforced concrete design by S. Unnikrishna Pillai & Menon, Tata Mc. Graw Hill, 2nd Edition, 2004
2. Advanced Reinforced Concrete Design – P.C. Varghese, Practice Hall, 2008
3. Limit state theory and design of reinforced concrete by Dr. S.R. Karve and Dr. V.L. Shah, Standard publishers, Pune, 3rd Edition, 1994
4. Reinforced concrete design by Kenneth Leet, Tata Mc. Graw-Hill International, editions, 2nd edition, 1991.
5. Reinforced concrete structural elements – behaviour, Analysis and design by P.Purushotham, Tata Mc.Graw-Hill, 1994.
6. Design of concrete structures – Arthus H. Nilson, David Darwin, and Chorles W. Dolar, Tata Mc. Graw-Hill, 3rd Edition, 2005.
7. Reinforced concrete structures, Vol.1, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, 2004.
8. Reinforced concrete structures – I.C. Syal & A.K. Goel, S. Chand, 2004.

4. DESIGN OF FOUNDATION ENGG.(Elective)

L-3,T-2,P-0

Soil exploration, shear strength of soil, Stress strain behavior, Bearing capacity of soil, theories for determination of the same, techniques of measurements. Flow through soils, flow nets, uplift pressure consolidation settlement analysis of foundations, magnitude, and rate of settlement, Earth pressure, Earth retaining Structures, design of retaining walls and shell piles by Force and fixed methods.

Types of foundations – Footing, rafts, Piles, wells and caissons etc., Design of different types of foundations and determination of their bearing capacities. Improvement of soils and foundations. Compaction stabilization grouting, etc.

Suggested Reference 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)

3. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
4. Poulos, H. G. & Davis, E. H. - Pile Foundation Analysis and Design John Wiley & Sons Inc (1980-08)
5. Reese, L. C. & Van Impe, W. F. - Single Piles and Pile Groups under Lateral Loading -Taylor & Francis Group (Jan 2000)
6. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Hand Book -Springer (2001)
7. Tomlinson, M. J. - Foundation Design and Construction - Prentice Hall (2003)
8. Lyman C. Reese, William M. Isenhour, Shin-Tower Wang- Analysis and Design of Shallow and Deep Foundations (2006)
9. Salgado, R. - The Engineering of Foundations McGraw-Hill, Boston (2008)

5. RIGID PAVEMENT DESIGN (Elective) L-3,T-2,P-0

Rigid pavement-history of development.

Wheel Load Stresses, Liquid sub grade and elastic solid sub grade, Oler's formulae, Westergard analysis of pavement design, Bradur's formulae, for corner loads and charts for liquid, elastic solid of finite and infinite depth.

Temperature stresses. Thermal properties of aggregates and concrete. Effect of temperature variation on concrete pavements. Westergard's and Themilsion's analysis of warping stresses. Analysis of stresses caused due to sub grade drag.

Design of airport pavement and rigid highway pavement.

Combination of stresses due to different cause, Slab dimensions Methods of Strengthening. Design of ties bars, Dowel bars and reinforced concrete slabs, Pre-stressed concrete slab- general details

Rigid pavement overlays on rigid pavements. Determination of overlay thickness.

Suggested Reference Books:

1. Institute of Transportation Engineers, Traffic Engineering Hand Book, 4th Edition, Prentice Hall, 1999.
2. Kadiyali, L. R., Traffic Engineering and Transportation Planning, Khanna Publishers, 2011.
3. Khisty, C. J., and Lall, B. K., Transportation Engineering, Prentice Hall of India Pvt. Ltd., 2002.
4. May, A. D., Traffic Flow Fundamentals, Prentice Hall, 1990.
5. Yang H Huang - Pavement Analysis and Design, 2nd Edition, Pearson Education
6. Khanna & Justo – Highway Engineering, Khanna Publishers.
7. Srinivasa kumar R – Pavement design , University press(India) Pvt.Ltd 2013
8. Yang H Huang - Pavement Analysis and Design, 2nd Edition, Pearson Education 2004
9. Mallick, R. B., and El-Korchi, T., Pavement Engineering - Principles and Practice, CRC Press, Taylor and Francis Group, Florida, USA, 2009.
10. Papagiannakis, A. T., and Masad, E. A., Pavement Design and Materials, John Wiley and Sons, New Jersey, USA, 2008.
11. Yoder, E. J., and Witzczak, M. W., Principles of Pavement Design, 2nd Edition, John Wiley and Sons, New York, USA, 1975.
12. IRC 58 – 2002 “Guidelines for Design of Rigid Pavements”, Indian Roads Congress, New Delhi.

6. PILE FOUNDATIONS (Elective) L-3, T-2, P-0

Introduction: Classification, Behavior of single pile, Load capacity of individual pile in compression, Uplift, Lateral Loads on piles, group action in piles load capacity and settlement bearing value of piles in groups.

Down drag on piles and pile group, Pile dynamics, Design of pile foundations and pile caps, subgrade, Reaction Method, Evaluation of sub grade modulus. Analysis and Design of Laterally Loaded Piles.

Suggested Reference Books:

1. Nainan P Kurian “Design of Foundation Systems: Principles And Practices” Narosa publish House New Delhi.

2. Joseph E. Bowles, "Foundation Analysis and Design" McGraw-Hill.
3. Berlinov M., "Foundation Analysis and Design" Mir.
4. Leonards G. A., "Foundation Engineering" Mc Graw Hill, NY.
5. Brahman S. P., "Foundation Engineering" Tata Mc Graw Hill Publishing House, New Delhi
6. Peck, R.B., Hanson, W.E. and Thornburn, T.H., "Foundation Engineering", 2nd Edition, Wiley Eastern Ltd., New York.
7. Teng, W.C., "Foundation Design", Prentice-Hall of India (Pvt) Ltd., New Delhi.
8. Tomlinson, M.J., "Foundation Design and Construction", 5th Edition, English Language Book Society, Longman Group Ltd., Singapore, 1986.
9. Nayak, N.V., "Foundation Design Manual for Practicing Engineers and Civil Engineering Students", Dhanpat Rai and Sons, New York.
10. Winterkorn, H.F. and Fang, H., "Foundation Engineering Handbook", Van Nostrand Reinhold Company, New York.
11. Robert W. Day: "Foundation Engineering Handbook" Mc Graw Hill.
12. IS: 6403 "Code of Practice for Determination of Bearing Capacity of Shallow Foundations", Bureau of Indian Standards, New Delhi.
13. IS: 2911 (Part 1) Section 1 to 4 "Code of Practice for Design and Construction of Pile Foundations", Bureau of Indian Standards, New Delhi.
14. IS: 2911 (Part 4) "Code of Practice for Design and Construction of Pile Foundations – Load Test on Piles", Bureau of Indian Standards, New Delhi.
15. IS: 8009 (Part I & II) "Code of Practice for Calculation of Settlements of Foundations", Bureau of Indian Standards, New Delhi.

7. EARTH RETAINING STRUCTURES (Elective)

L-3,T-2,P-0

1. Introduction: Earth Pressure Theories:

Ranking's and Coulomb's earth pressure theories for cohesionless and cohesive backfill, Computation of earth pressure for various cases-Inclined with surcharge-submerged and partially submerged strata backfill.

2. Rigid Retaining structures
3. Graphical Method of Earth pressure computation
4. Design of Gravity Retaining Wall
5. Flexible Retaining Structure.
6. Diaphragm wall
7. Cofferdams.

Suggested Reference Books:

1. Sowers, G. F. and Salley, H. I. – Earth and Rockfill Dams, Willams, R.C., and Wallace, T.S. 1965.
2. Abramson, L. W., Lee, T. S. and Sharma, S. - Slope Stability and Stabilisation methods – John Wiley & sons. (2002)
3. Bromhead, E. N. (1992). The Stability of Slopes, Blackie academic and professional, London.
4. Christian, Earth & Rockfill Dams – Principles of Design and Construction, Kutzner Published Oxford & IBH.
5. Ortiago, J. A. R. and Sayao, A. S. F. J. - Handbook of Slope Stabilisation, 2004.
6. Bowels, Joseph E., Foundation Analysis and Design, McGraw Hill Book Co., 1997.
7. Das, B. M., Foundation Engineering, Cengage Learning, 2007.
8. Gulhati, Shashi K. and Datta Manoj, Geotechnical Engineering, McGraw Hill Book Co., 2005.

8. ADVANCED STRUCTURAL MECHANICS (Elective)

L-3,T-2,P-0

Static and kinematics matrices, contragredience, Principles of virtual work, Force and displacement methods with applications to plane and space frame problems.

Organisation of computation, programming considerations, equation solvers. Non-linear analysis incremental procedures, material and geometrical non-linearities, large deformation elasto plastic analysis of frames.

Random vibrations, stationary and regicide processes, Autocorrect on function, power spectral density and their applications to SDOF and MDF systems, Introduction to non-linear dynamic analysis of tall frames.

Suggested Reference Books:

1. Matrix Analysis of Frames structures by William Weaver J.R and James M.Geve, CBS publications.
2. Advanced Structural Analysis by Ashok.K.Jain, New Channel Brothers.
3. Structural Analysis by C.S.Reddy.
4. Matrix Structural Analysis by Kanchi.
5. Matrix Methods of Structural Analysis by J.Meek.
6. Structural Analysis by Ghali and Neyveli.4. Thoft, C.P, and Baker, M.J., Structural Reliability Theory and its Application, Springer Verlag, 1982.

9. TRANSPORTATION ENGINEERING (Elective)

L-3,T-2,P-0

Classification of Transportation System, Highways, Railways, Waterways, Airways, Conveyors, Pipelines and Ropeways.

Basics of Traffic Engineering, Speed and Traffic Capacity studies, Parking and Accident studies, Traffic Control and Regulation, Design of intersections.

Types and causes of pavement failures, pavement Maintenance Management system (PMSS) Transportation and Environment; Need for Environment Impact Assessment (EIA) of Transportation Projects.

Transportation Planning Process, Transportation Surveys, Trip Generation, trip Distribution, Modal Split, Traffic Assignment, evaluation of Plans.

Land use Transport Models, Statistical Methods for Traffic Engineering, Transport Planning of different size of cities with special emphasis on mega cities.

Suggested Reference Books:

1. Bruton, M. J., An Introduction to Transportation Planning (The Living Environment), UCL Press, London, UK, 2000.
2. Edwards, J. D., Transportation Planning Handbook, 2nd Edition, Institution of Transportation Engineers, 1999.
3. Hutchinson, B.G., Principles of Urban Transportation System Planning, McGraw Hill, 1974.
4. Mayer, M., and Miller, E., Urban Transportation Planning: A Decision Oriented Approach, McGraw Hill, 2000.
5. Institute of Transportation Engineers, Traffic Engineering Hand Book, 4th Edition, Prentice Hall, 1999.
6. Kadiyali, L. R., Traffic Engineering and Transportation Planning, Khanna Publishers, 2011.
7. Khisty, C. J., and Lall, B. K., Transportation Engineering, Prentice Hall of India Pvt. Ltd., 2002.
8. May, A. D., Traffic Flow Fundamentals, Prentice Hall, 1990.
9. Yang H Huang - Pavement Analysis and Design, 2nd Edition, Pearson Education
10. Khanna & Justo – Highway Engineering, Khanna Publishers.
11. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers, 1999

10. ADVANCED IRRIGATION (Elective)

L-3,T-2,P-0

Introduction: Development of irrigation in India and its present position.

Soil Survey: Soils, their physical and chemical properties classification of plant nutrients and their role in crop production, total nitrogen.

Soil Moisture Relations: Water quality requirements for different crops, basic soil water relations, their importance in irrigation, field capacity, permanent wilting point, soil moisture measurement, flow of water through saturated and unsaturated soil.

Crops: Factors affecting distribution of crops, estimation of water requirement for different crops, fertilizer requirements and application, methods of crop improvement, insect, pest and disease control, crop adaptation to drought, dry land farming soil fertility management in intensive cropping pattern.

Methods of Irrigation: Surface and subsurface methods and their selection, efficiency of water application effect of delayed irrigation on crop yield.

Water use Management for Irrigation: Water distribution systems, assessment of water charges, scope of state and cooperative management.

Drainage and Land Relation: Use and purpose of drainage, water logging its cause, effects and methods of reclamation, design of surface and subsurface drainage systems.

Unit problems in soils: Effect of salts on physical properties of soil and on crop yield, relation of salt affected soils.

Soil Erosion and Conservation: Factors affecting soil erosion agencies causing erosion, control measures.

Suggested Reference Books:

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Irrigation Water Power and Water Resource Engg. by K.R. Arora.
4. Irrigation Theory and practices by A.M. Michel.
5. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
6. Irrigation and water Power engineering by M.M Das and M D Saikia, PHI.

11. WATER POWER ENGG. (Elective)

L-3,T-2,P-0

Introduction: Development of hydroelectric power comparative economics of hydro and thermal power components of hydro-power plant types of plants, investigations, required.

Hydro Power Estimates: Primary and secondary power load factor load curves, flow duration curves, number of units, plant office noises.

Reservoirs: Storage and pondage, capacity determination multipurpose reservoirs.

Review of Hydraulic structure design: Dams, weirs, regulators spillways, steel and reinforced pen stocks various surge tanks.

Power Stations: Basic functional structures, layout for substructures, draft tubes, special features of pumped storage plant tidal plants and underground power plants.

Machines: Selection of various types of turbines, effective head, characteristic curves.

Small Hydro Power Generation: Mini and Micro hydroelectric plants, type of size, potential type of turbines, merits, civil works needed.

Suggested Reference Books:

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.

3. Irrigation Water Power and Water Resource Engg. by K.R. Arora.
4. Irrigation and water Power engineering by M.M Das and M D Saikia, PHI.
5. Hydropower Engg, by James Donald

12. DESIGN OF EARTH DAM (Elective) L-3,T-2,P-0

Earth Dams: Criteria for safety and general requirements of foundation and materials zoning of earth dams. Seepage through and beneath earth dams and its control for different types of embankment and foundations.

Stability of the dam, constructional pore pressure and their influence, stability under draw down and steady seepage conditions, seismic effects, stresses in foundations.

Conditions through earth dams, protection of up stream and down stream slopes, typical design for different conditions.

Field compaction and control, construction planning and plant for an earth dam.

Rock fill dams: Typical sections, problems of design different types of membranes, settlement of rock fill dam, construction methods.

Suggested Reference Books:

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Irrigation Water Power and Water Resource Engg. by K.R. Arora.
4. Engineering for Dams, Vol. III (Earth, Rockfill, steel and timber dams) by Creager, Justin and Hinds, John Wiley and sons, NY

13. REINFORCED & PRESTRESSED CONCRETE STRUCTURES (Elective) L-3,T-2,P-0

Reinforced Cement concrete:

Limit state design of structures, yield line theory Application of working stress method in design of bunkers, silo, spherical and conical domes Liquid retaining structures, chimneys and cooling towers beams curved in plan.

Pre-stressed Concrete:

Analysis and design of end blocks, Analysis of continuous beams and frames, partial pre stressing use of non-pre stressed reinforcement, Fatigue of pre stressed concrete members, Design of transmission Poles, sleepers, water tanks, bridges pressure vessels Pre stressed anchorage.

Suggested Reference Books:

1. F.K. Kong and R. H. Evans, Reinforced and Prestressed Concrete Structures, 3rd Edition, Spon Press, December 1990.
2. Lin. T. Y., Design of Prestressed Concrete Structures, 3rd Edition, Wiley India Limited, 2010.
3. R. Park and T. Paulay, Reinforced Cement Concret Structures, MISL-WILEY Series, Wiley India Pvt. Ltd, 2009.
4. A.K. Chopra, Dynamics of Structures, 3rd Edition, Pearson, 2007.
5. Clough and Penzien, Dynamics of Structures, 5th Edition, McGraw Hill, 1975.
6. John M. Biggs, Introduction to Structural Dynamics, 1st Edition, McGraw Hill Book Co, 1964.
7. Mario Paz., Structural Dynamics Theory and Computation, 2nd Edition, CBS Publishers, 2010.

14. FINITE ELEMENT ANALYSIS (Elective)

L-3,T-2,P-0

Finite element technique, discretization, energy and variational approaches.

Basic theory, Displacement and force models, slope function theory, use of parametric and local coordinates, Convergence criteria, Numerical integration Applications.

Plane stress and Plain strain problems, axisymmetric solids, three dimensional problems, plate and shell structures, temperature and flow problems.

Nonlinear problems, Introduction to iterative and incremental procedures for material and geometrically nonlinear problems, examples from plane stresses and stability.

Programming, Organization of FEM programs, equations solving techniques, input/output plotting and mesh generation aspects, Graphic package for finite element method, time dependent problems by explicit and implicit schemes.

Suggested Reference Books:

1. Desai, C. S. and J.F. , Abel, Introduction to the Finite. Element Method Van Nostrand Reinhold Company (1972)
2. J. N. Reddy - Introduction to the Finite Element Method - McGraw-Hill Publishers, 1993
3. Krishna Murthy, C. S. - Finite element analysis - Theory and programming, Tata McGraw- Hill,1994
4. Zienkiewicz, O. C. - Finite element Methods, McGraw-Hill Publishers, 1971

15. GEOTECHNICAL PROCESSES (Elective)

L-3,T-2,P-0

Introduction

Dewatering: Methods-sumps and ditches, well point system deep well sumps, sheeting and open pumping, Electro-osmosis, theory and analysis of ground water lowering, choice and design of dewatering system.

Grouting Purpose, impermeability and consolidation grouting classification grouting material, Grouting pattern, Selection of grout, Method of grouting and grouting pressure Field test to check the effectiveness.

Compaction: Factors affecting compaction of soil, field compaction, Field control test

Stabilization, Necessity, Mechanism, Effect of Engineering properties, Design & Construction Technique of soil cement, soil lime, soil asphalt, Soil Chemical, Mechanical, Thermal & Electrochemical Stabilization.

Suggested Reference Books:

1. Modern Geotechnical Engineering – Alam Singh (IBT Publishers, Delhi, 1987)
2. Analysis and Design of Substructures – Swami Saran (Oxford and IBH, New Delhi, 1996)
3. Foundation Design and Construction (5th Edition) – Tomlinson, M.J. (ELBS, Singapore, 1988)
4. Foundation Engineering (Ed.) – Leonards, G.A. (McGraw Hill, New York, 1962)
5. Geotechnical Engineering – Lee, I.K., White, W. and Ingles, O.G. (Pitman, Marshfield, Mass (U.S.A.), 1983)

16. PHOTO INTERPRETATION AND REMOTE SENSING (Elective)

L-3,T-2,P-0

Introduction to photo-grammetry and photo interpretation, Aerial mosaics its uses, basic characteristics of photo images. Basic elements in photo interpretation for terrain analysis. Interpretation of land forms, interpretation of Bed rock type, Geological interpretation of Aerial photographs and land sat imagery Mineral exploration from aerial photography Satellite Application of P.I. in Geo-technical Engg. and Geo-technical processes.

REMOTE SENSING: electromagnetic radiation and its spectrum. Development of land sat system idealized remote sensing system; energy sources Target interactions, Atmospheric effects, practical remote sensing systems, Multi spectral photographic systems, scanners and Radio-meters, SLAR, Application of remote sensing systems, Geo-technical evaluation of an area by remote sensing techniques, Application of Remote sensing in Civil Engg.

Suggested Reference Books:

1. Charles, Elachi, Jakob van Zyl., Introduction to the Physics and Techniques of Remote Sensing – John Wiley and Sons Publications, 2006.
2. Chritian Matzler., Thermal Microwave Radiation: Applications for Remote Sensing, The Institution of Engineering and Technology, London, 2006.
3. James, B. Campbell, Randolph H. Wynne, Introduction to Remote Sensing - The Guilford Press, 2011.
4. Lillesand T.M and Kiefer R.W. Remote Sensing and Image Interpretation - 6th Edition, John Wiley and Sons, 2008.
5. Moffitt, Francis H. and Mikhail, Edward M., Photogrammetry, 3rd Edition, Harper and Row Publishers, 1980.
6. Wolf, Paul, R., Elements of Photogrammetry, 2nd Edition, McGraw Hill International Book Company, 1983.

17. GROUND WATER ENGINEERING (Elective)**L-3,T-2,P-0**

Introduction: The origin, flow and distribution of ground water, Hydro-geology of India, Ground water potential, Ground water quality techniques for location and evaluation of ground water. Ground water levels and fluctuations.

Ground Water Movement Darcy's Law, Estimation and measurement of coefficient of permeability, general equations of flow through porous media.

Wells And hydraulics of Wells, Aquifers and their general characteristics, Steady and unsteady radial flow, Non-equilibrium equations, Pumping test analysis, vessel in sloping aquifers wells with uniform recharge, multiple well systems, type of wells with uniform recharge, multiple well systems, type of wells. Design criteria, well development, well losses, equipment, construction methods.

Seepage Dupuits theory, Estimation of seepage, its control, Ground Water conservation, Safe yield. Conductive use of surface and ground water, Ground water, Ground water recharge, Seawater intrusion in coastal aquifers.

Suggested Reference Books:

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Irrigation Water Power and Water Resource Engg. by K.R. Arora.
4. Groundwater Hydrology' by Todd D. K. John Wiley & Sons. New York, 1998
5. Groundwater' by Raghunath H. M., Wiley Eastern Ltd., 1990
6. Water Resources Engg. By Larry W. Mays, John Wiley India
7. Water resources Engg. By Wurbs and James, John wiley India
8. Water Resources Engg. By R. K. Linsley, McGraw Hill
9. Bear, J. - Hydraulics of Groundwater, McGrawHill, New York, 1979
10. Bauer, Groundwater, John Wiley & Sons, 1992