SEMESTER IV

MA202 NUMERICAL TECHNIQUES

Solution of linear system - Gaussian elimination and Gauss-Jordan methods - LV - decomposition methods - Crout's method - Jacobi and Gauss-Seidel iterative methods - sufficient conditions for convergence - Power method to find the dominant eigenvalue and eigenvector

Solution of nonlinear equation - Bisection method - Secant method - Regula falsi method - Newton- Raphson method for $f(x) = 0$ and for $f(x,y) = 0$, $g(x,y) = 0$ - Order of convergence - Horner's method - Graeffe's method - Bairstow's method.

Newton's forward backward and divided difference interpolation - Lagrange's interpolation - Numerical Differentiation and Integration - Trapezoidal rule - Simpson's 1/3 and 3/8 rules - Curve fitting - Method of least squares and group averages.

Numerical Solution of Ordinary Differential Equations- Euler's method - Euler's modified method - Taylor's method and Runge-Kutta method for simultaneous equations and 2^{nd} order equations - Multistep methods - Milne's and Adams' methods.

Numerical solution of Laplace equation and Poisson equation by Liebmann's method - solution of one dimensional heat flow equation - Bender - Schmidt recurrence relation - Crank - Nicolson method - Solution of one dimensional wave equation.

References

1. Gerald, CF., and Wheatley, P.O., Applied Numerical Analysis, Mis. Addison Wesley, 1989.
2. Jain, MK., Iyengar,S.R.,and Jain,R.K., Numerical Methods for Scientific and Engineering Computation, Wiley Eastern, 1991.
3. Kandasamy, P.Thilagavathy, K., and Gunavathy,S., Numerical Methods, Chand and Co., 1997.

CE202 MECHANICS OF SOLIDS – II

Principle of virtual displacement and virtual forces - Castigliano's first theorem - Maxwell's reciprocal theorem. Determination of deflection curve of beams- double integration - Macaulay's method - Area moment method - Conjugate beam method - strain energy and dummy unit load approaches to deflection of Simple and Curved members. Statically indeterminate Structures - Propped cantilever, fixed and continuous beams - Theorem of three moments - Bending moment and shear force diagrams

Thick cylinders - Lame's equation - Shrink fit - compound cylinders.

Deflection of trusses - Dummy unit load method - Strain energy method - Williot Mohr's diagram

Theory of columns: Axial load- Euler's theory-Rankines formula, combined bending and axial load

References

1. Vazirani,V.N. and Ratwani, N.M. Strength of Materials, Vol. II, Kanna Publishers, 1996.
2. Timoshenko, S.P. and Gere, J.M. Mechanics of Materials, Tata McGraw Hill, 1992
3. Rajput R.K., Strength of Materials, S. Chand & Co., Ltd., 1996.

CE204 MECHANICS OF FLUIDS - II

Ideal fluid flow- Uniform flow- source - sink- doublet - combination of flow patterns - uniform flow and source- flow around cylinder - flow with circulation - lift. Boundary layer - displacement and momentum thickness - development of flow in circular pipes - Von Karman momentum equation - Laminar and turbulent boundary layers on flat plates - Drag in flat plates, cylinders and spheres - Drag coefficients - Boundary layer control.
Open Channel Flow - Classification - Terminology - velocity distribution in open channels - Chezy, Manning and other formulae - Best hydraulic section - specific energy - specific force - hydraulic jump and its characteristics - Gradually varied flow - computation of surface profiles. Velocity measurement with Pitot tube, Prandtl Pitot tube and current meter - discharge measurement in pipe flow - venturimeter, mouthpiece, orificemeter, nozzlemeter, bendmeter and rotameter - discharge measurement in open channel flow - All types of notches and weirs, venturiflume - critical depth meter - basic principles. Introduction to CFD- Dimensional homogeneity - dimensional analysis - Rayleigh`s method - Buckingham Pi theorem - applications - significance of dimensionless numbers - Model study and similitude - scale effect and distorted models .

References

1. Streeter, V.L. Fluid Mechanics, Tata McGraw Hill, 1998.
2. Chow, V.T. Open Channel Hydraulics, Tata McGraw Hill, 1975.
3. Nagaratnam, S. Fluid Mechanics, Khanna Publishers, 1989.

CE206 SURVEYING – II

Tacheometric Surveying - Stadia method - fixed hair method - Anallatic lens - Horizontal and inclined sights - vertical and normal staff - subtense bar - Tangential method - constant base and variable base measurements - simple problems - EDM and Total Stations.
Curve Setting - Horizontal curves - simple, compound and reverse curves - Circular curves - Transition curves - cubic parabola, log spiral - vertical curves - parabola - setting out of buildings - culverts - tunnels - marking for foundation and excavation.
Triangulation - different networks - orders and accuracies - intervisibility and height of stations, signals and towers - Base line measurement - instruments and accessories - tape corrections - extension of base line - Satellite stations - Reduction to centre - Introduction to Global Positioning System (GPS)

References

1. Duggal, S.K. Surveying Vol. I and II, Tata McGraw Hill, 2004.
2. Punmia, B.C. Surveying Vol.I and II, Standard Publishers, 1994.
3. Arora, K. R. Surveying Vol. I and II, Standard Book House, 1996.

CE208 GEOTECHNICAL ENGINEERING – II

Soil exploration - Planning - Augur boring - Soundings - Sampling - Plate load test, static and

dynamic penetrations tests - geophysical explorations - Lateral Earth Pressure - Plastic equilibrium - Rankine's theory - Active and passive earth pressure for cohesionless and cohesive soils - Earth pressure at rest - Coloumb's wedge theory - Rebhann's and Culmann's graphical solutions, Stability analysis

Foundation - functions and requisites- Different types - choice of foundation type – general principles of design. Bearing capacity - types of failures - Prandtl's and Terzaghi's bearing capacity analysis - Bearing capacity based on settlement and building codes

Shallow foundation - spread footings - combined footings - trapezoidal and strap footings - Raft foundation - Contact pressure distribution - settlement analysis - Types of settlement, control

Deep foundation - piles - types - load carrying capacity of pile - static and dynamic formula - pile load test - penetration test - pile groups - Efficiency - Feld's rule - Converse Labarre formula, Settlement of piles and pile groups - Negative skin friction - under reamed piles

References

1. Murthy, V.N.S, A text book of Soil Mechanics and Foundation Engineering, UBS Publishers & Distributors Pvt. Ltd., New Delhi 1999.
2. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publications Pvt. Ltd., New Delhi, 1995.
3. Gopal Ranjan and Rao, Basic and Applied Soil Mechanics, New Age International (P) Limited, New Delhi, 2002.
4. Braja M. Das, Principles of Foundation Engineering, Thomson Asia Pvt. Ltd., Singapore, 2005.

CE210 ENVIRONMENTAL ENGINEERING - I

Physical, chemical and biological characteristics of water - water analysis- IS and WHO standards- Requirements of water supply - Types of demand and their contribution - rate of consumption - Forecasting the population- variation in demand pattern.

Sources of water - quantitative and qualitative studies. Intakes - Channels and pipes for conveying water -- Pipes- hydraulic design of pressure pipe- Materials - laying- joining- testing - pipe appurtenances- Pumps and pumping stations

Treatment plants - process of treatments - mixing, aeration, sedimentation, coagulation, filtration, disinfection, softening - advanced water treatment. Distribution systems - analysis of distribution networks

Operation and maintenance of water supply to buildings - Rural water supply - Protected water supply - Saline water intrusion.

Note: Assignments include the drawings of various water treatment units.

References

1. Manual on Water supply and Treatment - CPHEEO, 1999
2. Birdie, G.S. and Birdie, Water Supply and Sanitary Engineering, Dhanpat Rai & Sons, 1992.
3. Duggal, K.N. Elements of Environmental Engineering, S.Chand & Co, 2002.
4. Punmia B.C, Ashok Jain & Arun Jain, Water Supply Engineering, Laxmi Publications, Pvt. Ltd., New Delhi, 2004.

CE214 SURVEY LAB – II

1. Theodolite surveying
2. Single plane observation of trignometrical leveling
3. Two plane method
4. Determination of Tacheometric Constants
5. Tangential Tacheometry
6. Subtense Bar
7. Setting out of curves, Buildings layout.
8. Total station

CE216 STRENGTH OF MATERIALS LAB

1. Test on springs
2. Deflection test
3. Torsion test
4. Tension test
5. Hardness test
6. Tests on brick
7. Tests on cement
8. Tests on concrete
9. Tests on aggregate
10. Tests on bitumen