MAHATMA GANDHI UNIVERSITY

B.TECH. DEGREE COURSE

8^{TH} SEMESTER

SCHEME
&
SYLLABUS

2002

CIVIL ENGINEERING BRANCH

CIVIL ENGINEEING

SCHEME
8TH SEMESTER

Course Code	Subject Code	Subject	Duration of Uty. Exam (hrs.)	No. of periods per week (hrs)			Marks			
				Lect.	Tut.	Prac.	Sessional	Theory	Practical	Total
A	C801	Advanced structural design	4	3	1	-	50	100	-	150
B	C802	Finite Element Analysis	3	3	1	-	50	100	-	150
C	C803	Building Technology and Management	3	3	1	-	50	100	-	150
D	C804	Environmental Engineering II	3	3	1	-	50	100	-	150
E	C805	Elective –II	3	3	1	-	50	100	-	150
F	C806	Elective –III	3	2	1		50	100	-	150
G	C807	Environmental Engineering Laboratory	3	-	-	3	50	-	100	150
H	C808	Project / Seminar	-	-	-	4	100	-		100
I	C809	Viva - Voce							50	50
Total			25	17	6	7	450	600	150	1200

SYLLABUS

ADVANCED STRUCTURAL DESIGN

C801 **2+2+0**

Module 1

Road bridges: I. R. C. Specifications - slab bridges -T-Beam bridges - box culvert - bearings.

Module 2

Shell structures: General principles for membrane theory for symmetrical uniformly distributed load - design of a simply supported single barrel cylindrical shell for membrane stresses - beam method. Folded plates: general principles - structural behaviour of plates (design not required)

Module 3

Industrial buildings: roof loads - analysis and design of trusses - design of purlins - design of bracing – supporting system.

Module 4

Design of plate girders and gantry girders - riveted and welded compound sections.

Module 5

Steel bridges: - I. S. Specifications - design of highway and railway bridges of plate girder type.

References

1. I. R. C. Bridge code, Indian Railway Bridge code, I. S. 456, I. S
2. Victor J.D., Design of Concrete Bridges, Oxford& I B H Publishing Company, New Delhi.
3. Krishna Raju, Advanced Design of Concrete Structures, Oxford& I B H Publishing Company, New Delhi.
4. Ramchandra, Design of Steel Structures. Vol II, Standard Book House, Delhi.
5. Ramaswamy G.S., Design and Construction of Concrete Shell Roofs, Mc Graw Hills

FINITE ELEMENT ANALYSIS

C802 **3+1+0**

Module 1

Introduction to FEM-Historical development-Idealization of actual structures-Mathematical model-General procedure of FEA-Displacement approach. Solution techniques- Gauss Elimination – Frontal solver (concepts only)

Module 2

Finite element analysis- -Energy principles- Principle of Stationary Potential Energy- Complementary Energy - Variational approach -Stable- Unstable- Neutral equilibrium-Virtual work- Principle of virtual forces – Principle of virtual displacements.

Module 3

Shape functions-Lagrangian and Hermition Interpolation – Polynomials – General coordinates-Area coordinates-Compatibility –C_0 and C_1 elements-convergence criteria- conforming & nonconforming elements – Patch test

Module 4

Stiffness matrix-Bar element-Beam element-Triangular elements - Constant Strain Triangle-Linear Strain Triangle- Isoparametric elements-Numerical Integration - Gauss Quadrature.

Module 5

General plate bending elements- Plate bending theory – Kirchhoff's theory – Mindlin's theory – Introduction to locking problems- preventive measures – reduced integration – selective integration. Axysymmetric elements- Introduction to shell elements

References

1. O C Zienkiewicz,.Finite Element Method, fourth Edition,McGraw Hill,
2. R.D.Cook, Concepts and Applications of Finite Element Analysis, John Wiley &Sons.
3. Stephen P.Timoshenko& Krieger, S.W., Theory of Plates and Shells, McGraw Hill.
4. C.S.Krishnamoorthy, Finite Element Analysis, Tata McGraw Hill .New Delhi, 1987.
5. S.Rajasekharan, Finite Element Analysis, Wheeler Publishing Co., &Sons.1993.
6. T.Kant, Finite Element Methods in Computational Mechanics, Pergamons Press.
7. K.J.Bathe, Finite Element Procedures in Engineering Analysis, Prentice Hall,
8. Mukhopadhyay M., Matrix Finite Element Computer and Structural Analysis, Oxford &IBH, 1984.
9. Irving H.Shames, Energy &Finite Element Methods in Structural Mechanics.
10. Desai C.S.&Abel J.F., Introduction to Finite Element Methods, East West Press.

BUILDING TECHNOLOGY AND MANAGEMENT

C803 **3+1+0**

Module 1

Concrete Mix Design: General concepts. BIS method of mix design, American standards of mix design, IS-method of mix design, Durability concepts in mix

design - Requirements and tests of materials required for mix design.-Fibre reinforced concrete- High performance concrete.

Form work. General arrangements – general requirements – common faults – materials for form work – form work arrangements – form work design – loads on forms – design procedure – form work vibration for compaction of concrete – stripping time and shoring.

Module 2

Prefabricated construction: Advantages, foundation units, wall panels, frames for opening, walls–units for roofs and floors – low cost roof systems. Hollow concrete blocks, Ferro cement – use and application – modular co-ordination – method of production – flow line method – station method – manufacturing process for structural units.

Codification and Standerdisation- Value analysis: Various methods and techniques.

Module 3

Construction company organization: Different types of organizational set up – construction team – objectives of civil engineering management – duties and responsibilities of a civil engineer – functions of construction management. Technical planning.

Site organization: Organization of labour, resources, materials, method of execution of the project – inspection and quality control**-** safety in construction.

Module 4

Materials Management: Functions of materials management – inventory control techniques.

Construction contracts: Item rate contract – Lump-sum contract –Labour contract – Negotiated contract – Global contract – Percentage contract – Cost plus percentage contract**-** Cost plus fixed fee contract- Cost plus fluctuating fee contract – Target contract – All in contract.

Module 5

Claims manual for a construction organization: Law of contract - Extra work and deviation order – claims – owner's claim – sub contractor's claim – disputes and arbitration – consequences of mistake in contracts – terms and conditions of contract – contract documents – earnest money – security deposit – warranty period – contract signed under coercion – contract signed by minors, insane or drunken persons – authority to agree and find, validity of an oral agreement – conditions and warranties – express terms and implied terms – voidable contracts and their performance – illegal and voidable contracts – liability for tort in contract- litigation – breach of contract and remedies – discharge of contract – equity, privity of contract – transfer of contractual rights and obligations.

References

1. M .S Shetty, concrete technology, S. Chand & Co.
2. S. P Arora, Building constructions, Dhanpat Rai & sons, New Delhi.
3. B. L Gupta, Amit Gupta, Construction Management and accounts, standard publishers and Distributions.
4. Construction Management and accounts – V .N Vazirani.
5. National Building code of India – Indian standards.
6. Construction Engineering & Management, S. Seetharaman, Umesh
7. Publications, Delhi.

ENVIRONMENTAL ENGINEERING - II

C804 **3+1+0**

Module 1

Introduction**:** Storage of water - effect of storage on quality of water, general layout of treatment plant - surface water and ground water. Aeration, purpose of aeration. Sedimentation - plain sedimentation, theory of sedimentation, continuous flow sedimentation tanks. Chemically aided sedimentation - necessity, theory of coagulation and flocculation - generally used coagulants, dosage, feeding, mixing devices, clariflocculators, design of flash mixers clarifiers and clarifloculators.

Module 2

Filtration **-** Theory of filtration, filter media - sand for filtration. Classification of filters - design, construction, control, operation and maintenance of rapid sand filters and slow sand filters. pressure filters, dual media & multimedia filters.Disinfection: requirements of a good disinfectant, chlorination - action, application, and dosage chlorine demand, pre chlorination, post chlorination, double chlorination, super chlorination, breakpoint chlorination, chloramination. Other disinfectants. Miscellaneous treatment methods: color, odour and taste removal, iron and manganese removal, deflouridation, removal of hardness, desalination.

Module 3

Introduction: Objectives of waste water treatment - Effluent standards, KSPCB Standards, BIS Standards. Layout of conventional treatment plant - preliminary, primary, secondary and tertiary treatments in general. Preliminary process: screens - types of screens, design, disposal of' screenings; comminutors, grit chamber - function, design, construction and operation, disposal of grit , detritus tank, skimming tank -function, design and operation, disposal of skimmings Sedimentation: Theory of sewage sedimentation - design, construction and operation, rectangular and circular tanks, disposal of sludge.

Module 4

Biological process: principle and theory of biological treatment**.** Sewage filtration: Trickling filters - design, construction and operation. Activated sludge process: Design, construction and operation of conventional and extended aeration, aeration methods. Miscellaneous methods- Stabilization ponds, Oxidation ditch, Aerated lagoons, rotating biological contactors; disinfection of sewage effluents.

Module 5

Sludge treatment and disposal: quantity of sludge, characteristics of sludge, sludge thickening, digestion, conditioning and disposal, design of sludge digesters only. Septic Tanks: Design (as per Ministry of urban development) construction, disposal of effluents, cleaning of tanks, Imhoff tanks.

Sewage treatment by high rate anaerobic methods: Anaerobic digestion, suspended growth, contact process, UASB, attached growth, filters, expanded bed - only basics (Ref. Wastewater Engineering by Metcalf and Eddy - 3rd Edn.)

References

1. Peavy, Rowe, Tchobanoglous, Environmental Engineering, Mc Graw Hill International Editions.
2. S. K. Garg, Environmental Engineering Vol. l & ll, Khanna Publishers, New Delhi.
3. B.C. Punmia, Water supply Engineering, Arihant Publications, Jodpur.
4. B.C. Punmia, Waste water Engineering, Arihant Publications, Jodpur.
5. Metcalf & Eddy, Waste water Engg. 3rd Edn., Mc Graw Hill International Editions.
6. Mark J Hammer, Water and waste water technology, John Wiley and sons, Inc.

ADVANCED MATHEMATICS (ELECTIVE - II)

CMELRT 805-1 **3+1+0**

Module 1 Green's Function

Heavisides, unit step function – Derivative of unit step function – Dirac delta function – properties of delta function – Derivatives of delta function – testing functions – symbolic function – symbolic derivatives – inverse of differential operator – Green's function – initial value problems – boundary value problems – simple cases only

Module 2 Integral Equations

Definition of Volterra and Fredholm Integral equations – conversion of a linear differential equation into an integral equation – conversion of boundary value problem into an integral equation using Green's function – solution of Fredhlom integral equation with separable Kernels – Integral equations of convolution type – Neumann series solution.

Module 3 Gamma, Beta functions

Gamma function, Beta function – Relation between them – their transformations – use of them in the evaluation certain integrals – Dirichlet's integral – Liouville's extension of Dirichlet's theorem – Elliptic integral – Error function.

Module 4 Power Series solution of differential equation

The power series method – Legendre's Equation – Legendre's polynomial – Rodrigues formula – generating function – Bessel's equation – Bessel's function of the first kind – Orthogonality of Legendre's Polynomials and Bessel's functions.

Module 5 Numerical solution of partial differential equations.

Classification of second order equations- Finite difference approximations to partial derivatives – solution of Laplace and Poisson's equations by finite difference method – solution of one dimensional heat equation by Crank – Nicolson method – solution one dimensional wave equation.

References

1. Ram P.Kanwal, Linear Integral Equation, Academic Press, New York.
2. Allen C.Pipkin, Springer, A Course on Integral Equations, Verlag.
3. H.K.Dass, Advanced Engg. Mathematics, S.Chand.
4. Michael D.Greenberge, Advanced Engg. Mathematics, Pearson Edn. Asia.
5. B.S.Grewal, Numrical methods in Engg.&science, Khanna Publishers.
6. R.F. Hoskins, Generalized functions, John Wiley and Sons.
7. Bernard Friedman, Principles and Techniques of Applied Mathematics, John Wiley and sons
8. James P.Keener, Principles of Applied Mathematics, Addison Wesley.
9. P.Kandasamy, K.Thilagavathy, K.Gunavathy Numerical methods, S.Chand & co.

THEORY OF SHELLS (ELECTIVE - II)

C805-2 **3+1+0**

Module 1

Structural behaviour of shells-classification of shells-translational and rotational shells-ruled surfaces-methods of generating the surface of different shells-hyperbolic paraboloid-elliptic paraboloid-conoid-Gaussian curvature-synclastic and anticlastic surfaces.

Module 2

Classical theories of shells-thin shell-thick shell-small deflection theory-stress resultants and deformations of shells without bending.

Module 3

Cylindrical shells-membrane theory of cylindrical shells-free body diagram of a cylindrical shell element-formulation of equilibrium equation.

Module 4

Bending theory of cylindrical shells-stresses and deformation of circular cylindrical shells-pressure vessels-cylindrical shells with uniform internal pressure-free body diagram of a differential cylindrical shell element- formulation of equilibrium equation.

Module 5

Finite element application on cylindrical shells-introduction to shell elements-flat elements-axisymmetric elements- degenerated elements-general shell element.

References

1. Timoshenko, W Krieger, Theory of plates and shells, Mc Graw Hill.
2. Gol'oenveizen, Theory of elastic thin shells, Pergaman Press, 1961.
3. J Ramachandran, Thin shells theory and problems, Universities press.
4. Novoshilov V V,Theory of thin elastic shells, P Noordoff, Groningen,1959.
5. Baker E H, Kovalesky and Flrish, Structural analysis of shells, Mc Graw Hill, New York.
6. Kraus H, Thin elastic shells, Wiley, New York, 1967.
7. Ramaswamy G S, Design and construction of concrete shell roofs, Mc Graw Hill, New York.
8. Wilhelm Flugge, Stresses in shells, Springs, Verlog, Berlin.

ADVANCED STEEL STRUCTURES (ELECTIVE - II)

C805-3 **3+1+0**

Module 1

Microwave and Transmission Towers: Introduction - Loads - Analysis of Microwave & Transmission towers - Design of members - Design of foundation - Design of Connections - Application using STAAD, SAP.

Module 2

Pre-Engineered Metal Buildings: Introduction - Loads - Metal cladding - Design of cold formed secondary framing - Optimization design of main frames - Wind bracing - Frame connections (haunch, ridge) - Column base connections (fixed, pinned) - Application using STAAD, STRAP.

Module 3

Multi-storey Buildings: Introduction - Anatomy of structure - Loads - Design of columns - Design of composite beams - Design of composite floor - Bracings – Connections - Application using STAAD, STRAP.

Module 4

Space Frames: Introduction - Structural types - Loads - Design of single layer barrel vault - Design of single layer dome - Design of double layer flat - Design of node connectors - Application using STAAD, SAP.

Module 5

Construction: Tolerances: Fabrication tolerances - Erection tolerances, Fabrication: Economy - Shop activities - Quality management, Erection: Method statement - programme – Machineries, Fire Protection: Regulations - Structural performance - Methods of protection, Corrosion Resistance: Corrosion process - Effect of environment - Protection methods.

References

1. Ram Chandra, Design of Steel Structures, Vol. II, Standard Book House, New Delhi.
2. Alexander Newman, Metal Building Systems: Design and Specifications,
3. Graham W. Owens, Peter R. Knowles, Steel Designers Manual, Blackwell Scientific Publications, Oxford, ISBN 0-632-03881-0.
4. Ramamrutham S., Design of Steel Structures, Dhanpat Rai Publishing Co., New Delhi, 2001, ISBN 81-87433-36-1.
5. Ramaswamy G. S., Suresh G. R., Analysis, Design and Construction of Steel Space frames, Thomas Telford Ltd., 2002, ISBN 0-7277-30142.
6. Edwin H. Gaylord, Jr., Charles N. Gaylord, Design of Steel Structures, McGraw-Hill, Inc., Singapore, ISBN 0-07-112623-6.
7. IS: 800 - 1984, Use of Structural Steel in General Building Construction, BIS, New Delhi.

8. IS: 802, Use of Structural Steel in Overhead Transmission Line Towers, BIS, New Delhi.
9. IS: 875 - 1987, Code of practice for Design Loads (Parts I, II & III), BIS, New Delhi.
10. IS: 806, Code of practice for use of Steel Tubes in General Building Construction, BIS, New Delhi.
11. IS: 1161, Specification for Steel Tubes for Structural Purposes, BIS, New Delhi.

HIGHWAY AND AIRFIELD PAVEMENTS (ELECTIVE - II)

C805-4 **3+1+0**

Module 1

Pavement types: stress distribution in pavements - theoretical subgrade conditions and traffic loadings Basic difference between flexible and rigid pavements - design factors - wheel load - equivalent single wheel load - repetition of loads - elastic modulii - climatic variations.

Module 2

Design of flexible pavements: group index method - CBR method - IRC recommendations - Me Load method - Burmister's layer theory.

Module 3

Design of rigid pavements: radius of relative stiffness - critical load positions - Westergaard's stress equation - Bradley's stress coefficients - design charts.

Module 4

Temperature stresses in concrete pavements: Westergaard's concept - wrapping stress - functional stress - combination of stresses.

Design of joints in concrete pavements: expansion joints - construction joints - design of dowel bars - tie bars - IRC recommendation.

Module 5

Evaluation of pavement condition: pavement instrumentation - types of pavement distress - roughness and skid resistance. Environmental influence and effects- pavements maintenance and overlays.

References

1. Bindra B.S, Highway Engineering, Danpat Rai and Sons.
2. H.J.Yoder, Principles of Pavement Design, John wiley and sons
3. Khanna O.P, Justo C.G., Highway Engineering, Nem Chand Publishers
4. IRC Standard specifications for Construction of Flexible and rigid pavements

ADVANCED FOUNDATION DESIGN (ELECTIVE - II)

C805-5 **3+1+0**

Module 1

Machine foundations: basic theory of vibrations-free and forced vibration of single degree of freedom with and without damping-two degrees of freedom with and without damping-dynamic soil properties-mass spring model and constants-elastic half space approach-determination of dynamic soil constants in laboratory and field based on IS code provisions. Modes of vibration of block foundation – natural frequency of foundation of soil system by Barkan's approach-methods of analysis-Barkan's method. Vertical translations, sliding, rocking, yawing (IS code method)

Module 2

Design of machine foundations: Static and dynamic design criteria-permissible amplitude of vibrations for different types of machines. Foundations for reciprocating machines- design criteria- calculation of induced forces and moments- multi cylinder engines-Foundations subjected to impact type of forces (hammer)-design data-design criteria-vibration isolation.

Module 3

Sheet Pile walls and Cofferdams: types and uses of sheet piles-design of cantilever sheet pile walls in granular and cohesive soils-anchored bulkhead-free earth support and fixed earth support method-coffer dams-uses- braced and cellular cofferdams.

Module 4

Special Foundations: Foundation for special structures such as water tanks, silos, cooling towers, guyed structures, ground storage tanks, chimneys, telecommunication towers, transmission line towers-foundation for under ground conduits- foundation for coastal and offshore structures-pre-stressed foundations. Shell Foundations-structural form and efficiency-different types.

Module 5

Foundations in Special soils: Foundation in expansive soil, soft and compressible soils, problems associated with foundation installation- ground water lowering and drainage- shoring and underpinning-different methods-damage and vibrations due to constructional operations

References

1. Bowles.J.E, Foundation Analysis and DesignMc Graw Hill Publishing Company.
2. N.P.Kurian, Modern foundations Tata Mc Graw Hill Publishing company
3. Srinivasulu P, Vaidyanathan C.V Handbook of Machine foundations
4. IS 2974-part I toV.
5. IS 5249

INDUSTRIAL WASTE ENGINEERING (ELECTIVE - II)

C805-6 **3+1+0**

Module 1

Introduction: Environmental pollution - Magnitude of the industrial waste problem in India - damage caused by industrial waste pollution. Effect of industrial wastes on streams and sewerage systems**:** Computation of organic waste loads on streams - Streeter phelps, Churchill and Thomas methods.

Module 2

Stream sampling**:** stream protection measures - effluent and stream standards. Characteristics of industrial wastes**:** physical, chemical and biological. retreatment of industrial wastes**:** waste volume reduction, waste strength reduction - neutralization, equalization and proportioning.

Module 3

Theories of treatments processes**:** removal of suspended solids by sedimentation and flotation, removal of colloidal solids by coagulation - removal of inorganic solids by evaporation & ion exchange. Removal of organic solids**:** lagooning, activated sludge treatment - extended aeration, step aeration, trickling filters. High rate anaerobic treatment - up flow and down flow filters; up flow anaerobic sludge blanket reactor - Disposal of sludge solids. Joint treatment of treated and untreated wastes with domestic sewage - discharge of raw and treated wastes to streams.

Module 4

Major industrial Wastes and their treatment**:** pulp and paper industry - oil refinery - textile industry - tannery.

Module 5

Treatment of industrial waste: canning - dairy - sugar - distillery.

References

1. M Narayana Rao, Waste water treatment, Rational methods of design and Industrial practice, Oxford & IBH Publishing Co. Pvt. Ltd, Bombay.
2. Nelson Leonard Nemerow, Theories and practices of industrial waste treatment, Addison-Wesley Publishing Co., Inc.
3. C Fred Gurnham, Principles of industrial waste treatment, John Wiley & Sons, Inc., New York.
4. W Wesley Eckenfelder Jr., Industrial water pollution control, International Edition, Mc Graw Hill Inc, New Delhi.

5. Hardam Singh, Industrial Waste water management Hand Book, Mc Graw Hill, NewDelhi.

ADVANCED HYDROLOGY (ELECTIVE - II)

C805-7 **3+1+0**

Module 1

Introduction: Hydrologic cycle-history of hydrology - application in engineering: water resources in the world - water resources in India. Weather and hydrology: Thermal circulation - effects of earth's rotation - effect of' land and water distribution - migratory systems - fronts - measurement of temperatures - Lapse rate of temperatures - geographic distribution of temperatures - time variations of temperatures - properties of water vapour- Measurement of humidity - geographic distributions of humidity - time variations in humidity-geographic variations of wind - time variations of wind - scanning and predicting weather.

Module 2

Precipitation: types of precipitation - measurement of precipitation recording gauges - automatic gauges radars -estimation of missing data and adjustment of records - mean areal depth of precipitation -rain gauge network- design principles-depth area duration curves - Hectograph and mass curve of rainfall - analysis of rainfall data - moving average curves - design storms - probable maximum precipitation curves snowfall and measurement. Determination of snowmelt. Water Losses:.Evaporation-evaporation pans – evapometre, control of' reservoir evaporation - soil evaporation - transpiration - estimation of evapo transpiration - infiltration - infiltration curves - determination of infiltration-irifiltration indices - water shed leakage - water balance.

Module 3

Runoff: Catchment characteristics - classification of streams - factors affecting-run off, run off estimation by empirical formulae, curves infiltration method, rational method, overland flow hydrograph and unit hydrograph, method. Hydrographs**:** Separation of stream, flow components - hydrograph separation - unit hydrograph - assumption - derivations of unit hydrograph - unit hydrograph of complex storms - instantaneous unit hydrograph - synthetic unit hydrograph. .

Module 4

Floods: Definition of standard project flood - maximum probable flood - probable maximum precipitation and design flood - estimation of peak flood-flood control. Measures - flood forecasting techniques- flood routing - analytical and graphical methods of flood routing. Sedimentation: The erosion process - factors controlling erosion - suspended load, bed load - estimation of sediment load (basic principles and statement of important.equations only) measurement of sediment load - reservoir sedimentation - control of reservoir sedimentation.

Module 5

Probability analysis of hydrological data**:** mean, median, mode, mean-deviation, standard deviation, variances and skewness of data normal, gamma, poisons, log normal and pears and type III distributions - flood, frequency by fuller's, Gumbel's, Powel and Ven Te chow methods.

Mathematical models in hydrology**:** definition of stochastic models, deterministic models-conceptual models and empirical models- optimisation of models and efficiency of models - method of determining 1UH by the s-curve hydrograph, convolution integral and conceptual models - synthetic stream flow - flow at ungauged sites - by multiple regression - reservoir mass curve - flood forecasting.

References

1. H. M.Reghunath, Hydrology, Wiley Easten Ltd., New Delhi.
2. Santhosh Kumar Garg, Hydrology and flood control engineering, Khanna Publishers
3. R.K. Linsley, M. A. Kholar, Hydrology for engineers, Tata Mc Graw Hill.

APPLIED GEOLOGY (ELECTIVE - II)

C805-8 **3+1+0**

Module 1

Plate tectonics: Plate tectonics and drift of continents-Pangaea and drift of Indian plate-formation of Himalayas-Tectonic frame work of South India - Tectonic movements-their significance-methods of detecting tectonic movements - radar interferometry & global positioning system.

Earthquake: Earthquakes in relation to plate tectonics-global seismic belts - seismic zones of Inida-seismicity of South India-earthquakes in Kerala - earthquake resistant structures-prediction of earthquake-defusing earthquake-Reservoir induced seismicity.

Module 2

Structural geology: Clinometer & Brunton compass-Measuring of strike and dip using clinometer/Brunton compass-Basic idea of toposheets-Lineaments-definition-singificance-techniques of identifying lineaments-major lineaments in South India and Kerala.

Remote sensing: Basic concepts-electromagnetic radiation, spectral windows, spectral signatures, sensors, false colour images, geocoded images.

Remotesensing satellites-Landsat.

Aerial photography: Basic concepts-stereopairs, stereoscopic vision, stereoscope-Limitations of aerial photography.

Applications: Interpretation of imageries (brief description only). Application of satellite imageries and aerial photographs in geological and hydrogeological studies.

Module 3

Hydrogeology - General: Groundwater-importance and availability-Aquifers-confined and unconfined-Artesian wells-Geologic formations as aquifer-laterite-sandy layers-weathered rock-fractured crystalline rock- their distribution in Kerala-Structures used for tapping groundwater-Open well, Bore well, Tube well & Filterpoint well (construction techniques not expected). Saline water intrusion.

Module 4

Hydrolgeology - Groundwater exploration techniques: Hydrogeological, geophysical & geobotanical methods-Geophysical method-resistivity survey-Wenner and Schlumberger configurations-interpretation of resistivity curve-curve matching technique.

Groundwater recharge: Natural & artificial. Structures used for artificial recharge-checkdams, subsurface dams, open well & bore well. Selection of site for subsurface dams-salient features.

Module 5

Practical Work: Identification of important rock forming **minerals**: 1.Quartz, 2.Feldspar, 3.Hypersthene, 4.Auguite, 5. Hornblende, 6. Biotite, 7.Muscovite, 8.Olivine, 9.Garnet, 10.Fluorite, 11.Tourmaline, 12.Calcite, 13.Kyanite, 14. Kaolin, 15. Serpentine. Identification of common **rock types**: Igneous rocks: 1. Granite, 2. Syenite, 3. Diorite, 4. Gabbro, 5. Peridotite, 6.Dolerite, 7.Basalt, 8.Pegmatite.Sedimentary rocks: 1.Conglomerate, 2.Breccia, 3.Sandstone, 4.Limestone, 5.shale.Metamorphic rocks: 1. Gneiss, 2. Schist, 3. Slate, 4. Marble, 5. Quartzite, 6. Augen gneiss, 8. Mylonite, 9. Pseudotachyllite. Special Indian rock types: 1. Charnockite, 2. Khondalite, 3. Laterite.

Recommended Field work: Field trips to learn identification of faults/lineaments in the field and groundwater exploration techniques.

References

1. Arthur Holmes, Physical geology, Thomas Nelson.
2. Arthur D. Howard, Geology in environmental planning, McGraw Hills, New Delhi.
3. M.P.Billings, Strucutural geology, Asia Publishing house, New Delhi.
4. N.W. Gokhale, A manual of problems in structural geology, CBS Publishers & distributors, New Delhi.
5. Thomas M. Lillesand & Raiph W. Kiefer, Remotesensing and image interpretation, John Wiley Sons, New York.
6. K.K.Rampal, Text book of photogrametry, Oxford & IBH Publishing company, New Delhi.
7. David Keith Todd, Groundwater hydrology, John Wiley & sons, New York.

8. H.M. Regunath, Groundwater, Willey Eeastern Ltd.
9. HH.Read, Rutleys elements of mineralogy, George Allen & Unwin Ltd, London.
10. G.W.Tyrell, Principles of petrology, B.I. Publications, Bombay.
11. E.G. Ehler & H. Blatt, Petrology-igneous, sedimentary & metamorphic, CBS Publishers & distributors, Delhi.

STRUCTURAL DYNAMICS AND STABILITY ANALYSIS (ELECTIVE - III)

C806-1 **2+1+0**

Module 1

Introduction-problems in nature-steady state problem-dynamic problem-stability problem (Eigen value problem)-introduction to dynamic loading-D'Alembert's equation of equilibrium-inertia force-effect of damping-Hamilton's principle.

Module 2

Single degree of freedom system-idealisation-free vibration-natural frequency-resonance-forced vibration-lumped mass-consistent mass.
solution techniques-determinant search procedure-Householders method

Module 3

Introduction to stability analysis-energy principles-stable, unstable and neutral equilibrium-fourth order differential equation for generalized bending problems-elastic instability of columns-Euler's theory-assumptions-limitations. General treatment of column stability problem as an Eigen value problem-various modes of failure for various end conditions- both ends hinged-both ends fixed-one end fixed other end free- one end fixed other end hinged

Module 4

Beam column-beam column equation-solution of differential equation for various lateral loads-udl and concentrated loads-solutions for various end conditions-both ends hinged-both ends fixed-one end fixed other end free- one end fixed other end hinged.

Module 5

Finite element application to dynamics-element stiffness matrix and mass matrix of a beam element. Finite element application to stability analysis- finite element stability analysis-element stiffness matrix –geometric stiffness matrix-derivation of element stiffness matrix and geometric stiffness matrix for a beam element.

References

1. Ray W Clough, Joseph Penzien, Dynamics of structures, Mc Graw Hill, Kogabusha Ltd.
2. Ziegler H, Principles of structural stability, Blarsdell, Wallham, Mass, 1963.

3. Thompson J M, G W Hunt, General stability of elastic stability, Wiley, New York.
4. Timoshenko, Gere, Theory of elastic stability, Mc Graw Hill, New York.
5. Don O Brush, B O O Almorth, Buckling of Bars, plates and shells,
6. Cox H L, The buckling of plates and shells, Macmillam, New York, 1963.
7. O C Zienkiewicz ,.Finite Element Method ,fourth Edition,McGraw Hill,
8. R.D.Cook, Concepts and Applications of Finite Element Analysis, John Wiley &Sons.

INTERNET PROGRAMMING AND JAVA (ELECTIVE - III)

C806-2 **2+1+0**

Module 1

Internet: Definition-principles of internet working-protocols TCP/IP.
E-mail- architecture and services. World wide web- definition- linking of documents in www-URL-DNS. Major categories of websites over Internet. HTML-Tags and writing pages.

Module 2

Importance of Java – advantages - method of byte codes - object oriented programming concepts in Java-data types – variables – arrays – operators - control statements.
Classes: Overloading – inheritance - packages and interfaces - exception handling-built in exceptions.

Module 3

Threads: Multi threading-string handling-an overview of important packages and interfaces used in Java-Java.util, Java.io.

Module 4

Applet: applet class-event handling-overview of event classes.
AWT: working with windows-graphics-text-AWT controls-layout managers-menu-images.

Module 5

Databases-JDBC connectivity- introduction to swing, RMI, servlets, COM, CORBA, Java Beams.

References

1. MK Goel, Internet,
2. Herbert Schildt, Java the complete reference, Tata Mc Graw Hill.
3. Steven Holzner, Java 2 Black book, Wiley Dreamtech
4. Joseph L Weber, Using Java, Prentice Hall India New Delhi.
5. James Gosling, Java Programming.

TRAFFIC AND TRANSPORTATION PLANNING (ELECTIVE - III)

C806-3 **2+1+0**

Module 1

Statistical methods for Traffic Engineering: definition and probability - probability distribution – Poisson, Binomial and normal distribution. Applications in traffic engineering: sampling theory and significance testing - linear regression and correlation - simple problems.

Module 2

Systems approach to transport planning: stages in transport planning - trip generation - introduction and definitions – factors affecting trip generations and attraction - Multiple linear regression analysis - category analysis - Modal split analysis.

Module 3

Trip Distribution: growth factor methods - synthetic methods. Trip Assignment: purpose, general principle - assignment techniques.

Module 4

Parking: Parking problems - desirable parking space standards for different land use -common methods of on- street parking, off-street parking facilities, parking surveys.

Street illumination: Definition of common terms - types and location of lanterns on straight roads and junctions avoiding glare.

Module 5

Transportation Economics: Road user cost-Motor Vehicle operation cost - fixed and variable costs - road user benefits - principles of economics - analysis through annual cost - rate of return and benefit cost ratio methods - worked out problems.

References

1. Khadiyali L.R. Traffic Engineering and Transport planning, Khanna Tech Publishers
2. Hutchinson “Principles of Urban transport systems Planning
3. Martin & Whol Traffic system Analysis for Engineers
4. Donald Drew Traffic Flow Theory

ENVIRONMENTAL GEOTECHNICS (ELECTIVE - III)

C806-4 **2+1+0**

Module 1

Clay mineralogy and soil structure: Gravitational and surface forces-inter sheet and inter layer bonding in the clay minerals- Basic structural units of clay

minerals- isomorphous substitution – kaolinite mineral- montmorillonite mineral- illite mineral- electric charges on clay minerals – base exchange capacity- diffused double layer- adsorbed water- soil structure- methods for the identification of minerals (introduction only).

Module 2

Effect of environment on Geotechnical properties of soils: Effect of drying on Atterberg limits.-Volume change behaviour- factors controlling resistance to volume change- general relationship between soil type, pressure and void ratio.- importance of mineralogical composition in soil expansion. Activity- sensitivity- causes of sensitivity-influence of exchangeable cations, pH and organic matter on properties of soils. Permeability of soils- hydraulic conductivity of different types of soils – Darcy's law and its validity- factors affecting permeability

Module 3

Wastes and Contaminants (introduction only): sources of wastes-types of wastes- composition of different wastes- characteristics and classification of hazardous wastes- generation rates- ground water contamination- sources of ground water contamination- transport mechanisms-potential problems in soils due to contaminants.

Module 4

Disposal and containment technics: Criteria for selection of sites for waste disposal- hydrological aspects of selection of waste disposal sites- disposal facilities- subsurface disposal technics-disposal systems for typical wastes (sketches only)

Module 5

Containment control systems- liners and covers for waste disposal- rigid liners- flexible liners. Ground modification technics in waste management – waste modification- ground modification- mechanical modification-hydraulic modification- chemical modification.

References

1. Mitchell, J (1976), " Fundamentals of soil behaviour", John Wiley and sons, New York
2. Lambe, T. W & Whitman, R. V (1979), " Soil Mechanics ", John Wiley and Sons, New York.
3. Gopal Ranjan & A.S.R Rao (1991), " Basic and Applied Soil Mechanics, Wiley Eastern Ltd., New Delhi.
4. Wilson, M. J (1987), " A Hand book of Determinative methods in Clay Mineralogy", Chapman and Hall, New York.
5. Robert M. Koerner (1984), "Construction and Geotechnical methods in Foundation Engineering", McGraw Hill Book Co., New York.

6. Yong R. N. (1992), " Principles of contaminant Transport in Soils, "Elsevier, New York.
7. Ramanatha Iyer T. S (2000), "Soil Engineering Related to Environment", LBS centre.

SOIL STABILITY ANALYSIS (ELECTIVE - III)

C806-5 **2+1+0**

Module 1

Ground water seepage- Laplace's equations for two dimensional flow- quick sand condition- construction of flownets- confined and unconfined flow-seepage in anisotropic soil conditions-piping-design of filters.

Module 2

Stability of earth slopes-modes of slope stability- analysis of slope stability problems- Swedish circle method- Friction circle method- Taylor's stability chart- Bishop's method- stabilization measures- instrumentation.

Module 3

Landslides: Introduction- movements associated with landslides-causes of landslides-consequences, classification and analysis of landslides-investigation of landslides-instrumentation-methods of preventing landslides.

Module 4

Earthquake effects on soil foundation system: earth quakes- ground shaking-liquefaction- ground deformations-seismic provisions in building codes

Module 5

Underpinning: Introduction-reasons-pit underpinning-pile underpinning-driven underpinning piles-shoring-special underpinning methods-moving structures

References

1. Hans.F.Winterkorn and Hsai Yang Fang Foundation Engineering handbook - Van Nostrand Reinhold Company
2. Bowles E.J. Foundation analysis and Design. Mc Graw Hill Publishing Co.
3. Gopal Ranjan and A.S.R.Rao Basic and applied Soil mechanics New Age International Publishing Company
4. Donald.P.Coduto Geotechnical Engineering –Principlesand practices, Prentice Hall India

ENVIRONMENTAL IMPACT ANALYSIS

C806-6 **2+1+0**

Module 1

Concepts of environmental impact analysis-Environmental protections, legislations, laws and Acts-air quality legislation-energy legislation-fish and wild life resources legislation-historical preservation legislation-factors for consideration in assessing environmental impact concept-short term vs. long term effects.

Module 2

Socio impact analysis-physical, social, aesthetic and economic environment-examples of types of socio impact analysis.

Module 3

Air quality impact analysis-air pollutants-sources-atmospheric interactions-environmental impact-assessment methodology, case studies. Noise impact analysis-effects of noise on people-estimating transportation noise impact-examples

Module 4

Water quality impact analysis-water quality criteria and standards-modelling-water quality impact by projects like High ways, power plants, agriculture and irrigation, forest management, vegetation and wild life impact analysis.

Module 5

Assessment methodologies-impact on biota-summerisation of environmental impact-checklist method.

References

1. John G Rau, David C Wooten, Environmental impact Analysis Handbook, Mc Graw Hill Book Company, New Delhi, 1980.

ENVIRONMENTAL ENGINEERING LAB

C807 **0+0+3**

1. Determination of (a) solids - total, suspended, dissolved, fixed, volatile, settleable SVI.
2. pH Value.
3. Conductivity.
4. Chemical oxygen demand.
5. D. 0. and Biochemical Oxygen Demand.
6. Jar test and Turbidity.
7. Chlorine demand and residual chlorine.

8. Determination of iron.
9. Determination of sulphates.
10. Acidity and Alkalinity.
11. Hardness.
12. Nitrogen - various forms.
13. M. P. N. Fecal coliforms using A-l medium.
14. Measurment of smoke density for diesel vehicles.
15. Measurment of H C and CO of exhaust from petrol driven vehicles.
16. Measurment of suspended particulate matter in ambient air.

PROJECT / SEMINAR

C 808 **0+0+4**

Each student is required to present a technical paper on a subject approved by the department. The paper should in general reflect the state of the art. He/she shall submit a report of the paper presented to the department. In addition to the seminar he/she shall undertake a project work (as a team or individually) in the 7th semester itself in consultation with the guide(s). On completion of the project work, he/she shall present the work done before a panel of staff members, and submit a report of the project work done to the department.

VIVA -VOCE

C809

A comprehensive Viva-voce examination will be conducted to assess the student's overall knowledge in the specified field of engineering. At the time of viva-voce, certified reports of seminar and project work are to be presented for evaluation.