COURSE WORK SYLLABUS FOR CIVIL ENGINEERING

Subject code:18SPHDCV01

STRUCTURAL ENGINEERING

Module 1

Concrete as construction material, mix design of light weight concrete, Ferro cement, crackingmoment and design of Ferro cement elements under tension, Fibre reinforced concrete,polymers in concrete, RPC,SCC,FRSCC and whisper concrete. High density and high strengthconcrete. --8 hrs

Module 2

Review of design philosophy, properties of structural concrete, behavior of members in flexure,axial load, shear and torsion, bond and anchorage, cracking, codal provisions, ductility, detailingprocedure,Prestressed concrete, ultimate strength in flexure, shear, torsion and combined loading,deflections and crack widths. Continuous beams and portal frames. --12 hrs

Module 3

Analysis of stresses, analysis of strain, stress-strain relations, extension, torsion and flexure of beams, Principal stresses and strains, two & three dimensional elasticity problems, theory of plasticity, yield criteria, Prandtl-Reuss Equation, --8 hrs

Module 4

Matrix formulation in structural dynamics, lumped and consistent mass matrices, condensation
of stiffness matrices. Analysis of normal modes. Modal superposition and direct integration for
dynamic response. Transfer matrices. --11 hrs

Module 5

Discrete and continuous structures, Force and displacement method of structural analysis,
Different types of finite elements in elasticity, beams, plates and shells. Application to dynamic
and nonlinear problems. Discussion of matrix manipulations and accuracy --11 hrs

References:

1. "**Concrete Technology**" - Theory and Practice, M.S.Shetty, S.Chand and Company, New Delhi

2. "Properties of Concrete"-Neville, A.M. : , ELBS, London

3. "Reinforced concrete Design"-by Pallai and Menon, TMH Education Private Limited

4. "Reinforced Concrete Structures", Volume 1, Dr. B. C. Punmia, Ashok Kr. Jain, Arun Kr. Jain,

5. "Pre-stressed Concrete"- N. Krishna Raju - Tata Mc. Graw Publishers

6. "Pre-stressed Concrete"- P. Dayarathnam : Oxford and IBH Publishing Co.

7. "Design of pre-stressed concrete structures"- T.Y. Lin and Ned H. Burns - John Wiley & Sons, New
York.

8. "Structural Dynamics of Earthquake Engineering", S Rajashekharan, CRC Press

9. "Structural Dynamics: Theory and Computation", By Mario Paz, William E. Leigh, Kluver Academic
Publishers

10. "Structural Dynamics"- Clough &Penzen : TMH.

11. "Theory of Elasticity" - International Students-Timoshenko. S.P. and Goodier. J.N. - Edition, McGraw
Hill Book Co. Inc., New Delhi.
12. Advanced Mechanics of Solids- Srinath.L.S. : Tata McGraw Hill Publications Co.Ltd., New Delhi.
13. "Finite Element Analysis for Engineering and Technology"- Chadrupatla, Tirupathi R., University
Press, India
14. "The Finite Element Method"- Zienkeiwicz. O.C. - Tata McGraw Hill Co. Ltd., New Delhi.

Subject code:18SPHDCV02

GEOTECHNICAL ENGINEERING

Module-I:

Basics of Soil Mechanics

Origin of soils, soil classification, three-phase system, fundamental definitions, relationship andinterrelationships, permeability & seepage, effective stress principle, Stability of slopes by variousapproaches, Compaction of soils: , methods of compaction (static, kneading, impact andvibration). IS light and heavy compaction tests. . Factors affectingcompaction.Fieldcompaction equipment and their suitability.Control of field compaction. Consolidation ofsoils,Terzaghi's theory of one dimension consolidation with final solution form Coefficient ofconsolidation and factors affecting it. Degree and rate of consolidation. Approximate theoreticalrelation between degree of consolidation and time factor, consolidation test as per latest relevantIS code. Shear strength of soils **– 10 hours.**

Module-II:

Analysis and design of Foundations: Shallow Foundation: proportioning anddesign of strip, spread, rectangular, trapezoidal, combined footings, raftfoundation& pile and raft foundation, modulus of subgrade reaction.

Deep foundation: classifications, load carrying capacity, static method for drivenpiles in sand and clay, negative skin friction, dynamic formulae, pile group, groupefficiency, under reamed piles, pile load test (static, dynamic), Pile integrity test,concept of batter piles.Drilled pier, Caissons, well foundation **– 12 hours**.

Module-III:

Earth retaining structures:

Introduction, Active and passive earth pressures, earth pressure at rest. Rankine's theory for the determination of active and passive earth pressure, coefficient of earth pressure,earth pressure distribution, total earth pressure and its point of application, , Coulombs theoryof Active and Passive earth pressure, Culman's and Rebhann's graphical methods Stability ofslopes, Factor of safety, slope, toe and base failure of finite slopes, Analysis of stability of slopesby method of slices, Taylor's stability number. nEffective, neutral and total stresses inhomogeneous soils - – **10 hours.**

Module- IV:

Reinforced soil structures and geotextiles:

Introduction to reinforced soil structures, comparison with reinforced cement concrete structures.Principles, concepts and mechanisms of reinforced earth. Materials used, properties, laboratory testing and constructional details, metallic strips, metallic grids, geotextiles, geogrids, geomembranes and geocomposites, their functions and design principles. Design applications of reinforced soil structures in pavements. Embankments, slopes, retaining walls and foundations. Reinforced soil structures for soil erosion control problems. Case studies of reinforced soil structures, discussion on current literature.

– 10 hours.

Modules-V:

Soil Dynamics

Single degree, Two degree and Multi degree of freedom system, Free and forced vibration, Transient response, Resonance and its effects, wave propagation – theory and application to dynamic problems. Dynamic soil properties – General, laboratory and field methods, factors affecting different properties, vibration inducing and measuring instruments. Shear strength and Liquefaction of soils – Stress – Strain and Strength characteristics of soils under dynamic loads, factors affecting, Resonance column test, Triaxial tests under dynamic loads,

Liquefaction of soils and factors influencing liquefaction, Dynamic earth pressure, retaining wall problems under dynamic loads. General principles of Machine foundation design – Introduction, Design criterion, types and requirements of Machine foundation.

-08hours

References:

1. Soil mechanics and foundations by B.C. Punmia, Laxmi publications Ltd. New Delhi.
2. Soil mechanics in engineering practice by Terzhaghi and Peck
3. Bowles. J. E. "**Foundation Analysis and Design**", 5th edition, The McGraw-Hill Companies, Inc, New York, 1996.
4. Koerner, R.H. Designing with geosythetics, Prentice Hall Inc, 1994.
5. Jones, C.J.E.P. Reinforcement and soil structures, Butterworth Publications, 1996.
6. Jewel, R.A. Soil reinforcement with geotextiles, CIRIA, 1996.
7. Ingold, J.S. and Miller, K.S., Geotextiles hand book, Thomas Telford Ltd, 1988
8. Swami Saran " Soil dynamics and Machine foundation" Golgotia (1999)
9. Kramer, S.L. (1996), "**Geotechnical Earthquake Engineering**", Prentice Hall, New York

Subject code:18SPHDCV03

Environmental Engineering and Management

Module - I

ENERGY & ENVIRONMENT- Global energy, Environmental resources, Energy consumption, needs and crisis.Energy production, utilization, Laws and Principles, Renewable sources &Non renewable sources of energy,Concerns about change in global temperature, Regional impacts of temperature change.

ENVIRONMENTALIMPACT ASSESSMENT-Developmental Activity and Ecological factors. EIA, EIS, FONSI, Base lineinformation, Frame work of Impact Assessment, development projects in environmental setting. Objective,limitations, methodologies & techniques of EIA. Assessment and Prediction of impacts, Public participationsystem, Environmental parameter – Activity relationships – matrices. EIA for various projects. 08 Hrs

Module - II

ENVIRONMENTAL PLANNING AND MANAGEMENT

Concept of Carrying capacity, Carrying capacity based regional planning, Engineering Methodology in Planningand its Limitations, Environmental Protection, Engineering Economics, Cleaner Technologies and their roles inEnvironmental Protection. TQM in Environmental Management and Protection – ISO 14000 Series of Standards.Environmental Audit.

TRANSPORT PROCESS AND MODELING IN AQUATIC SYSTEMS

Models as Comprehensive tools in Environmental Management Diffusion and dispersion – Molecular turbulent andshear diffusion, Fick's laws of diffusion and convective – diffusion equations flow regimes. Water qualitymodeling. Models for decaying pollutants in rivers. Streeter- phelps equation, Data collection. Estimation ofparameters. Calibration and verification of 1-D Oxygen model. Error measures. Mixing Zones in rivers.

Parameterestimation, Mixing coefficient. Dissolved Oxygen models for lakes , Ocean disposal of wastewater. Ground waterquality modeling concepts, Non point sources of pollution, Field data gathering and parameter estimation.Ecosystem model. 12 Hrs

Module - III

WASTEWATER TREATMENT ENGINEERING

Determination of kinetic coefficients. Fundamentals of process analysis, Mass balance analysis, Reactors and theirhydraulic characteristics, Reaction Kinetics & Reactor selection, . Physical, Chemical & Biological treatment ofwastewater, Treatment & disposal of sludge, Advanced wastewater treatment process, Waste treatability studies.

INDUSTRIAL WASTEWATER TREATMENT

Effects of Industrial Wastes, Effluent standards and stream standards.. Industrial Waste survey. Material balance,Sampling, Biomonitoring. Pretreatment of Industrial Wastewater-Wastewater Treatment in industries, Ultimatedisposal of Industrial Wastewater, effects of waste additions on physical and chemical properties of soil, Design ofcomplete treatment system, Environmental Auditing, Financial and Managerial opportunities. 10 Hrs

Module - IV

ATMOSPHERIC ENVIRONMENTAL POLLUTION AND CONTROL

Different Classification of air pollution sources, Characterization and sampling of atmospheric pollutants,Analytical methods, Effects of Air Pollutants, Smog, National ambient Air quality standards, criteria and indices,Air Pollution laws. Meteorology, General Characteristics of stack emission, plume behavior, Heat island effect, AirQuality Modeling: Particulates: Collection mechanism and efficiency, Particulate Pollution Control equipment, General Control of gases and vapours. Noise pollution.

ENVIRONMENTAL GEO-TECHNIQUES

Source, Production and Classification of Wastes; Soil Pollution Processes Physical-chemical and BiologicalInteraction in Soil, Effects on geotechnical Properties, Waste Disposal Facilities, Barrier systems-Basic concepts,design and construction, stability, compatibility and performance; contaminant Transformations and Transport insubsurface, Reuse of waste Materials, Contaminated site remediation. 12 Hrs

Module - V

REMOTE SENSING & GIS IN ENVIRONMENTAL ENGINEERING

Remote sensing in Environmental Engineering Basics of Remote sensing Techniques –Data Acquisition andInterpretation – Visual and digital interpretation – Application of remote sensing techniques to management ofWater resources. Monitoring of quality of environment, land use pattern studies. GIS – Concepts and spatialMethods. GIS, Data acquisition, Data processing, storage and retrieval, Computer Fundamentals of GIS and datastorage character files and binary files, file origination liked list, chains trees. GIS and Remote sensing data integration techniques in spatial Decision support system, land suitability, New work analysis virtual GIS. GIS insolid waste transport, re-modelling of distribution systems and Ground water, Vulnerabilty. 8 Hrs

REFERENCES:

1. Rao and Parulekar B.B., (1977), Energy Technology–Non-conventional, Renewable and Conventional",
2nd Edition, Khanna Publishers.
2. Wilber, L.C., (1989), "Handbook of Energy Systems Engineering", Wiley and Sons.

3. Nemerow N.N., (1971) – “Liquid Waste of industry theories, “Practices and Treatment. Addison Willey
New York.
4. Ross R.D. (1968)– “Industrial Waste Disposal”, Reinhold Environmental Series – New York.
5. Mahajan (1984) –” Pollution control in Process industries”. TMH, New Delhi.
6. Eckenfelder(2000)- “Industrial Water pollution Control”- McGraw hill Company, New Delhi American
Chemical Society, Washington D.C. USA
7. Jacobson. Z. A.(1999), Fundamental of Atmospheric modeling, Cambridge University Press, Cambridge.
8. Krogstad and Jacobsen, Dispersion of heavy gases, in encyclopedia of environmental control technologies,
edited by Cheremioinoff, Volume-2, Rulf publishing company, Houston.
9. Crawford Martin, “Air pollution control theory”, Tata McGraw- Hill publishing company Ltd. New Delhi,
1980.
10. Wark K., Warner C.F., and Davis. W.T., Air Pollution,(1998) “its origin and control”, Third Edition,
Harper and Row Publication.
11. Environment Impact Assessment – Larry W. Canter – McGraw Hill Publication.
12. Water and Wastewater Engineering Vol-II :- Fair, Geyer and Okun : John Willey Publishers, New York.
13. Waste Water Treatment, Disposal and Reuse : Metcalf and Eddy inc : Tata McGraw Hill Publications.
14. Thoman R. V. – Systems Approach to water quality management McGraw Hill –1980. 3. Biswas A. K. –
Models for water quality management – McGraw Hill 1980.
15. Rinaldi S. D.andSoncini, R- Modelling and Control of river water quality McGraw Hill – 1979.
16. Thomann and Mueller 1986., Principles of water quality management and control – Harper and Row pubs.
17. Perkins – Air Pollution
18. Kenneth Wark and Cecil F Warner – Air Pollution – its origin and control, Harper and Row, Publishers,
New York.
19. Odum – Fundamentals of Ecology – Addition Co.
20. Canter L – Environmental Impact Assessment McGraw Hill 1977.
21. Mall C.A.S. and Day J.W – Ecosystem modeling in theory and practice: An introduction with case NI
stories – John Willey.
22. Heer and Hagerty, Environmental Impact Assessment and statements. Van Nostrand and Reinhold Co.
1977.
23. Pater A BurraughRachalA Mc Donnas “Principle of GIS” (Oxford)
24. Christopher Jones “GIS and Computer Cartography”