Bachelor of Technology - Civil Engineering

Syllabus - First Semester

INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C

Course Code: CIV2105 **Credit Units: 03**

Course Objective:
The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure oriented programming language i.e. C.

Course Contents:

Module I: Introduction
Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.

Module II: Programming in C
History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.

Module III: Fundamental Features in C
C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.

Module IV: Arrays and Functions
One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations.
Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.

Module V: Advanced features in C
Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments.
Strings and C string library.
Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments.
File Handling.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- "ANSI C" by E Balagurusamy
- YashwantKanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, "C: The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.
- V. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.

References:

- ***Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.***
- ***J. B Dixit, "Fundamentals of Computers and Programming in 'C'.***
- P.K. Sinha and Priti Sinha, "Computer Fundamentals", BPB publication.

PROGRAMMING IN C LAB

Course Code:CIV2110 CreditUnits: 01

Software Required: Turbo C

Course Contents:

- C program involving problems like finding the nth value of cosine series, Fibonacci series. Etc.
- C programs including user defined function calls
- C programs involving pointers, and solving various problems with the help of those.
- File handling

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Syllabus - Second Semester

OBJECT ORIENTED PROGRAMMING IN C++

Course Code: CIV2203 CreditUnits: 02

Course Objective:
The objective of this module is to introduce object oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Contents:
Module I: Introduction
Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages. Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).

Module II: Classes and Objects
Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators.

Module III: Inheritance
Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hiérarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes.

Module IV: Polymorphism
Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.

Module V: Strings, Files and Exception Handling
Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:
Text:

- A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
- R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
- "Object Oriented Programming with C++" By E. Balagurusamy.
- Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

References:

- Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
- Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.

- YashwantKanethkar, “Object Oriented Programming using C++”, BPB, 2004

OBJECT ORIENTED PROGRAMMING IN C++ LAB

Course Code: CIV2206 CreditUnits: 01

Software Required: Turbo C++

Course Contents:

- Creation of objects in programs and solving problems through them.
- Different use of private, public member variables and functions and friend functions.
- Use of constructors and destructors.
- Operator overloading
- Use of inheritance in and accessing objects of different derived classes.
- Polymorphism and virtual functions (using pointers).
- File handling.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab

Syllabus - Third Semester

BUILDING TECHNOLOGY

Course Code: CIV2304 CreditUnits: 02

Course Objective:
The course covers building materials and their testing, cement and its applications foundation and structural members of building. Different areas and utilities of building like floors, doors etc.

Course Contents:
Module I
Building stones - Classification of rocks - Quarrying - Dressing - Properties and uses of common type of stones; Timber - Defects - Seasoning - Decay - Preservation - Plywood, fibre board, particle board; Clay products - Bricks - Manufacture - IS classifications - Properties and testing - Types of bricks - Tiles - Manufacture, properties and uses - Types of tiles; Ceramic products - Lime - Classification - Manufacture, properties and uses.

Module II
Cement - Ingredients - Manufacture - Types of cement - Properties and testing - Uses; Mortar - Sand - Properties - Types of mortar and uses; Concrete - Properties of fresh concrete and tests - Proportioning of concrete mixes - Properties of hardened concrete and tests – Recent developments in concrete; Iron and steel - Structural sections - Properties and uses of structural steel - Recent developments; Miscellaneous materials - Glass - Plastics -A.C.sheets – Thermocole.

Module III
Foundation - Timbering of foundation trenches - Bearing capacity of soils - Improvement of bearing capacity - Settlement of foundation - Description of spread, grillage, raft and pile foundations; Brick and stone masonry - Bonds in brick work - Types of stone masonry -Cavity walls - Lintels and arches; concrete construction - Batching, mixing, placing, compacting and curing of concrete - form work - Precast concrete - Prestressed concrete - Recent developments in concreting; Partition walls - Types and features.

Module IV
Floors and flooring – Different types and applications; Doors, windows and ventilators - Different types; Finishing works; Building Failures - Concrete failure - Steel failure -Foundation failure - Other types of failures – Causes and Remedial measures – Building repairs - Shoring - Underpinning – Scaffolding; Tall buildings - Framed structures - Steel and concrete frames – Joints in steel and concrete frames - Introduction to prefabrication – Slip form and lift slab constructions; Fire proof construction - Fire load - Fire resisting properties of building materials – Fire extinguishing methods – Fire proof construction methods.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Punmia B. C, Ashok Kr. Jain, Arun Kr. Jain, Building Construction, Laxmi Publications, New Delhi. (2008).
- Shetty M. S, Concrete Technology, S. Chand & Co., New Delhi (2008).

SURVEYING-I

Course Code: CIV2305 CreditUnits: 02

Course Objective:
Surveying is the basic element of mapping areas for civil engineering construction. Methods of surveying including leveling, and leveling methods, contours, estimation of volumes etc are covered.

Course Contents:

Module I
Introduction - classification of surveys - plane surveying - geodetic surveying – topographic surveying - reconnaissance - principle of working from whole to part - provision of control -conventional signs - chain survey - instruments - principles of chain survey - field book - plotting - tie line and check line - chaining and ranging - obstacles - chaining on sloping ground - errors in chain survey - uses of cross staff and optical square

Module II
Compass survey - prismatic compass - surveyor's compass - whole circle and reduced bearing- true and magnetic bearing - dip and declination - local attraction - traversing - plotting - error of closure - graphical and analytical adjustments - plane table survey - instruments and accessories - different methods - orientation - advantages and disadvantages of plane tabling -two point problem - three point problem - errors in plane tabling - minor instruments – hand levels - clinometer - Ceylon ghat tracer - hypsometer - pantagraph -ediograph - box sextant -telescopic alidade

Module III
Levelling - definition of level surfaces - mean sea level - reduced level - bench marks - levelling instruments - temporary and permanent adjustments - fly leveling - booking - reduction of levels - corrections for refraction and curvature - reciprocal leveling - longitudinal levelling and cross sectioning - contour survey - definition - characteristics of contour - uses of contour - methods of contouring - direct and indirect interpolation – plotting - areas and volumes - trapezoidal rule - Simpson's rule - area from latitude and departure - uses of planimeter - volumes - trapezoidal and prismoidal formula

Module IV
Total Station – introduction – EDM- measurement of horizontal & vertical angles – traversing – trigonometric leveling. Theodolite surveying - study of theodolite - temporary and permanent adjustments -measurement of horizontal angles - method of repetition and reiteration - measurement of vertical angles - theodolite traverse - calculation of co ordinates - corrections - traverse table - omitted measurements - tacheometric surveying - stadia system - fixed and movable hair methods - staff held vertical and normal - instrument constants - analytic lens – tangential system - direct reading tacheometer - subtense bar – trigonometric leveling

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- S.K Duggal, Surveying Vol 1 and II, 2nd ed., Tata - McGraw Hill, New Delhi (2004).
- Arora K.R., Surveying Vol I &II, Standard Book House, New Delhi (2008)
- Punmia, B.C., Ashok Kr. Jain, Arun Kr. Jain, Surveying Vol I & II, Laxmi Publications, New Delhi (2008).

STRENGTH OF MATERIALS

Course Code: CIV2312 CreditUnits: 04

Course Objective:
The objective of this course is to make the students understand the concept of stress and strain in different types of structure/machine under different loading conditions. The course also covers the simple and compound stresses due to forces, stresses and deflection in beams due to bending, torsion in circular section, strain energy, different theories of failure, stress in thin cylinder thick cylinder and spheres due to external and internal pressure.

Course Contents:
Module I: Simple stresses and strains
Concept of stress and strain; Hooke's law, Young's modulus, Poisson ratio, stress at a point, stress and strains in bars subjected to axial loading. Modulus of elasticity, stress produced in compound bars subject to axial loading. Temperature stress and strain calculations due to applications of axial loads and variation of temperature in single and compound walls.

Module II: Compound stress and strains
The two dimensional system; stress at a point on a plane, principal stresses and principal planes; Mohr's circle of stress. Graphical and Analytical methods for stresses on oblique section of body. Shear force and bending moment diagrams for cantilever, simply supported and overhanging beams.

Module III: Bending Stress
Theory of bending stresses in beams due to bending, assumptions in the simple bending theory, derivation of formula: its application to beams of rectangular, circular and channel sections, composite / flitched beams, bending and shear stresses in composite beams.

Module IV: Torsion
Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts torsional rigidity, combined torsion and bending of circular shafts principal stress and maximum shear stresses under combined loading of bending and torsion, analysis of close-coiled-helical springs.

Module V: Thin cylinders and spheres
Derivation of formulae and calculation of hoop stress, longitudinal stress in a cylinder and sphere subjected to internal pressure.

Module VI: Columns and struts
Columns and failure of columns, Euler's formulas; Rankine-Gordon's formula, Johnson's empirical formula for axially loaded columns and their applications**.**

Module VII: Slope and deflection
Relationship between moment, slope and deflection, Mohr's theorem; Moment area method; method of integration; Macaulay's method: Use of all these methods to calculate slope and deflection for the following:
a) Cantilevers
b) Simply supported beams with or without overhang
c) Under concentrated loads, uniformly distributed loads or combination of concentrated and uniformly distributed loads

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Jindal U.C., "Strength of Materials", Galgotia Publication, New Delhi, 1998.
- Ryder G.H., "Strength of Materials", Macmillan, Delhi, 2003.
- R.K. Bansal, "Strength of Materials", Laxmi Publication, New Delhi, 2001.

References:

- Sadhu Singh, "Strength of Materials", Khanna Publishers, New Delhi, 2000.
- Timoshenko S.P., "Elements of Strength of Materials", East-West affiliated, New Delhi, 2000.
- Hibbler R.C., "Mechanics of Materials", Prentice Hall, New Delhi, 1994.
- Popov Eger P., "Engg. Mechanics of solids", Prentice Hall, New Delhi, 1998.
- Fenner, Roger. T, "Mechanics of Solids", U.K. B.C. Publication, New Delhi, 1990.
- Srinath L.S. et.al., "Strength of Materials", McMillan, New Delhi,2001

CONCRETE TECHNOLOGY

Course Code: CIV2313 CreditUnits: 03

Course Objective: The students will be able to learn about the concrete making material materials, their significance and use. This will also enable the students to understand the manufacturing process of concrete and the precautions, various properties of concrete and different types of concrete and their application.

Course Contents:

Module I: Materials

Materials: cement - different types - chemical composition and physical properties - tests on cement - I.S. specifications - aggregates - classification - mechanical properties and tests as per I.S. - alkali aggregate reaction - grading requirements - heavy weight - light weight - normal weight - aggregate - sampling of aggregate - water - quality of water - permissible impurities as per I.S - admixtures - accelerators - retarders - water reducing agents – super plasticizers- use of silica fumes.

Module II: Manufacture

Manufacture of concrete - measurement of materials - storage and handling - batching plant and equipment - mixing - types of mixers - transportation of concrete - pumping of concrete - placing of concrete - under water concreting - compaction of concrete - curing of concrete - ready mixed concrete - mix design - nominal mixes - design mixes - factors influencing mix design - A.C.I method - I.S method - design for high strength mixes.

Module III: Properties of Concrete

Properties of concrete - fresh concrete - workability - factors affecting workability - tests for workability - segregation and bleeding - hardened concrete - factors affecting strength of concrete - strength of concrete in compression, tension and flexure - stress- strain characteristics and elastic properties - shrinkage and creep - durability of concrete - permeability - chemical attack - sulphate attack - resistance to abrasion and cavitaion - resistance to freezing and thawing - resistance to fire - marine atmosphere - quality control - frequency of sampling - test specimens - statistical analysis of test results - standard deviation - acceptance criteria

Module IV: Special Concretes

Special concrete - light weight concrete - high density concrete - vacuum concrete - shotcrete - Fibre reinforced concrete-polymer concrete - ferrocement - high performance concrete - self compacting concrete - types of failure - diagnosis of distress in concrete - crack control - leak proofing - guniting and jacketing techniques.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Neville A.M., Properties of Concrete, Pitman
- Shetty M.S., Concrete Technology, S I Chand & Company, 1993.
- Gambhir M.L., Concrete Technology, Tata McGraw Hill, 1995.
- Krishna Raju N., Design of Concrete Mixes, CBS publishers, 1988.
- Raina V.K., Concrete for Construction-Facts & Practices, Tata McGraw Hill publishing co. 1988.
- Murdock L.J., Concrete: Materials & Practice, Edward Arnold, 1968.

CIVIL ENGINEERING DRAWING LAB & CAD LAB

Course Code: CIV2307 CreditUnits: 01

Course Contents:

1. Paneled doors, glazed windows and ventilators in wood.
2. Steel and aluminum windows.
3. Steel roof trusses.
4. Reinforced concrete staircase.
5. Residential buildings with flat and pitched roof – RC and tiled.
6. Public buildings like office, dispensary, post office, bank etc.
7. Industrial buildings.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- National Building Code of India
- Local Building Bye-laws
- Callender, John Hancock, Time Saver Standards for Architectural design Data, Tata McGraw Hill.
- Chiara, Callender, John Hancock, Time Saver Standards for Building Type, McGraw Hill
- Chiara, Joseph De, Time Saver Standards for Site Planning, McGraw Hill
- Ching, Francis D K, Architectural Graphics. .John Wiley

STRENGTH OF MATERIALSLAB

Course Code: CIV2314 CreditUnits: 01

List of Experiments:

1. Universal Testing Machine
2. Tensile Test (MS)
3. Double Shear Test (MS)
4. Compression Test (CI)
5. BrinellHardness No.
6. Izod Impact
7. Testing Machine
8. Rockwell Hardness Tester
9. Spring Stiffness (Spring Compression Testing machine)
10. Torsion testing machine

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

BASICS OF NATURAL RESOURCES MANAGEMENT

Course Code: CIV2315 CreditUnits: 03

Course Objectives: students shall have a basic understanding of development problems associated with natural resource management, be able to explain and use basic concepts, such as water and nutrient balances, and to use GIS methods to visualise and analyse spatial data related to natural resource management.

Course Contents:

Module I
Introduction to Natural Resource Bases: Concept of resource, classification of natural resources. Factors influencing resource availability, distribution and uses. Interrelationships among different types of natural resources. Concern on Productivity issues. Ecological, social and economic dimension of resource management.

Module II
Forest resources: forest vegetation, status and distribution, major forest types and their characteristics. Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people, forest management. Developing and developed world strategies for forestry. Land resources: Land as a resource. Dry land, land use classification, land degradation, man induced landslides, soil erosion and desertification. Landscape impact analysis, wetland ecology & management. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Water ecology and management. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case-studies. Fish and other marine resources: Production, status, dependence on fish resource, unsustainable harvesting, issues and challenges for resource supply, new prospects.

Module III
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Resource Management Paradigms: Resource management the evolution and history of resource management paradigms. Resource conflicts: Resource extraction, access and control system. Approaches in Resource Management: Ecological approach; economic approach; ethnological approach; implications of the approaches; integrated resource management strategies. Poverty and implications in Resource Management in developing countries – Poverty in developing countries, causes and link with resources scarcity and poverty.

Module IV
Management of Common International Resources: Ocean, climate, International fisheries and management commissions; Antarctica: the evolution of an international resource management regime. Case Studies: 8
1. Resource management in mountain ecosystem
2. Dry-land ecosystem
3. The management of marine and coastal resources
4. Case study of shifting cultivation
5. Mangrove ecosystem and their management

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Recommended Books:

- Coastal Ecology & Management, Mann, K.H. 2000. Ecology of Coastal Waters with Implications for Management (2nd Edition).Chap. 2-5, pp.18-78 & Chap. 16, pp.280-303.
- Global Change and Natural Resource Management, Vitousek, P.M. 1994. Beyond global warming: Ecology and global change. Ecology 75, 1861-1876.
- Agarwal, K.C., 2001. Environmental Biology, Nidhi Publication Ltd. Bikaner.
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publishing House.
- Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment.Cambridge Univ. Press.
- Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
- Townsend C., Harper J, and Michael Begon. Essentials of Ecology, Blackwell Science

DISASTER MANAGEMENT & MITIGATION

Course Code: CIV2316 CreditUnits: 03

Course Contents:

Module I:
Understanding Disasters: Meaning, nature, characteristics and types of Disasters, Causes and effects, Disaster: A Global View

Module II:
Introduction to disaster Preparedness, Disaster Management: Prevention, Preparedness and Mitigation, Disaster Preparedness: Concept & Nature, Disaster Preparedness Plan, Disaster Preparedness for People and Infrastructure, Community based Disaster Preparedness Plan.

Module III:
Disaster Mitigation, Disaster Mitigation: meaning and concept, Disaster Mitigation Strategies, Emerging Trends in Disaster Mitigation, Mitigation management, Role of Team and Coordination.

Module IV:
Technologies for Disaster Management, Role of IT in Disaster Preparedness, Remote Sensing, GIS and GPS, Use and Application of Emerging Technologies, Application of Modern Technologies for the Emergency communication, Application and use of ICST for different disasters.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Sharma, R.K. & Sharma, G. (2005) (ed) Natural Disaster, APH Publishing Corporation, New Delhi.
- Carter, W. Nick, 1991: Disaster Management, Asian Development Bank, Manila
- Bryant Edwards (2005): Natural Hazards, Cambridge University Press, U.K.
- Roy, P.S. (2000): Space Technology for Disaster management: A Remote Sensing & GIS Perspective, Indian Institute of Remote Sensing (NRSA) Dehradun.

ENGINEERING ECONOMICS AND MANAGEMENT

Course Code: CIV2317 CreditUnits: 03

Course Objective: This course will enable the students to understand the basics concepts of organizations' economic environment, macroeconomics, financial and inventory management.

Course Contents:

Module I: Organizations and their Economic Environment
Definition of Economics and Managerial Economics – Nature and Scope – Definition and Concept of Good, Want, Value, Wealth, Utility – Utility and Demand – Law of Diminishing Marginal Utility – Assumptions and Importance. Demand and Supply – Law of Demand and Law of Supply. Market price and natural price. Standard market forms- Monopoly, Perfect competition. Organisational forms- Proprietorship, partnership, Joint Stock Company – Cooperative organisation.

Module II: Macroeconomics
Money- nature and functions – Inflation and Deflation – Kinds of Banking – commercial banks – Central banking – Credit instrument - Monetary Policy – International trade – Balance of trade and Balance of Payments – taxation – Direct and Indirect taxes – GST- Impact and Incidence of tax- Concept of National Income – Features with reference to developing countries.

Module III: Introduction to Management
Management Theory- Characteristics of management – Systems Approach to management – Concepts of goal, objective, strategies, programmes. Decision making under certainty, uncertainty and risk – Introduction to functional areas of management – Operations management, Human resources management, marketing management.

Module IV: Financial and Inventory Management
Need for Financial Management – Types of financing (Short term and long term) - Borrowing – Equity financing – Analysis of Financial Statement – balance sheet – Profit and Loss account – Fund flow statement – Ratio Analysis . Functions and objectives of Inventory management – Decision models – Economic Order Quantity (EOQ) model – sensitivity analysis of EOQ model - inventory model with planned shortages – Periodic order quantity – single period Inventory models

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Konni, Donnel C.O. and Weighnrich. H., Management, Eight Edition, McGraw Hill International Book Company, 1997.
- Philip Kotler, Marketing Management, Prentice-Hall of India, Edition 1998.
- G.W. Plossl, Production and inventory control by, Prentice Hall.
- Paul A Samuelson and William D Nardhaus, Economics, McGraw Hill International Edition.
- Barthwal R R, Industrial Economics – An Introductory Text Book, New Age International Pvt Ltd, 2000.
- Aninnya Sen, Microeconomics – Theory and Applications, OUP.
- Sharma J.L., Construction management and accounts, SathyaPrakashan, New Delhi, 1994.
- Srinath,L.S. An Introduction to Project Management, Tata McGraw Hill publications, 1995.

Syllabus - Fourth Semester

NUMERICAL ANALYSIS AND PROGRAMMING

Course Code: CIV2401 CreditUnits: 03

Course Objective:
This course deals with the techniques of numerical analysis, which gives the solution to applied problem when ordinary analytical method fails. Emphasis is given on computer programming also so that the given techniques can be used in design of engineering and scientific problems.

Course Contents:
Module I
Solution of Algebraic and Transcendental Equation
Error in a series approximation, Bisection Method, Iteration method, Method of false position, Newton-Raphson method
Solutions of Simultaneous equation
Gauss elimination method, Jacobi iteration method, Gauss Seidal method

Module II: Interpolation
Finite Differences, Difference tables
Polynomial Interpolation**:** Newton's forward and backward formula
Central Difference Formulae: Gauss forward and backward formula.
Interpolation with unequal intervals: Lagrange's Interpolation, Newton Divided difference formula

Module III: Numerical Integration and Differentiation
Introduction, Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rules.

Module IV: Solution of differential Equations
Euler's Method, Runga-Kutta Methods.

Module V: Statistical Computation
Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves etc, Data fitting with Cubic splines.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Rajaraman V, "Computer Oriented Numerical Methods", Pearson Education
- Gerald &Whealey, "Applied Numerical Analyses", AW
- Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Int.
- Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi

References:
- T Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods, TMH
- PradipNiyogi, "Numerical Analysis and Algorithms", TMH
- Francis Scheld," Numerical Analysis", TMH
- Sastry S. S, "Introductory Methods of Numerical Analysis", Pearson Education.
- Gupta C.B., Vijay Gupta, "Introduction to Statistical Methods", Vikas Publishing.
- Goyal, M, "Computer Based Numerical and Statistical Techniques", Firewall Media, New Delhi.

STRUCTURAL ANALYSIS-I

Course Code: CIV2402 CreditUnits: 04

Course Objective:
Structural Analysis, being the critical part in designing building and other structures, is important. Elastic theorems fixed and continuous beams, circular beams over simple support and theory of columns are covered in this course.

Course Contents:

Module I: Deflection of beams
Differential equation of the elastic curve - slope and deflection of beams by method of successive integration - Macaulay's method - Moment area method - Conjugate beam method - Deflection due to shear.

Module II: Elastic theorems and energy principles
Strain energy and complementary energy - review of strain energy due to axial load - bending, shear and torsion - principle of superposition - principle of virtual work - Castigliano's theorem for deflection - theorem of complementary energy - Betti's theorem - Maxwell's law of reciprocal deflections - principle of least work - application of method of virtual work (unit load method) and strain energy method for determination of deflections of statically determinate beams - pin-joined trusses and rigid frames - temperature effects.

Module III: Fixed and continuous beams
Statically indeterminate structures - degree of static and kinematic indeterminacies – brief introduction to force and displacement methods - fixed and continuous beams - force method - analysis by consistent deformation method - application of moment area and conjugate beam methods for fixed beams - theorem of three moments for continuous beams - shear force and bending moment diagrams - deflection and support settlement.

Module IV: Beams curved in plan
Analysis of cantilever beam curved in plan - analysis of circular beams over simple supports
Theory of columns
Axial loading of short strut - long columns - Euler's Formula - Rankine Formula – Secant Formula - eccentric loading - direct and bending stresses – Buckling Load as an eigen value problem.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Texts & References:
- R. Vaidyanathan, P. Perumal, Comprehensive Structural Analysis Vol. I & II, Laxmi Publications, New Delhi
- Reddy C.S., Basic Structural Analysis, 2nd ed., Tata McGraw Hill, New Delhi (2004).
- S Ramamrutham, R Narayan, Theory of Structures

TRANSPORTATION ENGINEERING-I

Course Code: CIV2404 CreditUnits: 03

Course Objective:
Modern road design and construction are covered in the syllabus.

Course Contents:

Module I: Highway Classification, Alignment and Geometrical Design
Introduction – Highway development in India - Classification of roads - Typical cross sections of roads in urban and rural area - Requirements and factors controlling alignment of roads - Engineering surveys for highway location - Pavement surface characteristics - Camber and width requirements – Sight distances - stopping and overtaking sight distances, overtaking zone requirements - Design of horizontal alignment - speed, radius, super elevation, methods of providing super elevation, extra widening of pavements, transition curves - Design of vertical alignment - gradient, grade compensation, summit curves and valley curves - worked out problems on all the above topics.

Module II: Traffic engineering
Introduction - Road user, vehicle and traffic characteristics - Speed and volume studies - Simple worked out problems - Principles of design of at-grade intersections -Simple layouts - Objectives, classification and uses of traffic signs and markings - Design of isolated signals by Webster's method.

Module III: Pavement Materials and Design
Desirable properties and testing of highway materials: road aggregates, bituminous materials and subgrade soil - Factors influencing the design of pavements - CBR method and IRC guidelines of flexible pavements design - Design of rigid pavements using IRC charts - worked out problems.

Module IV: Pavement Construction and Maintenance
Historical development of road construction -Construction of earth roads, WBM roads, stabilized roads, bituminous pavements, cement concrete roads and joints in cement concrete roads - Types and causes of failures in flexible & rigid pavements.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- Papacostas, C.S., Transportation Engineering and Planning, 3rd ed., Pearson Education, New Delhi (2008)
- O' Flaherty Coleman. A., Transport Planning and Traffic Engineering, Elsevier, New Delhi (2008).
- Slinn, Mike, Traffic Engineering Design (Principles and Practice), Elsevier, New Delhi (2008), O'Flaherty, Coleman A., Highways (The Location, Design, Construction and Maintenance of Pavement) 4thed, Elsevier, New Delhi (2008).

SURVEYING-II

Course Code: CIV2411 CreditUnits: 02

Course Objective:
Geoinformatics is an important data system for all civil engineering activities including construction of structures, dams, water systems etc. Correct and reliable information and geographical data are a requirement today. The course thus addresses this issue.

Course Contents:

Module I
Triangulation - principle - reconnaissance - selection of site for base line - selection of stations - orders of triangulation - triangulation figures - scaffolds and signals - marking of stations - intervisibility and heights of stations - satellite stations - base line measurement - equipment and corrections - adjustment of observations.

Module II
Survey adjustments and theory of errors – introduction – laws of accidental errors –probability curve – principle of least squares – laws of weights – probable error – normal equation – most probable value – method of correlates – angle adjustment – station adjustment – figure adjustment – adjustment of triangles.

Module III
Curves - types of curves - elements of a curve - simple curves - different methods of setting out – introduction to compound curves - reverse curves, transition curves, vertical curves.

Module IV
Photogrammetry – terrestrial and aerial photogrammetry – heights and distances from Photographs – flight planning — photo mosaic – photo interpretation – applications of photogrammetry. GNSS – GPS – differential GPS.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Texts & References:
- S.K Duggal, Sruveying Vol. I and II, 2nd ed., Tata McGraw Hill, New Delhi (2004).
- Arora K.R., Surveying Vol. I & II, Standard Book House, New Delhi (2008)
- Punmia B.C., Ashok Kr. Jain, Arun Kr. Jain, Surveying Vol. I &II, Laxmi Pub, New Delhi (2004)

FLUID MECHANICS

Course Code: CIV2412 CreditUnits: 04

Course Objective:
The objective of Fluid Mechanics subject is that students should understand the, properties of fluids, pressure measurement devices, hydraulic forces on surfaces, bouncy and flotation in fluids, kinematics and static behaviour of fluids, dimension and model analysis, laminar and turbulent flow, flow through pipes and orifices, boundary layer theory.

Course Contents:

Module I: Fluid Properties and Fluid Statics
Newtonian and Non-Newtonian Fluids; Viscosity; Incompressible and compressible fluids, compressibility. Forces on plane surfaces, forces on curved surfaces, buoyant forces, and stability of floating bodies, metacentre and metacentre height.

Module II: Kinematics of Fluid Motion
Steady and unsteady flow; uniform and non-uniform flow; Laminar and turbulent flow; streamline, path line and streak line; continuity equation, irrotational and rotational flow, velocity potential and stream function, vortex flow, free and forced vortex.

Module III: Dynamics of Fluid Flow
Euler's equation of motion and its integration to yield Bernoulli's equation, its practical applications – Pilot tube, Venturi meter; steady flow momentum equation, force exerted on a pipe bend.

Module IV: Dimensional Analysis and Principles of Similarity
Buckingham π-Theorem and its applications, Geometric, Kinematics and Dynamic similarity; Dimensionless numbers-Reynolds, Froude, Euler, Mach, Weber Number and their significance.

Module V: Laminar and Turbulent Flow
Reynold's experiment, critical velocity, steady laminar flow through a circular tube, flow between parallel plates. Transition from laminar to turbulent flow, courses of turbulence, velocity distribution law near a solid boundary, velocity distribution in rough pipes, Hazen – Williams's formula.

Module VI: Analysis of Pipe Flow
Energy losses, minor losses in pipe lines, concept of equivalent length, flow between two reservoirs, and multiple pipe systems – in series and parallel, siphon.

Module VII: Flow Measurements
Measurement of flow using Venturi meter, orifice meter, Pitot tube, measurement of flow in open channels – rectangular, triangular, trapezoidal weir, Cipoeletti weir.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- R.K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications (P) Ltd., 2002.
- Gupta, S. C., Fluid Mechanics and Hydraulic Machines, Pearson Education, 2007
- D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering", S.K. Kataria& Sons, 2000.

References:

- F. M. White, Introduction to Fluid Mechanics, McGraw Hill
- I.H. Shames, "Mechanics of Fluids", Tata McGraw Hill
- Douglas, J. F., Gasiorek, J.M. and Swaffield, J., Fluid Mechanics, Pearson Education, 4/e, 2006
- V.L. Streeter and E.B. Wylie, "Fluid Mechanics", Tata McGraw Hill
- Massey B S, Mechanics of Fluids, Van Nostrand Reinhold Co

NUMERICAL ANALYSIS AND PROGRAMMING LAB

Course Code: CIV2405 CreditUnits: 01

Course Contents:

Assignments will be provided for the following:

- Analysis of various numerical and statistical techniques

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

SURVEYING PRACTICAL

Course Code: CIV2407 CreditUnits: 01

Course Contents:

List of Exercises:

1. Introduction to Total Station including the settings etc.
2. Measurement of horizontal distance using Total Station.
3. Introduction to Measurement of Horizontal and Vertical angles by the use of Total Station.
4. Traversing by use of Total Station.
5. Setting out of Simple Curves – Linear Method.
6. Setting out of Simple Curves – Angular Method.
7. Setting out of Transition Curve.
8. Layout of a building.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

FLUID MECHANICS LAB

Course Code: CIV2413 CreditUnits: 01

Course Contents:

1.Verification of Bernoulli's Theorem

2.Experiment using Venturimeter

3.Determination of coefficient of Discharge C_d, C_c, $C_!$ Using

4.Circular/triangular/rectangular orifice

5.To find major head losses in a pipe line

6.To find minor head losses in a pipe line (sudden expansion/contraction/bend)

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

FLUID MACHINERY

Course Code: CIV2414 CreditUnits: 03

Course Objective:
Fluid power systems cover generation, transmission, and control applications of power by using pressurized fluids. This course imparts the knowledge of different fluid power systems (pneumatic and hydraulic) which are used in industries and hydropower plants.

Course Contents:

Module I:Introduction
Euler's equations for turbo machines; impulse and reaction forces due to fluid systems on stationery and moving system of vanes; jet propulsion.

Module II: WaterTurbines
Classification: Pelton, Francis, Propeller and Kaplan turbines; velocity triangles; efficiency; draft tubes, governing.

Module III: Pumps
Centrifugal pumps, velocity triangles, efficiency, turbine pumps, axial and mixed flow pumps.

Module IV: Performance of Fluid Machines
Similarity laws applied to rotodynamic machines; specific speed, unit quantities; characteristic curves; use of models; cavitations and attendant problems in turbo machines; selection of turbines hydroelectric plants.

Module V: HydraulicPower Transmission
Transmission of hydraulic power through pipe lines; water hammer; precautions against water hammer in turbine and pump installations: hydraulic ram.

Module VI: PowerHydraulics
Positive pumps: gear, vane, screw, pump, variable delivery valves: flow control, pressure control, direction control, solenoid operated valve, hydraulic circuits, fluid coupling and torque converter.
Pneumatic Power: Basic principles, comparison of pneumatic and hydraulic Systems.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Gupta, S. C., Fluid Mechanics and Hydraulic Machines, Pearson Education, 2007
- R.K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications (P) Ltd., 2002.

References:
- Dr. D.S. Kumar, "Fluid Mechanics & Fluid Power Engineering", S.K. Kataria& Sons,2001
- D.R. Malhotra & N.K. Malhotra, "The Fluid Mech. & Hydraulics", Satya Prakashan, 2001
- V.P. Gupta, Alam Singh, Manish Gupta, "Fluid Mechanics, Fluid Mechanics & Hydraulics", CBS Publishers; 1999.

HYDROLOGY AND FLOOD CONTROL

Course Code: CIV2415 CreditUnits: 03

Course Objective:
This course deals with advanced concept of hydrology.

Course Contents:

Module I
Introductionhydrologic cycle, water budget equations, world water balance, application in engineering. Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity-duration- frequency relationships, probable maximum precipitation.

Module II
Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapotranspiration-
measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities, indices, measurement & estimation

Module III: Runoff and Hydrographs
Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs.

Module IV: Flood
Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- 'Hydrology for Engineers' by Linsley R. K., Kohler M. A. and Paulhus J. L. H.
- 'Engineering Hydrology' by K. Subramanya
- 'Hydrology: Principles. Analysis. Design' by Raghunath H. M.
- 'Handbook of Applied Hydrology' by Chow V. T.
- 'Irrigation: Theory & Practice' by Michael A. M.

REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS

Course Code: CIV2416 CreditUnits: 03

Course Objective:
This course deals with remote sensing and geographic information systems.

Course Contents:
Module I
Concepts and foundations of remote sensing- electromagnetic spectrum, energy sources and radiation principles, energy interactions in the atmosphere and with earth surface features, data acquisition and interpretation, reference data, ideal remote sensing systems, characteristics of real remote sensing systems. Classification of maps, map scale, spatial reference system, map projections, grid systems, linkage of GIS to remote sensing. Radar principle- Factors affecting microwave measurements, radar wavebands, SLAR systems, interaction between microwaves and earth's surface. Basic principles of photogrammetry – geometrical characteristics of aerial photographs, photographic scale, ground coverage, area measurement, relief displacement of vertical features, image parallax, ground control, mapping.

Module II
Remote sensing platforms and sensors - Satellite system parameters, sensor parameters, imaging sensor systems, earth resources and meteorological satellites with microwave sensors, scanners, radiometers. The Indian Remote Sensing Program. Data types and format, scale and legend.
Visual Image Interpretation - Digital Image Processing - Basic character of a digital image, image rectification & restoration, preprocessing, registration, enhancement, contrast, spatial feature and multi image manipulation, spatial filtering, image transformations, image classification, performance analysis, data merging and GIS integration.

Module III
GIS overview – what is GIS, components, definitions & terminology, uses, GIS queries & architecture, theoretical models & framework, GIS technology trends, data sources, collection, and entry, data formats & standards, types of analysis, spatial data modeling, GIS data management, database models, storage of data, object based GIS models, data input & editing, data quality issues. Data analysis & modeling – Integration of remote sensing & GIS.

Module IV
Application of Remote Sensing& GIS in natural resources management with specific reference to impact of mining activities on environment, biodiversity, coastal zone protection, flood management, forest protection, monitoring urban growth, managing watersheds & water resources, hydrologic modeling, preventing natural disasters etc.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Thomas. M. Lillesand and Ralph. W. Kiefer, Remote Sensing and Image Interpretation:, John Wiley and Sons, Inc., 2002
- M. Anji Reddy, Text Book of Remote Sensing and Geographical Information Systems:, B.S. Publications, 2001
- Ian Heywood, Sarah Cornelius, and Steve Carver, An Introduction to Geographical Information Systems, Pearson Education Asia, 2001
- George. B. Korte, The GIS Book:, Onward Press, Thomson Learning, 2001
- D. P. Rao, Association of Exploration Geophysicists, 1995, Remote Sensing for Earth Resources.

Syllabus - Fifth Semester

STRUCTURAL ANALYSIS-II

Course Code: CIV2501 CreditUnits: 03

Course Objective:
The course builds upon the earlier course of Structural Analysis I and deals with more advanced methods.

Course Contents:

Module I: Force method of analysis of indeterminate structures Analysis of rigid frames of different geometry by consistent deformation method – settlement effects - analysis of pin-jointed trusses by consistent deformation method - externally and internally redundant trusses - effects of settlement and prestrains.

Module II: Displacement method of analysis of indeterminate structures Slope deflection method - analysis of continuous beams - beams with overhang - analysis of rigid frames - frames with sloping legs - gabled frames - frames without sway and with sway - settlement effects - moment distribution method as successive approximation of slope deflection equations - analysis of beams and frames - non-sway and sway analyses - Kani's method as iterative method of analysis of frames (outline only)

Module III: Moving Loads & Influence Lines
Introduction to moving loads - concept of influence lines - influence lines for reaction, shear force and bending moment in simply supported beams - influence lines for forces in trusses – analysis for different types of moving loads - single concentrated load - several concentrated loads - uniformly distributed load shorter and longer than the span.

Module IV: Cables, suspension bridges and arches
Analysis of forces in cables - suspension bridges with three-hinged and two-hinged stiffening girders - theory of arches - Eddy's theorem - analysis of three-hinged and two-hinged arches - settlement and temperature effects.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Wang C.K., Statically Indeterminate Structures, McGraw Hill, New York, 1983.
- Wilbur J.B. & Norris C.H., Elementary Structural Analysis, McGraw Hill, 1960.
- Wang C.K., Intermediate Structural Analysis, McGraw Hill, 1983.
- Timoshenko S.P. & Young D.H., Theory of Structures, McGraw Hill, 1965.
- Kinney S.J., Indeterminate Structural Analysis, Oxford & IBH, 1985.
- Matheson J.A.L., Hyperstatic Structures, John Wiley and Sons, 1996.
- Reddy C.S., Basic Structural Analysis, Tata McGraw Hill
- Negi L.S. &Jangid R.S, Structural Analysis, Tata McGraw Hill
- Rajasekaran S. &Sankarasubramanian G., Computational Structural Mechanics, PHI

PRINCIPLES OF STRUCTURAL DESIGN

Course Code: CIV2502 CreditUnits: 03

Course Objective:
Based on the course Structural Analysis the student should be able to start design of structures using various types of materials.

Course Contents:

Module I: Design Philosophy
Introduction –Structures and structural systems– Introduction – materials – mix design by IS method – basic properties of concrete and reinforcement, testing of concrete , Introduction to Various Design Philosophies– design considerations – loading standards – working stress method(WSM) – ultimate load method – probabilistic analysis and design – uncertainties in design –limit state method(LSM) – limit states – multiple safety factor formats – load and resistance factor design format – partial safety factor format.

Module II: Design of RC Beams
Basic design concepts of working stress method (WSM) – analysis of sections by WSM – Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method. Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method.

Module III: Shear and Torsion
Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments.

Module IV: Design of Slabs
Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Pillai S.U. & Menon D, Reinforced Concrete Design Tata McGraw Hill, 2003.
- Varghese P.C., Limit State Design of Reinforced Concrete, Prentice Hall of India, 2003.
- Mallick S.K. & Gupta A.K., Reinforced Concrete, Oxford & IBH, 1982.
- Jain A.K., Reinforced Concrete - Limit State Design, Standard Book House, 1998.
- Shetty M.S., Concrete Technology, S. Chand, 1988.
- Punmia B.C., Reinforced Concrete Structures Vol. I, Standard Book House, 2005
- Jain &Jaikrishna, Plain & Reinforced Concrete Vol. I, Nemchand, 2000.
- Sinha S.N., Reinforced Concrete Design, Tata McGraw Hill, 2005.
- Ram Chandra, Design of Steel Structures Vol. I, Standard Book House, 2005.
- Negi L.S., Design of Steel Structures Vol. I, Tata McGraw Hill, 2005.
- BIS Codes (IS 875, IS 10262, SP 23, IS 456, IS 800, SP 6, IS 883, IS 2750).

TRANSPORTATION ENGINEERING-II

Course Code: CIV2503 CreditUnits: 03

Course Objective:
This course deals with the design concept of railways, airport and tunnel.

Course Contents:

Module I: Components & Geometric Design of Railways
Introduction. Typical cross-sections. Various gauges. Coning of wheels and tilting of rails. Functions and requirements of component parts of a railway track. Creep of rails. Geometrical design of railway track. Horizontal curves, radius, superelevation, cant deficiency, transition curves, safe speed on curves, different types of gradients, grade compensation. Worked out problems.

Module II: Railway Operation and Control
Points and crossings and their design. Track junctions and simple track layouts. Details of different types of stations and yards. Signaling and interlocking. Control of train movements. Absolute block . Automatic block system and CTC system. Railway Construction and Maintenance:Construction of railway track: earthwork, plate laying and packing. Maintenance of track-alignment, gauge, renewal of component parts and drainage, modern methods of track maintenance.

Module III: Tunneling
Tunnel alignment and grade. Size and shape of a tunnel. Methods of tunneling in hard rocks. Full face method, heading and bench method, drift method. Methods of tunneling in soft soils. Compressed air and shield tunneling Shafts in tunnels. Ventilation of tunnel and various methods. Lining of tunnels. Drainage and lighting of . Micro Tunneling. Trenchless technology.

Module IV: Airport planning and Design
Introduction. Aircraft characteristics and their influence on planning of airports. Airport obstructions and zoning. Component parts of airport and site selection. Runway design. Orientation, basic runway length, corrections and geometric. Design of taxiways and aprons - Terminal area planning. Facilities in terminal area and their planning concepts, aircraft parking configurations. Airport drainage system. Surface and subsurface drainage systems and their design.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Antia K.F, Railway Track, New Book Company Pvt. Ltd, 1960.
- Agarwal M.M., Railway Engineering, Prabha and Co
- Khanna S.K & Arora M.G., Airport Planning and Design, Nemchand& Bros.
- Horonjeff R., Planning and Design of Airports, Mc Graw Hill
- Mundrey J.S, Railway Track Engineering, TMGS, 1988.

GEOTECHNICAL ENGINEERING-I

Course Code: CIV2551 CreditUnits: 03

Course Objective:
Soil mechanics and related topics are important areas in Civil Engineering and the first part of Geotechnical Engineering deals with soils and their characteristics.

Course Contents:
Module I: Nature of soil and functional relationships
Soil type -Concepts of single grained, honey combed and flocculent structure and their effects on the basic soil properties - 3 phase system - void ratio - specific gravity - dry density - porosity - water content - saturated unit weight - submerged unit weight - degree of saturation. Laboratory and field identification of soils:Determination of water content by oven drying -Specific gravity using pycnometer and specific gravity bottle - Grain size analysis by sieve analysis, hydrometer analysis and pipette analysis - Atterberg limits and indices – Visual identification by simple field tests - Field density by core cutter, sand replacement and wax coating methods. Classification of soils:Necessity - Principles of classification - I.S. classification – Plasticity charts - Group index.

Module II: Soil Water, Permeability and Stress Distribution
Soil water: Types - Effective stress - Total stress - Pore pressure - Pressure diagrams. Permeability: Definition - Darcy's law - Factors affecting permeability – Laboratory determination - Stratified soils: average permeability. Stress distribution:Boussinesq's equations for vertical pressure due to point loads- Assumptions and limitations - pressure bulb – Influence diagram - Vertical pressure due to uniformly distributed loads, line loads and strip loads - Newmark charts and their use - Westergaard's solution.

Module III: Consolidation and Compation
Consolidation: Definition - Concepts of coefficient of compressibility - Coefficient of volume change and compression index - e-log p curves - Terzaghi's theory of one dimensional consolidation – Determination of coefficient of consolidation- pre-consolidation pressure difference between consolidation and compaction. Compaction:Definition and objectives of compaction - Proctor test and modified proctor test - Concept of OMC and maximum dry density - Zero air voids line -Factors influencing compaction.- Effect of compaction on soil properties - Field compaction methods - Proctor needle for field control.

Module IV: Shear Strength and Stability of Slopes
Shear Strength:Definition - Mohr's strength and stress circles - origin of planes - Mohr's envelope - Mohr-Coulomb strength theory -Direct, triaxial and UCC tests - Drainage conditions - Measurement of pore pressure - Vane shear tests -Total and effective stress -strength parameters – Stress path, Liquefaction of sand - Choice of test conditions for field problems. Stability of slopes:Slope failure, base failure and toe failure - Swedish circle method - $\varphi=0$ analysis and $c=0$ analysis - Friction circle method - Taylor's stability number -Stability charts - Sliding block analysis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Terzaghi K. & Peck R.B., Soil Mechanics in Engineering Practice, John Wiley Sons, 1967.
- Alam Singh, Soil Engineering-Theory and Practice, Asia Pub, 1967.
- Punmia B.C., Soil Mechanics and Foundations, Saurabh,1992.
- Murthy V.N.S., Soil Mechanics and Foundation Engineering, Dhanpat Rai, 1984
- Khan I.H., Text Book of Geotechnical Engineering, Prentice Hall of India

MATERIAL TESTING LAB

Course Code: CIV2504 CreditUnits: 01

List of Exercises

1. Concrete:
   (a) Slump Test of Concrete (b) Compaction Factor Test of Concrete (c) Vee-Bee Test of Concrete (d) Compressive Strength.

2. Fine Aggregate:
   (a) Fineness Modulas (b) % of material less than 75 micron (c) Silt Content.

3. Flakiness Index.

4. Elongation Index.

5. Rebound Hammer Test.

6. Ultrasonic Pulse Velocity Meter

7. Bending test on steel beams.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

TRANSPORTATION ENGINEERING LABORATORY

Course Code: CIV2509 CreditUnits: 01

LIST OF EXPERIMENTS

Course objective: The students will learn different tests on aggregates and bitumen. They will also learn about the significance of these tests.

1. Impact test and Abrasion test of aggregate
2. Elongation and Flakiness index of aggregate
3. Water absorption test of aggregate
4. CBR test for subgrade
5. Determination of Flash and Fire test of bitumen
6. Determine the specific gravity of bitumen
7. Determination of penetration value of bitumen.
8. Determination of softening point test.
9. Determination of ductility of bitumen.
10. Determination of viscosity.
11. Determination of bitumen by centrifuge extractor.
12. Pavement evaluation and maintenance test.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text book & Reference:

- Khanna, S.K., Justo, C.E.G., and Veeraragavan, A., Highway Materials laboratory testing, Nem Chand & Brothers
- Relevant IRC and AASHTO codes

SUMMER INTERNSHIP EVALUATION-I

Course Code: CIV2535 CreditUnits: 03

Methodology:
Practical training is based on the theoretical subjects studied by students. An industry visit will be planned for each student and on-site practical training will be imparted with the help of the industry guide. The students are to learn various industrial, technical and administrative processes followed in the industry. On completion of the practical training the students are to present a report covering various aspects learnt by them and give a presentation on same.

Examination Scheme:

Feedback from industry/work place	20
Training Report	40
Viva	15
Presentation	25

SUSTAINABLE DEVELOPMENT IN CIVIL ENGINEERING

Course Code: CIV2510 CreditUnits: 03

Course Objectives: Learn about the principles, indicators and general concept of sustainability. Apprehend the local, regional and global impacts of unsustainable designs, products and processes. Student shall be able to apply the sustainability concepts in engineering. Know built environment frameworks and their use. Understand how building and design is judged and valued by clients and stakeholders and how to implement sustainability.

Course Contents:

Module-I

Introduction: Sustainability - Introduction, Need and concept of sustainability, Social-environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act.

Module-II

Global Environmental Issue: Resource degradation, Climate change, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon foot print Carbon sequestration – Carbon capture and storage (CCS). Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking

Module-III

Sustainable Design: Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design- Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. Sustainable cities, Sustainable transport.

Module-IV

Clean Technology and Energy: Energy sources: Basic concepts-Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy. Rainwater harvesting

Module-V

Green Engineering: Green Engineering concepts, Sustainable Urbanization, industrialization and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Reference Books:

- Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication
- ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System
- Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
- Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
- Malcolm Dowden, Climate Change and Sustainable Development: Law, Policy and Practice
- Daniel A. Vallero and Chris Brasier, " Sustainable Design: The Science of Sustainability and Green Engineering", WileyBlackwell
- Sustainable Engineering Practice: An Introduction, Committee on Sustainability, American Society of Civil Engineers.

AIR AND WATER POLLUTION CONTROL ENGINEERING

Course Code: CIV2511 CreditUnits: 03

Course Objectives:

- To impart knowledge on the principles and design of control of indoor/ particulate / gaseous air pollutant and its emerging trends.
- To introduce the fundamentals of mathematical models for water quality and the importance of model building.

Course Contents:

MODULE-I: INTRODUCTION TO AIR POLLUTION
Structure and composition of Atmosphere – Sources and classification of air pollutants - Effects of air pollutants on human health, vegetation & animals, Materials & Structures – Effects of air Pollutants on the atmosphere, Soil & Water bodies – Long- term effects on the planet – Global Climate Change, Ozone Holes – Ambient Air Quality and Emission Standards – Air Pollution Indices – Emission Inventories.

MODULE-II: AIR QUALITY MONITORING AND MODELLING
Ambient and Stack Sampling and Analysis of Particulate and Gaseous Pollutants -Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Transport & Dispersion of Air Pollutants - Introduction to Air Quality Modeling. Necessity, application and limitation of air quality modelling. Introduction to Dispersion Modeling, Photochemical Modeling and Receptor Modeling. Different air quality Dispersion models and their limitations.

MODULE-III: CONTROL OF AIR POLLUTANTS
Primary considerations in designing effective control strategy: Environmental, Engineering and Economic Factor - Factors to be considered while selecting control equipments - Various mechanisms to control gaseous pollutants and particulate matter. Control Equipment design for particulate matter: Gravity chamber, Cyclone separator, Electrostatic precipitator, fabric filter, bag filter, Wet scrubber, Venturi scrubber and absorption towers.Control Equipment design for gaseous pollutants: Absorption, Adsorption, Condensation and Incineration.

MODULE-IV: SURFACE AND SUB-SURFACE WATER QUALITY MODELLING
Water quality modeling of Streams, Lakes and impoundments and Estuaries – Water quality– model sensitivity – assessing model performance; Models for dissolved oxygen, pathogens and BOD-Streeter Phelps model for point and distributed sources - Modified Streeter Phelps equations -Toxicant modeling in flowing water - Groundwater flow and mass transport of solutes, Degradation of organic compounds, application of concepts to predict groundwater contaminant movement, seawater intrusion – basic concepts and modeling.

MODULE-V: AIR AND WATER QUALITY MODELLING SOFTWARES
Exposure to computer models for surface water quality, groundwater quality and air quality - Introduction to commonly used air quality models such as AERMOD, CALPUFF, ISCST3 and CALINE4 etc.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books/References:

- Steven C. Chapra, "Surface Water Quality Modeling", Tata McGraw-Hill Companies,Inc., New Delhi, 2008.
- "Water Quality Modelling for Rivers and Streams" Authors: Benedini, Marcello, Tsakiris, George, Springer Netherlands 2013.
- **"**Hydrodynamics and Water Quality**:** Modeling Rivers, Lakes, and Estuaries", Zhen-Gang Ji, John Wiley & Sons, 2008.
- "Modeling Groundwater Flow and Contaminant Transport By Jacob Bear, A. H.-D. Cheng, Springer Science & Business Media, 2010.
- "Mathematical Modeling of Groundwater Pollution" Ne-Zheng Sun, Alexander Sun, Springer New York, 2012
- Lawrence K. Wang, Norman C. Parelra, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, 2004.
- Noel de Nevers, "Air Pollution Control Engg"., Mc Graw Hill, New York, 1995.
- David H.F. Liu, Bela G. Liptak „Air Pollution", Lweis Publishers, 2000.
- Anjaneyulu. Y, "Air Pollution & Control Technologies" Allied Publishers (P) Ltd.,India, 2002. Arthur C.Stern, „Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
- Wayne T.Davis, „Air Pollution Engineering Manual", John Wiley &Sons, Inc., 2000.
- Daniel Vallero" Fundamentals of Air Pollution", Fourth Edition,2008.

COMPUTER APPLICATION IN HYDRO ENGINEERING

Course Code: CIV2512 CreditUnits: 03

Course Objective:
This course deals with computer application in hydro engineering.

Course Contents:

Module I
Review of Basic Hydraulic Principles – General flow characteristics, Energy and momentum principles and Equations, Pressure and free surface flows, HGL and TEL, Major and minor losses, Computer applications to simple flow problems, Introduction to SAP.
Storm Sewer Design and Gravity Piping Systems – Review of basic hydrologic principles, Gradually varied flow, Mixed flow profiles, Storm Sewer Applications.

Module II
Drainage Inlet Design, Culvert Hydraulics and Design.
Pressure Piping Systems & Water Quality Analysis – Analysis and design of water distribution systems
Introduction to Some Packages such as Flow Master, Storm CAD, Culvert Master, Water CAD, and Sewer CAD and EPANET.

Module III
Flow Routing - Hydrologic and hydraulic methods of routing, Sanitary sewer design including extended period simulation and routing.
Watershed modeling – Basic principles – Introduction to SWMM

Module IV
Water quality modeling in streams- Basic models, Introduction to software packages.
Ground water quality modeling
Introduction to remote sensing and GIS applications and web based applications

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Michael. M. Meadows & Thomas M Walski, Computer Applications in Hydraulic Engineering, Haestad Press, 2001.
- QIP short term course notes advanced IT applications in Civil Engineering: IIT, Kharagpur, 2001.
- L.W. Mays, Water Resources Engineering, John Wiley and Sons, 2001.
- S.C. Chapra, Surface Water Quality Modeling, McGraw Hill, Inc., 1997.

Syllabus - Sixth Semester

ENVIRONMENTAL ENGINERING-I

Course Code: CIV2601 CreditUnits: 03

Course Objective:
Based on course Environmental studies, the water resources and their management for environmental suitability are studied in this course.

Course Contents:

Module I: Scope of Environmental Engineering
Water Supply Engineering. Quantity of water. Types of water demand. Fluctuation in demand. Factors affecting consumption. Forecasting population. Design period.

Module II: Sources of water
Surface water sources. Intakes. Ground water Sources. Estimation of yield from various ground water sources. Quality of water. Drinking water standards – Water quality parameters- effects on human health- Methods of Physical, Chemical and Bacteriological analysis of water.

Module III: Treatment of water
Process details and design considerations. Aeration. Coagulation. Flocculation. Sedimentation. Filtration. Disinfection. Miscellaneous and advanced treatments. Iron and manganese removal. Fluoridation and defluoridation. Water Softening. Arsenic removal. Desalination. Membrane filtration.

Module IV: Water supply schemes
Gravitational, pumping and combined schemes. Pumps. Pumping stations. Transmission of water. Materials of water supply pipes. Design of gravity and pumping main. Distribution systems. Different layout of pipe networks.House connection from mains. Different valves, meters and hydrants. Storage reservoirs. Balancing reservoir. Detection and prevention of leaks in the distribution systems. Maintenance of distribution systems.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Garg S. K, Environmental Engineering, Vol. I, Khanna Publications, 2001, New Delhi.
- Birdie G.S & Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai & Sons, 1998, New Delhi.
- Duggal, K.N., Elements of Environmental Engineering, S Chand & Co. Ltd., 2000, New Delhi.
- Mark J. Hammer & Mark J. Hammer Jr., Water and Waste Water Technology, Prentice Hall of India Pvt. Ltd., 1998, New Delhi.
- Fair, Geyer &Okun, Water & Waste Water Engineering, John Wiley, 1966, New York.
- Ernest W. Steel & Terence J. Mc Ghee, Water Supply & Sewage, McGraw Hill, 1990, New York.
- Relevant BIS Codes.

STRUCTURAL CONCRETE DESIGN

Course Code: CIV2602 CreditUnits: 03

Course Objective:
This course deals with the design concept of designing concrete structure. As a prerequisite the students should have knowledge of principal of structural design.

Course Contents:
Module I: Design of Columns
Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts
Note: All designs shall be conforming to IS : 456 – 2000

Module II: Design of Footing
Analysis and design of beam curved in plan. 2 Structural behavior of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing.

Module III: Design of Tank
Design criteria, material specifications and permissible stresses for tanks, design concept of circular and rectangular tanks situated on the ground / underground, design of overhead tanks.

Module IV: Design of Retaining Wall
Structural behavior of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Pillai S.U. & Menon D., Reinforced Concrete Design Tata McGraw Hill, 2003
- Varghese P.C., Limit State Design of Reinforced Concrete, Prentice Hall of India, 2003
- Mallick S.K. & Gupta A.K., Reinforced Concrete, Oxford & IBH, 1982
- Jain A.K., Reinforced Concrete - Limit State Design, Standard Book House, 1998
- Punmia B.C., Reinforced Concrete Structures Vol. I, Standard Book House,2005
- Jain &Jaikrishna, Plain & Reinforced Concrete Vol. I, Nemchand, 2000
- Sinha S.N., Reinforced Concrete Design, Tata McGraw Hill, 2005
- BIS codes (IS 456, SP 16, SP 24, SP 34)

WATER RESOURCE ENGINEERING-I

Course Code: CIV2610 CreditUnits: 03

Course Objective:
This course deals with various concepts of water resources engineering. The course introduces the concept of hydrology, ground water and then deals with irrigation engineering. It also deals with design of dam.

Course Contents:

Module I: Hydrology
Hydrologic cycle- Precipitation, rainfall variations, measurement, presentation of RF data, Mean precipitation, Abstractions from precipitation- Runoff-Long term runoff, empirical formulae, short term runoff- hydrograph analysis. Flood-Rational and Empirical methods for prediction - Design floods. Ground water- Aquifer types-flow of ground water – Well hydraulics-Types of wells-Other sources of ground water.

Module II: Irrigation
Necessity of irrigation and type of irrigation systems.-Total planning concept-Water requirements of crops-Command area-duty-delta. Consumptive use of water –Irrigation efficiency-Irrigation requirement of crops-Reservoir planning-Site investigation-Zones of storage-Reservoir yield-Reservoir losses and Control-Life of reservoir

Module III
Diversion head works-Location – Essential components of Weir and Barrage-Weirs on permeable foundations-Blighs and khoslas seepage theories - Design procedure.
Dams - Types of dams and their selection-Gravity dam-Analysis and design.
Spillways-Different types and suitability.

Module IV
Regulation and control of canal system-Purpose, Types of canal regulation works and their functional aspects. Irrigation Outlets-Requirements, types, non-modular, semi-module and rigid module, selection criterion. River Training - Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
- Irrigation, Water Resources, and Water power Engineering By DrP.N.Modi, Standard Book House 1990
- Engineering Hydrology by K. Subramanya, TMH.
- Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
- Water Resources Engg. By Larry W. Mays, John Wiley India
- Water resources Engg. By Wurbs and James, John wiley India
- Water Resources Engg. By R. K. Linsley, McGraw Hill
- Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
- Irrigation Theory and practices by A.M. Michel.
- Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.

GEOTECHNICAL ENGINEERING-II

Course Code: CIV2651 CreditUnits: 03

Course Objective:
Advanced topics of soil mechanics and the design of foundations are covered in this course.

Course Contents:

Module I: Earth pressure
Earth pressure at rest. Active and passive earth pressure for cohesionless and cohesive soils. Coulomb's and Rankine's theories. Point of application of earth pressure for cases of with and without surcharge in cohesionless and cohesive soils. Culmann's and Rebhan's graphical construction for active earth pressure. Friction circle method for active earth pressure. **Site investigation and soil exploration:** Objectives. Planning. Reconnaissance. Depth of exploration. Methods of subsurface exploration. Test pits. Auger borings. Wash boring. Rotary drilling. Percussion drilling. Core drilling. Sampling. Types of soil samples. Splitspoon sampler. Thin walled sampler. Piston sampler. Denison sampler. Hand cut samples. Location of water table. S.P.T. Field vane shear test. Introduction to geophysical methods. Boring log. Soil profile.

Module II: Bearing capacity
Ultimate and allowable bearing capacity. Terzaghi's equation for bearing capacity for continuous circular and square footings. Types of shear failures. Bearing capacity factors and charts. Effect of water table on bearing capacity. Meyerhoff's bearing capacity heory. Skempton's formulae. Bearing capacity from field tests. Bearing capacity from building codes. Net bearing pressure. Methods of improvement of soil bearing capacity: vibro flotation and sand drains.
Settlement analysis: Distribution of contact pressure. Immediate and consolidation settlement. Estimation of initial and final settlement under building loads. Limitations in settlement computation. Causes of . Permissible, total and differential settlements. Cracks and effects of settlement.

Module III: Foundations
General considerations: Functions of foundations. Requisites of satisfactory foundations. Different types of foundations. Definition of shallow and deep foundation. Selection of type of foundation. Advantages and limitations of various types of foundations. Design considerations . Footings subjected to eccentric loading. Conventional procedure for proportioning footings for equal settlements.
Open excavation: Open foundation excavations with unsupported slopes. Supports for shallow and deep excavations. Stress distribution in sheeting and bracing of shallow and deep excavations. Stability of bottom of excavations. **Raft foundations**: Bearing capacity equations. Design considerations. Conventional design procedure for rigid mat. Uplift pressures. Methods of resisting uplift. Floating foundations.

Module IV: Pile foundations
Uses of piles. Classification of piles based on purpose and material. Determination of type and length of piles. Determination of bearing capacity of axially loaded. Single vertical pile. Static and dynamic formulae. Determination of bearing capacity by penetration tests and pile load tests (IS methods). Negative skin friction. Group action and pile spacing. Analysis of pile groups. Load distribution by Culmann's method. **Caissons and piers:** Open (well) caissons. Box (floating) caissons. Pneumatic caissons. Construction details and design considerations of well foundations. Drilled piers and their construction details.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Joseph E. & Bowles, *Foundation Analysis & Design*, McGraw Hill
- Leonards G.A., *Foundation Engineering*, McGraw Hill
- Teng W.C., Foundation Design, PHI, 1984
- Tomlinson M.J., Foundation Design & Construction, Pitman, 1963.
- Terzaghi& Peck, Soil Mechanics in Engineering Practice, Asia Publishing
- Arora K.R., *Soil Mechanics & Foundation Engg.*,Standard Publications, 1987.
- Murthy V.N.S., Soil Mechanics & Foundations.
- Punmia B.C., Soil Mechanics & Foundations, Laxmi, 1988.

GEOTECHNICAL ENGINEERING LAB

Course Code: CIV2605 CreditUnits: 01

Course Contents:

1. Specific gravity of coarse and fine grained soils.
2. Grain size analysis (a) Sieve analysis (b) Pipette analysis
3. Atterberg's limits and indices
4. Determination of field density (a) sand replacement method (b) core cutter method
5. Determination of coefficient of permeability by
   (a) Constant head method (b) Variable head method
6. Consolidation test
7. Compaction test (a) IS light compaction test (b) IS heavy compaction test
8. California Bearing Ratio test
9. Direct shear test
10. Triaxial shear test
11. Unconfined compressive strength test
12. Laboratory vane shear test

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

PRESTRESSED CONCRETE

Course Code: CIV2607 CreditUnits: 03

Course Objective:
This course deals with advanced concept of structural concrete design.

Course Contents:

Module I: Materials for prestressed concrete and prestressing systems
High strength concrete and high tensile steel – tensioning devices – pretensioning systems – post tensioning systems.

Module II: Analysis of prestress and bending stresses
Analysis of prestress – resultant stresses at a sector – pressure line or thrust line and internal resisting couple – concept of load balancing – losses of prestress – deflection of beams.

Module III: Strength of prestressed concrete sections in flexure, shear and torsion
Types of flexural failure – strain compatibility method – IS code procedure – design for limit state of shear and torsion.

Module IV: Design of prestressed concrete beams and slabs
Transfer of prestress in pre tensioned and post tensioned members – design of anchorage zone reinforcement – design of simple beams – cable profiles – design of slabs.
A design project for the design and detailing of a large span beam is envisaged at this stage.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- N. Krishna Raju, Prestressed concrete, Tata McGraw Hill, 2000
- T.Y. Lin, Ned H. Burns, Design of Prestressed Concrete Structures, John Wiley & Sons, 2004.
- P. Dayaratnam, Prestressed Concrete, Oxford & IBH,1982
- R. Rajagopalan, Prestressed Concrete, Narosa publishers, 2004.
- BIS codes (IS 1343)

TRAFFIC ENGINEERING AND MANAGEMENT

Course Code: CIV2608 CreditUnits: 03

Course Objective:
The students acquire comprehensive knowledge of traffic surveys and studies such as 'Volume Count', 'Speed and delay', 'Origin and destination', 'Parking', 'Pedestrian' and 'Accident surveys'. They achieve knowledge on design of 'at grade' and 'grade separated' intersections. They also become familiar with various traffic control and trafficmanagement measures.

Course Contents:

Module I: Introduction
Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering- Road, Traffic and Land Use Characteristics

Module II: Traffic Surveys and Analysis
Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services- Basic principles of Traffic Flow.

Module III: Traffic Control
Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design

Module IV: Geometric Design of Intersections
Conflicts at Intersections, Classification of 'At Grade Intersections, - Channallised Intersections - Principles of Intersection Design, Elements of Intersection Design, Rotary design, Grade Separation and interchanges - Design principles.

Module V: Traffic Management
Traffic Management- Transportation System Management (TSM) - Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, Oneway Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes, Introduction to Intelligent Transportation System (ITS).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Technical Publications, Delhi, 2000.
- Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
- Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management
- Guidelines of Ministry of Road Transport and Highways, Government of India.
- Subhash C. Saxena, A Course in Traffic Planning and Design, Dhanpat Rai Publications, New Delhi, 1989.
- Transportation Engineering – An Introduction, C.JotinKhisty, B.KentLall, Prentice Hall of India Pvt Ltd, 2006.

BASICS OF OPTIMIZATION TECHNIQUES AND MATHEMATICAL MODELING

Course Code: CIV2611 CreditUnits: 03

Course Objectives: Optimization is the process of obtaining the best result under given circumstances. In design, construction and maintenance of any engineering system, engineers have to take many technological and managerial decisions at several stages. The ultimate goal of all such decisions is either to minimize the effort required or to maximize the desired benefit. A number of optimization methods have been developed for solving different types of optimization problems. In this course, after discussing about the optimization problem formulation, Linear Programming, Non Linear Programming, Dynamic Programming techniques are explained in detail along with number of applications in civil engineering.

Course Contents:

MODULE-I

Introduction and Basic Concepts: Historical Development; Engineering applications of Optimization; Art of Modeling Objective function; Constraints and Constraint surface; Formulation of design problems as mathematical programming problems Classification of optimization problems Optimization techniques – classical and advanced techniques.

MODULE-II

Optimization using Calculus: Stationary points; Functions of single and two variables; Global Optimum Convexity and concavity of functions of one and two variables Optimization of function of one variable and multiple variables; Gradient vectors; Examples Optimization of function of multiple variables subject to equality constraints; Lagrangian function Optimization of function of multiple variables subject to equality constraints; Hessian matrix formulation; Eigen values Kuhn-Tucker Conditions; Examples.

MODULE-III

Linear Programming: Standard form of linear programming (LP) problem; Canonical form of LP problem; Assumptions in LP Models; Elementary operations Graphical method for two variable optimization problem; Examples Motivation of simplex method, Simplex algorithm and construction of simplex tableau; Simplex criterion; Minimization versus maximization problems Revised simplex method; Duality in LP;Primaldual relations; Dual Simplex method; Sensitivity or post optimality analysis Other algorithms for solving LP problems – Karmarkar's projective scaling method

MODULE-IV

Linear Programming Applications: Use of software for solving linear optimization problems using graphical and simplex methods Examples for transportation, assignment, water resources, structural and other optimization problems. Dynamic Programming, Dynamic Programming Applications Advanced Topics in Optimization

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

TEXT BOOK:

- S.S. Rao,"Engineering Optimization: Theory and Practice", New Age International P)Ltd., New Delhi, 2000.
- G. Hadley,"Linear programming", Narosa Publishing House, New Delhi, 1990.
- H.A. Taha,"Operations Research:An Introduction", 5th Edition, Macmillan, New York, 1992.
- K. Deb,"Optimization for Engineering DesignAlgorithms and Examples",Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.
- K.Srinivasa Raju and D. Nagesh Kumar, "Multicriterion Analysis in Engineering and Management",PHI Learning Pvt. Ltd., New Delhi, India, ISBN 978-81-203-3976-7, pp.288, 2 0 1 0.

Syllabus - Seventh Semester

STRUCTURAL STEEL DESIGN

Course Code: CIV2701 CreditUnits: 03

Course Objective:
This course deals with design of various steel structures. The prerequisite of this course is that the students should have good understanding of principles of structural design.

Course Contents:

Module-I: General Considerations
Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, StressStrain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seism ic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckl ing of Plate Elements. Introduction to Limit State Design Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actios (Loads), Probabilistic Basis for Design, Design Criteria

Module-II: Simple Connections
Riveted, Bolted and Pinned Connections Introduction, Riveted Connections, Patterns of Riveted Joint s, Bolted Connections, Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing- Type Connections, Prying Action, Tensile Strength of plate, Efficiency of the Joint, Combined Shear and Tension, Slip- Critical Connections, C ombined Shear and Tension for Slip- Critical Connections, Working Load Design, Pin Connections
Simple Welded Connections
Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in t he Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied t o the Edge of A Plate or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Section of Fasteners, Working Load Design

Module-III: Tension Members
Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Ten sion Member, Lug Angles, Splices, Gusset Plate, Working Load Design

Module-IV: Compression Members
Introduction, Effective Length, Slenderness Ratio (λ), Types of Sections, Types of Buckling, Classific ation of cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression M embers, BuiltUp Columns (Latticed Columns), Lacing, Batten, Compression Member Composed ofTwo Components Back to Back, Encased Column, Splices, Design of Column Bases

Module-V: Beams
Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stabilit y of Beams, LateralTorsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, BuiltUp Beams (Plated Beams), Linte ls, Purlins, Beam Bearing Plates, Castellated Beam, Effect of Holes in Beam, Introduction to Plate Gir der , Introduction to Gantry Girder.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Ramchandra, Design of Steel Structures Vol I and II, Standard book house, 1991
- P. Dayaratnam, Design of Steel Structures, (Wheeler), 1998
- M. Raghupathi, Design of Steel Structures, Tata McGraw Hill, 1985
- Lin &Breslar, Design of Steel Structures, John Wiley & Sons, 1963
- BIS codes (IS 800, SP: 6 – Part 1 to 6).

ENVIRONMENTAL ENGINEERING-II

Course Code: CIV2702 CreditUnits: 03

Course Objective:
This course deals with advanced environmental engineering concepts. It explains the design of various plumbing, treatment plant and solid waste management.

Course Contents:

Module I
Sanitary plumbing – sanitary fixtures – systems of piping – house drainage– connection of house drains and street sewers. Systems of sewerage– Dry weather flow and wet weather flow– sewers and sewer appurtenances – sewage pumping – maintenance of sewers.

Module II
Waste water- Characteristics– sampling – population equivalent — preliminary treatment of waste water – screens – grit chamber – detritus tank – Sedimentation tank.
Biological treatment (process details and design considerations) - Aerobic- Activated Sludge Process- Trickling Filter- Oxidation Ponds

Module III
Anaerobic treatment- Anaerobic digesters- Septic Tanks- Soak pits
Waste water disposal – disposal into stream –fundamentals of stream sanitation- disposal by irrigation – sludge treatment and disposal

Module IV
Solid waste management: Generation- on site handling and storage- transfer and transportprocessing-resource recovery- treatment and disposal.
Air pollution and control – sources –pollutants and their health effects– particulate and gaseous pollution control devices (fundamentals)-Settling chambers- Electrostatic precipitators- Cyclones-Wet Collectors-Gas absorption by tray and packed towers

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Birdie G. S and Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai and Sons (1998), New Delhi
- Duggal K.N., Elements of Environmental Engineering, S. Chand and Co. Ltd. (2000), New Delhi
- Garg S.K, Environmental Engineering Vol. II¸ Khanna Publications (2001) New Delhi
- Ehlers VM & Steel EW, Municipal & Rural Sanitation, 6th Edn.(1965)McGraw Hill.
- Sawyer and McCarte, Chemistry for Environmental Engineering, Tata McGraw-Hill, (2003) New Delhi,.
- Fair, Geyer &Okun, Water and Waste water Engineering, John Wiley & sons, Inc (1966)
- Metcalf & Eddy, Waste Water Engineering Treatment, Disposal & Reuse, Tata McGraw Hill (1979)

WATER RESOURCE ENGINEERING-II

Course Code: CIV2711 CreditUnits: 03

Course Objectives: To study the different aspects of design of hydraulic structures. To provide knowledge on various hydraulic structures such as energy dissipaters, head and cross regulators, canal falls and structures involved in cross drainage works

Course Contents:

MODULE-I:
Head Works:Types of head works, Functions and investigations of a diversion head work: component parts of a diversion head work and their design considerations, silt control devices.
Theories of Seepage: Seepage force and exit gradient, assumptions and salient features of Bligh's Creep theory, Limitations of Bligh's Creep theory, salient features of Lane's weighted Creep theory and Khosla's theory, Comparison of Bligh's Creep theory and Khosla's theory, Determination of uplift pressures and floor thickness.

MODULE-II:
Design of Weirs: Weirs versus barrage, types of weirs, main components of weir, causes of failure of weir and design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir. Energy Dissipation Devices: Use of hydraulic jump in energy dissipation, Factors affecting design, Types of energy dissipators and their hydraulic design.

MODULE-III:
Canal Regulators: Offtake alignment, cross-regulators – their functions and design, Distributory head regulators, their design, canal escape. Canal Falls: Necessity and location, types of falls and their description, selection of type of falls, Principles of design, Design of Sarda type, straight glacis and Inglis or baffle wall falls. Canal Out-lets : Essential requirements, classifications, criteria for outlet behaviours, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of nonmodular, semi-modular and modular outlets.

MODULE-IV:
Cross-Drainage works : Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts – their types and design considerations, super passages, canal siphons and level crossing.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Irrigation Engg. & Hydraulic Structure by Santosh Kumar Garg, Khanna Publishers
- Design of Irrigation Structures by R.K. Sharma, Oxford IBH Pub
- Irrigation Engg. and Hydraulics Structures by S.R. Sahasrabudhe, . Katson Publishing
- Irrigation Practice and Design Vol. I to VII by K.B. Khushlani. Oxford IBH Pub
- P.N. Modi; Irrigation with Resources and with Power Engineering, Standard Book House
- Irrigation Engg. Vol. I & II by Ivan E. Houk, John Wiley and sons

ENVIRONMENTAL ENGINEERING LAB

Course Code: CIV2704 CreditUnits: 01

Course Contents:

1. Determination of solids (total, dissolved, organic, inorganic and settleable) in water
2. Determination of turbidity and the optimum coagulant dose
3. Determination of alkalinity and pH of water
4. Determination of hardness and chlorides in water
5. Determination of iron and manganese in water
6. Determination of sulphates and sulphides in water
7. Determination of D.O and B.O.D of waste water
8. Determination of available chlorine in bleaching powder and the chlorine dose required to treat the given water sample
9. Determination of coliforms in water
10. Demonstration of Instrumental methods of pollutant analysis

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- Standard method for the examination of water and waste water, 2005, APHA, AWWA, WPCF Publication

SUMMER INTERNSHIP EVALUATION-II

Course Code: CIV2735 CreditUnits: 03

Objective:
There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

Guidelines
In order to achieve these objectives:

- **Each student will be allotted a supervisor** for proper guidance.
- **Student will first submit details of company, external guide, project title to coordinator/supervisor as per given schedule.**
- For internal assessment purpose, students will submit an industry feedback and a progress report.
- Student will maintain a file (**Internship File/Project Report**) which he/she will submit after completion of internship. **Further, coordinator will provide NTCC project guidelines and sample to help in preparation of file.** The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project Report

1. File should be in the following specification

- A4 size paper
- Spiral Binding
- **Font**

For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

- **Margins**

A margin of 3.75 cm (1½ inch) is to be given on the binding edge while on the other sides it is to be 2.5 cm (1 inch). The text of the report, including headings, figures, tables, and notes, but excluding page numbers, must be accommodated within the page area.

- **Line Spacing**

The line spacing in the main text must be between one-and-a-half (1.5). Single line spacing should be given for figure captions, table titles, figure legends, and footnotes. Equations, tables, figures, and quotations should be set off from the main text with adequate space (not less than the normal line spacing adopted for the main text). Two consecutive paragraphs should be separated by a spacing which must be larger than the line spacing adopted for the text.

- **Tables and Figures**

Each sketch, drawing, graph and photograph should have a figure number and title below the figure etc. Numbering should be sequential, chapter wise. For instance, if there are 24 figures chapter 3 spread over all of its sections the figure numbers run from Figure 3.1 through Figure 3.24. In figures experimental data should typically be represented by centered symbols, and theoretical data by continuous curves.
Each table should have a table number and caption above the table. Numbering should be sequential, chapter wise, as in the case of Figure numbers. For instance, if there are 18 tables in chapter 3 the table numbers run from Figure 3.1 through Figure 3.18.

Make sure that figures and tables are complete in other respects such as legends, references (if any) and coordinate labels with units. Each figure and table must be explicitly referred to in the text and located where its first reference occurs, preferably after the reference.

- **Drawings**

All engineering drawings must conform to relevant Standards and should include a title block. If drawings are large they should be included at the back of the report in a separate pocket. In case drawings are made using CAD packages, a CD ROM should be included which contains all the files and details of the packages used.

- **Equations**

The numbering of equations should be sequential, chapter wise. Numbered equations must be explicitly referred to in the text.

2. Report Size: The maximum number of pages of the Report should be preferably between 50-80 pages.

3. Report Layout: The report should contain the following components
Front Page
Declaration
Student Certificate (University)
Certificate (Company)
Acknowledgement
Abstract
Contents
List of Figures
List of Tables
Company Profile (optional)
Chapters
Appendices(optional)
References / Bibliography

The above components are described below:
1. **The Title Page**-- Format will be given by coordinator/supervisor.
2. **Declaration by the Students-**This is page number (i), the beginning of the small case Roman numeral page numbers. The student has to give a declaration to the effect that the data used for the work, the work depicted in the report, and the written material contained in the report are not copied from others and that due permission has been taken from, and due credit has been given to, the sources whenever they are used.
3. Certificate-This is page number (ii). It is given by the Institute. The certificate will be signed by the Faculty Supervisor(s) before the viva-voce after verifying the format and by the Head of the Department after review with the Supervisor(s).
4. Company Certificate: This is a certificate, which the company gives to the students.
5. Contents-This is page number (iii). The table of Contents should be titled just Contents (not Table of Contents). Try to fit it into one or two pages.
6. Acknowledgement-This is page number (iv). Keep this brief and avoid using informal language. This page must be signed by the candidate.
7. Abstract and **Keywords-**This is page number (v). The abstract (preferably one page) should contain the context/relevance of the problem at hand, a description of what was done and a gist of the significant observations/results.

The keywords (maximum 6) are a hint that what is contained in the report.

8. Company Profile: A Company Profile corresponds to a file with company-specific data. Company data can be stored there and included in a booking when needed.

9. **Chapters**—Introduction, Literature Review/Background Study etc. as given by coordinator/supervisor.

10. **References / Bibliography** --This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

ASSESSMENT OF THE INTERNSHIP FILE

Continuous Internal Assessment consists of topic relevance, progress report and industry feedback on company letterhead. Final Assessment includes viva, presentation, execution and report marks.

Examination Scheme:

Components	**IF**	**PR**	**R**	**E**	**V**	**FP**
Weightage (%)	20	20	15	15	15	15

V – Viva, IF – Industry Feedback, FP – Final Presentation, R – Report, PR-Progress Report, E-Execution

INDEPENDENT STUDY

Course Code: CIV2712 CreditUnits: 02

This is an elective, self-directed course to investigate aemergingareasof IT and Computer Science like Mobile Operating System, Cloud Computing, or from Current Research Areas etc. The primary goal of the course is to provide students with research exploration of a specific topic of interest to the individual student under the advisement of an instructor who will monitor and critique the student's progress.

Independent study provides students with the opportunity to work one-on-one with a Faculty on a particular topic. The student and faculty should discuss the aims and content of the study and present the proposal to Head of Department. The independent study proposal should include the study's title, theme, readings, work to be submitted, and syllabus. Faculty and student should meet for a minimum number of 2 hours per week. Student will give a seminar after completion of study.

TERM PAPER

Course Code: CIV2731 CreditUnits: 02

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

Guidelines for Term Paper

The procedure for writing a term paper may consist of the following steps:

1. Choosing a subject
2. Finding sources of materials
3. Collecting the notes
4. Outlining the paper
5. Writing the first draft
6. Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of Materials

a) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
b) Begin by making a list of subject-headings under which you might expect the subject to be listed.
c) The sources could be books and magazine articles, news stories, periodicals, scientific journals etc.

3. Collecting the Notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

a) Get facts, not just opinions. Compare the facts with author's conclusion.
b) In research studies, notice the methods and procedures, results & conclusions.
c) Check cross references.

4. Outlining the Paper

a) Review notes to find main sub-divisions of the subject.
b) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the First Draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

a) statement of purpose
b) main body of the paper
c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main idea.

6. Editing &Preparing the Final Paper

a) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
b) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
c) Check for proper spelling, phrasing and sentence construction.
d) Check for proper form on footnotes, quotes, and punctuation.
e) Check to see that quotations serve one of the following purposes:
   (i) Show evidence of what an author has said.
   (ii) Avoid misrepresentation through restatement.
   (iii) Save unnecessary writing when ideas have been well expressed by the original author.

f) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

1) Title page
2) Table of contents
3) Introduction
4) Review
5) Discussion&Conclusion
6) Bibliography
7) Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

a) summary of question posed
b) summary of findings
c) summary of main limitations of the study at hand
d) details of possibilities for related future research

Bibliography

From the very beginning of a research project, you should be careful to note all details of articles gathered. The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography. The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical Conventions:

Monographs

Crystal, D. (2001), Language and the internet, Cambridge: Cambridge University Press

Edited Volumes

Gass, S/Neu, J. (eds.) (1996), Speech acts across cultures, Challenges to communication in a second language, Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited Articles

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language, Berlin/ NY: Mouton de Gruyter: 285-316.

Journal Articles

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

Electronic book

Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved on [5.10.01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/.

Electronic Journal Articles

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document], German as a Foreign Language Journal [online] 1, Retrieved [12.09.00] from the World Wide Web, http://www.gfl-journal.com/

Other Websites

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document], Retrieved on [13.10.01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html

Unpublished Papers

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu

Unpublished Thesis/ Dissertations

Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg
Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin

Appendix

The appendix should be used for data collected (e.g. questionnaires, transcripts, etc.) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Examination Scheme:

Dissertation:	75
Viva voce	25
Total:	**100**

PROJECT

Course Code: CIV2732 CreditUnits: 02

Methodology

Topics of project are to be based on the latest trends, verifying engineering concepts /principals and should involve elementary research work. The projects may involve design, fabrications, testing, computer modeling, and analysis of any engineering problem. On completion of the practical training the students are to present a report covering various aspects learnt by them and give a presentation on same.

Guidelines for Project File

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critically analyzed by the faculty guide and corrected by the student at each stage.

Project File

The Project File may be a very useful tool for undertaking an assignment along-with a normal semester, an exploratory study, sponsored projects, a project undertaken during summer period or any other period where the researcher is not working with a company/organization. The project/ assignment may also be a part of the bigger research agenda being pursued by a faculty/ institution/ department

The project file is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation. This file may be considered in continuous assessment.

In general, the file should be comprehensive and includes:

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated objectives;
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen and may be useful to document for future reference.

Layout Guidelines for the Project File

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Assessment of the Project File

Essentially, the assessment will be based on the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The Project should fulfill the following assessment objectives:

- Range of research methods used to gain information
- Execution of research
- Data analysis (Analyse Quantitative/ Qualitative information)
- Quality Control
- Conclusions

Assessment Scheme:

Continuous Evaluation:

40% (Based on punctuality, regularity of work, adherence to plan and methodology, refinements/ mid-course corrections etc. as reflected in the Project File.)

Final Evaluation:

60% (Based on the documentation in the file, final report layout, analysis and results, achievement of objectives, presentation/ viva)

Syllabus - Eighth Semester

CONSTRUCTION MANAGEMENT AND QUANTITY SURVEYING

Course Code: CIV2801 CreditUnits: 03

Course Objective:
The main objective of this course is to train the student construction management and quantity surveying

Course Contents:

Module I
Construction Management – Network techniques – introduction – Bar charts – use of CPM and PERT for planning – time estimates – critical path – updating – crashing – resource smoothing – resource leveling – computer applications
Construction planning: Preparation of job layout – labour schedule – material schedule – equipment schedule

Module II:
Project Implementation **–** Tender – earnest money deposit – security deposit – contract – contract documents – measurements – completion certificate – inspection and quality control – standardization – organisations at national and international level (BIS & ISO) – role of certification

Module III
Quantity surveying - preparation of detailed estimates for: buildings - reinforced concrete structures - sanitary and water supply works

Module IV
Preparation of specification for common materials of construction and items of work as per IS - analysis of rates and preparation of abstract of estimate
Introduction to valuation of real properties: Depreciation – Sinking fund – methods of valuation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Vazirani V.N. &Chandola S.P., Heavy Construction, 1978.
- Jha J. & Sinha S.K., Construction & Foundation Engineering, Khanna Publications
- Verma L.C., Standardisation - A New Discipline
- Rangwala, Valuation of Real Properties, Charotar, 1978.
- Peurifoy R.L., & Ledbetter W.B., Construction Planning Equipment & Methods,
- McGraw Hill, 1956.
- Dutta B.N., Estimation & Costing in Civil Engg, UBSPD, 1992.
- Chakrabarthi, Estimation, Costing, Specification in Civil Engg,
- Shah N.A., Quantity Surveying & Specification in Civil Engg**.,**
- I.S 1200 (1968), Methods of Measurement of Building & Civil Engg. Works Mahajan S.P., Civil Estimating & Costing, Sathyaprakasham, 1988

DISSERTATION

Course Code: CIV2837 CreditUnits: 08

Methodology

Topics of project are to be based on the latest trends, verifying engineering concepts /principals and should involve elementary research work. The projects may involve design, fabrications, testing, computer modeling, and analysis of any engineering problem. On completion of the practical training the students are to present a report covering various aspects learnt by them and give a presentation on same.

Guidelines for Project File and Project Report

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critically analyzed by the faculty guide and corrected by the student at each stage.

Project File

The Project File may be a very useful tool for undertaking an assignment along-with a normal semester, an exploratory study, sponsored projects, a project undertaken during summer period or any other period where the researcher is not working with a company/organization. The project/ assignment may also be a part of the bigger research agenda being pursued by a faculty/ institution/ department

The Project File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation. This file may be considered in continuous assessment.

In general, the File should be comprehensive and include

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated objectives;
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen and may be useful to document for future reference.

Project Report

The Project Report is the final research report that the student prepares on the project assigned to him. In case of sponsored project the lay out of the project could be as prescribed by the sponsoring organization. However, in other cases the following components should be included in the project report:

- **Title or Cover Page**
  The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.
- **Acknowledgement(s)**
  Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.
- **Abstract**
  A good"Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.
- **Table of Contents**
  Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

  Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.
- **Materials and Methods**

  This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.
- **Results and Discussion**

  Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

  Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

  While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

  Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.
- **Conclusion(s) & Recommendations**

  A conclusion should be the final section in which the outcome of the work is mentioned briefly. Check that your work answers the following questions:
  - Did the research project meet its aims (check back to introduction for stated aims)?
  - What are the main findings of the research?
  - Are there any recommendations?
  - Do you have any conclusion on the research process itself?
- **Implications for Future Research**

  This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.
- **Appendices**

  The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.
- **References**

  References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

  Examples

  For research article

  Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic*Escherichia coli* O157: H7. *ClinMicrobiol Infect*, **8** (suppl 1): 116–117.

  For book

  Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

Layout Guidelines for the Project File & Project Report

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Assessment of the Project File and the Project Report

Essentially, the assessment will be based on the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The Project should fulfill the following assessment objectives:

- Range of Research Methods used to oASEin information
- Execution of Research
- Data Analyses (Analyse Quantitative/ Qualitative information)
- Quality Control
- Conclusions

Assessment Scheme:

Continuous Evaluation:

40% (Based on punctuality, regularity of work, adherence to plan and methodology,refinements/ mid-course corrections etc. as reflected in the Project File.)

Final Evaluation:

60% (Based on the Documentation in the file, Final report layout, analysis andresults, achievement of objectives, presentation/ viva)

INDUSTRIAL WASTE ENGINEERING

Course Code: CIV2803 CreditUnits: 03

Course Objective:
To provide the knowledge on the wastewater characteristics from industry, Define the Principles of pollution prevention and mechanism of industrial processes, andSuggest the suitable technologies for the treatment of wastewater.

Course Contents:

Module I
Industrial waste types and characteristics; levels of environmental pollution due to industrial wastes; health issues due to industrial wastes; ecological and human health risk assessment due to industrial wastes; waste characterization methods; treatment methods-conventional and recent trends. Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Nature and Origin of Pollutants – Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater monitoring and sampling - generation rates, characterization and variables –Toxicity of industrial effluents and Bioassay tests – Major issues on water quality management.

Module II
Waste management Hierarchy - Source reduction techniques – Periodic Waste Minimisation Assessments – Evaluation of Pollution Prevention Options – Cost benefit analysis – Pay-back period – Implementing & Promoting Pollution Prevention Programs in Industries.

Module III
Flow and Load Equalisation – Solids Separation – Removal of Fats, Oil & Grease- Neutralisation – Removal of Inorganic Constituents – Precipitation, Heavy metal removal, Nitrogen & Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration, Eletrodialysis& Evaporation – Removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced Oxidation processes – Treatability Studies.

Module IV
Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.

Module V
Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining–Pharmaceuticals–Sugar and Distilleries.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

References:

- "Industrial wastewater management, treatment & disposal, Water Environment" Federation Alexandria Virginia, Third Edition, 2008.
- LawranceK.Wang, Yung Tse Hung, Howard H.Lo and Constantine Yapijakis “handlook of Industrial and Hazardous waste Treatment”, Second Edition, 2004.
- Metcalf & Eddy/ AECOM, "water reuse Issues, Technologies and Applications", The Mc Graw- Hill companies, 2007.

- Nelson Leonard Nemerow, “Industrial waste Treatment”, Elsevier, 2007.
- Wesley Eckenfelder W., “Industrial Water Pollution Control”, Second Edition, Mc Graw Hill, 1989.
- Paul L. Bishop, „Pollution Prevention: - Fundamentals and Practice“, Mc-Graw Hill International, Boston, 2000.
- Waste water Treatment for pollution control and reuse by Soli. J. Arceivala, Shyam. R. Asolekar, Tata Mcgraw Hill, 2007.

SOLID WASTE MANAGEMENT AND RECYCLING

Course Code: CIV2808 CreditUnits: 03

Course objective: To provide information regarding different elements of Environmental pollution, their origin, characteristics and treatment.

Course Contents:

MODULE-I
Definition of solid waste-waste generation in a technological society- major legislation, monitoring responsibilities, sources and types of solid waste- sampling and characterization- Determination of composition of MSW- storage and handling of solid waste- Future changes in waste composition.

MODULE-II
Collection and transport of solid waste: Collection of Solid waste: type of waste collection systems, analysis of collection system- alternative techniques for collection system. Separation and Processing and Transformation of Solid Waste: unit operations used for separation and processing, Materials Recovery facilities, Waste transformation through combustion and anaerobic composting, anaerobic methods for materials recovery and treatment.

MODULE-III
Recycling of plastic materials and metals. Energy recovery – Incinerators. Transfer and Transport: need for transfer operation, transport means and methods, transfer station types and design requirements. Landfills: Site selection, design and operation, drainage and leachate collection systems – requirements and technical solutions, designated waste landfill remediation – Integrated waste management facilities.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books/References:

- John Pichtel-Waste Management Practices, CRC Press, Taylor & Francis Group.
- Technobanoglous et al –Integrated Solid Waste Management, McGraw- Hill
- Charles A. Wentz – Hazardous Waste Management, McGraw- Hill

BASICS OF FINITE ELEMENT METHOD

Course Code: CIV2809 CreditUnits: 03

Course Objective: This will enable the student to have a basic knowledge of finite element method and shall be able to appreciate and analyze linear elastic structures using finite element method.

Course Contents:

Module I: Introduction to FEM. Basic idea of FEM. Applications and importance of FEM. Differential equilibrium equations - strain displacement relation - linear constitutive relation - special cases- Principle of stationary potential energy - application to finite element methods. Some numerical techniques in finite element Analysis

Module II:
Displacement models - convergence requirements. Natural coordinate systems – Shape function. Interpolation function- Linear and quadratic elements - Lagrange & Serendipity elements- Strain displacement matrix - element stiffness matrix and nodal load vector. Coordinate Transformation: Transformation of vectors and tensors, transformation of stiffness matrices, degree of freedom within elements, condensation, condensation and recovery algorithm, substructuring, structural symmetry.

Module III:
Two dimensional isoparametric elements - Four noded quadrilateral elements – triangular elements- Computation of stiffness matrix for isoparametric elements - numerical integration, (Gauss quadrature) -Convergence criteria for isoparametric elements.

Module IV:
Assemblage of elements – Direct stiffness method- Special characteristics of stiffness matrix - Boundary condition & reaction - Gauss elimination and LDLT decomposition- Basic steps in finite element anlaysis, Introduction to Softwares based on FEM analysis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Cook, R.D., Malkus, D.S., Plesha, M.E., and Witt, R.J., Concepts and Applications of Finite Element Analysis, John Wiley & Sons, 2003.
- Zienkiewicz, O.C., and Morgan, K., Finite Element Approximation, John Wiley & Sons, 1983.
- C.S.Krishnamoorthy, Finite element analysis, theory and programming, Tata McGraw Hill, 2009.
- Finite element analysis, theory and progarmming by GS Krishna Murthy.
- Zienkiewicz, O.C., and Taylor, R.L., The Finite Element Method, Vols I to III, McGraw Hill, 1999.
- Reddy, J.N., An Introduction to the Finite Element Method, McGraw Hill, 2006.