BRANCH-CIVIL ENGINEERING

Specialization:STRUCTURAL & FOUNDATION ENGINEERING,
STRUCTURAL ENGINEERING,
CIVIL ENGINEERING,
GEOTECHNICAL ENGINEERING,
SOIL MECHANICS & FOUNDATION ENGINEERING,
SOIL MECHANICS,
WATER RESOURCE ENGINEERING AND MANAGEMENT,
WATER RESOURCE ENGINEERING,
TRANSPORTATION ENGINEERING

First Semester							
Theory					Practical		
Course Name	**Hours/ Week L/T**	**Credit Theory**	**University Marks**	**Internal Evaluation**	**Hours/ Week L/T**	**Credit Practical**	**Marks**
Computational Methods and Techniques	4-0	4	100	50	-	-	-
Internet of Things	4-0	4	100	50	-	-	-
Theory of Elasticity and Plasticity	4-0	4	100	50	-	-	-
Finite Element Analysis and its Application to the Civil Engineering	4-0	4	100	50	-	-	-
Environment Impact Assessment and Auditing	4-0	4	100	50	-	-	-
Lab-I					8	4	150
Total							
Total Marks: 900							
Total Credits: 24							

INTERNET OF THINGS (IoT)

MODULE I

Introduction to Internet of Things

Introduction-Definition & Characteristics of IoT , **Physical Design of IoT-** Things in IoT , IoT Protocols, **Logical Design of IoT-** IoT Functional Blocks, IoT Communication Models, IoT Communication APIs , **IoT Enabling Technologies-** Wireless Sensor Networks , Cloud Computing, Big Data Analytics , Communication Protocols , Embedded Systems, **IoT Levels & Deployment Templates.**

MODULE II

Domain Specific IoTs

Home Automation: Smart Lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors, **Cities-**Smart Parking, Smart Lighting, Smart Roads, Structural Health Monitoring, Surveillance, Emergency Response, **Environment-**Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest Fire Detection , River Floods Detection , **Energy-** Smart Grids , Renewable Energy Systems , Prognostics , **Retail-**Inventory Management , Smart Payments , Smart Vending Machines , **Logistics-**Route Generation & Scheduling , Fleet Tracking , Shipment Monitoring , Remote Vehicle Diagnostics, **Agriculture-**Smart Irrigation ,Green House Control ,**Industry -**Machine Diagnosis & Prognosis Indoor Air Quality Monitoring ,**Health & Lifestyle -**Health & Fitness Monitoring, Wearable Electronics

IoT and M2M Introduction, M2M-Difference between IoT and M2M, SDN and NFV for IoT-Software Defined Networking , Network Function Virtualization

MODULE III

IoT Platforms Design Methodology

IoT Design Methodology-Purpose & Requirements Specification ,Process Specification, Domain Model Specification, Information Model Specification , Service Specifications , IoT Level Specification, Functional View Specification , Operational View Specification , Device & Component Integration , Application Development, **Case Study on IoT System for Weather Monitoring, Motivation for Using Python**

IoT Physical Devices & Endpoints

What is an IoT Device-Basic building blocks of an IoT Device, **Exemplary Device: Raspberry Pi**, **About the Board, Linux on Raspberry Pi , Raspberry Pi Interfaces –** Serial, SPI , I2C , **Programming Raspberry Pi with Python-**Controlling LED with Raspberry Pi , Interfacing an LED and Switch with Raspberry Pi ,Interfacing a Light Sensor (LDR) with Raspberry Pi , **Other IoT Devices-** pcDuino, Beagle Bone Black , Cubieboard

MODULE IV

IoT & Beyond : Use of Big Data and Visualization in IoT, Industry 4.0 Concepts. Overview of RFID, Low-power design (Bluetooth Low Energy), range extension techniques (data mining and mesh networking), and data-intensive IoT for continuous recognition applications. Overview of Android / IOS App Development tools & Internet Of Everything

Text Books:

Internet of Things, A Hands on Approach, by Arshdeep Bahga & Vijay audisetti, University Press.

Reference Books:

The Internet of Things, by Michael Millen, Pearson

COMPUTATIONAL METHODS AND TECHNIQUES

MODULE-I:

Neural Networks: Artificial Neural Network and Introduction, Learning Rules, Knowledge Representation and Acquisition, Different Methods of Learning.
Algorithms of Neural Network: Feed-forward Error Back Propagation, Hopfield Model, Kohonen's Featrure Map, K-Means Clustering, ART Networks, RBFN, Application of Neural Network to the relevant field.

MODULE-II:

Fuzzy Logic: Basic Concepts of Fuzzy Logic, Fuzzy vs Crisp Set, Linguistic variables,Membership Functions, Operations of Fuzzy Sets, Fuzzy If-Then Rules, Variable Inference Techniques, Defuzzification, Basic Fuzzy Inference Algorithm, Fuzzy System Design, FKBC and PID Control, Antilock Breaking System(ABS), Industrial Applications.

MODULE-III:

Optimization Fundamentals: Definition, Classification of Optimization Problems, Unconstrained and Constrained Optimization, Optimality Conditions.
LINEAR Programming: Simplex Method, Duality, Sensitivity Methods
NON-LINEAR Programming: Newton's Method, GRG Method, Penalty Function Method, Augmented Langrange Multiplier Method, Dynamic Programming and Integer Programming, Interior Point Methods, Karmakar's Algorithm, Dual Affine, Primal Affine.

MODULE-IV:

Genetic Algorithm: GA and Genetic Engineering, Finite Element based Optimization, PSO,BFO, Hybridization of Optimization Technique, Application of Optimization Technique for Solving Projects(Project solutions). Implementation of Branch Relevant Industrial Applications by Matlab Code.
Books Recommended:

1. Neural Networks- by Simon Haykin
2. Fuzzy Logic with Engineering Application- by ROSS J.T (Tata Mc)
3. Neural Networks and Fuzzy Logic – by Bart Kosko
4. An introduction Fuzzy Control – by D.Driankor, H. Hellendorn, M.Reinfrank (Narosa Pub)
5. Fuzzy Neural Control – by Junhong NIE & Derek Linkers (PHI)
6. Related IEEE/IEE Publications
7. Fuzzy System Design Principles, Building Fuzzy IF-THEN Rule Bases – by Riza C. Berikiu and Trubatch, IEEE Press
8. Ashok D. Begundu & chandrapatla T.R "Optimization concept and application in engineering",Prentice Hall,1999
9. Rao S.S "Engineering Optimization"
10. Gill,Murray and Wright ,"Practical Optimization"
11. James A.Memoh. "Electric Power System Application Of Optimization".
12. Song Y.,"Modern Optimization Techniques In Power System"
13. Optimization Research;Prabhakar Pai,Oxford University Press.

FINITE ELEMENT METHOD IN CIVIL ENGINEERING

Module I:

Introduction:

Finite Element Method-Basic Concepts and Solution of Discrete Problems-Steady State and Time Dependent Continuous Problems. Application of Finite Method through illustrative Examples. Finite Difference Method-Finite Difference. Representation of Differential Equations- Stability Consistency and Convergence of Partial Differential Equations-Time integration-Finite Difference Methods in Solution of Steady and Unsteady Problem-Jacobi's Method, Gauss Seidel Method.

Module II:

FEM for Two and Three Dimensional Solids:

The Continuum, Equations of Equilibrium, Boundary Conditions, Strain displacement relations, Stress strain Relations, Plane stress and plane Strain problems, Different methods of structural analysis including numerical methods. Basics of finite element method (FEM), different steps involved in FEM, Different approaches of FEM, Direct method, Energy approach,.

Module III:

Element properties:

Interpolation Functions for General Element Formulations: Compatibility and Completeness, Polynomial Forms: One Dimensional Elements, Geometric Isotropy, Triangular Elements, Rectangular Elements, Lagrange and Serendipity Elements, Solid Elements, Isoparametric Formulation, Stiffness Matrix of Isoparametric Elements. Three Dimensional Elements, Isoparametric Formulations, Axisymmetric Elements; Numerical Integration: One, Two and Three Dimensional.

Module IV:

Analysis of Frame Structures:

Stiffness of Truss Members**,** Analysis of Truss**,** Stiffness of Beam Members**,** Finite Element Analysis of Continuous Beam**,** Plane Frame Analysis**,** Analysis of Grid and Space Frame, Introduction to Plate Bending Problems**,** Finite Element Analysis of Shell.

Additional Applications of FEM:

Finite Elements for Elastic Stability**,** Finite Elements in Fluid Mechanics and ground water modelling.

Reference Book:

1. Reddy, J. N., An Introduction to the Finite Element Method, 3rd Edition, McGraw-Hill Science/Engineering/Math, 2005.
2. Logan D. L., A First Course in the Finite Element Method, Thomson- Engineering, 3rd edition, 2001.
3. Cook R.D., Malkus, D.S. and Plesha, M.E., Concepts and Applications of Finite Element Analysis, Third Edition, John Wiley, 1989.
4. O. C. Zienkiewicz and Y. K. Cheung, The Finite Element Method in Structural and Soild Mechanics, McGraw Hill, London
5. Logan D. L., A First Course in the Finite Element Method, Thomson- Engineering, 3rd edition, 2001.
6. S. S. Rao, Finite Element Analysis, Elsevier Butterworth-Heinemann
7. W. Weaver Jr. and J. M. Gere, Matrix Analysis of Framed Structure, CBS Publishers & Distributors, New Delhi, India
8. K.A. Hoffman, Computational Fluid Dynamics, McGraw Hill.

THEORY OF ELASTICITY & PLASTICITY

Module 1:

Linear elasticity; stress, strain, constitutive relations, strain displacement relations, three dimensional stress and strain analysis, compatibility, stress and displacement functions.

Module 2:

Two dimensional problems in Cartesian and polar coordinates, description of an elasticity problem as a boundary value problem, bending of beams-cantilever and simply supported beam.

Module 3:

Torsion of rectangular bars including hollow sections, torsion of a circular and a rectangular section

Module-4: Elements of plasticity, failure & yield criterion, Equations of plasticity, plastic stress-strain relations, flow rule, velocity field, slip lines and plastic flow, incremental plasticity.

Books:

(1**)** S.P.Timoshenko & J.N.Goodier,"Theory of Elasticity", McGraw Hill-1970.
(2) M.Kachanov, "Theory of Plasticity", MIR Publication.
(3) C.R.Calladine, "Plasticity for Engineers", Ellis Horwood, Chichester,U.K.,1985

ENVIRONMENTAL IMPACT ASSESSMENT AND AUDITING

Sustainable Development Framework for Environmental Impact Assessment. screening, Scoping and Base line Studies, Significance and Importance of Impacts, Mitigation aspects, Assessment of alternativees, Public Hearing, Decision Making. Assessment of impacts on physical resources, ecological resources, human use values and quality of life values.

Impact assessment methodologies -various methods, their applicability. Strategic Environmental Assessment. Environmental Management Planning. Disaster management planning.

Concepts of environmental audit, objectives of audit. Types of Audits; Features of Effective auditing; Programme Planning; Organisation of Auditing Programme, pre-visit data collection. Audit Protocol; Onsite Audit; Data Sampling - Inspections - Evaluation and presentation; Exit Interview; Audit Report - Action Plan - Management of Audits.

References

1. Larry, W. C "Environmental Impact Assessment" McGraw Hill Inc. Singapore.
2. Riki Therirvel, E.Wilson, S.Thompson, D.Heaney, D. Pritchard. Earthscan "Strategic Environmental Assessment" London.
3. Alan Gilpin "Environmental Impact Assessment-Cutting edge for the 21st century" CUP, London.
4. Peter Wathern, Unwin Hynman "Environmental Impact Assessment-Theory & Practice", Syndeny.
5. Paul, A Erickson "A Practical Guide to Environmental Impact Assessment", Academic Press.