CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

FEEDBACK ON CURRICULUM -2020-21

ANALYSIS AND ACTION TAKEN REPORT

Structured feedbacks on curriculum are obtained from stakeholders. The suggestions are analyzed and corrective measures suggested by stakeholders are considered.

Sr. No.	Suggestions/Comments	Actions taken
1	Advancement in Civil Engineering related to CSE & IT field technologies should be introduced.	Courses like Applications of Artificial Intelligence in civil engineering, Applications of Data Analytics in Civil Engineering And Applications Of Blockchain Technology In Civil Engineering have been added as per the guidelines of AICTE model curriculum.
2	Design of Raft Footings and Intze Tank design should be known to students as they are commonly increasing.	Design Of Raft Footings & Design Principles of An Intze Tank these topics are introduced in RCD-II syllabus.

PROFESSOR & HEAD
Department of Civil Engineering
Chaitanya Bharathi Institute of Technology
GANDIPET, HYDERABAD-5000 075

18CE E22

APPLICATION OF DATA ANALYTICS IN CIVIL ENGINEERING
(Core Elective –5)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To identify the sources and characteristics of civil engineering data
2. To find the hidden patterns within the data by processing the raw data
3. To use the information obtained in order to make civil engineering project decisions
4. Study the applications of data analytics in civil engineering
5. To identify various open source tools and resources related to data analytics

Course Outcomes: On successful completion of this course, student will be able to

1. define the descriptive, predictive and prescriptive models and select suitable tools or techniques for application in civil engineering problems
2. identify the discrete and continuous random variables and select appropriate mathematical models which support decision making under uncertainty
3. design data collection process required for descriptive and exploratory models for problems in civil engineering
4. relate estimators and estimates to process of estimation and thus implement the various modeling techniques to uncover the patterns in the civil engineering related data
5. formulate hypothesis and their corresponding confidence intervals for various count data based and discrete choice models along with goodness of fit measures

UNIT I:

Introduction: Fundamentals and the context of data analytics, descriptive, predictive and prescriptive models of data analytics, evolution of data analytics solutions such as SQL analytics, visual analytics, big data analytics, and cognitive analytics. Data analytics tools and techniques used in civil engineering.

UNIT II:

Random variables: Sample, population, sample space, frequentist and Bayesian notations of probability, discrete and continuous random variables and their distributions.

Statistical Modelling: Overview, application, desirable features, issues and pitfalls of statistical models, framework for developing models, basic steps in model building and decision making under uncertainty.

UNIT III:

Experimental and observational study design: sample selection, recruitment, and data collection method selection. Descriptive and exploratory data analysis, including: measures of central tendency, histograms, density distributions, and box plots. Examples of descriptive and exploratory analysis for civil engineering related problems.

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UNIT IV:

Estimation, estimators and estimates; criteria for assessing estimators, asymptotic properties. Estimation techniques: method of moments, ordinary least squares (OLS) regression, log likelihood estimation. OLS – assumptions of linear regression, linear relationship, and estimation of coefficients. Log likelihood estimation - definition of likelihood and log likelihood, parameter estimation using maximum likelihood estimation technique, desirable properties of maximum likelihood estimators.

UNIT V:

Statistical inference of models including tests, confidence intervals and hypothesis testing. Statistical models of independent data including simple and multiple linear regression.Count data and discrete choice models: Binary, multinomial logit models, and count data models with applications in travel choice and transport safety. Process of model selection, goodness of fit and sensitivity analysis.

Text Books:

1. MashrurChowdary, Amy Apon and KakanDey, Data Analytics for Intelligent Transportation Systems, 2012
2. SubhashishSamaddar and SatishNargundkar,Data Analytics: Effective methods for Presenting Results, CRC press, 2012.

Suggested Reading:

1. S.M Yadav, Application of soft computing techniques in civil engineering, 2018.
2. V.K.Jain, Data Science and Analytics, Khanna Publishing, 2018.
3. http://nptel.ac.in/courses/106106126/

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Department of Civil Engineering
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18CEE27

APPLICATIONS OF BLOCKCHAIN TECHNOLOGY IN CIVIL ENGINEERING
(Core Elective-6)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

1. To get the terminologies and overview of Blockchain technology
2. To study the concepts and foundation of Blockchain technology
3. To understand the applications of Blockchain technology in civil engineering
4. To design use cases and architecture Blockchain technology
5. To study benefits, limitations and identify application area of Blockchain technology

Course outcomes: at the end of course, students would be able to:

1. Gain a clear understanding of the concepts that underlie Blockchain and Blockchain and types of Blockchain.
2. Understand key mechanisms like decentralization, transparency and trust, immutability.
3. Understand the importance of Blockchain in construction industry apply the concepts of smart contracts using Blockchain technology.
4. Understand and apply the project management systems using Blockchain technology.
5. Apply the concepts of building information modelling using Blockchain technology.

UNIT 1:Introduction to Blockchain: Introduction to centralized, decentralized and distributed system, History of Blockchain, Various technical definitions of Blockchain. **Generic elements of a blochchain:** Block, Transaction, Peer to peer network, Node, Smart contract, Why it's called blckchain. **Types of Blockchain:** Public Blockchains, Private Blockchains, Semi-private Blockchains, Sidechains, Permissioned ledger, Distributed ledger, shared ledger, Fully private and proprietary Blockchains, Tokenized Blockchains, Token less Blockchains, CAP theorem and Blockchain.

UNIT II: Concepts of Blockchain Technology: Cryptography, Hashing, Nonce, Distributed database, Consensus, Smart Contract, Component of block, and Structure of Blockchain. Applications of Blockchain technology, Tiers of Blockchain technology: Blockchain 0, Blockchain 1, Blockchain 2, Blockchain 3, generation of Blockchain X.

UNIT III:Applications of Blockchain technology in Civil Engineering: Importance of Blockchain in construction industry. Blockchain in operation, public and Private Blockchain types, Smart contracts on the Blockchain to enhance efficiency, Ideal solution for the construction industry.

UNIT IV:Payment and Project Management: Blockchain enabled project collaboration, Transparency in construction industry, Procurement and Supply Chain Management, Sustainable procurement in the construction industry enabled by Blockchain, Fostering enhanced and trust in the supply chain

UNIT V:Building Information Modelling (BIM) – BIM and Blockchain. Project delivery 'designed' to 'as built'.Smart Asset Management through BIM.Challenges and Implementation – Stages of Blockchain implementation in the industry.

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Crypto currency: Bitcoin, Bitcoin definition, keys and addresses, public keys in Bitcoin, private keys in Bitcoin, Bitcoin currency units.

Textbooks:

1. Imran Bashir, "Mastering Blockchain", Packt Publishing Limited, 2nd edition 2018.
2. Narayan Prusty, "Building Blockchain Projects", Packt Publishing, 1st edition 2017.

References:

1. Blockchain For dummies, IBM Limited Edition, John Wiley & Sons, Inc.
2. Lemes, Samir, and LamijaLemes. Blockchain in Distributed CAD Environments". In International Conference "*New Technologies Development and Applications*", pp. 25-32. Springer, Cham, 2019.
3. Blockchain Technology in the Construction Industry-Digital Transformation for High Productivity, 2018.

PROFESSOR & HEAD
Department of Civil Engineering
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18CE E17

APPLICATION OF ARTIFICIAL INTELLIGENCE IN CIVIL ENGINEERING
(Core Elective 4)

Instruction	3LHoursperweek
DurationofSemesterEndExamination	3Hours
SemesterEndExamination	70Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Provide a strong foundation of fundamental concepts in Artificial Intelligence.
2. Learn various types of neural networks and study the applications of neural networks
3. Learn the concepts of Fuzzy systems and applications in civil engineering
4. Study the applications of support vector machines in civil engineering
5. Study the different types of regression analysis techniques and applications in civil engineering

Course Outcomes: On Successful completion of this course, student will be able to

1. recall fundamental knowledge on artificial intelligence.
2. understand neural networks and their types and apply neural networks in the domain of civil engineering.
3. understand and apply fuzzy controllers to solve real-world civil engineering problems.
4. explain basic concepts of support vector machines and choose appropriate techniques relevant to civil engineering.
5. develop a regression models for civil engineering problems.

UNIT I:

Introduction: introduction, brief history, intelligent systems: ELIZA, categorization of intelligent systems, components of AI program. Foundations of AI, sub areas of AI, applications, current trends in AI.

UNIT II:

Artificial Neural Networks: introduction, artificial neural networks: neuron model, activation functions, neural network architecture. Single layer feed forward networks, multi-layer feed forward networks, radial basis function networks, design issues of artificial neural networks, recurrent networks.

Applications: construction technology evaluation, predicting carbonation depth in concrete structures, optimal calibration of water distribution systems, traffic control system for isolated intersections, classification of pavement surface distress, back calculation of flexible pavement moduli from falling weight deflectometer data, back calculation of pavement profiles from the Spectral analysis of surface waves test

UNIT III:

Fuzzy sets and fuzzy logic: introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules, fuzzy systems.

Applications: pipe networks, real time reservoir operation, evaluation of existing reinforced concrete bridges, optimization of steel structures, diagnosing cracks in RC structures, construction scheduling, wastewater treatment systems, pavement cracking detection, road accident analysis

UNIT IV:

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Machine learning: introduction, machine learning systems, supervise and unsupervised learning, inductive and deductive learning, clustering, support vector machines

Applications: slope stability analysis, settlement of shallow foundations on cohesionlesssoils, evaporate losses in reservoirs, undrained shear strength of clay, prediction of compressive strength of self-compacting concrete, traffic signal coordination.

UNIT V:

Regression Analysis: Relationship between attributes using Covariance and Correlation, Relationship between multiple variables: Regression (Linear, Multivariate) in prediction. Residual Analysis, Hypothesis testing of Regression Model, R-square and goodness of fit, Multiple Linear Regression, Non-Linear Regression, logistic regression.

Applications: determination of uniaxial compressive strength and modulus of elasticity, prediction of fracture parameters of concrete, choose alternative route by optimization in transportation, capacity of signalized and unsignalized intersections, choose different mode by cost optimization.

Text Books:

1. PijushSamui, DwarkadasPralhaddas Kothari, Artificial intelligence in Civil Engineering: AI in Civil Engineering, 2012.
2. Ian Flood, Nabil Kartam, Artificial Neural Networks for Civil Engineers: advanced features and applications, 1998.

Suggested Reading:

1. S.M Yadav, Application of soft computing techniques in civil engineering, 2018.
2. SarojKaushik, "*Artificial Intelligence*", Cengage Learning India, 2012.
3. Nelson M. Mattos, "*An Approach to Knowledge Base Management*", Springer Berlin Heidelberg, 1991.

Online Resources:

1. http://nptel.ac.in/courses/106106126/
2. http://nptel.ac.in/courses/106105077/

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18CE E14

REINFORCED CONCRETE DESIGN-II
(Core Elective-4)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The student shall be able to
1. Comprehend the concepts of design and detailing of combined rectangular and trapezoidal footings.
2. Understand the design and detailing of cantilever and counterfort type of retaining walls.
3. Learn the concepts of design and detailing of various water tanks.
4. Grasp the knowledge from relevant IRC codes, design and detailing of RC solid slab bridge.
5. Know the procedures for design and detailing of T-beam bridges.

Course Outcomes: At the end of the course the student will be able to
1. develop the plan layout, design and detail rectangular & trapezoidal combined footings and beam-slab type raft footing.
2. analyse for stability, design, the various components and detail cantilever and counterfort type retaining walls.
3. interpret the specifications from relevant codes, determine the design forces, design various components and detail rectangular and circular water tanks including Intze tanks.
4. understand the clauses from relevant IRC codes, design and detail the various components of Solid slab bridge.
5. analyse the slab panels using effective width method/ Pigeaud's curves, girders using Courbon's method and design & detail the various components of T-Beam bridges.

UNIT – I:
Combined Footings: Limit state design & detailing of combined rectangular and trapezoidal footings – Design of raft footings (Beam Slab type up to 3 x 2 grid)

UNIT – II:
Retaining walls: Limit state design and detailing of cantilever and counterfort type of retaining walls under various conditions of backfill.

UNIT – III:
Water tanks: Elastic Design & Detailing of circular and rectangular ground level and over-head tanks, Design principles of Intze tank - Design of staging for wind loads.

UNIT – IV:
Bridges: Basic components- Types of bridges -Loads on bridges- IRC standards; Elastic design and detailing of two lanes, simply supported RC Solid Slab Bridge including Kerb.

UNIT- V:
T-beam bridges: Components of a T-beam bridge- Elastic design and detailing of two lane, Simply Supported, Three girder T-beam bridge- Use of effective width method- Pigeaud's curves and Courbon's method.

Text Books:
1. N. Krishna Raju, "*Advanced Reinforced Concrete Design (IS: 456-2000)* ", CBS Publications 2nd Edition,2010.
2. Vazirani and Ratwani," *Design Of Concrete Bridges*", Khanna Publishers, 1998.

Suggested Reading:
1. D. S. PrakashRao, "*Design Principles and Detailing of Concrete Structures*", Tata McGraw-Hill Publishing Co. Ltd., 1998.
2. D. Johnson Victor, "*Essentials of Bridge Engineering*", paperback, Oxford & IBH, Publishing Co., New Delhi, 6th Edition, 2015.

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