

Course Code	Course Name	Credit
CSC601	Data Analytics and Visualization	03

Module		Detailed Content	Hours
1		Introduction to Data analytics and life cycle	5
	1.1	<p>Data Analytics Lifecycle overview:Key Roles for a Successful Analytics, Background and Overview of Data Analytics Lifecycle Project</p> <p>Phase 1: Discovery: Learning the Business Domain, Resources Framing the Problem, Identifying Key Stakeholders. Interviewing the Analytics Sponsor, Developing Initial Hypotheses Identifying Potential Data Sources</p> <p>Phase 2: Data Preparation: Preparing the Analytic Sandbox, Performing ETLT, Learning About the Data, DataConditioning, Survey and visualize, Common Tools for the Data Preparation Phase</p> <p>Phase 3: Model Planning: Data Exploration and Variable Selection, Model Selection ,Common Tools for the Model Planning Phase</p> <p>Phase 4: Model Building: Common Tools for the Model Building Phase</p> <p>Phase 5: Communicate Results</p> <p>Phase 6: Operationalize</p>	
2		Regression Models	8
	2.1	Introduction to simple Linear Regression: The Regression Equation, Fittedvalue and Residuals, Least Square	
		Introduction to Multiple Linear Regression: Assessing the Model, Cross-Validation, Model Selection and Stepwise Regression, Prediction Using Regression	
	2.2	Logistic Regression: Logistic Response function and logit, Logistic Regression and GLM, Generalized Linear model, Predicted values from Logistic Regression, Interpreting the coefficients and odds ratios, Linear and Logistic Regression: similarities and Differences, Assessing the models.	
3		Time Series	7
		Overview of Time Series Analysis Box-Jenkins Methodology, ARIMA Model Autocorrelation Function (ACF) ,Autoregressive Models ,Moving Average Models ,ARMA and ARIMA Models , Building and Evaluating an ARIMA Model, Reasons to Choose and Cautions	
4		Text Analytics	7
	4.1	History of text mining, Roots of text mining overview of seven practices of text analytic, Application and use cases for Text mining: extracting meaning from unstructured text, Summarizing Text.	
		Text Analysis Steps, A Text Analysis Example , Collecting Raw Text ,Representing Text ,Term Frequency—Inverse Document Frequency (TFIDF),Categorizing Documents by Topics, Determining Sentiments , Gaining Insights .	

5		Data analytics and visualization with R	6
	5.1	Introduction to R: Data Import and Export, Attribute and Data type, Descriptive statistics. Exploratory Data Analysis: Visualization before analysis, DirtyData, visualizing single variable, examining Multiple variable, Data Exploration versus presentation.	
6		Data analytics and Visualization with Python	6
	6.1	Essential Data Libraries for data analytics:Pandas, NumPy, SciPy. Plotting and visualization with python: Introduction to Matplotlib, Basic Plotting with Matplotlib, Create Histogram, BarChart, Pie chart, Box Plot, violin plot using Matplotlib.	
	6.2	Introduction to seaborn Library, MultiplePlots, Regressionplot, regplot.	
		Total	39

Course Code	Course Name	Credit
CSC602	Cryptography and System Security	03

Module	Detailed Content	Hours
1	Introduction & Number Theory	
1.1	Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, mono-alphabetic and poly-alphabetic substitution techniques: Vignere cipher, playfair cipher, Hill cipher, transposition techniques: keyed and keyless transposition ciphers, steganography).	7
2	Block Ciphers & Public Key Cryptography	7
2.1	Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm, The knapsack algorithm, El-Gamal Algorithm. Key management – Diffie Hellman Key exchange	
3	Cryptographic Hashes, Message Digests and Digital Certificates	7
3.1	Authentication requirement – Authentication function , Types of Authentication, MAC – Hash function – Security of hash function and MAC –MD5 – SHA – HMAC – CMAC, Digital Certificate: X.509, PKI	
4	Digital signature schemes and authentication Protocols	6
4.1	Digital signature and authentication protocols : Needham Schroeder Authentication protocol, Digital Signature Schemes – RSA, El Gamal and Schnorr, DSS.	
5	System Security	6
	Operating System Security: Memory and Address Protection, File Protection Mechanism, User Authentication. Linux and Windows: Vulnerabilities, File System Security Database Security: Database Security Requirements, Reliability and Integrity, Sensitive Data, Inference Attacks, Multilevel Database Security	
6	Web security	6
6.1	Web Security Considerations, User Authentication and Session Management, Cookies, SSL, HTTPS, SSH, Web Browser Attacks, WebBugs, Clickjacking, CrossSite Request Forgery, Session Hijacking and Management, Phishing Technique, DNS Attack, Secure Electronic Transaction, Email Attacks, Firewalls, Penetration Testing	

Course Code	Course Name	Credit
CSC603	Software Engineering and Project Management	03

Module		Detailed Content	Hours
1		Introduction to Software Engineering	
		Nature of Software, Software Engineering, Software Process, Capability Maturity Model (CMM) Generic Process Model, Prescriptive Process Models: The Waterfall Model, V-model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, Agile process, Agility Principles, Extreme Programming (XP), Scrum, Kanban model	08
2		Requirements Analysis and Cost Estimation	06
	2.1	Software Requirements: Functional & non-functional – user-system requirement engineering process – feasibility studies – elicitation – validation & management – software prototyping – S/W documentation – Analysis and modelling Requirement Elicitation, Software requirement specification (SRS) 3Ps (people, product and process) Process and Project metrics Software Project Estimation: LOC, FP, Empirical Estimation Models - COCOMO II Model	
3		Design Engineering	07

	3.1	Design Process & quality, Design Concepts, The design Model, Pattern-based Software Design. 4.2 Architectural Design :Design Decisions, Views, Patterns, Application Architectures, Modeling Component level Design: component, Designing class based components, conducting component-level design, User Interface Design: The golden rules, Interface Design steps & Analysis, Design Evaluation	
4		Software Risk, Configuration Management	05
	4.1	Risk Identification, Risk Assessment, Risk Projection, RMMM Software Configuration management, SCM repositories, SCM process Software Quality Assurance Task and Plan, Metrics, Software Reliability, Formal Technical Review (FTR), Walkthrough.	
5		Software Testing and Maintenance	05
	5.1	Testing: Software Quality, Testing: Strategic Approach, Strategic Issues- Testing: Strategies for Conventional Software, Object oriented software, Web Apps Validating Testing- System Testing- Art of Debugging. Maintenance : Software Maintenance-Software Supportability- Reengineering- Business Process Reengineering- Software Reengineering- Reverse Engineering- Restructuring- Forward Engineering.	
6		IT Project Management and Project Scheduling	08
	6.1	Introduction, 4 P's, W5HH Principle, Need for Project Management, Project Life cycle and ITPM, Project Feasibility, RFP, PMBOK Knowledge areas, Business Case, Project Planning, Project Charter and Project Scope.	
	6.2	Project Scheduling: Defining a Task Set for the Software Project, Timeline charts WBS, Developing the Project Schedule, Network Diagrams (AON, AOA), CPM and PERT, Gantt Chart, Tracking the Schedule, Earned Value Analysis	

Course Code	Course Name	Credit
CSC604	Machine Learning	03

Module		Detailed Content	Hours
1		Introduction to Machine Learning	6
	1.1	Introduction to Machine Learning, Issues in Machine Learning, Application of Machine Learning, Steps of developing a Machine Learning Application.	
		Supervised and Unsupervised Learning: Concepts of Classification, Clustering and prediction, Training, Testing and validation dataset, cross validation, overfitting and underfitting of model	
		Performance Measures: Measuring Quality of model- Confusion Matrix, Accuracy, Recall, Precision, Specificity, F1 Score, RMSE	
2		Mathematical Foundation for ML	5
	2.1	System of Linear equations, Norms, Inner products, Length of Vector, Distance between vectors, Orthogonal vectors	
	2.2	Symmetric Positive Definite Matrices, Determinant, Trace, Eigenvalues and vectors, Orthogonal Projections, Diagonalization, SVD and its applications	
3		Linear Models	7
	3.1	The least-squares method, Multivariate Linear Regression, Regularized Regression, Using Least-Squares Regression for classification	
	3.2	Support Vector Machines	
4		Clustering	4
	4.1	Hebbian Learning rule	
	4.2	Expectation -Maximization algorithm for clustering	
5		Classification models	10
	5.1	Introduction, Fundamental concept, Evolution of Neural Networks, Biological Neuron, Artificial Neural Networks, NN architecture, McCulloch-Pitts Model. Designing a simple network, Non-separable patterns, Perceptron model with Bias. Activation functions, Binary, Bipolar, continuous, Ramp. Limitations of Perceptron.	
	5.2	Perceptron Learning Rule. Delta Learning Rule (LMS-Widrow Hoff), Multi-layer perceptron network. Adjusting weights of hidden layers. Error back propagation algorithm.	
	5.3	Logistic regression	
6		Dimensionality Reduction	07
	6.1	Curse of Dimensionality.	
	6.2	Feature Selection and Feature Extraction	
	6.3	Dimensionality Reduction Techniques, Principal Component Analysis.	

Course Code:		Course Title	Credit
CSDLO6013		Image and Video Processing	3
Module		Content	Hrs
1		Digital Image Fundamentals	04
	1.1	Introduction to Digital Image, Digital Image Processing System, Sampling and Quantization,	
	1.2	Representation of Digital Image, Connectivity, Image File Formats : BMP, TIFF and JPEG.	
2		Image Enhancement in Spatial domain	08
	2.1	Introduction to Image Enhancement : Gray Level Transformations, Zero Memory Point Operations,	
	2.2	Histogram Processing,.	
	2.3	Neighbourhood Processing, Spatial Filtering, Smoothing and Sharpening Filters	
3		Image Segmentation	06
	3.1	Segmentation based on Discontinuities (point, Line, Edge)	
	3.2	Image Edge detection using Robert, Sobel, Prewitt masks, Image Edge detection using Laplacian Mask.	
	3.3	Region Oriented Segmentation: Region growing by pixel Aggregation, Split and Merge	
4		Image Transforms	09
	4.1	Introduction to Unitary Transforms	
	4.2	Discrete Fourier Transform(DFT), Inverse DFT, Properties of DFT, Fast Fourier Transform(FFT),	
	4.3	Discrete Hadamard Transform(DHT), Inverse DHT, Fast Hadamard Transform(FHT), Discrete Cosine Transform(DCT), Inverse DCT	
5		Image Compression	08
	5.1	Introduction, Redundancy, Fidelity Criteria	
	5.2	Lossless Compression Techniques : Run length Coding, Arithmetic Coding, Huffman Coding	
	5.3	Lossy Compression Techniques: Improved Gray Scale Quantization, Vector Quantization	
6		Digital Video Processing	04
	6.1	Introduction to Digital Video Processing, Sampled Video	
	6.2	Composite and Component Video, Digital video formats and applications	
		Total	39

Blockchain: Sem VI								
Course Code	Course Title	Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
HBCC601	Block chain Platform	04	--	--	04	--	--	04

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Introduction to Block chain and Bit coin,	2	--
I	Introduction to Block chain Platforms	<p>Why Blockchain Platform: Platform types, Public, Private, technology requirements for implementation.</p> <p>Introduction to Ethereum, Hyperledger and Smart Contracts. Case study of blockchain Application.</p> <p>Self-learning Topics: Study different applications of block chain.</p>	6	CO1
II	Public Block chain	<p>Introduction, Characteristics of Public Blockchain, Advantages. Examples of Public Blockchain-Bitcoin: Terminologies and Transaction, Ethereum: Smart contract, Comparison of Bitcoin and Ethereum, Other public Blockchain platforms.</p> <p>Self-learning Topics: Study any one case study on public block chain.</p>	8	CO2, CO3
III	Ethereum Blockchain	<p>Introduction, Ethereum and Its Components: Mining, Gas, Ethereum, Ether, Ethereum Virtual Machine, Transaction, Accounts.</p> <p>Architecture of ethereum, Smart Contract: Remix IDE, Developing smart contract for ethereum blockchain, e-voting applications using smart contract, Dapp Architecture.</p> <p>Types of test-networks used in ethereum, Transferring Ethers Using MetaMask, Mist Wallet, Ethereum Frameworks, Case study of Ganache for ethereum blockchain. Deploying e-voting applications on Ganache framework.</p> <p>Ethereum 2., Concept of Beacon chain, POS (Proof of Stake), Sharding of Chain.</p> <p>Self-learning Topics: Study case study on any ethereum blockchain.</p>	12	CO2, CO3, CO6
IV	Private Blockchain	<p>Introduction, Key Characteristics, Need of Private Blockchain. Consensus Algorithm for private Blockchain (Ex. RAFT and PAXOS), Smart Contract in Private Blockchain, Case Study of E-commerce Website, Design Limitations.</p> <p>Self-learning Topics: Case study on private block chain.</p>	8	CO4
V	Hyperledger Blockchain	<p>Introduction to Hyperledger, tools and frameworks, Hyperledger Fabric, Comparison between Hyperledger Fabric & Other Technologies, Distributed Ledgers.</p> <p>Hyperledger Fabric Architecture, Components of Hyperledger Fabric: MSP, Chain Codes etc., Transaction Flow, Advantages of Hyperledger Fabric Blockchain, working of Hyperledger Fabric, Creating Hyperlegder network, Case Study of Supply chain management using Hyperledger</p> <p>Self-learning Topics: Case study on Hyperledger blockchain.</p>	12	CO5, CO6
VI	Other Blockchain platforms	<p>Corda, Ripple, Quorum and other emerging blockchain platforms, Case Study on any of the blockchain platforms.</p> <p>Developing Blockchain application on Cloud(AWS/Azure)</p> <p>Self-learning Topics: Compare different blockchain platforms.</p>	4	CO5