B.TECH. III Semester-6	L	T	P	C
CS 601: Machine Learning	3	0	2	4

Prerequisite
Linear Algebra, Matrix Calculus, Probability and Statistics

Unit - 1	14 Hours
Introduction: Machine Learning, Types of Machine Learning. Supervised Learning: Linear Regression (Gradient Descent, Normal Equations), Weighted Linear Regression (LWR), Logistic Regression, Perceptron, (cross-)Entropy, Natural Gradient, Exponential Family and Generalized Linear Models, Generative Models (Gaussian Discriminant Analysis, Naive Bayes), k-Nearest Neighbours, Kernel Method (SVM, Gaussian Processes), Tree Ensembles (Decision trees, Random Forests, Boosting and Gradient Boosting)	
Unit - 2	**8 Hours**
Learning Theory: Regularization, Bias-Variance Decomposition and Tradeoff, Concentration Inequalities, Generalization and Uniform Convergence, VC-dimension Deep Learning: Neural Networks, Backpropagation, Deep Architectures	
Unit - 3	**10 Hours**
Unsupervised Learning: K-means, Gaussian Mixture Model (GMM), Expectation Maximization (EM), Variational Auto-encoder (VAE), Factor Analysis, Principal Components Analysis (PCA), Independent Components Analysis (ICA)	
Unit - 4	**10 Hours**
Reinforcement Learning: Markov Decision Processes (MDP), Bellmans Equations, Value Iteration and Policy Iteration, Value Function Approximation, Q-Learning Applications: Advice on structuring an ML project, Evaluation Metrics, Recent Applications	
Total Contact Time: 42 Hours	

Recommended Books

1. Alpaydin, Introduction to Machine Learning , Third Edition, PHI
2. Haykin, Neural Networks and Learning Machines, PHI
3. Chris Bishop, Pattern Recognition and Machine Learning, Springer
4. Tom Mitchell, Machine Learning, McGraw-Hill.
5. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2004
6. Cathy O'Neil & Rachel Schutt, “Doing Data Science, Straight Talk From The Frontline”, O'Reilly, 2014.
7. Joel Grus, “Data Science from Scratch: First Principles with Python”, O’Reilly Media, 2015.
8. Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, O'Reilly Media, 2012.

B.TECH. IV Semester-6	L	T	P	C
CS 602: Information Security	3	0	2	4

Unit - 1	6 Hours
Introduction to Security, Security Basics – Confidentiality, Integrity, Availability; Introduction to types of attacks, Introduction to Security Threats: Viruses and Worms, Intruders, Insiders, Terrorists, Information warfare, Types of attack: Denial of service (DOS), backdoors and trapdoors, sniffing, spoofing, man in the middle, replay, TCP/IP Hacking, Phishing attacks, Distributed DOS, SQL Injection, Buffer Overflow, Brute Force.	
Unit - 2	**12 Hours**
Review of Number Theoretic Algorithms, Symmetric Encryption and Hash Function: Introduction to Symmetric encryption; Asymmetric encryption, Encryption algorithm / Cipher, Encryption and Decryption using: Caesar's cipher, play fair cipher, shift cipher, shift cipher, Vigenere cipher, one time pad (vermin cipher), hill cipher, Transposition techniques, Modern Block Ciphers, Symmetric Cryptographic Algorithms, Hashing function:SHA1	
Unit - 3	**12 Hours**
Asymmetric encryption & Public Key Infrastructure: Diffie-Hellman, RSA, Digital Signatures, Public key infrastructures: basics, digital signatures, digital certificates, certificate authorities, registration authorities, Trust Models: Hierarchical, peer to peer. *Organizational Security*: Password selection, Piggybacking, Shoulder surfing, Dumpster diving, installing unauthorized software /hardware, Access by non-employees, Physical security: Access controls Biometrics: finger prints, hand prints, Retina, Patterns, voice patterns, signature and writing patterns, keystrokes, Physical barriers, Password Management, vulnerability of password, password protection, password selection strategies, components of a good password.	
Unit - 4	**12 Hours**
Network Security: Firewalls: working, design principles, trusted systems, Kerberos, IP security: overview, architecture, IPSec configurations, IPSec security, Security topologies, Email security. *Web Security*: Intruders: Intrusion detection systems (IDS): host based IDS, network based IDS, logical components of IDS, signature based IDS, anomaly based IDS, Intrusion detection systems, Web security threats, web traffic security approaches, Introduction to Secure Socket Layer (SSL); Transport Layer Security(TLS)	
Total Contact Time: 42 Hours	

Recommended Books

1. Principles of Computer Security CompTIA Security and Beyond (Exam SY0-301), 3rd Edition, Conklin, Wm. Arthur Gregory White, Dwayne Williams, McGraw Hill
2. Cryptography and Network Security Principles and Practices, Williams Stallings, Pearson Education, Third Edition
3. Cryptography and Network Security, B A Forouzen , TMH
4. Cryptography and Network Security Principal and Practices, Atul Kahathe, TMH
5. Computer Security , Dieter Gollman , Wiley India Education, Second Edition

B.TECH. III Semester-6	L	T	P	C
CS 603: Web Engineering	3	0	2	4

Prerequisite

Unit - 1	14 Hours
Introduction to Web Engineering, Web Programming vs. Web Engineering, Introduction to Web: HTTP, URL, Web Browser, Web Server, SMTP Server, ISP, Hyperlink, DNS, XML, Parsers and Internet based services, Web Architecture, Introduction to JavaScript and jQuery, Introduction to Angular JS (A Client Side MVC framework). HTTP Protocol. Resources - URIs, URL, URN - Syntax and Schemes, Relative URLs, WebSocket - Events, Methods and Attributes, Architectural components of the web - Proxies, Cache, Gateways, Tunnels, Agents	
Unit – 2	**12 Hours**
RESTAPI - Fundamentals, Resource Modeling, URI, Representations, Usage of HTTP, SOAP - Protocol Introduction, Comparison with REST API, Syndication Protocols (Atom, RSS), Tomcat/Apache Web Server - Overview, Configuration, Working Model & Web Site Creation, Usage of TCP/IP, Log Files, Apache Modules & Directives, Security - Anonymous Access, Authentication, Certificate based interaction, Allow & Deny of Hosts, Session Management, Client-Server Relationship; Web Server Serving Static, Embedded and Dynamic contents from DB and using Python, HTML; Getting data from Client & Link; Multi-tasking.	
Unit – 3	**16 Hours**
Introduction to Node.js, MongoDB, AngularJS and ExpressJS Node.js - Writing a web-server, Event Loop, Concurrency, Asynchronous coding, Callback Functions, Exception Handling, Event Emitters, Event Listeners, Promises ExpressJs - Router, Middleware, Routes, Generating HTML AngularJS - Data binding - OneWay, TwoWay Bindings, Digest Loop, Controllers, Directives Tasks, Debugging, Testing Introduction, Singleton, MVC, Proxy. Architectural Patterns – MVC. Design Patterns - Singleton, Proxy, Deploying the Services on Kubernetes/Dockers. Building and running a Docker.	
Total Contact Time: 42 Hours	

Recommended Books

1. Web Engineering: A Practitioner's Approach by Roger Pressman and David Lowe, McGraw-Hill, 2009.
2. Web 2.0 Architectures: What Entrepreneurs and Information Architects Need to Know by James Governor, Dion Hinchcliffe, and Duane Nickull, O'Reilly, 2009.
3. Web Engineering: Modelling and Implementing Web Applications: Modelling and Implementing Web Applications.
4. Web Engineering - The Discipline of Systematic Development of Web Applications, GertiKappel, Birgit Proll, Siegfried Reich, Werner Retschitzegger.
5. “JSON at Work: Practical Data Integration for the Web”, 1st Edition, Tom Marrs, O’REILLY
6. “JavaScript: The Definitive Guide”, 5th Edition, David Flanagan, O’REILLY
7. “HTTP: The Definitive Guide”, by David Gourley, Brian Totty, Marjorie Sayer, Anshu Aggarwal, Sailu Reddy, O’REILLY
8. “REST API Design Rulebook” by Mark Masse, O’REILLY
9. “Node.js, MongoDB and AngularJS Web Development: The Definitive Guide to Building JavaScriptBased Web Applications from Server to Frontend (Developer's Library)”, 1st Edition, BradDayley

10. “Apache: The Definitive Guide”, 3rd Edition by Ben Laurie, Peter Laurie, O’REILLY
11. Tomcat: The Definitive Guide, 2nd Edition, Jason Brittain, Ian F Darwin, O’REILLY
12. “Getting MEAN with Mongo, Express, Angular, and Node”, by Simon Holmes