B.TECH. IV Semester-7	L	T	P	C
CS 701: Artificial Intelligence	3	0	2	4

Unit - 1	6 Hours
Introduction to AI: Basics of problem- solving: problem representation paradigms, state space, satisfiability vs optimality, pattern classification problems, example domains.	
Unit - 2	**14 Hours**
Problems, State Space Search & Heuristic Search Techniques: Search Techniques : Problem size, complexity, approximation and search; depth, breadth and best search; Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis, knowledge based problem solving, artificial neural networks: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations.	
Unit - 3	**14 Hours**
Knowledge Representation & Acquisition: Knowledge representation: First order and non-monotonic logic; rule based, frame and semantic network approaches, Knowledge Acquisition: Learn ability theory, approaches to learning. *Uncertainty*: Uncertainty Treatment: formal and empirical approaches including Bayesian theory, belief functions, certainty factors, and fuzzy sets. Detailed Discussion from Example Domains: Industry, Language, Medicine, Verification, Vision, Knowledge Based Systems.	
Unit - 4	**8 Hours**
Game Playing & Expert Systems: Overview, Minimax, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Languages and Machines : AI languages and systems, special purpose architectures, expert systems, Case studies	
Total Contact Time: 42 Hours	

Recommended Books

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall, Pearson Education
2. Nils J. Nilsson, Artificial Intelligence: A New Sythesis, Morgan-Kaufmann.
3. Artificial Intelligence: Elaine Rich And Kevin Knight, Tata Mcgraw-Hill
4. E. Charniack and D. McDermott, Artificial Intelligence, Addison Wesley
5. Winston P.H., Artificial Intelligence, 3rd edition, Addison Wesley

Useful Links

1. AI on the Web
2. http://www.aaai.org

B.TECH. IV Semester-7	L	T	P	C
CS 702: Network Security	3	0	2	4

Unit - 1	6 Hours
Introduction to Security Threats: Threats to security: Viruses and Worms, Intruders, Insiders, Criminal organizations, Terrorists, Information warfare, Avenues of Attack, steps in attack, Security Basics – Confidentiality, Integrity, Availability; 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.	
Unit - 2	**10 Hours**
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 - 3	**12 Hours**
Cryptography and Public Key Infrastructure: 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 , Hashing function : SHA1 , Asymmetric encryption: Digital Signatures, Public key infrastructures : basics, digital signatures, digital certificates, certificate authorities, registration authorities, Trust Models: Hierarchical, peer to peer.	
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, Mc Graw 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. IV Semester-7	L	T	P	C
CS 703: Natural Language Processing	3	0	2	4

Unit - 1	14 Hours
Introduction: Human languages, Formal language and Natural Language, Finite state transducer, Introduction to corpus, elements in balanced corpus, Tree Bank, WordNet. *Morphology and N-Grams*: Inflectional morphology, Derivational morphology, Finite state morphological parsing, Morphology and Indian languages, Simple N-grams, Smoothing, Back off, Entropy.	
Unit - 2	**14 Hours**
Speech Tagging and Syntax: Stochastic POS tagging, HMM, Transformation based tagging (TBL), Handling of unknown words, named entities, Multi word expressions, Speech Processing: Speech and phonetics, Vocal organ, Phonological rules, Probabilistic models-Spelling error, Bayesian method to spelling, Minimum edit distance, Bayesian method of pronunciation variation, Viterbi algorithm, HMM and Speech recognition.	
Unit - 3	**8 Hours**
Semantic Parsing: Parsing- Unification, Statistical Parsing, Probabilistic parsing, Semantic Interpretation, word Sense System, Tree Bank.	
Unit - 4	**6 Hours**
Application and Case Studies: Application: Sentiment analysis, spelling correction, Word sense disambiguation, Machine translation, Text Classification, Question answering system.	
Total Contact Time: 42 Hours	

Recommended Books

1. Dan Jurafsky and James Martin, Speech and Language Processing, 2nd Edition, Prentice-Hall (2008)
2. Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cummin
3. Charniack, Eugene, Statistical Language Learning, MIT Press,
4. Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press
5. C. D. and H. Schütze: Foundations of Statistical Natural Language Processing ,The MIT Press
6. Radford, Andrew et. al., Linguistics, An Introduction, Cambridge University Press

B.TECH. IV Semester-7	L	T	P	C
AE 704: Innovation and Entrepreneurship	3	0	1	4

Unit - 1	10 Hours
Concepts of Entrepreneurship: Scope of Entrepreneurship, Definitions of Entrepreneurship and Entrepreneur, Characteristics of an Entrepreneur, Entrepreneurial Development models and Theories, Entrepreneurs Vs Managers Classification of Entrepreneurs; Major types of Entrepreneurship – Techno Entrepreneurship, Women Entrepreneurship, Social Entrepreneurship, Intrapreneurship (Corporate entrepreneurship), Rural Entrepreneurship, Family Business etc.; Problems for Small Scale Enterprises and Industrial Sickness; Entrepreneurial Trait Tests; Entrepreneurial Environment – Political, Legal, Technological, Natural, Economic, Socio – Cultural etc. ; Motivation; Business Opportunity Identification	
Unit - 2	**12 Hours**
Functional Management area in Entrepreneurship: *Marketing Management*: Basic concepts of Marketing, Development of Marketing Strategy and Marketing plan, Online Marketing, New Product Development Strategy *Operations Management*: Basic concepts of Operations management, Location problem, Development of Operations strategy and plan *Personnel Management*: Main operative functions of a Personnel Manager, Development of HR strategy and plan *Financial Management*: Basics of Financial Management, Ratio Analysis, Capital Budgeting, Working Capital Management, Cash Flow Statement, Break Even Analysis	
Unit - 3	**10 Hours**
Project Planning: Product Development – Stages in Product Development; Feasibility analysis – Technical, Market, Economic, Financial etc.; Project report; Project appraisal; Setting up an Industrial unit – procedure and formalities in setting up an Industrial unit; Business Plan Development *Protection of Innovation Through IPR*: Introduction to Intellectual Property Rights – IPR, Patents, Trademarks, Copy Rights	
Unit - 4	**10 Hours**
Innovation and Incubation: Innovation and Entrepreneurship, Creativity, Green Technology Innovations, Grassroots Innovations, Issues and Challenges in Commercialization of Technology Innovations, Introduction to Technology Business Incubations, Process of Technology Business Incubation *Sources of Information and Support for Entrepreneurship*: State level Institutions, Central Level institutions and other agencies	
Total Contact Time: (42 + 14) Hours	

Recommended Books

1. Desai Vasant, Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, India, 6 th Revised Edition, 2011
2. Charantimath P. M., Entrepreneurial Development and Small Business Enterprises, Pearson Education, 3 rd Edition, 2018
3. Holt David H., Entrepreneurship: New Venture Creation, Pearson Education, 2016
4. Chandra P., Projects: Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill, 9 th Edition, 2019
5. Banga T. R. &Shrama S.C., Industrial Organisation & Engineering Economics, Khanna Publishers, 25 th Edition, 2015
6. Prasad L.M., Principles & Practice Of Management, Sultan Chand & Sons, 8th Edition,2015

B.TECH. IV Semester-7	L	T	P	C
CS 751: Block-chain Technology	3	0	0	3

Unit - 1	8 Hours
Introduction: Introduction, Background and History, Purpose and Scope, Money, Currency, Ledgers, Bitcoin Core, Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof	
Unit - 2	**12 Hours**
Block Chain: Introduction, Advantage over conventional distributed database, Block chain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Block chain application, Soft & Hard Fork, Private and Public block chain.	
Unit - 3	**14 Hours**
Distributed Consensus: Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate. *Crypto Currency*: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum -Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Side chain, Name coin	
Unit - 4	**8 Hours**
Crypto Currency Regulation: Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Block chain, Block chain Use Cases – Finance, Industry, Blockchain in Government and Blockchain Security	
Total Contact Time: 42 Hours	

Recommended Books

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press
2. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
3. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
4. DR. Gavin Wood, “ETHEREUM: A Secure Decentralized Transaction Ledger,”Yellow paper.2014
5. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

B.TECH. IV Semester-7	L	T	P	C
EC 751: Wireless and Mobile Communication	3	0	0	3

The Cellular Concept - System Design Fundamentals	12 Hours
Introduction to Wireless Communication System: Overview of wireless Communication: History, Technical issues, brief of current wireless systems. Cellular system, Hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies Distance to frequency reuse ratio, Channel & co-channel interference reduction factor, S/I ratio consideration and calculation for Minimum Co-channel and adjacent interference, Handoff Strategies, Umbrella Cell Concept, Trunking and Grade of Service, Improving Coverage & amp; Capacity in Cellular System-cell splitting, Cell sectorization, Repeaters, Micro cell zone concept, Channel antenna system design considerations.	
Mobile Radio Propagation Model, Small Scale Fading	**10 Hours**
Large scale path loss:-Free Space Propagation loss equation, Path-loss of NLOS and LOS systems, Reflection, Ray ground reflection model, Diffraction, Scattering, Link budget design, Max. Distance Coverage formula, Empirical formula for path loss, Indoor and outdoor propagation models, Small scale multipath propagation, Impulse model for multipath channel, Delay spread, upper bound Small scale, Multipath Measurement parameters of multipath channels, Types of small scale Fading, Rayleigh and Rician distribution, Statistical for models multipath fading channels.	
Multiple Access Techniques for Wireless Communications	**8 Hours**
Introduction, Comparisons of multiple Access Strategies Time Division Multiple Access, Code Division Multiple Access, Frequency Division Multiple Access, Orthogonal Frequency Division Multiplexing.	
Wireless Systems and Recent trends in Wireless Communication	**12 Hours**
GSM system architecture, Radio interface, Protocols, Localization and calling, Handover, Authentication and security in GSM, GSM speech coding, Concept of spread spectrum, Architecture of IS-95 CDMA system, Air interface, CDMA channels, Soft handoff, Power control in CDMA, RAKE Receiver, GPRS system architecture. Introduction to Wi-Fi, WiMAX, ZigBee Networks, Wireless Adhoc Network and Mobile Portability, Security issues and challenges in a Wireless network. Recent developments from Third Generation (3G) to 5G wireless networks.	
Total Contact Time: 42 Hours	

Recommended Books

1. Theodore S. Rappaport, Wireless Communication, Prentice hall.
2. Upena D. Dalal , Wireless Communication, Oxford Higher Education.
3. Rajpandya, Mobile and personal Communication system and services, IEEE press (PHI).
4. Vijay Garg, Wireless Communications and Networking, Elsevier
5. T.G.Palanivelu, R. Nakkeeran , Wireless Mobile Communication, PHI.

B.TECH. IV Semester-7	L	T	P	C
CS 761: Computer Ethics and Public Policy	3	0	0	3

Unit - 1	14 Hours
Introduction: Why Computer Ethics?: A Brief History of Computers and the Internet, Meaning of Ethics, Distinction between Law and Ethics, Computer Ethics as a Unique Kind of Ethics *Philosophical & Professional Ethics*: Descriptive and normative claims, Ethical Relativism, Utilitarianism, Deontological Theories, Virtue Ethics, Individual and Social Policy ethics, Characteristics of Profession, codes of ethics and professional conduct, The Ethical Decision-Making Process, Steps in the Ethical Decision-Making Process, Culture Clash on the Net Case and its solution	
Unit - 2	**14 Hours**
Privacy Concerns and Case Studies: Understanding computer privacy issues , Reframing the issues, Legislative background, Global Perspective, Proposal for better privacy protection, cybersquatting, Fake IDs, Identity Theft, Intellectual Property, Open-Source Software, Phishing, Pharming, Software Bombs, Sale of Term Papers Online, Sale of Academic Degrees Online, Web Spoofing, Internet Fraud Case, Free Software Case, Finals Week Case, Software Licensing: Stuck in the Middle Case, Borrowed Hardware Case, Risks of academic Cheating by Computer Case, Cookies, Employee Monitoring, Government Surveillance, Hackers, Fingering Case, E-mail Addresses Case, Deceased Student Case, Chain Letter Case, Accountability of Bloggers, Online Voting, Google and Chinese Censorship Case, File Transfer Case, Ethical Issues in Parasitic Computing	
Unit - 3	**14 Hours**
Ethics and the Internet: Ethics Online & Social Implications and Social Values.: Significant characteristics, Hacking and Hackers ethics, New spice of old crime, Netiquette, Policy approaches, ACM Code of Ethics and Professional Conduct, Software Engineering Code of Ethics and Professional Practice, The Ten Commandments of Computer Ethics, The World Summit on the Information Society, Geneva Plan of Action, Tunis Commitment, Technology and Social Change, Embedded values and Impeded values, Democratic values in Internet, Access and Digital divide, Overarching and Future Issues	
Total Contact Time: 42 Hours	

Recommended Books

1. Johnson, Deborah G. (2001). Computer ethics, 3rd edition. Upper Saddle River, NJ: Prentice Hall. A philosophical survey of the ethical issues arising around computer technology.
2. Moor, James H. (1985). "What Is Computer Ethics?" Metaphilosophy 16(4): 266–275. Classic piece on why the study of computer ethics is needed.
3. Advisory Committee on Automated Personal Data Systems. Records, Computers, and the Rights of Citizens. U. S. Department of Health, Education, and Welfare Publication No. (OS) 73–94, July 1973.

B.TECH. IV Semester-7	L	T	P	C
CS 762: Web 2.0	3	0	0	3

Client	6 Hours
Languages - JavaScript, Angular and Node JS, Python, HTML5 – Review JSON - JSON Grammer, JSON in JavaScript, JSON in Java/Python - Create, Parse JSON data, XML - JSON comparison AJAX, Tools, Mashup	
Protocols & Frameworks	**12 Hours**
HTTP & HTTPS - Protocol & Messages - Version, Headers, Body, Methods, Status codes, Meaning of Error Codes (200, 400, 401, 402, 404, etc) Resources - URIs, URL, URN - Syntax and Schemes, Relative URLs WebSocket - Events, Methods and Attributes Architectural components of the web - Proxies, Cache, Gateways, Tunnels, Agents RESTAPI - Fundamentals, Resource Modeling, URI, Representations, Usage of HTTP SOAP - Protocol Introduction, Comparison with REST API Syndication Protocols (Atom, RSS)	
LAMP (Linux, Apache, MySQL, PHP/Perl/Python) Stack	**12 Hours**
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	
MEAN Stack, Patterns, Dockerization/Containers	**12 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. “JSON at Work: Practical Data Integration for the Web”, 1st Edition, Tom Marrs, O’REILLY
2. “JavaScript: The Definitive Guide”, 5th Edition, David Flanagan, O’REILLY
3. “HTTP: The Definitive Guide”, by David Gourley, Brian Totty, Marjorie Sayer, Anshu Aggarwal, Sailu Reddy, O’REILLY
4. “REST API Design Rulebook” by Mark Masse, O’REILLY
5. “Node.js, MongoDB and AngularJS Web Development: The Definitive Guide to Building JavaScript-Based Web Applications from Server to Frontend (Developer's Library)”, 1st Edition, Brad Dayley
6. “Apache: The Definitive Guide”, 3rd Edition by Ben Laurie, Peter Laurie, O’REILLY
7. Tomcat: The Definitive Guide, 2nd Edition, Jason Brittain, Ian F Darwin, O’REILLY
8. “Getting MEAN with Mongo, Express, Angular, and Node”, by Simon Holmes

B.TECH. IV Semester-7	L	T	P	C
EC 762: Electronic System Design	3	0	0	3

Unit - 1	10 Hours
DC-to-DC Converter Introduction, Simple DC to DC Converter: Series Controlled Regulator, Shunt Controlled Converter, Practical Regulators Switched Mode Power Converters: Primitive DC-to-DC converter, A simplified analysis of the primitive converter, Nonidealities in the primitive converters More Versatile Power Converters: Buck Converter, Boost Converter, Buck-Boost Converter Discontinuous Mode of Operation in DC to DC Converters: Buck converter in DCM operation Isolated DC to DC converters: Forward Converter, Push-Pull converter, Half and Full Bridge converter, Fly-back converter	
Unit - 2	**10 Hours**
The 741 BJT OP-AMP: The 741 Circuit, DC Analysis, Small-Signal Analysis, Frequency Response, Slew Rate *Non-Linear OP-AMP Circuits*: The Basic Logarithmic Amplifier (Log Amplifier with a diode, Log Amplifier with a BJT), The Basic Antilog Amplifier, Signal Compression with Logarithmic Amplifiers *Power Amplifiers*: IC power amplifiers: A Fixed-Gain IC Power Amplifier, The Bridge Amplifier; Class D Power Amplifiers; Power Transistors: Package and Heat Sinks, Power BJTs, Power MOSFETs, Thermal Considerations	
Unit - 3	**10 Hours**
Analog Multiplier: Simple Multiplier Using An Emitter Coupled Transistor Pair, Gilbert Multiplier Set, Complete Four Quadrants Analog Multiplier, IC Multiplier, Application Of Analog Multiplier *Transcounductance-C Filters*: Methods for IC Filter Implementation, Transconductors, Second-order G_m-C filter *Switched Capacitor Filter*: The Basic Principle, Practical Circuits, Final Remarks. *Process Control Systems*: Proportional Control, Proportional Plus Integral (PI) Control, Proportional Plus Derivative (PD) Control, Proportional Plus Integral Plus Derivative (PID) Control	
Unit - 4	**12 Hours**
Sample-and-Hold (S/H) Characteristics: Sample Mode, Hold Mode, Aperture Error *DAC Specifications*: Differential Nonlinearity, Integral Nonlinearity, Offset, Gain Error, Latency, Signal-to-Noise Ratio (SNR), Dynamic Range *ADC Specifications*: Quantization Error, Differential Nonlinearity, Missing Codes, Integral Nonlinearity, Offset and Gain Error, Aliasing, Signal-to-Noise Ratio, Aperture Error *DAC Architectures*: Digital Input Code, Resistor String: Mismatch errors related to the resistor-string DAC, Integral Nonlinearity of the resistor-string DAC, Differential Nonlinearity of the Worst-Case Resistor-String DAC *ADC Architectures*: Flash ADC (Accuracy issues for the Flash ADC) *ADC0808/ADC0809*: Introduction, Functional Description, Analog Inputs: Ratiometric Inputs, Absolute Analog Inputs, Differential Inputs, Analog Input Considerations; Microprocessor Interfacing, Interfacing to the 8080, Conclusion *DAC0808*: General Description, Features, Block and Connection Diagrams, Ratings and Electrical Characteristics, Typical Applications	
Total Contact Time: 42 Hours	

Recommended Books
1. V. Ramanarayanan, "Course Material on Switched Mode Power Conversion", IISC, 2007. 2. A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press, 7th Edition. 3. Botkar K. R.,"Integrated Electronics", Khanna Publishers, 10th Ed., 2006. 4. Baker Jacob R., Harry W. Li and Boyce David E.,“CMOS: Circuit Design, Layout and Simulation”, Wiley Interscience, 2003 5. " ANB-247 Using the ADC0808/ADC0809 8-Bit µP Compatible A/D Converters with 8-Channel Analog Multiplexer", TI Application Note. 6. " DAC0808 8-Bit D/A Converter", TI Application Note.