Shivaji University, Kolhapur

Master of Computer Applications (MCA)

(Under faculty of Science and Technology)

(Under CBCS)

MCA II SEMESTER III

Sr. No	Course type	Course code	Course title	Theory contact hours per week	Practical hours per week	Credits	University exam	Internal continuous assessment	Total
1	Core	MCA-C09	Artificial Intelligence	4	-	4	80	20	100
2	Core	MCA-C10	PHP	4	-	4	80	20	100
3	Core	MCA-C11	Computer Networks	4	-	4	80	20	100
4	Core Elective	MCA-CE01	1. Cyber Security 2. Natural Language Processing 3. Computer Graphics 4. Machine Learning 5. Theory of Computation 6. Cloud Computing	4	-	4	80	20	100
5	Management Elective	MCA-ME01	1. Management Information System 2. Supply Chain Management 3. Knowledge Management 4. Business Process Management 5. E-Commerce 6. Semantic Web	4	-	4	80	20	100

6	Core	MCA-L05	PHPLab	-	6	4	80	20	100
7	Core	MCA-P01	Project	-	6	4	80	20	100
			Total	20	12	28	560	140	700

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MCA (Choice Based Credit System)
Under Faculty of Science and Technology
Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022
MCA-II- Semester- III
MCA-C09: Artificial Intelligence

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Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes:

1. Apply problem solving by intelligent search approach.
2. Represent knowledge using AI knowledge representation techniques.
3. Design solutions to real life problems by applying neural network and genetic algorithm
4. techniques.
5. Derive solutions for problems with uncertainty using Fuzzy theory.

UNIT-I   **(15 HOURS)**
Introduction to AI: AI Problems, AI Techniques, Defining the Problem as a State Space Search, Problem Characteristics ,   Search and Game Playing: Breadth first search, depth first search, hill climbing, heuristic search, Best first search, A* algorithm, AO* algorithm, Minmax& game trees, refining minmax, Alpha – Beta pruning, constraint satisfaction

UNIT-II   **(15 HOURS)**
 Knowledge Representation: Introduction, Propositional Logic, Syntax and Semantics, Interpretations, Properties, Predicate logic,   Normal Forms, Normal form steps for conversion, Prenex Normal Form, Disjunctive Normal Form Conjunctive Normal Form, Inference Techniques, Resolution, Unification, Frames, Frame Representation Language, Conceptual Dependency, Scripts, Semantic Net, Rule Based Representation, Forward and Backward Reasoning

UNIT-III   **(15 HOURS)**
 Neural Networks: Introduction, Basic Concepts of Neural Networks, Model of an Artificial Neuron, Activation Functions, Feedforward Network, Recurrent Network, Learning Methods, deep learning and deep neural network. Fuzzy Set Theory, Fuzzy Membership, Fuzzy Operations, Fuzzy Logic Systems.

UNIT-IV   **(15 HOURS)**
Genetic Algorithm: Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis of Selection Operations, the Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm. Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis.

References:

1. Artificial Intelligence & Expert Systems, Dan W. Patterson, Prentice Hall of India, 2005
2. Artificial Intelligence, Elaine Rich, Kerin Knight, Tata McGraw Hill Publishing Company, New Delhi, 2nd Ed, 2004
3. Artificial Intelligence : A Modern Approach, Stuart Russel, Pearson Education, 3rd. Ed., 2011
4. Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications, S. Rajasekaran, G. A. VijayalakshmiPai, Prentice-Hall of India, 2003
5. S. N. Sivanandam, Principles of Soft Computing, Wiley India, 2007
6. Artificial Intelligence & Soft Computing Behavioral & Cognitive Modeling of the Human Brain, Amit Konar, CRC Press, New York, 2008
7. Introduction to Machine Learning, EthemAlpaydin, PHI Learning Pvt. Ltd, 3rd Ed., 2014
8. S. Haykin. Neural networks and learning machines. Pearson 2008.

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Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022
MCA-II- Semester- III
MCA-C10: PHP

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes:

1. Students can get the knowledge of Basics of PHP language ,Object-oriented PHP and PHP connection with MYSQL.
2. They will create Website and Web Application Development using Open Source Language PHP.
3. They will Learn Laravel Framework and Create CRUD application with Laravel Framework.

UNIT I   **(15 HOURS)**
Introduction of PHP: Embedding PHP with HTML, Enhancing further, PHP Language Basics: Using variable in PHP, understanding Data types, operator and expressions. Making decisions: simple decision with if statements, switch, ternary operator, do..while loop, for statement, break, loop skip iteration, nested loop. Arrays: creating and accessing array elements, looping through arrays, multidimensional array, manipulating array. Function: calling functions, working with variable functions, own functions references, recursive functions. Strings: creating and accessing strings, searching strings, replacing text within strings and formatting strings.

UNIT II   **(15 HOURS)**
Handling HTML forms with PHP: HTML forms work, capture form data with PHP, multivalue fields, web forms with PHP, storing PHP variables in forms, create file upload forms,redirecting PHP. Introducing Database and SQL: Deciding how to store data, quick play withMYSQL,connecting to MYSQL from PHP, retrieving data from MYSQL with PHP. PHP CRUDwith MYSQL.

UNIT III   **(15 HOURS)**
Cookies – What is Cookie, Cookie Syntax, How to Create, Store, Retrieve and Delete Cookie. PHP File Upload – Create an Upload-File Form, Upload Script and Save Uploaded file, putting restrictions on uploads. Session – What is Session? Creating, Storing and Destroying Sessions.Classes& Object – OO Concepts, Define Class, Class Attributes, An Object, Creating an Object, Object Properties & Methods, Object constructors and destructors, Static Method, Class Inheritance, Abstract Class, Implement Inheritance.

UNIT IV   **(15 HOURS)**
PHP Framework(Codeigniter and Laravel): Introduction of Framework, Features of Framework, Codeignitor: Models, Views, Controllers, Installation, Working with Simple Database Pgm file.

References:

1. Matt Doyle, Beginning PHP 5.3,Wiley India Edition,2012 .
2. PHP6 and MySQL, Steve Suehring, Tim Converse and Joyce Park, Wiley India 2010, Second Edition.
3. VikramVaswani, PHP: A Beginners guide,TataMcgraw Hill,2009.
4. Core PHP Programming" by Atkinson Leon, SuraskiZeev, Pearson Publication
5. Larry Ullman, PHP 6 and MySQL 5,Pearson Education,2008.
6. Laravel: Up & Running: A Framework for Building Modern PHP Apps by Matt Stauffer OREILLY.
7. CodeIgniter for Rapid PHP Application Development - David Upton ,packtpub 7. Professional CodeIgniter- Thomas Myer, Wrox Press Ltd

MCA (Choice Based Credit System)
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MCA-II- Semester- III
MCA-C11: Computer Network

Internal Marks: 20   External Marks: 80   Theory: 04 hours/week

Course Outcomes:

1. Course Outcomes:
2. Analyze the basics of data communications and network architecture.
3. Analyze functions of each layer of a computer network.
4. Evaluate essential features of specific protocols in the common protocol suite.
5. Analyze the methodology and the rationale behind addressing, routing, and congestion control.
6. Understand various multiplexing and switching methods used in networks.
7. Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack, and explain the characteristics of hybrid systems.
8. Identify some of the factors driving the need for network security

UNIT-I   **(15 HOURS)**
Data communication-analog and digital signal transmission, Data transmission-serial and parallel transmission, communication and transmission modes (synchronous, asynchronous), error control(forward, backward) error detection(parity, block sum check, CRC), transmission media (twisted pair, coaxial cable, optical fibers), unguided transmission media(radio waves, microwaves, infrared), classification of computer network- geographical spread (LAN,WAN, MAN), topology-(bus, star, ring, mesh, tree), ownership (private, public, VAN), switchingcircuit, packet, message and routing, multiplexing-FDM,TDM, concentrator, components of computer networks-files server, workstation, network interface unit, transmission media, hub, repeater, bridge, router, gateway, mode. Case study- Prepare/ present report on network components used in any selected organization/Institute/Company.

UNIT-II   **(15 HOURS)**
Data Link Layer: Error detection and control code- Error Control -Hamming Code and CRC Flow Control -Stop and Wait protocol, sliding window protocol, Random Access Protocols - ALOHA – pure and slotted. Network Layer: Store-and-forward packet switching, Services Provided to the Transport Layer, Implementation of Connectionless and Connection Oriented Service, concept of routing, optimality principle, routing algorithms-shortest path, distance vector, link state, hierarchical, broadcast, multicasting. Congestion control & congestion control algorithm.

UNIT-III   **(15 HOURS)**
Transport Layer- Introduction, transport service primitives, multiplexing, UDP, TCP . Application Layer-Domain name system (DNS), Telnet, File transfer protocol (FTP), Simple mail transport protocol (SMTP), Hyper text transfer protocol (HTTP), Network file system(NFS).

UNIT-IV   **(15 HOURS)**
Network Security- Introduction, concept of cryptography, authentication protocols, firewall, virtual private networks (VPN),wireless security, email security, web security- SSL. Case Study – Implementation of LAN, Configuration of various connecting devices

References:

1. Computer Networks Andrew Tanenbaum Pearson Education
2. Computer Networks Fundamentals and applications, R S Rajesh, K S Easwarakumar, R Balasubramanian, VIKAS Publishing House Pvt. Ltd.
3. Data Communication and Networks James Irvin, David Harle Wiley
4. Computer Networks protocols, Standards and Interface Black C. Prentice Hall of India
5. Computer Communication Networks William Stalling Prentice Hall of India

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To be implemented from the academic year 2021-2022
MCA-II- Semester- III
MCA-CE01-1: Cyber Security

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes:

1. Understand the fundamentals of Cyber security and Cyber crimes
2. Classify and mitigate different cyber security threats.
3. Determine different Internet and Cyber Security Controls
4. Identify cyber security standards and Legal framework of Cyber security.

UNIT-I   (15 HOURS)
Introduction to Cyber Security: Overview of Cyber Security Cyber Threats: Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage. Introduction to Cyber Crime Recognizing Computer Crime: Computer as subject, computer as object, computer as targets. Passive attacks: Network Analysis; eavesdropping; Traffic control Active attacks: Phishing, Sniffing, spoofing, Denial of service attack. Malicious Code: Virus, Worm, Trojan horse, Perpetrators: Hackers; Crackers, Causes of cyber crime: Lack of security, Inadequate security, Vulnerabilities in network.

UNIT-II   (15 HOURS)
Cyber Security Controls Intrusion detection system: Categories of Intrusion Detection System, Types of Intrusion Detection System, Features and limitations. Intrusion prevention system: Honeypots, Types of Honeypots. Encryption: Key elements of encryption systems, Symmetric key cryptography, Asymmetric key cryptography, Digital signature, Digital certificate. Firewall System: Features, Types of firewall, Implementation of firewalls.

UNIT-III   (15 HOURS)
Internet Security controls Internet Security: Secure Socket Layer(SSL), Secure Hypertext Transfer Protocol(S/HTTP), IPSec, Secure Multipurpose Internet Mail Extensions(S/MIME). Web browser security: Filtering services in web browser.
E-mail Security: Encryption for Secure E-Mail, Secure E- Mail System: PGP (Pretty Good Privacy), S/MIME (Secure Multipurpose Internet Mail Extensions).

UNIT-IV   (15 HOURS)
Cyber Laws and Security Standards Cyber security standards: ISO 27001, International Standards maintained for Cyber Security, Information Security Audit. Cyber Security Management: Ethical hacking, Penetration testing, Computer forensics Cyber law: Digital laws and legislations, National Cyber Security Policy, Information Technology Act, 2000, Amendments in IT Act, Cyber crimes under IPC acts. Legal issues and challenges in India.

References:

1. Essential Computer Security: Everyone's Guide to Email, Internet and Wireless security", by Tony Bradley, Syngress Publication 2006
2. "Cryptography & Network Security", by Behrouz A. Ferouzan, Tata McGraw Hill, 2007.
3. Information & Network Security for GTU, I. A. Dhotre V. S. Bagad, Technical Publication, Edition 2018
4. Cyber frauds, cyber crimes and law in India by Pavanduggal.
5. Digital forensics, DSCI.Nasscom, 2012 7. Cyber crime investigation, DSCI.Nasscom, 2013

6. How Personal and Internet Security Work, Preston Gralla, Que Publications
7. Computer Security Concepts, Issues and Implementation, Cengage Learning, Alfred Basta and Wolf Halton,
8. Digital Defense: A Cybersecurity Primer , Joseph Pelton , Indu B. Singh
9. Cryptography and Network Security: Principles and Practice by William Stallings
10. Computer and Information Security Handbook by John R. Vacca
11. Cyberlaw: The Law of the Internet and Information Technology, Brian Craig.
12. Cyber Warfare: Techniques, Tactics and Tools for Security Practitioners 2nd Edition by Jason Andress , Steve Winterfeld,

MCA (Choice Based Credit System)
(Under Faculty of Science)
To be implemented from the academic year 2021-2022
MCA-II- Semester- III
MCA-CE01-2: Natural Language Processing

Internal Marks: 20   External Marks: 80   Theory: 04 hours/week

Course Outcomes:

1. To understand Vocabulary Matching and ultra fast tokenization modules with Spacy.
2. To develop pattern matching modules using Stemming and Lemmatization
3. To apply POS tagging and NER for finding patterns.
4. To apply SciKit-Learn for Text Classification
5. To analyze Sentiment with NLTK and understand semantics.

UNIT-I: **(15 Hours)**

Natural Language Processing(NLP) Basics: Introduction, NLP Phases, Corpus, regular expression, Spacy – Setup, Overview, Spacy Basics, Tokenization, Stemming, Lemmatization, stop words, phrase matching and vocabulary, project to extract most common words from a story.

UNIT-II: **(15 Hours)**

Part of Speech (POS) Tagging and Named Entity Recognition(NER): Introduction to POS and NER, part of speech tagging- Rule-Based and Stochastic, Named Entity Recognition, Sentence Segmentation, A project on Finding patterns in speeches.

UNIT-III: **(15 Hours)**

Text Classification: Introduction to Text Classification, Machine Learning Overview, Classification Metrics, Confusion Matrix, Scikit-Learn Primer, Text Feature Extraction, Text Classification. Simple projects like creating word clouds, email Spam Detection.

UNIT-IV: **(15 Hours)**

Semantics and Sentiment Analysis: Introduction to Semantics and Sentiment Analysis, Elements of Semantic Analysis, Semantics and Word Vectors, Semantics and Word Vectors with Spacy, Sentiment, Analysis, Sentiment Analysis with NLTK, Movie Review Project using Sentiment Analysis Code.

References:

1. Natural Language Processing with Python– Analyzing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, and Edward Loper.
2. Hands-On Natural Language Processing with Python: A Practical Guide to Applying Deep Learning Architectures to Your NLP Applications, RajalingappaaShanmugamani and Rajesh Arumugam
3. Speech and Language Processing, Daniel Jurafsky and James H. Martin Handbook of Natural Language Processing, Frederick J. Damerau, Nitin Indurkhya

MCA (Choice Based Credit System)
Under Faculty of Science and Technology
Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022
MCA-II- Semester- III
MCA-CE01-3: Computer Graphics

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Objectives:

1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
3. Use of geometric transformations on graphics objects and their application in composite form.
4. Extract scene with different clipping methods and its transformation to graphics display device.
5. Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.
6. Render projected objects to naturalize the scene in 2D view and use of illumination models for this.

UNIT-I   **(15 HOURS)**
Introduction:a) Input/output devices : Keyboard, Mouse, Trackball, Joysticks, Data Glove, Digitizers, Light pen, Touch panels, Image scanners, Printers and plotters. b) Logical Input Devices: Locator, Stroke, String, Valuator, Choice and Pick. c) Video Display Devices: Refresh Cathode-Ray Tubes, Raster-Scan Displays, Random-Scan Displays, Color CRT Monitors, Direct-View Storage Tubes, Flat Panel Displays d) Raster-Scan Systems: Video Controller, Raster-Scan Display Processor, Random-Scan Systems.

UNIT-II   **(15 HOURS)**
Output Primitives :a) Line, Circle, Ellipse and Curve generation algorithm, b) Polygon filling algorithm c) Windowing and clipping : Window to Viewport transformation, line clipping and polygon clipping, B) 2D and 3D transformations : a) 2D basic transformation, other transformation, composite transformation, matrix representation and homogeneous transformation, b) 3D concepts : Display models, parallel and perspective projections c) 3D basic transformation, other transformation & composite transformation.

UNIT-III   **(15 HOURS)**
Colors in computer graphics :Chromatic and achromatic light, properties of light, color lookup tables, Color models : XYZ, RGB, CMY, HSV, HLS, B) Curve generation: a) Bezier curve, properties of Bezier curve, Cubic Bezier Curve, b) B-Spline curves : i) Uniform, Periodic B Spline, ii) Cubic, periodic Bspline, iii) Open, uniform B- Spline iv) Non-uniform B-spline, c) Beta-Spline : Beta spline continuity conditions, cubic periodic beta spline, matrix Representation, d) Introduction to fractal (Koch and Hilberts curve)

UNIT-IV   **(15 HOURS)**
Illumination model and shading methods :a) Basic illumination models : Ambient light, diffuse reflection, specular reflection and its Phong model, shadows and transparency, ray tracing, displaying continuous tone images, halftone pattern and Dithering techniques, aliasing and antialiasing b)Phong rendering methods: Constant intensity shading, Gouroud shading, Phong and Fast Phong shading B) Visible surface detection methods :Classification of visible surface detection algorithm, Back-face detection, depth-buffer method, A-buffer method and Painter's algorithm C) Design and

implementation of Application s/w : Study of advance software platform viz. 3-D studio max, Animator Pro, Introduction to OPEN GL, comparison with the facilities provided by conventional IDEs viz. C C++, Visual computing environment,

References:

1. Computer Graphics --- Donald Heran and M Pauline Baker
2. Computer Graphics --- F. S. Hill J R
3. Principles of interactive Computer Graphics --- Newmann Sproul
4. Fundamentals of interactive Computer Graphics --- Foley J D & van Dam
5. Theory and problems of Computer Graphics --- Plastock& Kelly
6. Computer Graphics --- A.P.Godase
7. Computer Graphics : a programming approach -- Steven Harrington

MCA (Choice Based Credit System)
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Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022
MCA-II- semester- III
MCA-CE01-4: Machine Learning

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes:

1. Acquire a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
2. Have an understanding of the strengths and weaknesses of many popular machine learning approaches.
3. Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
4. Be able to design and implement various machine learning algorithms in a range of real-world applications.

UNIT-I   **(15 HOURS)**
Foundations for Machine Learning: Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation, ML Techniques overview, Validation Techniques (Cross-Validations), Feature Reduction/Dimensionality reduction, Principal components analysis (Eigen values, Eigen vectors, Orthogonality).

UNIT-II   **(15 HOURS)**
Classification: Naïve Bayes Classifier, Model Assumptions, Probability estimation, Required data processing, M-estimates, Feature selection: Mutual information, Classifier K-Nearest , K-Nearest Neighbor algorithm, Decision trees:Representing concepts as decision trees. Recursive induction of decision trees.Picking the best splitting attribute: entropy and information gain, Overfitting, noisy data, and pruning. , Support Vector Machines Linear learning machines and Kernel space, Making Kernels and working in feature space, SVM for classification problems.

UNIT-III   **(15 HOURS)**
Clustering: Distance measures, Different clustering methods (Distance, Density, Hierarchical) Iterative distance-based clustering; dealing with continuous, categorical values in K-Means, Constructing a hierarchical cluster, K-Medoids, k-Mode and density-based clustering, Measures of quality of clustering

UNIT-IV   **(15 HOURS)**
Association Rule mining: The applications of Association Rule Mining: Market Basket, Recommendation Engines, etc. A mathematical model for association analysis; Large item sets; Association Rules, Apriori: Constructs large item sets with mini sup by iterations; Interestingness of discovered association rules, Application examples; Association analysis vs. classification, FP-trees

References:

1. Machine Learning, Tom Mitchell.
2. Pattern Recognition and Machine Learning, Christopher Bishop.
3. The Elements of Statistical Learning: Data Mining, Inference and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman.

4. T. Hastie, R. Tibshirani, and J. Friedman. The Elements of Statistical Learning. Springer 2011. (Available for download on the authors' web-page: http://statweb.stanford.edu/~tibs/ElemStatLearn/)
5. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective, MIT Press 2012.
6. Christopher M. Bishop. Pattern Recognition and Machine Learning, Springer 2007.

MCA (Choice Based Credit System)
(Under Faculty of Science)
To be implemented from the academic year 2021-2022
MCA-II-Semester-IV
MCA-CE01-5: Theory of computation

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes:

1. Understand basic concepts of theoretical computer science
2. Ability to apply knowledge of DFA and NFA for applications.
3. Regular expression representation of regular language.
4. Good understanding of Context Free Grammar
5. Applications of Turing Machine and Push Down automata

UNIT-I   **(15 HOURS)**
Basic concepts of Automata Theory: Alphabets, Strings and Languages, Deterministic Finite
Automata (DFA), Nondeterministic Finite Automata (NFA), Representation of NFA and DFA
using Transition Tables and State Diagrams. NFA with ε-transitions, Equivalence of NFA and
DFA, Minimization of DFA.

UNIT-II   **(15 HOURS)**
Regular Expressions and Languages: Introduction, Definition of regular expression, Kleen's
Theorem, Equivalence of regular expression and Finite Automata, Pumping Lemma for regular
Languages, Closure properties of Regular Languages, Finite Automata with Output: Moore and
Mealy Machine, Equivalence of Moore and Mealy Machines.

UNIT-III   **(15 HOURS)**
Context Free Grammars: Definition of Grammar, Classification of Grammars, Chomosky's
Hierarchy. Context Free Grammars (CFG) and Context Free Languages (CFL) -
Definition,Examples, Parse trees, Ambiguous Grammars, Simplification of Grammars, Normal
forms of CFGs: Chomsky Normal Form (CNF) and Greibach Normal Form (GNF), Closure
properties of CFLs, Pumping lemma for CFLs.

UNIT-IV   **(15 HOURS)**
Push Down Automata (PDA) and Turing Machines: PDA - Definition and Description, Language of
PDA, PDA and CFLs, Determinism and Non determinism in PDA, PDA applications. Introduction,
Basic Features of a Turing Machine, Language of a Turing Machine, Variants of Turing Machine:
Multitapes, Nondeterministic Turing Machine, Universal Turing Machine.Halting problem of Turing
Machine.

References:

1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani,
   and Ullman. 2nd edition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw
   Hill
3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI
4. Theory of Computer Science, K.L.P.Mishra, N. Chandrashekharan , PHI.
5. Introduction to Computer Theory, Daniel I.A. Cohen, Second Edition, John Wiley

MCA (Choice Based Credit System)
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Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022
MCA-II Semester-III
MCA - CE01-6:Cloud computing

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes:

1. Acquire knowledge of cloud computing and its usage.
2. Understand components and operations of cloud computing system.
3. Understand the concept of Virtualization and design of cloud Services
4. Enhance the skills for data management, storage and operations in cloud computing system.
5. Study recent trends in cloud computing.

UNIT – I   **(15 HOURS)**
Fundamentals of cloud computing
Evolution of cloud computing, characteristics of cloud computing, need of cloud computing, Components of cloud computing, cloud computing architecture, client server architecture, grid computing environment, Cloud computing vs. Cluster computing, types of cloud, major players in cloud computing, advantages and challenges of cloud computing.

UNIT – II   **(15 HOURS)**
Virtualization
Virtualization architecture and its needs, benefits and challenges, types of virtualization, Levels of Virtualization Implementation, virtualization of CPU, Memory and I/O devices, server virtualization, virtualization design requirements, virtualization structure, open source virtualization technology, Pros and cons of virtualization. Hypervisor, Virtual Machine Types, load balancing, Examples of cloud services- Microsoft azure, Google cloud, VMware, Amazon EC2.

UNIT – III   **(15 HOURS)**
Cloud computing services & security
Cloud services-IaaS, SaaS, PaaS, DaaS, MaaS, CaaS, DBaas, Implementation and Architecture of Eucalyptus, Nimbus &OpenNebula, cloud development techniques, cloud based storage, cloud backup, Cloud security - Cloud Security Challenges and Risks, disaster recovery, data integration, data transformation, data migration, challenges with data security

UNIT – IV   **(15 HOURS)**
Recent trends in cloud computing
Cloud standards, service oriented architecture (SOA) for cloud application, mobile cloud computing its application, architecture and working. MongoDB, MapReduce implementations for the Cloud.Multi-cloud approach, Role of AI in Cloud Computing, Hybrid and on- premise cloud.IoT cloud platforms.

References:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From

1. Parallel Processing to the Internet of Things", 2012, 1st Edition, Morgan Kaufmann Publishers.
2. Kailash Jauaswal, JagannathKallakurchi, Donald J. Houde, Dr. Deven Shah, "Cloud
3. Computing", Black Book, Dreamtech , 2014
4. Barrie Sosinsky, "Cloud Computing Bible, " Wiley India Pvt. Ltd. 2012
5. Prasant Kumar Pattnaiket.al., Fundamentals of Cloud Computing, Vikas Publication
6. House Pvt. Ltd.,first Edition 2015
6. Dr. U.S. Pandey, Dr. KavitaChoudhary, "Cloud Compting", S. chand, 2014
7. Imad M. Abbadi, "cloud Management Security", Wiley,2019
8. RajkumarBuyya,JamesBroberg, Andrzej Goscinski, "cloud Computing Principles and
7. Paradigms", Wiley,2015
8. Dr. Kumar Saurabh, "Cloud Computing", second Edition, wiley,2012
9. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing "A Practical Approach"
10. McGraw-Hill.

Master of Computer Applications (MCA)
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To be implemented from the academic year 2021-2022
Part II Semester III
MCA-ME01-1: Management Information System

Internal Marks: 20   External Marks: 80   Theory: 04 hours/week

Course Outcomes:
1. To learn computer based Information system (IS) for business function.
2. To study IT Infrastructure for processing organizational data.
3. To study Key System Applications for the Digital Age.
4. To understand DSS techniques for effective decision making.
5. To understand applications of IS with case studies inorganization.

UNIT-I   (15 HOURS)
Information system (IS) definition, Role of IS in Business, data and information, functions of IS, Dimensions of IS, types of IS, cloud computing, big data and mobile technology in MIS, interdependence between organizations and IS, Contemporary Approaches to IS, E-business, E-commerce.

UNIT-II   (15 HOURS)
IT Infrastructure, Database Approach to Data Management, Relational DBMS, Capabilities of DBMS, Using Databases to Improve Business Performance and Decision Making, Telecommunications and Networking in Today's Business World, Communications Networks, Internet Services and Communication Tools, System Vulnerability and Abuse, Technologies and Tools for Protecting Information Resources.

UNIT-III   (15 HOURS)
Key Concepts in E-commerce: Digital Markets and Digital Goods in a Global Marketplace, Types of E-commerce, E-commerce Business Models, E-commerce Revenue Models, Social Networking and the Wisdom of Crowds, E-commerce Marketing, B2B E-commerce: New Efficiencies and Relationships, The Mobile Digital Platform and Mobile E-Commerce.

UNIT-IV   (15 HOURS)
Decision Support System (DSS) - Definitions of DSS, Architecture of DSS, Scope of DSS, Characteristic and Capabilities of DSS - Components of DSS, Information Systems Functional Areas-Finance, Marketing, Inventory control, Production, Human Resource Management, Transaction Processing Systems, Executive Information Systems, Case studies.

References:

1. Management Information Systems: Managing the Digital Firm Kenneth C. Laudon (Pearson).
2. Management of Information systems – Gordon B. Davis&MargrethH.Olson.
3. Management of Information systems JawadekarW.S.
4. Information systems management in practice – Ralph H. Sprague Jr. & Barbara C. McNurlin.
5. Management of information systems – James A.O'Brien.
6. Information system concepts for management – 4th edition Lucas Management of information systems – 2nd edition – KroenkeDavid.

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To be implemented from the academic year 2021-2022
MCA-II- Semester- III
MCA-ME01-2: Supply Chain Management

Internal Marks -20   External Marks-80   Theory-04 H/Week

Course Outcomes:

1. Understand importance of supply chain management.
2. Define role of logistics and transportation in material flow management.
3. Apply supply chain strategies in business process management.
4. Identify importance of Information Technology in supply chain management.

UNIT-I   (15 HOURS)
Introduction: Introduction to supply chain management, Concept and definition of Supply Chain, Physical distribution, Logistics and Supply Chain, Concept and evolution of Supply Chain Management, Importance of Supply Chain, Key issues in Supply Chain Management, Enablers of supply chain performance, Challenges in maintaining supply chain in India.

UNIT-II   (15 HOURS)
Material Flow Management: Inventory Management – Introduction, Types of inventory, Inventory related cost, Analyzing, impact of supply chain redesign on inventory. Transportation – Drivers of transportation decision, Modes of transportation: Choices and their performance measures. Network Planning – Introduction, Network design, Inventory positioning and logistics coordination.

UNIT-III   (15 HOURS)
Supply Chain Integration : Introduction, Push based supply chain, Pull based supply chain, Push – Pull supply chain, Identifying appropriate supply chain strategy and implementing strategy. Internal and external integration.

UNIT-IV   (15 HOURS)
Information Technology in Supply Chain Management : Enabling supply chain management through IT - IT in supply chain transaction execution, IT in supply chain collaboration and coordination, IT in supply chain decision support, IT in supply chain measurement and reporting. Supply chain management application marketplace. Future trends in supply chain management.

References:

1. Designing and Managing the Supply Chain – David Simchi Levi, Philip Kaminsky, Edith Simchi Levi, Ravi Shankar, Tata McGraw Hill Education Pvt. Ltd.
2. Supply Chain Management – Janat Shah, Pearson Education
3. Exploring the Supply Chain – UpendraKachru, Excel Books
4. Business Logistics/ Supply Chain Management – Ronald Ballou, Samir Shrivastava, Pearson Education
5. Supply Chain & Logistics Management - Bowersox, Closs& Cooper, Tata McGraw Hill Education
6. Fundamentals of SCM: Twelve drivers of competitive advantage - John Mentzer, Sage Publication

Master of Computer Applications (MCA)

Under Faculty of Science and Technology
Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022
Part II Semester- III
MCA- ME01-3: Knowledge Management

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes:

1. To study types and important dimensions of knowledge.

2. To understand knowledge management concepts.

3. To learn organizational impacts of KM.

4. To understand the key constituents of knowledge management solutions.

5. To know KM roles, audit and ethics.

UNIT-I   **(15 HOURS)**

Knowledge Management (KM) Evolution, values of knowledge, organizational KM, key elements for successful implementation, knowledge economy, Organizational KM-Drivers, Approaches, Strategies, Components and Functions, Learning organizations, Data, information, knowledge, important dimensions of knowledge, types of knowledge, KM life cycle, knowledge Conversion.

UNIT -II   **(15 HOURS)**

Organizational knowledge creation, knowledge networks, organizational knowledge mapping techniques, core implementation issues, organizational knowledge acquisition/capture, implementation methodology, knowledge acquisition tools, organizational knowledge indexing, processing, Document management system, DBMS, Data warehouse, Data mining, OLAP, organizational knowledge dissemination.

UNIT-III   **(15 HOURS)**

Developing KM framework, implementation phases, architectural components, KM system requirements, tools, KM system components, implementation strategies, organizational organic capabilities architecture, organizational KM architecture, organizational knowledge repositories, KM applications, organizational collaborative platforms, organizational knowledge measurement framework, organizational knowledge measurement techniques and organizational implementation barriers.

UNIT-IV   **(15 HOURS)**

K-Careers – introduction, KM roles, new organizational roles, organizational k-role classification, KM job opportunities, knowledge audit, Knowledge need analysis, Knowledge inventory

analysis, Knowledge Flow analysis, Knowledge mapping, Ethics in KM.

References:

1. Knowledge Management – Sudhir Warier Vikas Publications
2. "The knowledge Management Toolkit – Orchestrating IT, Strategy, and Knowledge
3. Platforms", AmritTiwana, Pearson, Fifth Impression 2009, Education.
4. Knowledge Management Systems – Stuart Barncs, Thomson Learning
5. Key Issues in the New Knowledge Management – J.M.Firestone, M.W. Mcelroy.
6. Developing Expert system for Business – Chandier / Liang
7. Knowledge Management – Pankaj Sharma APH Pub.
8. Knowledge Management-Elias M. Awad&Hassan M. Ghaziri Pearson publication

Master of Computer Applications (MCA)

Under Faculty of Science and Technology
Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022
Part II Semester- III
MCA-ME01-4 : Business Process Management

Internal Marks -20   External Marks-80   Theory-04 H/Week

Course Outcomes:

1. Identify weaknesses in a given process design and suggest improvements that will benefit organizational performance.
2. Develop an implementation and integration strategy for processes that leverages organizational and technical capabilities of an organization.
3. Understand importance and working of business process reengineering.
4. Define e-business strategies and technologies for business improvement.

UNIT-I   **(15 HOURS)**
Introduction to Business Process : Concept and Overview of Business Process, History of BPM, Business Process Management Lifecycle, Introduction to Process Modeling, components of a Process Model, Capture business reality, Business Process Performance Parameters, Business Process Identification.

UNIT-II   **(15 HOURS)**
Business Process Metrics & Technology: BPMS, Systems Components and Architecture, Workflow automation and value chain, Process Metrics, Business Activity Monitoring, Business Intelligence, Process Dashboards, Predictive Process Simulation, Data Mining based on Process Data, Business Process Optimization, BPM Maturity Models, BPM best practices.

UNIT-III   **(15 HOURS)**
Business Process Reengineering Introduction & Conceptual foundation of BPR Need of BPR, BPR objectives Role of IT in BPR, Emergence of reengineering concept, rethinking of BPR process, BPR phases, Process visioning and mapping Benchmarking, business process improvement, business process redesign, Management of BPR implementation, Recognizing People and Managing Change. BPR and ERP.

UNIT-IV   **(15 HOURS)**
E-Business   Characteristics of e- business, Elements of an e- Business solution, e- business roles & their challenges, e- business opportunities, e- business requirements, Impacts of e-business, Managing e – business infrastructure – hardware & system software infrastructure, application infrastructure, Internet technology, Web technologies & applications, Collaborative technologies – EDI, Workflow systems, Building e- presence – need of a website, process of designing website.

References:

1. Harmon, Paul: Business Process Change. A Guide for Business Managers and BPM and Six Sigma Professionals. 2nd Edition, Morgan Kaufmann, San Francisco, ISBN-10: 0123741521 ISBN-13: 978-0123741523.
2. Metters, King-Metters, Pullman, Walton (2007) Business Process Management.
3. Davis, R.: An Introduction to Business Process Modeling: getting started with BPM, (1st ed.) Springer, New York, 2007
4. Jeston, John; Nelis, Johan: Business Process Management: Practical Guidelines to Successful Implementations. Butterworth-Heinemann, 2006, pp. 464, ISBN 0750669217
5. Marlon Dumas _ Marcello La Rosa _Jan Mendling _ Hajo A. Reijers, Fundamentals of

Business Process Management, Springer- E-Book

6. Business Process Reengineering – Jayaraman M.S. (TMG)
7. Best Practices in Reengineering – Carr D.K. Johnanson H.J.(MGH)
8. Business Process Reengineering: Myth & Reality – Coulson Thomas C.
9. The Essence of Business Process Reengineering Peppard J, RowlandP.(PH)
10. Process Innovation: Reengineering Work Through Information Technology – Davenport T.H. (HBSchoolPress)
11. e- Business & e – Commerce Management: Strategy, Implementation, Practice –
1. Dave Chaffey, Pearson Education
12. e – Business: Organisational Technical Foundations – Michael Papazoglou, Pieter M.A. Ribberes, Wiley India (P) Ltd.
13. Introduction to E- Business: Management and Strategy – Colin Combe, Elsevier
14. E- Business and E- Commerce: Managing the Digital Value Chain, Andreas Meier,
2. Henrik Stormer, Springer.

MCA (Choice Based Credit System)
Under Faculty of Science and Technology
Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022
Part- II Semester -III
MCA-ME01-5 :E-Commerce

Internal Marks -20   External Marks-80   Theory-04 H/Week

Course Outcomes:

1. Understand the basics of E-Commerce
2. Differentiate different E-payment systems available for E-commerce.
3. Identify different tools used to design and develop E-commerce web sites.
4. Analyze different security issues and security tools in E-Commerce.

UNIT-I   (15 HOURS)

Definition of E-Commerce; Difference between e-commerce and traditional commerce; Main Activities of Electronic Commerce; Benefits of E-Commerce; Broad Goals of Electronic Commerce; Main Components of E-Commerce; Process of E-Commerce; Types of E-Commerce: Business - to - Business (B2B), Business - to - Consumer (B2C), Consumer - to - Consumer (C2C), Consumer - to - Business (C2B), Applications of E-Commerce, Advantages and limitations of E-Commerce

UNIT-II   (15 HOURS)

Overview of Electronics Payments, Types of Electronic Payment Systems; Digital Token-Based Electronic Payment Systems, Smarts Cards, Credit Card, Debit Card, Digital wallets, Net Banking, Trends in E-Payments: Real Time Gross Settlement (RTGS); National Electronic Funds Transfer (NEFT); Immediate Payment Service (IMPS); Unified Payments Interface (UPI), Unstructured Supplementary Services Data (USSD), Steps for Electronic Payment.

UNIT-III   (15 HOURS)

Technologies Used in E-Commerce; Pre-requisites of E-Commerce; Role of Internet and Web in E-Commerce; Web Site Communication; EDI Definition; EDI Requirement in E-Commerce, Definition of Intranet, Component of an Intranet, Role of Intranet in B2B Application; Definition of XML, Business importance in using XML Based Technology, Steps to Design and Develop an E-Commerce Website, Introduction to Mobile computing; Introduction to mobile commerce, Advantage of M-Commerce.

UNIT-IV   (15 HOURS)

Client-Server network, Emerging client server security threats, Threats to Servers, Software Agents and Malicious code Threat, Trojan horses, Malwares, Worms, Viruses, Fraud schemes in E-commerce and E-payments, Security tool in E-Commerce: Introduction to web security, Firewalls & its types, Configuration of firewalls, Data and Transaction security in E-Commerce, Customer Protection and Security of Digital Payments.

References :

1. E-Commerce - Concepts, Models and Strategies, C. S. V. Murthy, Himalaya, Publishing House.

2. E-Business and E-Commerce Management: Strategy, Implementation and Practice, 5th edition, Dave Chaffey, Pearson Publications.
3. E-COMMERCE: An Indian Perspective, P.T. Joseph, PHI Publications.
4. Network Security Essentials: Applications and Standards, 4th Edition, William Stallings, Prentice Hall Publications.
5. Cryptography and E–Commerce, Jon C. Graff, Wiley Publications.
6. E Commerce for Entrepreneurs: Launch your E-commerce startup with strong technology and digital marketing, Dr. Sudeshna Chakraborty, Priyanka Tyagi, BPB Publications.

Additional readings

https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/PSSBOOKLET93D3AEFDEAF14044BC1BB3666

2C41A8C.PDF, Payment Systems in India - Booklet – RBI,

MCA (Choice Based Credit System)
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Part- II Semester -III
MCA-ME01-6 :Semantic Web

Internal Marks -20   External Marks-80   Theory-04 H/Week

Course Outcomes:

1. Understand the basics of semantic web.
2. Identify the role of description framework and ontology in semantic web.
3. Apply different frameworks to develop semantic web applications.
4. Evaluate the role of semantic web in different application areas.

UNIT-I   (15 HOURS)

Foundation of Semantic Web :Introduction to the Semantic Web: Evolution of Semantic web, Semantic web and Web 2.0, Introduction to Linked Data, Objectives of Semantic web, Difference between WWW and Semantic web, Benefits of Semantic web to organizations, Challenges for Semantic web, Examples of Semantic websites: Nokia's support portal, Oracle's virtual press room, Yahoo!'s Finance portal,

UNIT-II   (15 HOURS)

Components of Semantic Web :Introduction to Knowledge Representation: Introduction to descriptive logic (DL), First Order Logic (FOL), Semantic Networks, Frame Based Knowledge Representation, Introduction to Uniform Resource Identifiers (URI), Structured Web Documents in XML: Introduction to XML, XML Structuring, Namespaces in XML, Addressing and querying XML document, Data Processing in XML, Working with XML Schema, DTD.

UNIT-III   (15 HOURS)

Semantic Web Technology :Introduction to Resource Description Framework (RDF): RDF syntax, RDF serialization format: N-triple and tutle, RDF Schema. Introduction to Ontologies: Ontology Languages for the Semantic Web, Web Ontology Language (OWL), Description of the OWL Language, Layering of OWL, Design Of Ontology using RDF, Design Of Ontology using OWL, Examples of OWL. Case Study: Pizza Ontology

UNIT-IV   (15 HOURS)

Application Development using Semantic Web

Ontology Design and Management using the Protege editor, Ontology Reasoning with Pellet, Ontology Querying with SPARQL: simple Graph Patterns, Complex Graph Patterns, Group Patterns,

Queries with Data Values, Filters - Ontology Programming with the Jena API, Application areas for Semantic Web: Health care and Life sciences, Public administration, Engineering, Emerging trends in semantic web.

References:

1. Semantic Web: Concepts, Technologies and Applications, by Karin Breitman, Springer
2. The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management, Michael C. Daconta, Wiley
3. Practical RDF, Shelley Powers, O'Reilly
4. Owl: Representing Information Using the Web Ontology Language, Lee W. Lacy, Trafford Publishing
5. Learning SPARQL 2nd edition: Querying and Updating with Sparql 1.1, by Bob Ducharme, O'Reilly

Additional Reading

1. W3C Semantic Web FAQ: w3.org/RDF/FAQ

2. Semantic Web Case Studies and Use Cases: w3.org/2001/sw/sweo/public/UseCases

3. Semantic Web Tools: w3.org/wiki/SemanticWebTools

MCA-L05 PHP Lab

Internal Marks -20   External Marks-80   Theory-04 H/Week

This laboratory course should consist of 10-12 programming exercises with focus on covering the hands-on aspects covered in theory course.

MCA-P01 Project

Internal Marks -20   External Marks-80   Theory-04 H/Week

Project

MCA II SEMESTER IV

Sr. NO	Course type	Course code	Course title	Theory contact hours per week	Practical hours per week	Credits	University exam	Internal continuousassessment	Total
1	Core	MCA-C12	Data Science	4	-	4	80	20	100
2	Core	MCA-C13	Advanced Web Technology	4		4	80	20	100
3	Core	MCA-C14	Android Development with Kotlin	4	-	4	80	20	100
4	Core Elective	MCA-CE02	1. Block chain Technology 2. Deep Learning 3. Network Security 4. Optimization Techniques 5. Robotics 6. Internet of Things(IoT)	4	-	4	80	20	100
5	Management Elective	MCA-ME02	1. Business Intelligence 2. Enterprise Resource Planning 3. Human Resource Management 4. Big Data Analytics 5. Social Media Management 6. Web Mining	4	-	4	80	20	100
6	Core	MCA-L06	Advanced Web technology & Mobile Technology Lab	-	6	4	80	20	100

7	Core	MCA-P02	Project	-	6	4	80	20	100
			Total	20	12	28	560	140	700

MCA (Choice Based Credit System)
Under Faculty of Science and Technology
Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022
MCA II SEMESTER IV
MCA-C12: Data Science

Internal Marks -20   External Marks-80   Theory-04 hrs. /week

Course Objectives:

1. Gain an in-depth understanding of Data Science processes, data wrangling, data exploration, data visualization, hypothesis building, and testing
2. Install the required Python environment and other auxiliary tools and Libraries
3. Gain expertise in Machine Learning using the Scikit-Learn package
4. Gain an in-depth understanding of supervised learning
5. Use the matplotlib library of Python for data visualization
6. Gain an in depth understanding of Deep Learning

UNIT-I   **(15 HOURS)**
Introduction to Data Science
Introduction of Data Science,Need of Data Science,Role of Data Scientist, Tools for Data Science, Applications Of Data Science, Facets of Data, Benefits of Data, Data Science Process, The Big Data and Hadoop Ecosystem, Distributed DataBase(NoSQL),Introduction of Data Science Python Libraries.

UNIT-II   **(15 HOURS)**
Data Science with Python
Installing Anaconda,,Jupyter Notebooks, Numpy and pandas, Exploratory Data Analysis,visualization of data using Matplotlib and Seaborn, Introduction of mathematical computing with NumPy and Scientific Computing with Python (Scipy).

UNIT-III   **(15 HOURS)**
Machine Learning
Introduction to Artificial Intelligence and Machine Learning, Supervised Learning, Feature Engineering, Supervised Learning Classification, Unsupervised Learning, Time Series Modeling, Ensemble Learning Recommender Systems. Introduction to Machine Learning Frameworks. Machine Learning with Scikit–Learn.Introduction of AutoML.

UNIT-IV   **(15 HOURS)**
Deep Learning
Introduction to Neural Networks Forward and backward propagation. Introduction to Deep Learning , Convolution Neural Network ,Recurrent Neural Network. Deep Learning with Keras or PyTorch or fastai.Creating Deep Learning Model.

References:

1. Data Science from Scratchby Joel Grus, O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA
2. Machine Learning, Tom Mitchell.
3. Hari Shreedharan, Using Flume Flexible, Scalable, and Reliable Data Streaming, O'Reilly Media
4. Kord Davis, Ethics of Big Data: Balancing Risk and Innovation, O'Reilly.
5. Tom White, Hadoop – A Definitive Guide, O'Reilly.

6. Goodfellow, I., Bengio, Y., Courville, A., &Bengio, Y. (2016). Deep learning (Vol.1). Cambridge: MIT press.
7. Deep Learning with Python, François Chollet

MCA (Choice Based Credit System)
Under Faculty of Science and Technology
Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022
MCA II SEMESTER IV
MCA-C13: Advanced Web Technology

Internal Marks -20   External Marks-80   Theory-04 hrs. /week

Course Outcomes:

1. Students will be able to develop application using MVC
2. Students will be able to understand Entity Framework
3. Students will be able to understand the use bootstrap
4. Students will be able to understand the use Angular JS
5. Students will be able to understand the use Node JS

UNIT –I   **(15 HOURS)**
Introduction to MVC: Benefits of using ASP.NET MVC, Role of Model, View, and Controller, ASP.NET MVC Works, Naming conventions, Creating views, Defining controllers, Defining data model, creating strongly-typed views, Creating strongly-typed views. Razor View Engine: Razor Basics, Razor design goals, Implementation of Razor view, Razor syntax, Accessing Model Data in Razor views

UNIT -II   **(15 HOURS)**
Using Entity Framework: Crud Operations, Crud Operation Using BO Class, Crud Operations Using Generic BO Class, Authentication and Authorization: Windows Authentication, Forms Authentication, Role Based Authentication,   Working with URLs and Routing: Understanding the Routing Mechanism, Adding a Route Entry, Using Parameters, Using Defaults, Using Constraints.

UNIT –III   **(15 HOURS)**
Introduction to Bootstrap: History of Bootstrap, Advantages of Bootstrap Framework, Responsive webpage, Bootstrap Grid, Container, Offset Column, Reordering Columns, Bootstrap Typography, Bootstrap Tables, Bootstrap Form Layout, Bootstrap Components, Glyphicons Component

UNIT –IV   **(15 HOURS)**
Introduction to AngularJS: Expressions, Modules, Directives, Directive, Data Binding, Controllers, Scope, Filters, Services, AngularJS AJAX, Tables, Select Boxes
Introduction to Node JS: Advantages of Node JS, Setup Development Environment, Functions, Buffer, Module, Modules Types, Node Package Manager, Creating Web Server, File System, Debugging Node JS Application, Events.

References:
1. Professional ASP.NET MVC 5, by Jon Galloway, Brad Wilson, K. Scott Allen, David
2. Matson
3. ASP.NET MVC 4 and the Web API: Building a REST Service from Start to Finish by
4. Jamie Kurtz
5. Mastering Bootstrap 4 by Benjamin Jakobus and Jason Marah
6. AngularJS by Brad Green and ShyamSeshadri
7. Learning AngularJS: A Guide to AngularJS Development by Ken Williamson
8. Node.js 8 the Right Way: Practical, Server-Side JavaScript That Scales by Jim R. Wilson
9. Get Programming with Node.js by Jonathan Wexler

MCA (Choice Based Credit System)
Under Faculty of Science and Technology
Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022

MCA II SEMESTER IV
MCA-C14: Android Development with Kotlin

Internal Marks -20   External Marks-80   Theory-04 hrs. /week

Course Outcomes:

1. Comprehend Kotlin language
2. Understand Android Studio Environment and application structure.
3. Demonstrate different layouts, views, activities and intents
4. Design good user interface for the application.
5. Able to store, retrieve and load data
6. Demonstrate programming skills using Kotlin

UNIT-I   **(15 HOURS)**
Introduction to Kotlin
Kotlin basics: Introduction to Kotlin, Benefits of using Kotlin, Use Kotlin REPL to practice basic expressions, Control flow statements in Kotlin, Null safety with Kotlin. Functions: Creating and calling functions with default and named arguments, Writing concise and compact functions, Passing functions as arguments to other functions, Writing simple lambdas.
Classes and Objects: Introduction to object-oriented programming in Kotlin, Classes and objects in Kotlin, Constructors, Visibility modifiers, Subclasses and inheritance, Interfaces, Data classes, Singleton class enums, Pairs, triples and collections in Kotlin, Extensions in Kotlin

UNIT-II   **(15 HOURS)**
Introduction to Android
Buildind first Android app: Installing Android Studio, Creating an Android app project, Deploying the app to an emulator or a device, Building an Android app that contains images and a click handler, Modifying views within the layout of an app, Adding libraries to module gradle file. Layouts: Creating layouts in Android Studio using XML and the Layout Editor, Adding interactivity to your app, Working with ConstraintLayout, Data binding basics

App Navigation: Creating Fragments, Defining NavHostFragment, navigation graphs, navigational paths, Functionality of Back and Up buttons, Defining the options menu, Creating a navigational drawer, Using the Safe Args plugin and passing of arguments, Starting an external Activity.

UNIT-III   **(15 HOURS)**
Android Application Architecture
Activity and Fragment Lifecycles: Understanding Activity and Fragment Lifecycles, Exploring logging options in your app, Using the Android Lifecycle library, Exploring configurationchanges

App Architecture (UI Layer): Using the recommended Android App Architecture, Using the LifeCycle, ViewModel,andViewModelFactory classes, Adding LiveData and LiveData, observers, Adding Data Binding with ViewModel and LiveData, Adding LiveData, transformations

App Architecture (Persistence): Overview of Room Persistence Library, Introduction to coroutines, Advanced RecyclerView use cases: Introduction to RecyclerView Fundamentals,

Implementing data binding with RecyclerView, Using GridLayout with RecyclerView, Interacting with RecyclerView items, Adding headers in RecyclerView

UNIT-IV   **(15 HOURS)**

Connect to the Internet and App Design

Connect to the Internet: Connecting to a web service with the Retrofit library, Parsing a JSON response with the Moshi library, Using coroutines with Retrofit ,Loading and displaying images from the Internet, Filtering data from the Internet.

Repository pattern and WorkManager: Adding an offline cache and repository, Implementing WorkManager, Working with background workers and periodic WorkerRequest

App UI Design: Introduction to basic app design, Understanding Styles and Themes, Implementing Material Design, Designing for everyone

References:

1. https://developer.android.com/kotlin
2. https://developer.android.com/kotlin/getting-started-resources
3. Kotlin for Android Developers: Learn Kotlin the Easy Way While Developing an Android App by , Antonio Leiva (Free ebook)
4. Learn Android Studio 3 with Kotlin: Efficient Android App Development by, Ted Hagos, Apress publisher.
5. https:// www.shabakeh-mag.com/sites/default/files/files/attachment/1397/04/1530550032.pdf

Master of Computer Application (MCA)
Under Faculty of Science and Technology
Introduced from June 2020 and Onwards
To be implemented from the academic year 2020-2021
Part II   Semester IV
MCA-CE02-1: Blockchain Technology

Internal Marks: 20   External Marks: 80   Theory: 04 hours/week

Course Outcomes:

1. Understand the concept of Blockchain Technology and explain the concept why we need blockchain. Also understand the concepts of transactions, block, PoW, Consensus
2. Understand the simulation of blockchain technology without any central controlling or trusted agency and how bitcoin cryptocurrency work.
3. Understand the concept of digital currency, how it can be protected against fraud, scam, hacking and devaluation.
4. Students will able to design and implement new ways of using blockchain for applications other than cryptocurrency and explore platforms such as Ethereum to build applications.

UNIT-I   **(15 HOURS)**
History of Blockchain Technology: Basics of blockchain, History, Uses of Blockchain, Structure of a block, Transactions, Understand the difference between centralized, decentralized and distributed peer to peer networks, Types of blockchains, Objectives of consensus mechanisms, famous hacks, wallet, security and safeguards Public Ledger, Distributed Consensus.

UNIT-II   **(15 HOURS)**
Cryptographic Primitives and Overview of what is blockchain:
Cryptographic hash functions – collision free, hiding, puzzle friendly (properties), Hash Chain, Hash tree- Merkle Tree, Public Key cryptography, Digital signatures. Use of hash functions and digital signatures in blockchain, recording transaction, confirmation and verification of transaction, consensus building: distributed consensus, Consensus mechanism: PoW, PoS, PoB, PoA, blockchain architecture, Merkle root tree

UNIT-III   **(15 HOURS)**
Bitcoin and Etherum: History of bitcoin, Double Spending, Script (FORTH), Mining Process, History, Architecture, Account Types , Gas, Transactions, Introduction to etherum, Ethereum Virtual Machine, Ethereum Mining process, Solidity. Hyperledger Fabric: Features of hyperledger, Architecture, ordering service, Transaction Flow, Membership and Identity Mangement, Gossip Protocol

UNIT-IV   **(15 HOURS)**
Case Study: Blockchain in Government Digital Identity, Healthcare, Land Registration, Supply Chain Management.

References:

1.   Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Bitcoin and Cryptocurrency Technologies, Princeton University Press
2.   Don Tapscott,AlexTapscott, Blockchain Revolution, ISBN No. 9781101980132
3.   Mark Gates, Blockchain ultimate Guide to understanding Blockchain, Bitcoin,Cryptocurrencies, Smart Contracts and Future of money, Wise Fox Publishing
4.   VikramDhillon, David Metcalf, Max Hooper, Blockchain Enabled Applications, Apress, ISBN No.13:978-1-4842-3081-7

5. Melanie Swan,Blockchain Blueprint for a new economy, O'Reilly, First Edition, ISBN No.978-1-491-92049-7

6. MayukhMukhopadhyay, Ethereum Smart Contract Development, Packt publishing, First Edition, ISBN No.978-1-78847-304-0

7. Chris Dannen, Introducing Ethereum and Solidity, Apress, ISBN No.978-1-4842- 2535-6

MCA (Choice Based Credit System)
Under Faculty of Science and Technology
Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022
MCA II SEMESTER IV
MCA-CE02-2: Deep Learning

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes:
1. Understand the fundamental concepts of artificial neural networks.
2. Understand the convolutional neural networks, recurrent neural networks.
3. Understand the relationship between machine learning, deep learning and artificial intelligence
4. Build own deep learning project

UNIT-I   (15 HOURS)
Artificial Neural Networks: Introduction, Perceptron Training Rule, Gradient Descent Rule Neural Networks - Introduction, Basic Concepts of Neural Networks, Model of an Artificial Neuron, Activation Functions: Sigmoid, Rectified Linear Unit (ReLU), Hyperbolic, Softmax. Feed forward Network, Recurrent Network.

UNIT-II   (15 HOURS)
Introduction to deep learning: Definition, Need, Relationship between Artificial intelligence, machine learning, and deep learning, Deep learning Process. Deep Learning Network: Deep learning applications, Advantages and Limitations of deep learning.

UNIT-III   (15 HOURS)
Introduction to Convolutional Neural Networks: Introduction to CNNs, Kernel filter, Principles behind CNNs, Multiple Filters, CNN applications Introduction to Recurrent Neural Networks: Introduction to RNNs, Unfolded RNNs, Seq2Seq RNNs, LSTM, RNN applications

UNIT-IV   (15 HOURS)
Deep Learning with Keras / PyTorch: Setting up Project, Starting Jupyter, Importing Libraries, and Creating Deep Learning Model.

References:

1. Deep Learning with Python, François Chollet.
2. Artificial Neural Networks PHI Learning Pvt. Ltd, 2009, Yegnanarayana, B.
3. Dive into Deep Learning, Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola
4. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.
5. Introduction to Deep Learning, Eugene Charniak
6. Neural Networks and Deep Learning by Michael Nielsen's

MCA (Choice Based Credit System)
Under Faculty of Science and Technology
Introduced from June 2020 and Onwards
To be implemented from the academic year 2021-2022
MCA II SEMESTER IV

MCA-CE02-3: Network Security

Internal Marks: 20   External Marks: 80   Theory: 04 hours/week

Course Outcomes:

1. Understand the fundamental principles of access control models and techniques, authentication and secure system design.
2. Understand the basics of cryptography and encryption systems.
3. Understand principles and practice of different encryption techniques.
4. Identify and mitigate different network security systems.

UNIT-I   **(15 HOURS)**
Network Security: Need for Security; Threats and Vulnerabilities in Networks – Threats in Transit, Protocol Flaws, Impersonation; Virus and Malicious Code; Active and Passive Attacks; Network Security Controls – The OSI Security Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Honeypots, Traffic flow security; Firewalls – Types Design and Types of Firewalls, Personal Firewalls, Comparison of Firewall Types, Firewall Configurations;

UNIT-II   **(15 HOURS)**
Basics of Cryptography: Cryptography Terminologies; Classical Encryption Techniques; Substitution Techniques– The Caesar Cipher, One-Time Pads, Playfair Cipher; Transposition Techniques– Rail Fence Cipher, Route Cipher, Columnar Cipher; Steganography-concept, Encryption and Decryption: Characteristics of Good Encryption Technique; Properties of Encryption Systems; Types of Encryption Systems- Based on Block, Based on Key.

UNIT-III   **(15 HOURS)**
Types of Encryption and Decryption Systems: Block Ciphers - Data Encryption Standard (DES) Algorithm, Security of the DES, Advanced Encryption Standard (AES) Algorithm, Strength of the Algorithm, DES and AES Comparison; Public Key Encryption- Characteristics of Public Key System; RSA Technique – Encryption Method; Key Exchange Techniques- Distribution of Public Keys; Diffie-Hellman Scheme; Hash Functions and Digital Signature - Hash function, SHA, HMAC, Security of hash function, Properties of Digital Signature, Digital Signature Standards, Cryptanalysis.

UNIT-IV   **(15 HOURS)**
IP, Web and E-mail Security: IP Security- Overview of IP Security; IP Security Architecture; Authentication Header; Encapsulating Security Payload (ESP); Pretty good privacy, Ethical Hacking: Introduction to Ethical Hacking, terminology, Hackers, Crackers, and other related Terms Hactivism, threats, Hacking History, Ethical Hacking, Objectives and Motivations.

References:
1. Cryptography and Network Security Principles and Practice Fourth Edition, William Stallings, Pearson Education
2. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall PTR
3. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007.
4. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
5. Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication in Public World", PHI 2002
6. Cryptography and Network Security, AtulKahate, TMH.

MCA (Choice Based Credit System)
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MCA II SEMESTER IV
MCA-CE02-4: Optimization Techniques

Internal Marks -20   External Marks-80   Theory-04 hrs. /week

Course Objectives:

1. To impart knowledge in concepts and tools of operations research.
2. To understand mathematical models used in optimization techniques.
3. To formulate a real-world problem as a mathematical programming model.
4. To solve specialized linear programming problems like the transportation, assignment and
5. game problems.

UNIT-I   **(15 HOURS)**
Operation Research
1.1: Overview of Operation Research: Introduction
1.2: Origin and Development of Operation Research
1.3: Operation Research and Decision Making
1.4: Methodology of Operation Research
1.5: Applications Operation Research

UNIT-II   **(15 HOURS)**
Linear Programming Problems (LPP)
2.1: Introduction to LPP: Concept and Definitions of some terms
2.2: Mathematical Formulation of LPP and Duality in LPP
2.3: Graphical Solution to LPP
2.4: Simplex Method and Big-M method
2.5: Illustrative Examples

UNIT-III   **(15 HOURS)**
Transportation Problem
3.1: Transportation Problem (TP) – Introduction
3.2: Mathematical Formulation of TP
3.3: Solution of TP: North-west corner rule, Least cost method, Vogel's Approximation
 Method (VAM)
3.4: Transportation Algorithm (MODI – Method)
3.5: Illustrative Examples

UNIT-IV   **(15 HOURS)**
Assignment Problem and Game Theory
4.1: Assignment Problem (AP) – Introduction
4.2: Mathematical Formulation of AP
4.3: Solution of AP: Hungarian Assignment Method
4.4: Game Theory: Introduction, Two-Person zero-sum Games and Minimax-Maximin
 Principle
4.5: Illustrative Examples

References:

1. Hadley G.(1969): Linear Programming, Addison Wesley

2. Taha H. A. (1971): Operation Research: An Introduction, Macmillan N.Y.

3. KantiSwaroop& Gupta M. M.(1985): Operations Research, Sultan Chand & Co. ltd.

4. P.Gupta&D.S.Hira(2010): Operation Research, Sultan Chand & Co. ltd.

5. J. K. Sharma. (2003): Operation Research: Theory and Applications. Macmillan.

MCA (Choice Based Credit System)
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MCA II SEMESTER IV
MCA-CE02-5: Robotics

Internal Marks -20   External Marks-80   Theory-04 hrs. /week

Course outcomes:
1. Explain the basic concepts of working of robot
2. Analyze the function of sensor in robot and design the robotic arm with various tools
3. Program the robot for a typical application and path planning using robotic vision
4. Understand the various robot programming languages
5. Conduct and design the experiments for various robot operations
6. Use the advanced techniques for robot processing

UNIT –I   (15 HOURS)
Introduction, brief history, types, classification and usage, science and technology of robots, Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kind of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders-tachometers-strain gauge based force torque sensor-proximity and distance measuring sensors-and vision

UNIT –II   (15 HOURS)
Classification of end effectors-tools as end effectors-drive system for grippers-mechanical adhesive-vacuum magnetic-grippers-hooks and scoops-gripper force analysis-and gripper design- active and passive grippers, Classification of end effectors-tools as end effectors-drive system for grippers-mechanical adhesive- vacuum magnetic-grippers-hooks and scoops-gripper force analysis-and gripper design- active and passive grippers

UNIT –III   (15 HOURS)
Robotic vision systems-image representation-object recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations, Introduction to robot languages-VAL-RAPID-language-basic commands-motion instructions- pick and place operation using industrial robot manual mode-automatic mode-subroutine command based programming-move master command language-introduction-syntax-simple problems

UNIT –IV   (15 HOURS)
Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space applications-Industrial robots-artificial intelligence in robots-application of robots in material handling-continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc

References:
1. Industrial robotic technology-programming and application by M.P.Groover et al, McGrawhill 2008
2. RicharedD.Klafter.ThomasAchmielewski and MickaelNegin, Robotic Engineering an Integrated approach prentice hall India- newdelhi-2001
3. Robotics, Vision, and Control, Peter Corke, Springer, 2011
4. Introduction to Robotics, John J. Craig, Addison-Wesley Publishing, Inc., 1989
5. Introduction to Robotics, P. J. McKerrow, ISBN: 0201182408
6. Robotics technology and flexible automation by S.R. Deb, TMH2009

MCA (Choice Based Credit System)
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MCA II SEMESTER IV
MCA-CE02-6: Internet of Things (IoT)

Internal Marks -20   External Marks-80   Theory-04 hrs. /week

Course outcomes:
1. Apply the concepts of IoT
2. Identify the different technologies
3. Apply IoT to different applications
4. Analysis& evaluate protocols used in IoT
5. Design smart city in IoT.
6. Analysis data received through sensors in IoT

UNIT –I   **(15 HOURS)**
Basics of IoT: Understanding IoT fundamentals, IOT Architecture and protocols, Various Platforms for IoT, Real time Examples of IoT, Overview of IoT components and IoT Communication Technologies, Challenges in IOT
Arduino Simulation Environment: Arduino Uno Architecture, Setup the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED, push button and buzzer with Arduino, Interfacing Arduino with LCD

UNIT –II   **(15 HOURS)**
Sensor & Actuators with Arduino: Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino, Interfacing of Actuators with Arduino, Interfacing of Relay Switch and Servo Motor with Arduino
Basic Networking with ESP8266 WiFi module: Basics of Wireless Networking, Introduction to ESP8266 Wi-Fi Module, Various Wi-Fi library, Web server- introduction, installation, configuration, Posting sensor(s) data to web server

UNIT –III   **(15 HOURS)**
Cloud Platforms for IOT: Virtualization concepts and Cloud Architecture, Cloud computing, benefits, Cloud services -- SaaS, PaaS, IaaS, Cloud providers & offerings, Study of IOT Cloud platforms, ThingSpeak API and MQTT, Interfacing ESP8266 with Web services
Architecture for IoT: Domain model specification, Information Model Specification, Service specification, IoT Level specification, Functional view, Operational view, Device and Component Integration, User centred design, Open source development, End user programming, Tools for IoT

UNIT –IV   **(15 HOURS)**
Developing IoT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi Implementation of IoT with Arduino and Raspberry, Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT

References:
1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014
2. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1st Edition, VPT, 2014

3. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011

4. David Hanes, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press, ISBN-13: 978-1-58714-456-1, ISBN-10: 1-58714-456-5, 2017

5. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012, ISBN:978-1-119-99435-0

6. Raj Kamal, "Embedded Systems: Architecture, programming and Design", 2nd Edition, McGrawHill, ISBN: 13: 9780070151253

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MCA II SEMESTER IV
MCA - ME02 –1-:Business Intelligence

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes:
1. Understand the basic concepts of Business Intelligence.
2. Know the steps of Business Intelligence life cycle and planning process
3. Apply Business Intelligence methods and techniques in addressing strategic business problems in organizations
4. Understand the data analysis techniques and application prototyping
5. Make better decisions by conducting in-depth analysis to both technical and business problems

UNIT-I   **(15 HOURS)**
Fundamentals of Business Intelligence: Business intelligence: Definition, Effective and timely decisions, data, information and knowledge, role of mathematical models, BI architectures. Types of Business Intelligence, Business Intelligence Applications, Decision Support Systems: Definition, Evolution of information systems, development of DSS, representation of the decision-making process. Mathematical models for decision making: Structure, development of a model, classes of models, Role of Business Intelligence in Modern Business.

UNIT-II   **(15 HOURS)**
Business Intelligence Life Cycle: Business Intelligence Lifecycle, Enterprise Performance Life Cycle (EPLC) Framework Elements, Life Cycle Phases, Human Factors in BI Implementation, BI Strategy, Transformation Roadmap, Building a transformation roadmap, BI Development Stages and Steps, Parallel Development Tracks, BI Framework. Business Intelligence Project Planning and Requirements: Definition BI project: managing, defining, planning activities, Project Requirements - General and specific requirements, activities, deliverables, roles.

UNIT-III   **(15 HOURS)**
Data Analysis and Application Prototyping: Data Analysis: Business focused data analysis, top-down logical data modeling, bottom up source data analysis, data cleansing activities, Prototyping: Purpose, best practices, types, building successful prototypes, application prototyping activities

Unit-IV   **(15 HOURS)**
Database Design and ETL Design: Differences in database design, logical and physical database design activities, deliverables, roles. ETL Design: Implementation strategies, preparing for ETL process, Designing the extract programs, transformation programs, load programs, ETL process flow, Evaluating ETL tools

REFERENCE BOOKS
1. Ramesh Sharda, DursunDelen, Efraim Turban, "Business Intelligence and Analytics: Systems for Decision Support" Pearson Education
2. Swain Scheps, "Business Intelligence For Dummies", Wiley Publishing, Inc.
3. Rick Sherman, Business Intelligence Guidebook: From Data Integration to Analytics 1st Edition
4. Carlo Vercellis, "Business Intelligence: Data mining and Optimization for Decision Making", John Wiley and Sons, 2009.
5. Larissa T. Moss and Shaku Atre, "Business Intelligence Roadmap: The Complete project lifecycle for decision support applications", Addison Wesley, 2003.

6. Efraim Turban, Ramesh Sharda, DursunDelen and Janine E. Aronson, "Business Intelligence – A Managerial Approach", Second Edition, Pearson Prentice Hall, 2010

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MCA II SEMESTER IV
MCA-ME02-2: ENTERPRISE RESOURCE PLANNING

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes:
1. Understand importance and working of ERP.
2. Design ERP implementation strategies and process
3. Understand ERP Business Modules and marketing strategies
4. Identify ERP and Related technologies

UNIT-I: **(15 HOURS)**

Introduction: Definition of Enterprise, Business Processes, Introduction to ERP, Basic Concepts of ERP, Justifying ERP Investments, Risks of ERP , Difference between traditional system and ERP, Need of ERP, Evolution of ERP, Benefits of ERP, Risks of ERP , Growth of ERP. Business Integration and ERP, Business Process Management, Need of BPR, Components of BPR.

UNIT-II: **(15 HOURS)**

ERP Implementation Challenges, ERP Implementation (Transition) Strategies, ERP Implementation Life Cycle, Pre-implementation Tasks, Requirements Definition, Implementation Methodologies, Package Selection, ERP Project Teams, Process Definition, Vendors and Consultants, Dealing with Employee Resistance, Contracts with Vendors, Consultants and Employees, Training & Education, Data Migration, Project Management & Monitoring, Post Implementation Activities, Success & Failure Factors of an ERP Implementation, Operation and Maintenance of the ERP System, Measuring the Performance of the ERP System.

UNIT-III: **(15 HOURS)**

Business Modules of ERP- Finance Module of an ERP Package, Manufacturing Module of an ERP Package, Human Resources Module of an ERP Package , Materials Management Module of an ERP Package, Quality Management Module of an ERP Package, Marketing Module of an ERP Package Sales, Distribution & Service Module of an ERP Package

ERP Markets – ERP Marketplace and Marketplace Dynamics.

UNIT- IV: **(15 HOURS)**

Management Information, System (MIS), Decision Support System (DSS), Executive Support System (ESS), Data Warehousing, Data Mining, On-Line Analytical Processing (OLAP), Supply

Chain Management, Customer Relationship Management Post Implementation review of ERP packages – in Manufacturing, Services and Others Organizations, Customization of ERP for different types of Industries.

ERP Vendors- SAP, JD Edwards, ORACLE, Peoplesoft, BAAN.

ERP Case Studies

References:

1. ERP Demystified: Alexis Leon, TMH New Delhi ,3rd Ed.

2. ERP Ware: ERP Implementation Framework : V.K. Garg &N.K. Venkita Krishnan, PHI.

3. ERP Concepts &Planning : V.K. Garg &N.K. Venkita Krishna, PHI, 2nd Ed..

4. ERP a managerial perspective- . Sadagopan , TMH.

5. ERP by- Zaveri and Jyotindra, Himalaya publications

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MCA II SEMESTER IV

MCA - ME02 –3:Human Resource Management

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes:

1. Understand the importance of human resources.
2. Describe the steps involved in the human resource planning process
3. Understand the training needs and use of HRIS.
4. Know about the purposes of performance management systems and appraisal.
5. Know the list of occupational safety and health administration enforcement priorities.

UNIT-I   **(15 HOURS)**
FUNDAMENTALS OF HRM
Introduction, Definition, Scope, Role, Objectives, Importance of HRM, HRM versus Personnel Management, qualities of HR manager, evolution and growth of HRM, trends and opportunities, HRM in Indian and global environment, legal and ethical context, laws for discriminatory practices, equal opportunity employment.

UNIT-II   **(15 HOURS)**
STAFFING, RECRUITMENT AND SELECTION
HR polices, need, type and scope, human resource planning, job analysis, recruiting goals and objective, factors affecting, recruiting sources, selection process, pre-employment testing, interviews, job offers, Industrial relations-objectives, approaches, significance. Wage and Salary administration-meaning, factors affecting wage/ salary

UNIT-III   **(15 HOURS)**
TRAINING AND DEVELOPMENT
New employee orientation, difference between training and development, organizational development, Training methods, evaluating training, career development, mentoring and coaching, career stages.Human Resources Information Systems (HRIS)-meaning, concept, objective, need. HRIS model, implementation of HRIS, benefits and limitations of HRIS.

UNIT-IV   **(15 HOURS)**
Performance evaluation, rewards and benefits safe and healthy work environment appraisal process, methods, team appraisal, rewards, theories of motivation, compensation administration, occupational safety and health act, issues, stress assistance program, labor management, employee unions labor legislation. promotion, demotion, transfer and separation, employee grievances, redressal methods.

References:
1. V S P Rao, "Human Resource Management", Second Edition, Excel Books 2005.
2. Decenzo and Robbins, Human Resource Management, Wilsey, 10th edition, 2012.
3. Mamoria C.B. and Mamoria.S., Personnel Management, Himalaya Publishing Company, 1997.
4. Mirza S. Saiyadain Human Resource Management, Tata McGraw Hill, 4th edition 2009
5. EugenceMckenna and Nic Beach Human Resource Management, Pearson Education Limited, 2002.
6. Garry Dessler, Human Resource Management, Pearson Education Limited, 2002.
7. Decenzo and Robbins, Human Resource Management, Wilsey, 6th edition, 2001.
8. Wayne Cascio, Managing Human Resource, McGraw Hill, 1998.
9. Ivancevich, Human Resource Management, McGraw Hill 2002.

10. BiswajeetPattanayak, Human Resource Management, Prentice Hall of India, 3rd edition 2005
11. Edwin Flippo, Personnel & Human Resource Management.
12. C. Appa.Rao, Strategic Human resource management

MCA (Choice Based Credit System)
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MCA II SEMESTER IV
MCA ME02-4: Big Data Analytics

Internal Marks -20 External Marks-80 Theory-04 h/week

Course Outcomes:

1. Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
2. Understanding different tools for Big Data Analytics.
3. To study issues relating Big Data Security.
4. Develop Big Data Solutions using Hadoop Eco System

UNIT-I **(15 HOURS)**
Introduction to Big Data: Definition of Big Data, Sources of Big Data, Characteristics of Big Data, Harnessing Big Data, Real time data processing, Structure of Big Data, Need of Big Data Management, Big Data life Cycle and processing, Concepts in Data Warehousing and its Relevance for Big Data. Applications of Big Data, Benefits of Big Data Management.

UNIT-II **(15 HOURS)**
Fundamentals of Big-data analytics: Overview & analytics life cycle, Need, Structured and multi-structured data analysis, Big-data analytics major components, Analytical models and approaches, Relational and nonrelational Databases, Application areas, Design and analysis of Analytics model- Analytics design steps, Understanding different data processing models, Statistical models, Predictive models, Descriptive models.

UNIT-III **(15 HOURS)**
NoSQL: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, Use of NOSQL in industry, SQL vs NOSQL . Introduction to Hadoop: Features, Advantages, limitations. Overview of Hadoop Eco systems - Hadoop distributions - Hadoop vs. SQL ,RDBMS vs. Hadoop ,Hadoop Components , Architecture, Big Data Analytics Tools.

UNIT-IV **(15 HOURS)**
Introduction to HDFS: HDFS operations. Features, Architecture, Cluster capacity planning, Hadoop cluster setup and administration. Map-Reduce - Map-Reduce Architecture, Writing Map-Reduce program, Examples of Map-Reduce. Pig - architecture, Pig datatypes, Defining schema, Reading and storing data through Pig, Hive-Introduction, Hive Vs RDBMS, Data Base Operations in Hive. Big Data Security, Security concerns with Hadoop, Hadoop Security Challenges and threats, Hadoop security best practices, Hadoop Kerberos Security Implementation &Configuration, Securing Sensitive Data in Hadoop Setting up audit logging in Hadoop cluster,

References:
1. "Professional Hadoop Solutions", Boris lublinsky, Kevin t. Smith, AlexeyYakubovich Wiley, ISBN: 9788126551071, 2015.
2. "Understanding Big data ", Chris Eaton,Dirkderoos. McGraw Hill, 2012.
3. BIG Data and Analytics , Sima Acharya, SubhashiniChhellappan, Willey 4
4. Tom White, Hadoop: The Definitive Guide, O'Reilly, 3rd edition
5. Dirk Deroos, Hadoop for Dummies, wileyTom White, "HADOOP: The definitive Guide", O Reilly 2012.

6. "Big Data Analyticswith R and Haoop", VigneshPrajapati, Packet Publishing 2013.
7. "Oracle Big Data Handbook", Tom Plunkett, Brian Macdonald ,Oracle
8. Press, 2014.
9. , Hadoop in Practice, Alex Holmes ,manning 1 st edition.
10. Programming Pig, O'Reilly by Alan Gates,
11. Programming Hive,O'Reilly by Edward Capriolo, Dean Wampler, Jason Rutherglen,
12. "Oracle Big Data Handbook", Tom Plunkett, Brian Macdonald ,OraclePress, 2014.
13. "Big Data and Business analytics", JyLiebowitz, CRC press, 2013.
14. "Hadoop Operations", Eric Sammer, O'Reilley, 2012.
15. HADOOP SECURITY :TODAY AND TOMORROW
16. http://www.bigdatauniversity.com/
17. http://www.cloudera.com/content/cloudera/en/solutions/enterprisesolutions
18. /security-for-hadoop.html

MCA (Choice Based Credit System)
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MCA II SEMESTER IV
MCA-ME02-5 :Social Media Management

Internal Marks -20 External Marks-80 Theory-04 h/week

Course Outcomes:

1. Understand the evolution of Social Media
2. Identify importance of Content Management of Social media.
3. Evaluate different analytical tools to measure the performance of Social media.
4. Create social media presence through effective social media strategies.

UNIT-I (15 HOURS)

Basics of Social Media :Introduction to Social Media: Definition, History of Social Media, Types of Social Media, Social Media services, Examples of Social Media: Facebook, Twitter, WhatsApp, etc., Impact of Social Media, Advantages and Disadvantages of Social Media, Application Domains of Social Networking Business Applications: Marketing and HR, Educational Applications, Social and Political Applications, Medical and Health Applications, Current research on Social Media.

UNIT-II: (15 HOURS)

Social Media Content Management :Social Media Content Overview, The Role of Content in Social Media, Anatomy of a Social Media Post: The Role of Text in Posts, The Role of Images in Posts, The Role of Video in Posts, Create a Social Media Presence: Identify What to Post, Creating a Storyboard, Using a Content Calendar, Creating a Content Calendar, Repurposing Content, Auditing Content, Building a Following on Social Media, Interacting and Moderating on Social Media

UNIT-III (15 HOURS)

Social Media Analytics: Social media landscape, Attributes and Metrics of Social Media, Social Media Models,, Need for Social Media Analytics; Application of SMA in different areas, Web analytics tools: Clickstream analysis, A/B testing, online surveys, Web crawling and Indexing, Natural Language Processing Techniques for Micro-text Analysis, Collecting and analyzing social media data, Information visualization and exploration tools for social media.

UNIT-IV (15 HOURS)

Social Media Strategies :Introduction to digital marketing, Introduction to social media marketing, Social Media marketing tools, Social media marketing strategies, Social media marketing strategies for different platforms: Facebook, Instagram, Twitter, LinkedIn, Youtube, Social media etiquette, Social media influencers, Social reviews, Security and safety issues of Social Media, Privacy Issues of Social

Media, Legal Issues of Social Media.

References:

1. Social Media Analytics, Marshall Sponder, McGraw Hill
2. Social Media Marketing, Tracy L. Tuten, Michael R. Solomo, Sage
3. Social Media Metrics: How to Measure and Optimize Your Marketing Investment, Jim Sterne, Wiley
4. Social Media ROI: Managing and Measuring Social Media Efforts in Your Organization, Olivier Blanchard, Que Biz-Tech publication
5. Fundamentals of Writing: How to Write Articles, Media Releases, Case Studies, Blog Posts and Social Media Content, Paul Lima, Ingram publication

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MCA II SEMESTER IV
MCA -ME02-6: Web Mining

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Oucomes:

1. To focus on a detailed overview of the data mining process and techniques, specifically those that are relevant to Web mining
2. To Understand the basics of Information retrieval and Web search with special emphasis on web Crawling
3. To appreciate the use of machine learning approaches for Web Content Mining
4. To understand the role of hyper links in web structure mining
5. To appreciate the various aspects of web usage mining

UNIT-I   (15 HOURS)
Introduction – Web Mining – Theoretical background –Algorithms and techniques – Association rule mining – Sequential Pattern Mining -Information retrieval and Web search – Information retrieval Models-Relevance Feedback- Text and Web page Pre-processing – Inverted Index – Latent Semantic Indexing – Web Search – Meta-Search – Web Spamming

UNIT-II   (15 HOURS)
Web Content Mining – Supervised Learning – Decision tree - Naïve Bayesian Text Classification - Support Vector Machines - Ensemble of Classifiers. Unsupervised Learning - K-means Clustering - Hierarchical Clustering –Partially Supervised Learning – Markov Models - Probability-Based Clustering - Evaluating Classification and Clustering – Vector Space Model – Latent semantic Indexing – Automatic Topic Extraction - Opinion Mining and Sentiment Analysis - Document Sentiment Classification

UNIT-III   (15 HOURS)
Web Link Mining – Hyperlink based Ranking – Introduction -Social Networks Analysis- Co-Citation and Bibliographic Coupling - Page Rank -Authorities and Hubs -Link-Based Similarity Search - Enhanced Techniques for Page Ranking - Community Discovery – Web Crawling -A Basic Crawler Algorithm- Implementation Issues- Universal Crawlers- Focused Crawlers- Topical Crawlers Evaluation - Crawler Ethics and Conflicts - New Developments

UNIT- IV   (15 HOURS)
a) Structured Data Extraction: Wrapper Generation – Preliminaries- Wrapper Induction- Instance-Based Wrapper Learning - Automatic Wrapper Generation: Problems - String Matching and Tree Matching -Multiple Alignment - Building DOM Trees - Extraction Based on a Single List Page and Multiple pages- Introduction to Schema Matching - Schema-Level Match -Domain and Instance-Level Matching – Extracting and Analyzing Web Social Networks.
b) Web Usage Mining - Click stream Analysis -Web Server Log Files - Data Collection and Pre-processing - Cleaning and Filtering- Data Modeling for Web Usage Mining - The BIRCH Clustering Algorithm -Affinity Analysis and the A Priori Algorithm – Binning. Discovery and Analysis of Web Usage Patterns – Modeling user interests –Probabilistic Latent Semantic Analysis.

Reference:
1. Bing Liu, " Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-Centric Systems and Applications)", Springer; 2nd Edition 2009
2. GuandongXu ,Yanchun Zhang, Lin Li, "Web Mining and Social Networking: Techniques and
3. Applications", Springer; 1st Edition.2010

4. Zdravko Markov, Daniel T. Larose, "Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage", John Wiley & Sons, Inc., 2007
5. SoumenChakrabarti, "Mining the Web: Discovering Knowledge from Hypertext Data", Morgan Kaufmann; edition 2002
6. Adam Schenker, "Graph-Theoretic Techniques for Web Content Mining", World Scientific Pub Co Inc , 2005
7. Min Song, Yi Fang and Brook Wu, Handbook of research on Text and Web mining technologies, IGI global, information Science Reference – imprint of :IGI publishing, 2008.

Part- II Semester –III

MCA-L06 Advance technology & Mobile technology Lab

Internal Marks -20   External Marks-80   Theory-04 H/Week

This laboratory course should consist of 10-12 programming exercises with focus on covering the hands-on aspects covered in theory course.

Part- II Semester –III

MCA-P02 Project

Internal Marks -20   External Marks-80   Theory-04 H/Week

Project