ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus
(From Academic Session 2020-21 onwards)

MASTER OF COMPUTER APPLICATIONS (MCA)

3rd Semester

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure
(From Academic Session 2020-21 onwards)

MASTER OF COMPUTER APPLICATIONS (MCA)
3rd Semester

Sl. No.	Sub-Code	Subject	Hours per Week			Credit	Marks	
			L	T	P	C	CE	ESE
Theory								
1	MCA202301	Artificial Intelligence and Machine Learning	3	1	0	4	30	70
2	MCA202302	Web Technology and Services	3	1	0	4	30	70
3	MCA202303	Introduction to Data Science	3	1	0	4	30	70
4	MCA202E2*	Elective-II	3	0	0	3	30	70
5	MCA202E3*	Elective-III	3	0	0	3	30	70
Practical								
1	MCA202324	Mini Project and Seminar	0	1	6	4	30	70
TOTAL			**15**	**4**	**6**	**22**	**180**	**420**
Total Contact Hours per week: 25								
Total Credits: 22								

Elective –II

Sl No	Subject Code	Subjects
1	MCA202E21	Compiler Design
2	MCA202E22	Advanced Computer Architecture
3	MCA202E23	Cryptography and Network Security
4	MCA202E24	Microprocessors
5	MCA202E25	Optimization Techniques
6	MCA202E2*	Any other subject offered from time to time with the approval of the University

Elective –III

Sl No	Subject Code	Subjects
1	MCA202E31	Information retrieval Systems
2	MCA202E32	Soft Computing
3	MCA202E33	Unix Network Programming
4	MCA202E34	Big Data Analytics
5	MCA202E35	Embedded Systems
6	MCA202E3*	Any other subject offered from time to time with the approval of the University

Detail Syllabus:

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202301	**Artificial Intelligence and Machine Learning**	**3-1-0**	**4**

MODULE 1: Introduction to AI
Meaning and definition of AI, Relationship between AI and machine learning, the foundation of AI (1940-present), Intelligent Agent: definition, how agent work, structure of Agent, example of Agent, Problem solving Agent, Goal based agent, Simple reflex Agent, Environment and properties of Agent, Definition of state and actions.

MODULE 2: Problem Solving with AI Techniques
Problem solving environment, 8 Puzzle problem, Crypt arithmetic, Missionaries and cannibal, Real world problem, Route finding, Travelling salesman problem, searching strategy, Breadth First Search, Uniform Cost search, Depth First Search, Bidirectional Search, Best First Search, Greedy Search A*, Heuristic functions, iterative improvement algorithm, Hill Climbing search, Forward and Backward chaining, Game Tree search, Minimax, Alpha, Beta, Heuristic in Game Tree Search.

MODULE 3: Knowledge Representation with Grammar
Knowledge base Agent, Knowledge base sentence, knowledge representing Language, Inference, Background knowledge, Propositional Logic, Syntax, Semantics, Validity, Inference Rules models, First Order Logic, Syntax, Semantics, Terms Atomic sentence, Complex sentence, Quantifiers, Nested quantifiers, Equality, Kinship Domain, Axioms, Definitions and Theorem, Universal Eliminations, Existential Elimination, Generalized Modus Ponens, Higher Order Logic – Functional and Pedi care expressions, uniqueness quantifier, operator, notational variations.

MODULE 4: Expert System
Definition of Expert System, Characteristics of Expert System, Components of Expert System, Application of Expert Systems.

MODULE 5: Introduction to Machine Learning
Definition, need of machine Learning, Types of Machine Learning, Association Rule Mining- Introduction Techniques, Supervised Techniques, Classification and Regression, Unsupervised Techniques, Clustering Ensembles Methods and Techniques, Algorithms, Decision Tree, Naïve, Bayes, Nearest Neighbor Estimation, A simple Classifier, Perceptron, K-means.

MODULE 6: Tensorflow OR R
Tensor Flow: Introduction, Installation, Basic – Data structure, Dimensions, Machine Learning, Algorithm, Implementation, Visualization, Word Embedding, Exporting dataset to Tensor Flow, Forming Graph. R-introduction to R, Vectors, Vectorised operations, Functions in R, Package in R, Matrices, Arrays and List operations, Acessing List Components and values, Applying Functions.

Text Books/Reference Books:

1. Staurt J Russel and Peter Norvig: "Artificial Intelligence: A Modern Approach", Pearson Education 2005.
2. Elaine Rich and Kelvin Knight, "Artificial Intelligence" TMGH 2002
3. Avron Barr and Edward A, Feigenbaum, "Handbook of Artificial Intelligence" CSE Deptt, Stanford Univ.
4. Alex Smola and SVN Vishwanathan, "Introduction to Machine Learning", Cambridge University
5. Nills J Nilson, "Introduction to Machine Learning" Deptt of CSE, Stanford University 1998
6. Shai Shalev Swartz, Sahi Ben David "Understanding Machine Learning From theory to Algorithms" Cambridge University Press 2014.
7. Tom M Mitchelli, "Machine Learning" MGH 1997
8. R Akerkar "Introduction to Artificial Intelligence"

9. Norman Matloff, “The Art of R- Programming “A tour of statistical Software design” No startch 2011
10. Jared P lander, “R for everyone, Adavanced Analytics and graphics”AW, Data analysis series 2013.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202302	Web Technology and Services	3-1-0	4

MODULE 1: Introduction to Web Technology

Introduction to web technology: The World Wide Web, www Architecture, Web Search Engine. Web Crawling, Web Indexing, Web Searching, Search Engine, Optimization and Limitations, Introduction to the Semantic Web.

Introduction to Web Services: Web Service, Software as a Service, Web Service, Architectures, SOA Service Oriented Architecture, XML (Extensible Markup Language)

MODULE 2: Web Application Development

Web Application Development: introduction to PHP (Hypertext Preprocessor), syntax, variables, strings, operators, Loops, array, Built-in Functions, User-Defined Functions, Processing Forms, Using PHP Includes, Database Connectivity-JDBC, ODBC, Regular Expressions, Sending Mail, Object-Oriented PHP, Cookies and Sessions, File Uploads.

Bootstrap: introduction to bootstrap, color management, buttons, table, drop-down, navigation-bar, images, pagination, jumbotron, alert, forms, progress bar, grid, utilities and filters.

MODULE 3: Web Security

Web security: Issues and principles, Security model, Confidentiality, authentication, Integrity, Non-repudiation, Access Control, and Availability. Sniffing, spoofing, phishing, pharming, Cryptography, Cipher Text, Digital Signature, Digital Certificates;

Network security: SSL, Firewalls, Tunnels, IP Security, X-HTTP, IPV4 & IPV6 security.

MODULE 4: Web Services and Web Object Model

Web Services & Middleware: Concept and functions, CORBA, DCOM & CORBA, Service Oriented Architectures: web services, SOAP architecture

Web Object Model: CORBA, COM, DCOM, IIOP.

MODULE 5: Frameworks and Web Content Management Systems

Different Frameworks in web development: MVC, Front-end and Back-end Framework: concepts, functions and features; **Front-end Framework**: React JS, Angular JS etc.; **Back-end Framework**: Django, Flask, Laravel, Ruby on Rails, Node JS etc.

Web Content Management Systems: Joomla, WordPress, Drupal - Content creation using the CAM Model, Content customization images, video, audio, tags, formats, etc., Adding and displaying menus, Linking menus to articles and other features.

Web Applications Case Studies: Cloud computing, IOT, Application of Artificial Intelligent (AI) in Web, E-Commerce

Text Books/References:

1. Web Technology by Deital & Deltal.
2. Php: The Complete Reference 1st Edition (Steven Holzner).
3. Mastering Bootstrap 4 (Jakobus Benjamin)

Online reference.

1. https://wwwjoomla.org/
2. https://wordpress.com/
3. https://www.drupal.org/

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202303	**Introduction to Data Science**	**3-1-0**	**4**

MODULE 1: Introduction to Statistic for Data Science

Descriptive Statistics (Sampling Techniques, Measure of Central Tendency, Measure of Variation), Correlation and Regression (Karl's Pearson Correlation Coefficient, Rank Correlation, Bivariate Frequency Distribution, Regression Coefficient), Probability Theory, Distribution Function (Random Variable, Probability Mass Function and Probability Density Function, Probability Distribution (Binomial Distribution, Poisson Distribution, Continuous Probability Distribution), High Dimensional Space- Introduction, Geometry of High Dimension, Markov Law of Large Number.

MODULE 2: Introduction to Data Mining

Data Preprocessing Steps: Data cleaning, Data Transformation, Data Reduction; Measure of Similarity and Dissimilarity: Euclidean, Manhattan, Jaccard, Makowski; Feature Selection (Filter, Wrappers), Dimensionality Reduction (Feature Embedding, Factor analysis, PCA and LDA;Supervised and Unsupervised Learning

MODULE 3: Algorithms

Classification Techniques - Decision Tree, Rule Based Classifier, Probabilistic Classifier, and K Nearest Neighbor; Association Rule Mining: APriori, FP Growth; Clustering Techniques- K Mean, Hierarchical Clustering Algorithm, DBSCAN, Partitioning Method, CLARANS, CLIQUE; Genetic Algorithm, Temporal Models, Time Series Model (ARMA); Ensemble Method- Bagging, Random Forest, Adaptive Boosting, Gradient Boosting.

MODULE 4: Deep Learning Computation

Layer and Blocks, Custom Block, Sequential Block: Parameter Management (Access, Initialization, Tied Parameter), Deferred Initialization, Custom Layer (Layer with Parameter, Layer without parameter)

MODULE 5: Artificial Neural Network

Introduction, Basic concepts of artificial neural networks, Earlier neural networks: ADALINE, MADALINE. Neural Network Architectures: Single layer feedforward network, Multilayer feedforward network, Recurrent network

MODULE 6: Natural Language Processing

Introduction, Grammar Checkers, The different analysis levels- Morpho Lexical, Syntactic, Semantic (Networks, Parsers), Pragmatic (Knowledge Representation, Reasoning, Plan and Goal Recognition), Lexical level (Error Tolerant Lexical Processing), Syntactic Level (Logical Focus, Ambiguity Resolution)

Books/ Reference:-

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.
5. Gupta, S.C. and Kapoor, V.K.: "Fundamentals of Mathematical Statistics", Sultan & Chand & Sons, New Delhi, 11th Ed, 2002.
6. Hastie, Trevor, et al. "The elements of Statistical Learning", Springer, 2009.
7. Ross, S.M., "Introduction to Probability and Statistics",Academic Foundation, 2011.
8. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
9. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Third Edition, 2014.
10. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202E21	Compiler Design	3-0-0	3

MODULE 1: Overviews
The structure of a Compiler, Applications of Compiler Technology, Programming Language Basics, Syntax Definition, Syntax-Directed Translation, Parsing, Translator for Simple expressions, Lexical Analysis, Symbol Tables, Intermediate Code Generation

MODULE 2: Lexical Analysis
Specification of Tokens, Strings and Languages, Regular Expressions, Recognition of Tokens, Use of Lex, Finite Automata

MODULE 3: Syntax Analysis
Role of the Parser, Parse trees and derivations, Top-Down parsing, Recursive-Descent Parser; bottom-up parsing, Operator precedence parser, LR parsers- SLR and LALR, Handling Ambiguity
Syntax-Directed Translation: Evaluation of SSD, Construction of Syntax Trees

MODULE 4: Intermediate-Code Generation & Code Optimization
Semantic analysis, Attribute grammars, Type checking, Type Conversions and Overloading, Symbol tables for compilers. Runtime Environments: Activation records, heap management, garbage collection Error detection and recovery.
Code Optimization: Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Peephole Optimization.

MODULE 5: Introduction to Data-Flow Analysis
Register allocation, Loop optimization, Instruction Scheduling and Software Pipelining, Automatic Parallelization

Text Books/ References:

1. Aho A. Ravi Sethi and D Ullman. Compilers – Principles Techniques and Tools, Addison Wesley, 2006.
2. D. M.Dhamdhare, System Programming and Operating Systems,Tata McGraw Hill &Company, 1996.
3. Kenneth C. Louden, Compiler Construction – Principles and Practice, Cengage Learning Indian Edition, 2006.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202E22	Advanced Computer Architecture	3-0-0	3

MODULE 1: Introduction to Parallel Processing
Parallel processing trends, Levels of parallel processing, parallelism in uniprocessor systems- parallel processing mechanisms
Parallel Computer Structures: Pipeline computers, Array processors, Multiprocessor systems, Architecture classification schemes- Flynn's, Feng's and Handler's classifications

MODULE 2: Pipelining in Uniprocessors
Linear pipelining principles, Classifications of pipeline processors, Instruction and arithmetic pipelines, Principles of designing pipeline processors-Instruction prefetch, branch handling, forwarding, Hazards and its types, hazards detection and resolution.

MODULE 3: Vector Processing
Vector processing requirements, pipeline computers and vectorization methods, Various vector processors- STAR 100, CRAY-1, CYBER-205, Fujitsu 200 and their special features.

MODULE 4: Structures and Algorithms for Array Processors
SIMD Array Processors, SIMD interconnection networks, Parallel algorithms for array processors, SIMD computers and their performance enhancement

MODULE 5: Multiprocessor Architecture and Programming
Functional structures, interconnection networks, parallel memory organizations, multiprocessor control and algorithms, interprocess communication mechanism, system deadlocks and protection, multiprocessor scheduling strategies, parallel algorithms for multiprocessor- synchronous and asynchronous.

MODULE 6: Data Flow Computer
Data driven computing and languages, advantages and potential difficulties etc.

Text books / Reference Books:

1. Computer architecture and parallel processing by Kai Hwang, Faye A. Briggs
2. Computer system architecture by M. Morris Mano.
3. Advanced Computer Architecture by Kai Hwang.
4. Parallel processing system by Evans. D.J.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202E23	Cryptography and Network Security	3-0-0	3

MODULE 1: Introduction

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

MODULE 2: Symmetric Key Cryptography Mathematics of Symmetric Key Cryptography

Algebraic structures - Modular arithmetic-Euclid‟s algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- Symmetric Key Ciphers: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard - RC4 – Key distribution.

MODULE 3: Public Key Cryptography Mathematics of Asymmetric Key Cryptography

Primes – Primality Testing – Factorization – Euler‟s totient function, Fermat‟s and Euler‟s Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - Elgamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography

MODULE 4: Message Authentication and Integrity

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509

MODULE 5: Security Practice and System Security

Electronic Mail security – PGP, S/MIME – IP security – Web Security - SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls.

Text Books/Reference Books:

1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb Deep Mukhopadhyay, McGraw Hill
2. Cryptography and Network Security, William Stallings, (6e) Pearson.
3. Everyday Cryptography, Keith M.Martin, Oxford
4. Network Security and Cryptography, Bernard Meneges, Cengage Learning

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202E24	Microprocessors	3-0-0	3

MODULE 1: Introduction to Microprocessor System

Evolution of Microprocessors, Historical background- reason behind microprocessor technology, Intel Microprocessor family: 4004 to Pentium, Main components of a microprocessor based system; Function of a microprocessor

MODULE 2: Introduction to 8085 Microprocessor Architecture

CPU, address bus, data bus and control bus. Input/Output devices, buffers, encoders, latches and memories. Internal Data Operations and Registers, Pins and Signals, Peripheral Devices and Memory Organization, Interrupts

MODULE 3: 8085 Microprocessor Instructions

Classification, Format and Timing. Instruction Set: 8 Bit and 16 Bit Instructions, Programming and Debugging, Subroutines

MODULE 4: 8085 Microprocessor Interfacing

8259, 8257, 8255, 8253, 8155 chips and their applications, A/D conversion, memory, keyboard and display interface (8279)

MODULE 5: 8086 Microprocessor Architecture and Instruction Set

Architecture of Intel8086 (Bus Interface Unit, Execution unit),register organization, memory addressing, memory segmentation, Operating Modes.

Instruction Set: Addressing Modes: Instruction format: Discussion on instruction Set: Groups: data transfer, arithmetic, logic string, branch control transfer, processor control. Interrupts- Hardware and software interrupts, responses and types

Textbook and References:

1. Gaonkar R,“ Microprocessor Architecture, Programming and Applications with the 8085”, Penram International.
2. Hall D.V.,“ Microprocessors and Interfacing”, Tata McGraw-Hill Publishing Company Limited.
3. Short K. L.,“ Microprocessors and Programmed Logic”, 2nd Ed.,Pearson Education

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202E25	Optimization Techniques	3-0-0	3

MODULE 1: Introduction
Introduction to Linear Programming Problem (LPP), Graphical method, simplex method, Two Phase method, degeneracy, alternative optima, Graphical sensitivity analysis

MODULE 2: Linear Programming
LP-Duality and Sensitivity Analysis: Definition of Dual, Primal-Dual Relationships, Dual Simplex Sensitivity or Post Optimal Analysis.

MODULE 3: Advanced Linear Programming
Revised Simplex Method, Bounded-Variable Algorithm, Duality, Parametric programming

MODULE 4: Integer Programming
Formulation and Applications-Cutting Plane Algorithm-Branch and Bound Method.

MODULE 5: Deterministic Inventory Models
EOQ models, EOQ with price breaks, Multi-Item EOQ with storage limitation.

MODULE 6: Queuing Systems
Pure birth and Pure death models, generalized Poisson queuing model, single server models.

Textbooks/ Reference Books:

1. Operations Research- An Introduction, by Hamdy A.Taha , 9th Edition, Pearson Education – 2012
2. Optimization Techniques, by L.R.Foulds, Springer ,Utm , 1981.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202E31	Information retrieval Systems	3-0-0	3

MODULE 1: Introduction
Basic of IR, the retrieval process, Architecture of IR system
IR Models: Taxonomy of IR models, Document retrieval and ranking, Boolean retrieval model, Vector space retrieval model, Probabilistic model, Text similarity matrices – TF IDE weighting and cosine similarity

MODULE 2: Tokenizing, Indexing and Implementation of Vector Space Retrieval
Simple Tokenizing, word tokenization, Text tokenization, stop word removal, word stemming, indexing architecture
Evaluation of IR: Relevance and Retrieval, Performance matrices, Basic measures of text retrieval

MODULE 3: Query Operation and Languages
Relevance feedback and pseudo relevance feedback, Query expansion and its types, Query language, Text representation using markup languages

MODULE 4: Text Categorization and Clustering
Categorization algorithms, Clustering algorithms, Application to information filtering, Hadoop, Map reduce

MODULE 5: Web Search and Link Analysis
Working principle of Search engine, Basic crawler architecture, web crawling, Link analysis, page ranking, XML retrieval, semantic web, Trends and research issues

Text Books/ Reference Books:

1. An introduction to information retrieval. C. Manning, P.Raghavan,H.Schutze, Cambridge University press
2. Baeza-Yates and Ribeiro-Neto, Modern Information Retrieval, Addison Wesley
3. Bruce Croft, D. Metzler, T. Strohman, Search Engines Information Retrieval in Practice Pearson. Stefan Büttcher, Charles L. A. Clarke and Gordon V. Cormack, Information Retrieval Implementing and Evaluating Search Engines. MIT Press

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202E32	Soft Computing	3-0-0	3

MODULE 1: Artificial Neural Networks

Introduction, Perception -Representational Power of Perception, The Perceptron Training Rule, Multilayer Networks and Backpropagation Algorithm- Convergence and Local Minima, Feedforward Networks, Hypothesis Space Research, Hidden Layer Representation, Alternative Error Function, Recurrent Network.

MODULE 2: Fuzzy Logic

Crisp set and Fuzzy set, Basic concepts of fuzzy sets, Fuzzy set operations, Fuzzy Arithmetic-fuzzy numbers, Fuzzy ordering, Fuzzy vectors. Fuzzy measures-belief and plausibility measure. Probability Measure-Measure of fuzziness, Fuzzy integrals. Membership functions: Features of membership function, Fuzzification. Fuzzy Rule Based Systems: Fuzzy proposition, Formation and decomposition of rules, Fuzzy reasoning, Fuzzy inference systems, Fuzzy expert system. Defuzzification: Maxmembership, Centroid method, Weighted average, Mean max.

MODULE 3: Multi-Objective Optimization Problem Solving

Introduction to multi-objective optimization problems (MOOPs). MOOPs issues, Multi-Objective Evolutionary Algorithm (MOEA), Non-Pareto and Pareto based approaches to solve MOOPs

MODULE 4: Genetic Algorithms

Traditional optimization and search techniques, Genetic algorithms. Operators: Encoding, Selection, Crossover, Mutation. Classification: Adaptive genetic algorithms, Hybrid genetic algorithms, Parallel genetic algorithms, Real coded genetic algorithm

MODULE 5: Hybrid Systems

Neuro fuzzy hybrid systems, Adaptive neuro-fuzzy inference systems, Fuzzy backpropagation network, Genetic neuro hybrid system, Genetic algorithm based backpropagation network, Genetic fuzzy hybrid systems.

Textbooks/ Reference Books:

1. Soft Computing by Saroj Kaushik and Sunita Tewari, McGraw Hill
2. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani: Neuro-fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, PHI Learning.
3. Introduction to Soft Computing, Neurofuzzy and Genetic Algorithms, Samir Roy, Udit Chakraborty, Pearson Education
4. Satish Kumar: Neural Networks, A Classroom Approach, 2nd Edition, Tata McGraw-Hill Education

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202E33	Unix Network Programming	3-0-0	3

MODULE 1: Overview of System Programming
Unix History; Fundamental Concepts; System Programming Concepts; Unix File I/O; Standard I/O Library; fcntl; ioctl; Unix Processes; Program Execution; Error Handling; Unix Signals
Unix Inter Process Communication: Unix IPC, Pipes, FIFOs, System V Message queues, System V Semaphores, System V Shared Memory, Memory mapping

MODULE 2: UNIX Inter Process Communication
Unix IPC, Pipes, FIFOs, System V Message queues, System V Semaphores, System V Shared Memory, Memory mapping

MODULE 3: Socket Programming
Overview of Transport Layer Protocols: TCP, UDP; Client- server architectures; Sockets, Sockaddr structure; TCP and UDP Socket API; TCP client-server examples; UDP examples; Socket Options; Domain name conversion API; IPv6 differences; IPv4-IPv6- compatibility; Choice: TCP or UDP; Adding reliability to UDP applications; Protocol Implementation Issues: encoding, framing; Case study: HTTP, CGI; Windows Socket API; Java Socket API

MODULE 4: UNIX I/O Models
Non-Blocking I/O; I/O multiplexing; Signal driven I/O; Asynchronous I/O (POSIX API); Client and server design with select() call; shutdown(); Advanced I/O API
Unix Domain Protocols: Daemons; Addressing; Socket pair; Descriptor passing; User credentials; Credential passing; Daemon processes; inetd super server, sylogd

MODULE 5: Client-Server Design Alternatives
Overview of Pthreads; Pthreads Synchronization; Non-blocking I/O; Non-blocking connect; Client alternative designs; Performance analysis; Preforking models; Prethreading models; Performance analysis; Case study: Apache; The C10K problem; Event- driven architectures; Concurrency models for UDP servers

MODULE 6: Multicasting and Broadcasting
Concepts & implementation, broadcasting & multicasting in IPv6; Raw sockets, Data link access Socket creation; input, output; ping: design & implementation; trace route: design & implementation; UDP asynchronous errors; Distributed Programming SUN RPC: high level API; port mapper; rpcgen; XDR; lowlevel API: authentication; multithreading; Overview: DCE- RPC, DCOM, Java RMI, CORBA; Web-based RPC overview: XML-RPC, SOAP

MODULE 7: Network Programming in JAVA
Network basics, TCP sockets, UDP sockets (datagram sockets), Server programs-single threaded server, multithreaded server, Remote Method Invocation (Java RMI)-Basic RMI Process, Implementation details-Client-Server Application

Text Books/Reference Books

1. W. R. Stevens, UNIX Network Programming, Vol I, Networking APIs: Sockets and XTI, PearsonEducation, 3rd Edition.
2. W.R.Stevens, UNIX Network Programming, Interprocess Communication, Vol II Pearson Education, 2nd Edition.
3. The Linux Programming Interface: Linux and UNIX System Programming Handbook by Michael Kerrisk, No Starch Press © 2010

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202E34	Big Data Analytics	3-0-0	3

MODULE 1: Introduction to Big Data
Problems of Traditional Data, Definition of Big Data, Source of Big Data, 5V's concept, Characteristics and Types of Big data, Real Life Examples of Big Data, Applications and Tools of Big Data, Challenges, Introduction of Hadoop, Big Data Vs Hadoop, ***Case Study 1*** –IBM Big Data Strategy

MODULE 2: Introduction to HADOOP
History of Hadoop, Module of Hadoop, Architecture of Hadoop, Namenode and Datanode of Hadoop, Core Components- Map Reduce, Hive, Pig and HBase, Hadoop Streaming. Hadoop Ecosystem, Installation of Hadoop, ***Case Study 2*** –Getting started with Hadoop and Loading Data in Hadoop.

MODULE 3: HADOOP Distributed File System (HDFS)
The design of HDFS, HDFS Concept, Hadoop File System Interface, Data Flow, data Ingest with Flume and Sqoop, Hadoop I/O-Compression, Serialization, Avro and File Based Data Structure, HDFS Features and Goals, YARN-Components and Benefits, ***Case Study 3***-Time Series Analysis in Context of Big Data.

MODULE 4: Map Reduce
Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features, ***Case Study 4*** –Big Data Study On Netflix Data Communication.

MODULE 5: HADOOP Eco System
PIG-Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing Operators, Hive –Hive Shell, Hive Services, Hive Metastore, Comparisons with Traditional Databases, HiveQl, Tables, Querying Dataand User Defined Functions, HBase-Hbasics,Concepts, HBasevs RDBMS, ***Case Study 5*** –WALMART work procedure using Big Data

Textbooks/Reference Books:

1. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
2. Tom White "Hadoop: The DefinitiveGuide" Third Edit on, O'reily Media, 2012.
3. ArvindSathi, "BigDataAnalytics: Disruptive Technologies for Changing the Game", MC Press, 2012.
4. Pete Warden, "Big Data Glossary", O'Reilly, 2011

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202E35	Embedded Systems	3-0-0	3

MODULE 1: Introduction to Embedded Systems
Definition of Embedded System, Embedded System Vs General Computing Systems, History, Classification based on generation, complexity etc. Major application areas. Purposes/specific features, recent trends.

MODULE 2: Embedded System Architecture
Hardware architecture, its different components with functionality. Different types of processors used their trade-offs features Examples of Domain specific embedded systems with examples e.g. working of Washing machine automobile etc. Networking concept in embedded system Different buses used I2C PCI CANetc. Software architecture, Embedded operating system architecture categories of embedded operating system, Application software options with high level and assembly level language and different tools used for software development. Process of creation of ROM image/firmware design Study of some microcontroller/processor 8051 / PIC /AVR /ARM/DSP study of Embedded readymade boards like Adriano Raspberry implementing small projects

MODULE 3: Design
Process of Embedded System Development, Different models, waterfall model, requirement analysis, design tradeoffs, hardware software co design different hardware platforms – single board PC add on cards custom made hardware platforms. communication interfaces RS232 RS422 USB Infrared IEEE 1394 firmware Ethernet IEEE 802.11 Bluetooth Embedded firmware design creation of ROM image

MODULE 4: Programming
Different programming options Assembly High level for Embedded systems. Requirement of Embedded real time Operating Systems its features implementation

MODULE 5: Development and Testing
Testing of Embedded systems, Embedded product development life cycle EDLC and its importance, Latest trends in Embedded industry, Fundamental concept in RT Linux and Navigation Systems

Text Books/References:

1. Introduction to Embedded Systems Shibu K V Mc Graw Hill Education
2. Embedded Systems Architecture programming and design Raj Kamal Tata Mc Graw Hill
3. Embedded Real Time Systems concept design and programming K V K K Prasad Dreamtech
4. 8051 microcontrollers and embedded Systems Mazidi and Mazidi

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA202324	Mini Project and Seminar	0-1-6	4

Mini Project: Development of WEB/Android /Embedded / Database Application Systems (12 weeks)

Seminar: Advanced/Recent topics of Computer Science/Engineering selected by the faculty

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