ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati

Course Structure and Syllabus

MASTER OF COMPUTER APPLICATIONS (MCA)

(From Academic Session 2018-19 onwards)

MCA 4th Semester

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati
Course Structure

MASTER OF COMPUTER APPLICATIONS (MCA)

(From Academic Session 2018-19 onwards)

MCA 4ᵗʰ Semester

Semester IV/ MCA

Sl. No.	Sub-Code	Subject	Hours per Week			Credits	Marks	
			L	T	P	C	CE	ESE
Theory								
1	MCA182401	Computer Networks-I	3	1	0	4	30	70
2	MCA182402	Software Engineering	3	0	0	3	30	70
3	MCA182403	Embedded Systems	3	0	0	3	30	70
4	MCA182404	Web Technology	3	0	0	3	30	70
5	MCA18240E1*	Elective-I	3	0	0	3	30	70
Practical								
1	MCA182415	Laboratory-IV (Web based DBMS, Embedded Systems)	0	0	8	4	30	70
TOTAL			15	1	8	**20**	**180**	**420**
Total Contact Hours per week : 24								
Total Credits: 20								

Elective-I Subjects (Any One)		
Sl. No.	Subject Code	Subjects
1	MCA18240E11	Data Mining and Warehousing
2	MCA18240E12	Software Project Management
3	MCA18240E13	Management Information Systems
4	MCA18240E14	Advanced Database Management System
5	MCA18240E1*	Any Other Subject offered from time to time with the approval of the University

Detailed Syllabus:

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA182401	**Computer Networks-I**	**3-1-0**	**4**

Course Outcome:
- Able to explain the importance of data communications and explain data communication works in data networks and the Internet.

- Identify and explain the use of different internetworking devices and their functions.

- Explain and analyse the role of protocols in networking.

- Analyze the services and features of the various layers of data networks.

- Design, calculate, and apply subnet masks and addresses to fulfill networking requirements.

MODULE 1 : Introduction (7 Lectures)
Overview : Goals of networking, types, application, topologies, Standards, performance issues. Basics of digital communication, signal, noise, LAN, MAN, WAN. Networking and internetworking devices. Network Architecture: ISO-OSI reference model, TCP/IP model, design philosophy, layer, protocol, interface, and service concepts. Layer-wise functionality.

MODULE 2 : Physical Layer (10 Lectures)
Basic functions and services, Concepts of data transmission, Analog and digital Transmission, Asynchronous and Synchronous transmission, bandwidth, data rate of a Channel, modulation and multiplexing methods: PCM, FDM, TDM, Switching techniques (Circuit, Packet switching and message switching), modem, encoding methods, communication media.

MODULE 3 : Data Link Layer (9 Lectures)
Basic functions and services, Design issues, link layer services, Framing, error control and correction techniques, CRC, Sliding window protocols, Selective repeat, go back and protocols and their performance, HDLC, PPP.

MODULE 4 : Medium Access Control sublayer (9 Lectures)
Basic function and services, Channelization, Channel allocation problem, Dynamic channel allocation, multiple access protocols, ALOHA. Slotted ALOHA, CSMA, CSMA/CD, standard LAN/WAN, MAC protocols (IEEE 802.x, 802.3-Gigabit Ethernet/ Fast 802.4, 802.5), Ethernet, wireless LAN (IEEE 902.XX, LIC), Bluetooth and satellite networks, Virtual Circuit networks, Frame relay and ATM.

MODULE 5 : Network Layer   **(8 Lectures)**

Basic functions and services, Virtual circuits and datagram subnet, Concatenated virtual circuits, connectionless internetworking, tunnelling, routing, fragmentation, firewall and gateway routing algorithms (shortest path, flooding, flow based, distance vector), Congestion control, traffic shaping, flow specification, load shedding jitter control. Connecting Devices: Repeater, bridge, Router, Gateway, Switch, HUB, NIC, Socket and ports.

Text Books/References:

1. Tanenbaum A.S., Computer Network, PHI (EEE)
2. Forouzan, Data communication and networking, 4th Edn, TMGH
3. Stalling, Data and Computer Communication, PHI (EEE)
4. Comer, Internetworking with TCP/IP (Vol-I/II/III)
5. Stevens, UNIX Network Programming, PHI (EEE)

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA182402	**Software Engineering**	**3-0-0**	**3**

MODULE 1: (8 Lecturers)
Introduction to Software Engineering
Basic concept of Software Engineering, Waterfall model, Classical waterfall model, Iterative waterfall model, RAD, Prototyping model, Evolutionary model, Spiral model, Agile methodology.

Software Project Management (6 Lecturers)
Planning of a software project; project - control and project team standards; Scheduling, Risk management, Configuration management. Software cost estimation and evaluation techniques.

MODULE 2: Software Design using UML (10 Lecturers)
SRS – different methodologies and techniques
Various design concepts and notations; Modern design techniques; high level design and detailed design; Structured design, object -oriented design

Coding
Standards and guidelines for coding, coding walkthrough, code inspection.

MODULE 3: Software Verification and Validation methods (9 Lecturers)
Documentation and implementation procedures; Performance of software systems; software metrics and models; Documentation of project systems, manuals and implementation.

Testing
Structural Testing, Unit Testing of a test suite etc.

MODULE 4: Software Reliability (6 Lecturers)
Definition and concepts of software reliability; Software errors, faults, repair and availability - re-availability and models; use of database as a case tool. Software Quality Control and Management - ISO 9000 and CMM - SEI models.

MODULE 5: Software Maintenance (6 Lecturers)
Categories of maintenance; Problems during maintenance; solution to maintenance problems, Maintenance process, Maintenance models, Reverse Engineering, Software Re-Engineering, Estimation of Maintenance costs.

Case Tools.

Text Books/References:

1. RICHARD. Fairley, Software Engineering Concepts, McGraw Hill Publication.
2. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publishing House, 1999.
3. Roger S. Pressman, Software Engineering: A Practitioner's Approach, McGraw Hill Publication.
4. Reference: Rajib Mall, Fundamentals of Software Engineering, Prentice-Hall of India, 1999.
5. Ian Somerville, Software Engineering, Addison Wesley.
6. C. Ghezzi M. Jazayeri and D. Mandrioli, Fundamentals of Software Engineering, Prentice Hall Of India, 1994.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA182403	**Embedded Systems**	**3-0-0**	**3**

MODULE 1: Introduction to Embedded Systems (6 Lecturers)

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 (20 Lecturers)

Hardware architecture, its different components with functionality. Different types of processors used their trade-offs features Examples of Domain specific embedded systems with examples eg working of Washing machine automobile etc. Networking concept in embedded system Different buses used I2C PCI CAN etc.

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 (10 Lecturers)

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 (4 Lecturers)

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

MODULE 5: (5 Lecturers)

Testing of Embedded systems
Embedded product development life cycle EDLC and its importance
Latest trends in Embedded industry
Fundamental concept in RTLinux 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
MCA182404	Web Technology	3-0-0	3

MODULE 1:   (10 Lecturers)
Internet Basics
Network Connectivity Types- dial up- PPP, SLIP; leased, VSAT, ISP, HTTP, TCP/IP, IP Address, Domain Names, DNS, Services-email, WWW, Search Engine.

Concept of Client –Server Computing
Paradigm, Thin Client vs. Flat Client, Middle ware, Client Pull, Server Push, Hypermedia Information, Concept of Threading/Multithreading

Web Client
Browser +Architecture, Basic features & Functions, Client-side Inclusive- Scripts, VB Scripts, Java Scripts, ActiveX, ASP, Plugins, Case Study- Netscape Communicator, IE.

MODULE 2:   (10 Lecturers)
File Server and Mail Server
FTP, Telnet, SMTP, MIME etc.

Web Server
Stateful vs. Stateless Servers, Web Server Architecture, Basic features & Functions, URL, Server side inclusive – CGI, API, PERL, Web database Connectivity- JDBC, ODBC, Case Study- IIS, Apache, Tomcat.

MODULE 3: Web Application Development   (10 Lecturers)
HTML, DHTML with DTD concept <head> & <body> section, able, form, Frame, hyperlinks, Web Page Design using HTML authoring tools- FrontPage/ Dream weaver.

MODULE 4: Web Security   (5 Lecturers)
Firewalls, Tunnels, SSI, X-HTTP, IPV & IPV6 security, Digital Signature.

MODULE 5: Web Object Model   (10 Lecturers)
CORBA, COM, DCOM, IIOP, Coexistence with VRML & XML.

Text Books/References:

1. Asp .net Using VB.net – Wrox Press Ltd - By Cornes, Goode, Sussman, Krishnamoorthy, Miller.

2. Web Technology by Deital & Deital

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA18240E11	Data Mining and Warehousing	3-0-0	3

MODULE 1: Introduction to Data Mining (6 Lecturers)

Concept of Data Mining, KDD vs. Data Mining, Architecture of Data Mining, different data repositories, Data Mining Functionalities, Classifications of Data Mining Systems, Data Mining Task Primitives, Integration of Data Mining System.

MODULE 2: Introduction to Data Warehousing (8 Lecturers)

Data Warehouse, Characteristics, need for data warehousing, Operational database Vs. Data warehouse, Multidimensional data model, Schemas for Multidimensional databases, OLAP operations, Design of Data Warehouse, Architecture, Data Warehouse Models, Implementation from Data Warehouse to Data Mining.

MODULE 3: (10 Lecturers)

Mining Frequent patterns and Association Rules.
Association rule, Methods to discover Association rules, Algorithms for finding frequent item sets: A Priori, Partition, Pincer-Search, DIC, FP-Tree Growth and Border Algorithm.

MODULE 4: Clustering Techniques: (10 Lecturers)

Introduction to Clustering, Clustering Paradigms, Partitioning algorithms: k-Means, k-Medoids, PAM, CLARA and CLARANS, Density based algorithm: DBSCAN, Hierarchical algorithms: BIRCH, CURE, Categorical clustering algorithms: ROCK, CACTUS

MODULE 5: Other Techniques for Data Mining: (5 Lecturers)

Neural network and Rough sets, their applications in Data mining, Genetic Algorithms and its applications, Concept of Web Mining, Text Mining, Temporal Data Mining.

MODULE 6: Applications and Trends in Data Mining: (6 Lecturers)

Data Mining Applications: DM for –Financial data analysis, Retail industry, Telecommunication industry, Biological data analysis, Other scientific applications.
Trends in Data mining

Text Books/References:

1. Han. J and Kamber. M, Data mining, Concept and Techniques, Esevier

2. A.K. Puzari, "Data Mining Techniques", University Press

3. Tan, Data Mining, Pearson.

4. Dolf Zantinge, P. Zantinge, Data mining, PHI

5. Sam Anahory, Data Warehousing in the real world, Pearson

6. Principles of Data Mining. Hand. David, Mannila. Heikki, Smyth, Padhraic. PHI

7. Sam Anahory, Data Warehousing in the real world, Pearson

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA18240E12	Software Project Management	3-0-0	3

MODULE 1: Project Evaluation and Project Planning (7 Lectures)

Importance of Software Project Management, Activities Methodologies, Categorization of Software Projects, Setting objectives, Management Principles, Management Control, Project portfolio Management, Cost-benefit evaluation technology, Risk evaluation, Strategic program Management, Stepwise Project Planning.

MODULE 2: Project Life Cycle and Effort Estimation (7 Lectures)

Software process and Process Models, Choice of Process models, Mental delivery, Rapid Application development, Agile methods, Extreme Programming – SCRUM, Managing interactive processes, Basics of Software estimation – Effort and Cost estimation techniques.

MODULE 3: Activity Planning and Risk Management (9 Lectures)

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical patterns – Cost schedules.

MODULE 4: Project Management and Control (8 Lectures)

Framework for Management and Control – Collection of data, Visualizing progress, Cost monitoring, Earned value analysis, Project tracking, Change control, Software Configuration management, Managing contacts, Contact Management

MODULE 5: Staffing in Software Projects (9 Lectures)

Managing people: Organizational behavior, Best methods of staff selection, Motivation, The Oldham-Hackman job characteristics model, Stress, Health and Safety, Ethical and Professional concerns, Working in teams, Decision Making, Organizational Structure, Dispersed and Virtual teams, Communication plans, Leadership.

TEXTBOOK:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

REFERENCES:

1. Robert K. Wysocki "Effective Software Project Management" – Wiley Publication,2011.
2. Walker Royce: "Software Project Management"- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, "Managing Global Software Projects" – McGraw Hill Education (India), Fourteenth Reprint 2013.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA18240E13	**Management Information Systems**	3-0-0	3

MODULE 1: INTRODUCTION (7 lectures)
MANAGEMENT INFORMATION SYSTEM (MIS), Organization and Information Systems, Changing Environment and its impact on Business - The IT/IS and its influence. The Organization: Structure, Managers and activities - Data, information and its attributes - The level of people and their information needs - Types of Decisions and information - Information System, categorization of information on the basis of nature and characteristics.

MODULE 2: INFORMATION SYSTEMS (8 lectures)
Transaction Processing System (TPS) - Office Automation System (OAS) - Management Information System (MIS) - Decision Support System (DSS) and Group Decision Support System (GDSS) - Expert System (ES) - Executive Support System (EIS or ESS).

MODULE 3: COMPUTER IN TELECOMMUNICATION AND NETWORKS (7 lectures)
Communication, Media, Modems & Channels - LAN, MAN & WAN - Network Topologies, Internet, Intranet and Extranet. Wireless technologies like Wi-Fi, Bluetooth and Wi-Max.

MODULE 4: MANUFACTURING AND SERVICE SYSTEMS (5 lectures)
Information systems for Accounting, Finance, Production and Manufacturing, Marketing and HRM functions - IS in hospital, hotel, bank.

MODULE 5: ENTERPRISE SYSTEM (7 lectures)
Enterprise Resources Planning (ERP): Features, selection criteria, merits, issues and challenges in Implementation - Supply Chain Management (SCM): Features, Modules in SCM - Customer Relationship Management (CRM): Phases. Knowledge Management and e-governance

MODULE 6: CHOICE OF IT (3 lectures)
Nature of IT decision - Strategic decision - Configuration design and evaluation Information technology implementation plan.

MODULE 7: SECURITY AND ETHICAL CHALLENGES (8 lectures)
Ethical responsibilities of Business Professionals – Business, technology. Computer crime – Hacking, cyber theft, unauthorized use at work. Piracy – software and intellectual property. Privacy Issues and the Internet Privacy. Challenges – working condition, individuals. Health and Social Issues, Ergonomics and cyber terrorism.

Text Books/References:
1. "Management Information Systems", Kenneth J Laudon, Jane P. Laudon, Pearson/PHI
2. "Management Information Systems", W. S. Jawadekar, Tata McGraw Hill Edition
3. MIS by Ralph Stair
4. Introduction to Information System", James A. O' Brien, Tata McGraw Hill
5. "Management Information Systems", S. Sadagopan, PHI
6. "Management Information Systems", Effy Oz, Thomson Course Technology
7. Corporate Information Strategy and Management", Lynda M Applegate, Robert D Austin et al, Tata McGraw Hill

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA18240E14	**Advanced Database Management System**	**3-0-0**	**3**

MODULE 1: (12 lectures)
Query Processing: Review of disk storage systems, blocking factor, Access path: searching, indexing and hashing techniques, external sorting, transformation of relational expressions, breaking of queries into sub queries to optimize execution plan.
Study of algorithms: Select, Project and Join Operations, set operations, aggregation Cost based query optimization. measurement of cost of a query considering different access path, evaluation of expressions.
Heuristic query optimizations: query tree query graph and representation of queries in query tree, Steps for heuristic query optimization, semantic query optimization.

MODULE 2: (10 lectures)
Parallel Databases: Parallel database architecture, scale up and speedup using parallel database architecture, Introductory concepts, partitioning techniques, interoperation parallelism and intra operation parallelism - Parallel Sort algorithms (range partitioning sort, parallel external sort-merge), Parallel Join Algorithms (partitioned join, fragment-and-replicate join, parallel hash join), interoperation parallelism (pipelined, independent). Example of parallel databases.

MODULE 3: (12 lectures)
Distributed Databases: Replication and fragmentation, network transparency, join processing, distributed transaction processing, two-phase and three-phase commit protocols, handling failure, coordinator selection, concurrency control (locking, timestamping), deadlock handling (centralized, fully distributed), multi-database systems.

MODULE 4: (6 lectures)
Security and Integrity: Violations, authorization, views, privileges, granting privileges, discretionary and mandatory access control mechanism, Bell La-podulas Security Access Control Mechanism, Designing databases using mandatory access control mechanisms, security specification in SQL.

MODULE 5: (5 lectures)
Introductory concepts on following topics: Data mining and Data Warehousing, Multimedia Databases, Information retrieval systems, spatial and graphical databases, transactions processing monitors, transactional workflows, active and main memory databases.

Text Books/References:
1. Elmasari and Navathe, Fundamentals Of Database System, Narosa Publishing Company, 1989.
2. J.D. Ullman, principles of Database Systems, Galgotia Publishing Private Limited.
3. Silberschats, Kroth and Sudershan, Principles of Database Systems, McGraw Hill Publication.
4. C.J. Date, An Introduction to Database Systems, Vol-I and Vol-II, Addison-Wesley Publishing Company.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCA182415	**Laboratory-IV (Web based DBMS, Embedded Systems Lab)**	**0-0-8**	**4**

➢ **Practical related to web based DBMS and Embedded Systems**

****