DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
FACULTY OF ENGINEERING & ARCHITECTURE

SYLLABUS

MASTER OF COMPUTER APPLICATIONS (MCA)

First and Second Semester Examination, 2021
Third and Fourth Semester Examination, 2022

JAI NARAIN VYAS UNIVERSITY
JODHPUR

NOTIFICATION

In compliance to decision of the Hon'ble High Court all students are required to fulfil the 75% attendance in each subject and there must be 75% attendance of the student before he/she could be permitted to appear in the examination

REGISTRAR (ACADEMIC)

Contents

MASTER OF COMPUTER APPLICATIONS (MCA)
General Information for Students

1. **Duration :**
The course of study for Master of Computer Applications (MCA) shall extend over a period of four semesters spread over two academic sessions for regular students. On satisfactory completion of the course and after passing the final examination, a candidate shall be awarded MCA degree.

2. **Eligibility :**
(a) The eligibility of candidate to seek admission in MCA course shall be decided by the state government or the authorized body formed/assigned by the state government for the MCA admission purpose, e.g. RMCAAT.
(b) For Lateral Entry Candidates:
The eligibility of candidate to seek admission in MCA course through lateral entry procedure, if any shall be decided by the state government or the authorized body formed/assigned by the state government for the MCA admission purpose, e.g. RMCAAT.

3. **Admission Process:**
The admission process for the course of MCA shall be as decided by the state government or authorized body formed/assigned by state government for the MCA admission purpose, e.g. RMCAAT.

4. **Attendance**
The attendance requirement in the Faculty of Engineering & Architecture shall be, "In compliance of the decision of the Hon'ble High Court all students are required to fulfill the 75% attendance rule in each subject and there must be 75% attendance of the student before he/she could be permitted to appear in the examination".
Condemnation of shortage of attendance:
The shortage of attendance up to the limits specified below may be condoned on valid reasons:
(i) Upto 6% in each subject plus 5 attendances in all aggregate of subject/papers may be condoned by the Vice-Chancellor on the recommendation of the Head of the Department for the Post-graduate students.
(ii) The N.C.C./N.S.S. Cadets sent out to parades and camps and such students who are deputed by the University to take part in games, athletics or cultural activities may for- purposes of attendance be treated as present for the days of these absence in connection with the aforesaid activities and that period shall be added to their subject wise attendance.

5. **Examination Rules**
There shall be an examination at the end of each semester.
At the end of First Semester – First Semester Examination for MCA Degree
At the end of Second Semester – Second Semester Examination for MCA Degree
At the end of Third Semester – Third Semester Examination for MCA Degree
At the end of Fourth Semester – Fourth Semester Examination for MCA Degree
The examination shall be conducted by means of written papers, practicals including sessionals, presentations and viva-voce as per the scheme of examination specified in the syllabus.

6. **MCA Examinations**
A candidate who has undergone regular course of study for the a semester shall be eligible to appear at that Semester Examination for the MCA Degree, and he/she shall be required to show competent knowledge of the subjects mentioned in the teaching and examination scheme for the respective course of study. In case of any semester other than first semester, the candidate shall Pass/ATKT (Allow to Keep Term) the previous semester examination.

7. For B.Sc./ B.Com./ B.A. passed candidates admitted to M.C.A. :

The B.Sc./ B.Com./ B.A. passed candidates admitted in M.C.A. Ist semester shall be required to undergo an additional bridge course of study (subjects mentioned below) in I and II semesters of M.C.A. Ist year along with other theory units of the semester examinations.

The candidate will have to qualify all the subjects of the bridge course, the marks obtained in Bridge Course subjects will not be considered in the final result of that semester.

Candidate failing in any subject of the bridge course shall be awarded ATKT and this will not be considered in the count of Main Semester ATKT.

Theory Papers
Ist Semester
CSE 501 A : Computer Organization & Architecture
CSE 502 A: C++ Programming
IInd Semester
CSE 503 A: System Software and Operating System

Practicals and Sessionals
Ist Semester
CSE 501 B: Computer Organization & Architecture Laboratory
CSE 502 B: C++ Programming Laboratory
IInd Semester
CSE 503 B : System Software and Operating System Laboratory

8. Criteria to Pass, Fail or ATKT

(a) To pass, a candidate should obtain at least 'P' grade in each theory paper, at least 'B' grade in each practical and sessionals and at least 'C' grade in SGPA (Semester Grade Point Average).

(b) A candidate who doesn't fail in more than three units (theory & practical) of the prescribed courses for him in that semester shall be ATKT in the next semester. However he/she shall reappear and pass in the subjects in which he/she has failed, if any, in next regular examination of that semester. The course work marks obtained by him/her shall be carried over.

(c) If a candidate fails in more than three units (theory & practical) of the prescribed courses for him in that semester or doesn't secure prescribed minimum SGPA in that semester, he shall not be permitted to continue his studies in the next semester, and treated as an Ex-student, and he/she has to reappear in all theory papers, practicals and sessionals of that semester. All the marks obtained in course work, shall be carried over.

(d) A candidate who has passed all practicals and sessionals but failed in more than three theory papers of that semester shall appear in that semester examination as Ex-student in all theory papers. His practical and sessional marks of the semester shall be carried over.

(e) A candidate, who fails in one course work in any course, shall not be permitted to appear in final examination of that course. He/she has to join as a regular student in the course when it is offered next by the department, based on the availability of resources and suitability of the candidate, head may organize and arrange special classes for the particular subject to minimize the loss to the student. In case, the course is discontinued in the department, the student can take up, another course in lieu of the course discontinued, subject to approval of the head of the department.

(f) If a candidate fails in more than one course work shall not be permitted to appear in final examination of that semester. He/she has to attend as regular student in that semester.

(g) A candidate who fails in any elective subject may be permitted by the head of the department to change the elective subject. He/she shall be required to undergo a regular course of study for the new elective subject.

9. Result Computation

(a) On the basis of percentage of obtained marks the process of result computation will be as follows, and followings will be awarded:

(i) For every subject : Grade and Score Point

(ii) For every semester : Semester Grade Point Average (SGPA) up to precision of two digits after decimal.

(iii) For every semester : Cumulative Grade Point Average (CGPA) up to current semester, up to precision of two digits after decimal.

Step 1: For each subject the percentage of obtained marks will be converted into Grade as per Table II

Table II: Percentage of Obtained Marks to Grade Conversion

Percentage of Obtained Marks in Theory Subjects	Percentage of Obtained Marks in Practical /Course work	Grade
85≤per	85≤per	O
70≤per<85	70≤per<85	A+
60≤per<70	60≤per<70	A
55≤per<60	55≤per<60	B+
50≤per<55	50≤per<55	B
45≤per<50	NA	C
35≤per<45	NA	P
per<35	per<50	F
Absent	Absent	AB

Step 2: For each subject convert the Grade to Score Point as per Table III.

Table III : Grade to Score	
Grade	Score Points
O	10
A+	9
A	8
B+	7
B	6
C	5
P	4
F	0
AB	0

Step 3: Semester Grade Point Average (SGPA) of k^{th} semseter is

$$SGPA = \frac{\sum_{i=1}^{n} P_i * C_i}{\sum_{i=1}^{n} C_i}$$

Where P_i is Score Points in i^{th} subject,
C_i is Credits of i^{th} subject,
n is total number of subjects in current k^{th} semester

Step 4: Cumulative Grade Point Average (CGPA) of k^{th} semester is

$$CGPA = \frac{\sum_{j=1}^{m} S_j * C_j}{\sum_{j=1}^{m} C_j}$$

Where S_j is SGPA of j^{th} semester,
C_j is total Credits in j^{th} semester, and
m is total number of semesters upto current k^{th} semester.

(b) Awarded SGPA and CGPA shall be recalculated if a candidate passes a subject or all subjects of any semester in 2nd or later attempt.

(d) To calculate SGPA and CGPA, obtained marks for all subjects shall be considered irrespective of whether it is F grade (Failed or absent) or any other grade.

10. Maximum Time Period and Extension

(a). A candidate, who has not passed finally after seven years from the date of admission, shall not be allowed to continue the course.

(b). However the Vice-Chancellor in consultation with the Head of the Department may waive this limit of seven years for the candidate who could not complete their MCA Courses in one stretch. The reasons for granting exemption shall be recorded in writing. Such extension shall not exceed one year, consecutive to the seventh year, resulting total eight year from the date of admission.

11. Medium of Instruction and Examinations

The medium of Instructions and Examination in all Master of Computer examinations of Theory/Practical and Sessional, Seminar and Dissertation shall be English.

LIST OF TEACHING STAFF

PROFESSOR

1. **Dr. N.C. Barwar (HEAD)** B.E., M.E., Ph.D., MISTE, MIE
2. Dr. Anil Gupta B.E. (Hons), M.Tech., Ph.D., MCSI, MISTE

ASSOCIATE PROFESSOR

1. Shri Shrwan Ram B.E., M.E.

ASSISTANT PROFESSOR

1. Dr. (Mrs.) Rachna MCA, Ph.D.
2. Dr. Alok Singh Gahlot B.E. , MS, Ph.D.
3. Ms Simran Choudhary B.Tech., M.E.
4. Shri Abhisek Gour B.Tech., M.E.

MASTER OF COMPUTER APPLICATIONS
FIRST SEMESTER - TEACHING AND EXAMINATION SCHEME 2021

Branch Code	*Subject Code*	*Subject*	*Lecture*	*Tutorial*	*Practical*	*Contact Hours*	*Credits*	*Exam Hours*	*Marks*				
								ETE/PRE	*Theory*		*Practical*		*Total*
									CWS	*ETE*	*PRS*	*PRE*	
A: Written Papers													
CSE	511A	Internet Technology (M)	3	1	-	4	4	3	20	80	-		100
CSE	512A	Advanced Data Structures (M)	3	1	-	4	4	3	20	80	-		100
CSE	513A	Advanced Java Programming (M)	3	1	-	4	4	3	20	80	-		100
CSE	514A	Visual Computing (M)	3	1	-	4	4	3	20	80	-		100
CSE	515A	Python Programming (M)	3	1	-	4	4	3	20	80	-		100
Total (A)			**15**	**5**	**-**	**20**	**20**	**-**	**100**	**400**	**-**		**500**
B: Practical and Sessional													
CSE	511B	Internet Technology Laboratory (M)	-	-	2	2	1	3	-		50	50	100
CSE	512B	Advanced Data Structures Laboratory (M)	-	-	2	2	1	3	-		50	50	100
CSE	513B	Advanced Java Programming Laboratory (M)	-	-	2	2	1	3	-		50	50	100
CSE	514B	Visual Computing Laboratory (M)	-	-	2	2	1	3	-		50	50	100
CSE	515B	Python Programming Laboratory (M)	-	-	2	2	1	3	-		50	50	100
TOTAL(B)			**-**	**-**	**10**	**10**	**5**	**-**	**-**		**250**	**250**	**500**
Grand Total (A+B)			**15**	**5**	**10**	**30**	**25**	**-**	**100**	**400**	**250**	**250**	**1000**

To pass, a candidate must obtain:
(a) 35 per cent in each written paper,
(b) 50 per cent in each of the practicals and sessionals
(c) 45 per cent in aggregate

CWS Class Work Sessional
ETE : End-Term Examination
PRS: Practical Sessional
PRE: Practical End-Term Examination

MASTER OF COMPUTER APPLICATIONS
FIRST SEMESTER - TEACHING AND EXAMINATION SCHEME 2021 (BRIDGE COURSE)

Branch Code	*Subject Code*	*Subject*	*Lecture*	*Tutorial*	*Practical*	*Contact Hours*	*Credits*	*Exam Hours*	*Marks*				
								ETE/PRE	*Theory*		*Practical*		*Total*
									CWS	*ETE*	*PRS*	*PRE*	
A: Written Papers													
CSE	501A	Computer Organization & Architecture (M)	3	1	-	4	4	3	20	80	-		100
CSE	502A	C++ PROGRAMMING (M)	3	1	-	4	4	3	20	80	-		100
Total (A)			**6**	**2**	**-**	**8**	**8**	**-**	**40**	**160**	**-**		**200**
B: Practical and Sessional													
CSE	501B	Computer Organization & Architecture Laboratory (M)	-	-	2	2	1	3	-		50	50	100
CSE	502B	C++ PROGRAMMING Laboratory (M)	-	-	2	2	1	3	-		50	50	100
TOTAL(B)			**-**	**-**	**4**	**4**	**2**	**-**	**-**		**100**	**100**	**200**
		Grand Total (A+B)	**6**	**2**	**4**	**12**	**10**	**-**	**40**	**160**	**100**	**100**	**400**

To pass, a candidate must obtain:
(a) 35 per cent in each written paper,
(b) 50 per cent in each of the practicals and sessionals
(c) 45 per cent in aggregate

CWS Class Work Sessional
ETE : End-Term Examination
PRS: Practical Sessional
PRE: Practical End-Term Examination

MASTER OF COMPUTER APPLICATIONS

SECOND SEMESTER - TEACHING AND EXAMINATION SCHEME 2021 (BRIDGE COURSE)

Branch Code	*Subject Code*	*Subject*	*Lecture*	*Tutorial*	*Practical*	*Contact Hours*	*Credits*	*Exam Hours*	*Marks*				
								ETE/PRE	*Theory*		*Practical*		*Total*
									CWS	*ETE*	*PRS*	*PRE*	
A: Written Papers													
CSE	503A	System Software and Operating System (M)	3	1	-	4	4	3	20	80	-		100
Total (A)			**3**	**1**	**-**	**4**	**4**	**-**	**20**	**80**	**-**		**100**
B: Practical and Sessional													
CSE	503B	System Software and Operating System Laboratory (M)	-	-	2	2	1	3	-		50	50	100
TOTAL(B)			**-**	**-**	**2**	**2**	**1**	**-**	**-**		**50**	**50**	**100**
Grand Total (A+B)			**3**	**1**	**2**	**6**	**5**	**-**	**20**	**80**	**50**	**50**	**200**

To pass, a candidate must obtain:

(a) 35 per cent in each written paper,

(b) 50 per cent in each of the practicals and sessionals

(c) 45 per cent in aggregate

CWS Class Work Sessional **PRS**: Practical Sessional

ETE : End-Term Examination **PRE**: Practical End-Term Examination

MASTER OF COMPUTER APPLICATIONS
SECOND SEMESTER - TEACHING AND EXAMINATION SCHEME 2021

Branch Code	*Subject Code*	*Subject*	*Lecture*	*Tutorial*	*Practical*	*Contact Hours*	*Credits*	*Exam Hours*	*Marks*				
									Theory		*Practical*		*Total*
								ETE/PRE	*CWS*	*ETE*	*PRS*	*PRE*	
A: Written Papers													
CSE	521A	Design of Databases (M)	3	1	-	4	4	3	20	80	-		100
CSE	522A	Web Application Development (M)	3	1	-	4	4	3	20	80	-		100
CSE	523A	Computer Networks and Information Security (M)	3	1	-	4	4	3	20	80	-		100
CSE	524A	AI & Machine Learning (M)	3	1	-	4	4	3	20	80	-		100
CSE		Elective –I (M)	3	1	-	4	4	3	20	80	-		100
Total (A)			**15**	**5**	**-**	**20**	**20**	**-**	**100**	**400**	**-**		**500**
B: Practical and Sessional													
CSE	521B	Design of Databases Laboratory (M)	-	-	2	2	1	3	-		50	50	100
CSE	522B	Web Application Development Laboratory (M)	-	-	2	2	1	3	-		50	50	100
CSE	523B	Computer Network and Information Security Laboratory (M)	-	-	2	2	1	3	-		50	50	100
CSE	524B	AI & Machine Learning (M)	-	-	2	2	1	3	-		50	50	100
CSE	525B	Elective –I Laboratory (M)	-	-	2	2	1	3	-		50	50	100
TOTAL(B)			**-**	**-**	**10**	**10**	**5**	**-**	**-**		**250**	**250**	**500**
Grand Total (A+B)			**15**	**5**	**10**	**30**	**25**	**-**	**100**	**400**	**250**	**250**	**1000**

To pass, a candidate must obtain:
(a) 35 per cent in each written paper,
(b) 50 per cent in each of the practicals and sessionals
(c) 45 per cent in aggregate

CWS Class Work Sessional
ETE : End-Term Examination
PRS: Practical Sessional
PRE: Practical End-Term Examination

MASTER OF COMPUTER APPLICATIONS
THIRD SEMESTER - TEACHING AND EXAMINATION SCHEME 2022

Branch Code	*Subject Code*	*Subject*	*Lecture*	*Tutorial*	*Practical*	*Contact Hours*	*Credits*	*Exam Hours*	*Marks*				
								ETE/PRE	*Theory*		*Practical*		*Total*
									CWS	*ETE*	*PRS*	*PRE*	
A: Written Papers													
CSE	611A	Design and Analysis of Algorithm (M)	3	1	-	4	4	3	20	80	-		100
CSE	612A	Data Science & Analytics (M)	3	1	-	4	4	3	20	80	-		100
CSE	613A	Software Engineering (M)	3	1	-	4	4	3	20	80	-		100
CSE		Elective –II (M)	3	1	-	4	4	3	20	80	-		100
CSE		Elective –III (M)	3	1	-	4	4	3	20	80	-		100
Total (A)			**15**	**5**	**-**	**20**	**20**	**-**	**100**	**400**	**-**		**500**
B: Practical and Sessional													
CSE	611B	Design and Analysis of Algorithm Laboratory (M)	-	-	2	2	1	3	-		50	50	100
CSE	612B	Data Science & Analysis Laboratory (M)	-	-	2	2	1	3	-		50	50	100
CSE	613B	Software Design Laboratory (M)	-	-	2	2	1	3	-		50	50	100
CSE		Elective –II Laboratory (M)	-	-	2	2	1	3	-		50	50	100
CSE		Elective –III Laboratory (M)	-	-	2	2	1	3	-		50	50	100
TOTAL(B)			**-**	**-**	**10**	**10**	**5**	**-**	**-**		**250**	**250**	**500**
Grand Total (A+B)			**15**	**5**	**10**	**30**	**25**	**-**	**100**	**400**	**250**	**250**	**1000**

To pass, a candidate must obtain:
(a) 35 per cent in each written paper,
(b) 50 per cent in each of the practicals and sessionals
(c) 45 per cent in aggregate

CWS Class Work Sessional
ETE : End-Term Examination
PRS: Practical Sessional
PRE: Practical End-Term Examination

MASTER OF COMPUTER APPLICATIONS
FOURTH SEMESTER - TEACHING AND EXAMINATION SCHEME 2022

Branch Code	*Subject Code*	*Subject*	*Lecture*	*Tutorial*	*Practical*	*Contact Hours*	*Credits*	*Exam Hours*	*Marks*				
								ETE/PRE	*Theory*		*Practical*		*Total*
									CWS	*ETE*	*PRS*	*PRE*	
CSE	621B	Seminar (M)	-	-	-	-	5	3	20	-	80		100
CSE	622B*	System Design Project (M)	-	-	-	-	20	3	100	-	200		300
Grand Total			**-**	**-**	**-**	**-**	**25**	**-**	**120**	**-**	**-**		**400**

*Industrial Training / Project

To pass, a candidate must obtain:
(a) 35 per cent in each written paper,
(b) 50 per cent in each of the practicals and sessionals
(c) 45 per cent in aggregate

CWS	Class Work Sessional	**PRS**:	Practical Sessional
ETE	: End-Term Examination	**PRE**:	Practical End-Term Examination

LIST OF ELECTIVES

Elective Group (stream)	Elective-I	Elective-II	Elective-III
Computer Science	2. CSE- 531 Robotics & Embedded Systems 3. CSE- 532 Microprocessors	1. CSE- 631 Compiler Design 2. CSE- 632 Advanced DBMS 3. CSE- 633 Image Processing & Computer Vision	1. CSE- 731 Big Data Analytics 2. CSE- 732 Advanced Computer Architecture 3. CSE- 733 Soft Computing
Application Development	1. CSE- 541 Human Computer Interaction 2. CSE- 542 Professional Practice, Cyber Laws & Ethics	1. CSE- 641 Mobile Application Development 2. CSE- 642 .NET Technologies 3. CSE 643 Multimedia	1. CSE- 741 Modern Web Development 2. CSE- 742 Geographical Information Systems
Network & Infrastructure	1. CSE- 551 Client Server Computing 2. CSE- 552 Cyber Security 3. CSE- 553 LINUX Operating System	1. CSE- 651 Cloud Computing 2. CSE- 652 Wireless Technologies 3. CSE- 653 Mobile Computing	1. CSE- 751 Blockchain 2. CSE- 752 Internet of Things 3. CSE- 753 Computer Network Management

- **Students have to choose Elective-I from any one stream (Elective Group). Once chosen the stream (Elective Group) for Elective-I the same stream will continue for Elective-II and Elective-III.**

MASTER OF COMPUTER APPLICATIONS

FIRST SEMESTER (BRIDGE COURSE)

CSE 501A - COMPUTER ORGANISATION AND ARCHITECTURE (M)

3L, 1T **3 Hours, 80 Marks**

Data Representation & Arithmetic: Integer, Fixed & Floating point Representations. Addition & Subtraction. Parallel & BCD Adder. Binary Multiplication, Booth's Algorithm. Binary Division. Floating Point Arithmetic.

Central Processing Unit – Stored Program Concept, Von-Neumann Architecture. General Register Organization, Stack Organization, Instruction Formats, Addressing Modes. Data Transfer - Buses, Bus Formats and operations, Instruction Sets – RISC & CISC architectures.

Organization of computer system - Basic Building blocks of CPU, Construction of ALU. Registers, Logical, Shift and Data Transfer Operations. Timing and Control. I/O and interrupt instructions.

Memory Elements - RAM, Static and Dynamic RAM, dimension of memory access, ROM, PROM, EPROM, EEPROM, Magnetic, CCD architectures. Hierarchy of memories. Associative memory. TLBs & Cache Organization.

I/O and Interrupts - Isolated and Memory-mapped input-output, Interrupts in I/O systems. Serial Communication. Interfacing of keyboards and printers. Secondary Storage - Magnetic tapes, disks, floppy disks, optical disk and flash drives.

CSE 502A – C++ PROGRAMMING (M)

3L, 1T **3 Hours, 80 Marks**

Introductory idea of C Programming. Basic concept of Object Oriented Programming, concept of class, object, inheritance, encapsulation, polymorphism.
Structure of C++ program, token and identifier, data types, operator, type conversion and type cast operators. Console I/O cin and cout. Control statements, if, loops, break, continue, goto.
Functions- Declaration, definition, parameter passing, reference variable, overloaded functions, inline functions, default arguments, return by reference.
Classes and objects, class definition, object declaration, constructors and destructors, dynamic initilization of objects, copy constructors.
Operator overloading, unary, binary operator, data and type conversions, conversion among objects, basic types and different classes.
Derived classes and base classes, protected access specifier, derived class constructors, abstract base class, inheritance – public and private inheritance, multiple inheritance, member function, constructor, ambiguity in inheritance.
Pointers, addresses, pointers and strings, memory management using new and delete operator.
Virtual functions, friend function, static function, dynamic binding.
File handling, File Operation functions and attributes.
Introduction to streams, templates and exception handling.

MASTER OF COMPUTER APPLICATIONS

SECOND SEMESTER (BRIDGE COURSE)

CSE 503A – SYSTEM SOFTWARE AND OPERATING SYSTEM (M)

3L, 1T **3 Hours, 80 Marks**

Overview of System Architecture. Types and Goals of System Software. Hierarchy of Programming Languages. Design of an Assembler – Functions, Data Structures and Algorithms. Introduction to Loaders & Linkers – Absolute loaders, Bootstrap loaders, Library Search & Linkage Editors. Dynamic & Static Linking.

Operating Systems: Overview, Structure and Services, System Calls. Programs, Process and Threads. Process Life Cycle. Operations on Processes. User mode & Kernel Mode Programs.

Process Management: Process Scheduling – Objectives & Algorithms. Inter Process Communication. Process Synchronization – Critical Section Problem, S/W & H/W Approaches. Peterson's Solution. Semaphores, Monitors. Classical Problems.

Deadlock: Overview, Characteristics, Prevention, Avoidance, Detection and Recovery.

Memory Management: Address Spaces – Logical and Physical. Contiguous & Non-Contiguous Allocation, Fragmentation. Swapping, Paging, Segmentation. Virtual Memory – Demand Paging, Page Replacement Algorithms, Thrashing.

File Concepts & File Systems: Directory Structure, Access Methods, File Protection. Disk Scheduling Algorithms. Input/Output: Polling, Interrupt Driven, Direct Memory Access. Security and Authentication in OS.

MASTER OF COMPUTER APPLICATIONS

FIRST SEMESTER

CSE 511A - INTERNET TECHNOLOGY (M)

3L, 1T **3 Hours, 80 Marks**

Introduction – basic computer communication, modems, Types of Networks- LAN, MAN, WAN Network topologies. Concept of switching, circuit, message and packet. Internetworking devices, repeater, bridge, router, gateways. Basic idea of client/server computing, naming computers and domain names. Concept of File Transfer Protocol, Remote Login, E-mail, WWW and their working. Introduction to search engines and browser extensions.

HTTP Protocol. HTTP Headers & Status Codes. Overview of HTML - Lists, Graphics, Tables, Documents, Iframes. Forms – Input types, Content types, Placeholders, Validations, Input and Form Events. HTML5 - New Structural Tags (Article, Header, Nav etc.), Multimedia Tags (Audio,Video), Canvas & SVG.
Java Script: Introduction, programming constructs: variables, operators and expressions, conditional checking, functions and dialog boxes, JavaScript DOM, Creating forms, Introduction to Cookies. Object Oriented techniques in JavaScript.
Web page layouts, interaction and usability concepts. Cascading Style Sheets (CSS) – Selector Rules, Text, Layout, Visual Styling. CSS Animations. JQuery – Accessing DOM elements, Animations, Event Feedbacks. Introduction to JQuery UI Plugins.
Introduction to CGI and XML. AJAX: Introduction, HTTP Request, XMLHttpRequest, Asynchronous requests using Jquery and JSON.
Practice of website design and the necessary tools for website designs. Inspecting and profiling tools for debugging webpage elements, layout, styling and scripts.

CSE 512A - ADVANCED DATA STRUCTURES (M)

3L, IT **3 Hours, 80 Marks**

Concepts of Primitive and Non-Primitive Data Structures, Review of basic data structures - Stack, Queues and Linked Lists – Structure and Operations.
Introduction to Graphs. Representation of graphs – Performance Comparison. BFS and DFS. Walk, Paths and circuits. Isomorphism, connectedness, Euler graph, subgraph, operations on graph, Hamiltonian Paths and Circuits. Bipartite graphs. Planar and Dual graphs, representations of planar graphs. Applications of Graphs, Coloring, covering and partitioning, chromatic number, Cyclomatic Complexity.
Trees, Spanning tree, Cut-sets, Connectivity and Separability, Tree Traversals. Directed Graphs - binary relations, connectedness. Directed Acyclic Graphs. Search Trees – BST. Weight Balanced Trees – AVL and Red Black Trees. B-Trees and its variants. Applications of trees - Network flow, Circuits, Tournaments.
Hash Maps & Tables. Structure, Operation & Applications. Chaining, Probing. Sets, Tuples, Associative Arrays, Sparse Matrices and Dictionaries.

* Algorithms of these data structures is not covered in this subject.

CSE 513A - ADVANCED JAVA PROGRAMMING(M)

3L, IT **3 Hours, 80 Marks**

J2EE and J2SE. The birth of J2EE databases. The maturing of Java, Java Beans and Java Message Service.

J2EE multi-tier architecture. Distributed systems, real time transmission, software objects webservices. The tier clients resources and components accessing services.

J2EE multi-tier architecture. Client tier implementation.

Enterprise Java Beans tier implementation. Enterprise information system tier implementation. Enterprise Application strategy. The enterprise application clients, client presentation, client expert validation, client control, duplicate client requests.

Session management, client–side session state, server-side session state.

WebTier and Java Server pages, presentation and processing, the inclusion strategy, style sheets, simplify Error Handling.

Enterprise Java Beans Tier. Entity to enterprise Javabeans relationship, efficient data exchange, eneterprise Java Beans performance. The model view controller (MVC).

Interfaces and inheritance, potential problems with inheritance, maintainable classes, performance enhancements.

J2EE Database Concepts, Data, Database tables, Database schemas, identifying information, decomposing attributes to data, decomposing by example defining data, the art of choosing a name normalizing data, the normalization process grouping data, creating primary keys, functional dependendcy, transitive dependencies, foreign key, referential integrity, art of indexing, an index in motion, drawbacks using an index clustered keys, derived keys selective, exact matches and partial matches searching for phonetic matches.

JDBC objects, JDBC and embedded SQL, Java and XML, Java Servelets, Java server pages, Eneterprise Java Beans.

CSE 514 A – VISUAL COMPUTING (M)

3L, 1T **3 Hours, 80 Marks**

Visual Synthesis. Taxonomy of Computer Graphics – Raster & Vector Displays, Frame Buffer, Persistence, Resolution, Refresh Rate, Aspect Ratio. Interactive vs Passive Graphics Systems. Input Modes & Methods. Basics of Coordinate Systems – Points, Lines, Planes and Curves. Color Generation – RGB, CMYK, HSV.

Two-Dimensional Systems – 2D Objects Representation, 2-D Transformations, 2-D Viewing Pipeline, Clipping. Polygon Filling. Antialiasing. Three-Dimensional Systems – Projection Methods, Degrees of Freedom, 3-D Graphics Pipeline, 3-D Object Representation – Polygon Surfaces, Polygon Meshes. Visible Surface Detection - Back face, Z-buffer, painter algorithm.

Concepts of Imaging Systems. The Pinhole Camera and its properties. Illumination Models – Ambient, Diffuse, Specular. Halftones and Dithering. Anatomy of a Digital Camera.

Image Based Visual Computing. Processing in Spatial and Frequency Domain. Image Filters - Convolution and Linear Filters. Blur, Sharpen and Edge Operations. Histogram, Color and Pixel level operations. Thresholding and Band Pass Filters. Non-Linear and Morphological Operations – Noise Filtering, Dilation, Erosion, Majority. Contour Properties & applications.

Definitions and Brief Introduction only – Image Segmentation, Registration, Restoration and Compression. Image Retrieval using Color, Shape and Texture. Object Detection & Recognition. Open Problems in Computer Vision.

CSE 515 A – PYTHON PROGRAMMING (M)

3L, 1T **3 Hours, 80 Marks**

Python Introduction, Installing and setting Python environment in Windows and Linux, basics of Python interpreter, Execution of python program, Editor for Python code, syntax, variable, types. Flow control: if, if-else, for, while, range function, continue, pass, break.
Strings: Sequence operations, String Methods, Pattern Matching.

Lists: Basic Operations, Iteration, Indexing, Slicing and Matrixes; Dictionaries: Basic dictionary operations; Tuples and Files; Functions: Definition, Call, Arguments, Scope rules and Name resolution; Modules: Module Coding Basics, Importing Programs as Modules, Executing Modules as Scripts, Compiled Python files(.pyc), Standard Modules: OS and SYS, The dir() Function, Packages

Input output and file handling, Object Oriented Programming features in Python: Classes, Objects, Inheritance, Operator Overloading, Errors and Exceptions: try, except and else statements, Exception Objects, Regular expressions, Multithreading, Modules to handle multidimensional data: Numpy, Panadas. Packages for Visualization : Matplotlib, Plotting 2D & 3D Data. Interacting with the plots.

Networking: Socket module, Port Scanning, Packet Sniffing, Traffic Analysis, TCP Packet Injection, Log analysis.
HTTP Communications with Python built in Libraries, Web communications with the Requests module, Introduction to web scrapping.

MASTER OF COMPUTER APPLICATIONS

SECOND SEMESTER

CSE 521 A – DESIGN OF DATABASES (M)

3L, 1T **3 Hours, 80 Marks**

Overview and History of DBMS. File System v/s DBMS. Advantages of DBMS - Describing and Storing Data in a DBMS. Types of DBMS. Queries in DBMS. Structure of a DBMS.

Entity Relationship model: Overview of Entities, Attributes and Relationships. Features of the ER Model- Sets, Constraints & Hierarchies. Data Design with ER Model. Relational Algebra – Selection, Projection, Set Operations, Renaming, Joints, Division, Relation Calculus, Expressive Power of Relational Algebra.

Structured Query Language: Data Definition, Data Manipulation and Data Control Language Commands. Union, Intersection, Except, Nested Queries, Set-Comparison, Aggregate Operators, Null Values. Join Queries, Group & Order Clauses. Key Constraints in SQL, Views & Triggers. Introduction to ODBC and JDBC.

Schema & Normalization - Introduction to Schema, Functional Dependencies, Relational Normal Forms, Need for Normalization, Decomposition into BCNF and 3-NF. Transactions: Transaction Concept, Transaction States, Atomicity, Consistency, Isolation & Durability.

Concurrent Control - Concurrent Executions, Serializability, Lock-Based Protocols, Timestamp-Based Protocols, Deadlock Handling. Database Failures – Introduction and Recovery Schemes. Shadow Paging and Log-based Recovery. Recovery with Concurrent transactions.

CSE 522 A - WEB APPLICATION DEVELOPMENT (M)

3L, 1T **3 Hours, 80 Marks**

PHP Language structure, variables, Pre-defined variables, Super Global variables, data types, operators, expressions. Control flow, switch, loops, functions, Code blocks. Arrays, Super Global arrays, Multi-dimensional array, Creating index based and Associative array, Accessing array, Functions, string operations, Forms, Accessing user input.

Classes and Objects in PHP, creating objects, Modifiers, Inheritance, Exception Handling.

Combining HTML and PHP Code. Handling cookies, Handling session. Working with session variable, starting and destroying session. Working with files and directories, File and image uploads and File downloads, Errors handling in PHP. Working with date and Time function, HTTP headers, Page Redirect.

MySQL - Data types, table creation. Commands: Insert, select, update, replace, delete etc. Using transactions and stored procedures. Interacting with MySQL using PHP. Persistent Connections & Queries.

Web Applications - Mailing lists, Discussion forums, Ecommerce & Shopping Cart mechanism, Integration of payment gateway, Integrating emails to web application, Open Authentication services. Concepts related to web apps - Website Analytics, SEO, Mobile-First and Responsive Design, Conversions.

CSE 523 A - COMPUTER NETWORKS AND INFORMATION SECURITY (M)
3L, 1T **3 Hours, 80 Marks**

Introduction to Computer Networks, Types of Networks, Standards, Protocol Layers. The OSI Model. Introduction to Switching – Circuit and Packet Switching. Error Detection and Correction - Block coding, Cyclic codes, Checksum, Forward error correction.
Data link control: DLC services, Framing, Flow and error control, Data link layer addressing and protocols, HDLC and P2P. MAC Layer - Random Access, Controlled Access and Channelization. Wired LANs and Ethernet Protocol.
Network Layer – Packets, Connectionless and Connection-Oriented protocols services. Introduction to IPv4 & IPv6. IPV4 Addressing, Forwarding of Packets. Routing algorithms. Performance – Delay, Throughput, Packet Loss, Congestion. Datagrams & Fragmentation. OSPF & BGP. Introduction to Multicasting – types, addresses, forwarding. Overview of ICMP & IGMP.
Transport Layer – Services, Protocols – Stop-and-wait, Go-Back-N, Selective Repeat, Piggybacking. Datagrams & UDP – Services & Applications. TCP – Services, Features, States. Windows in TCP, Flow & Error Control, Congestion Control, Timers. Session and Application Layer – Introduction to WWW and HTTP, FTP, SMTP, TELNET, SSH, DNS and SNMP. Introduction to Multimedia and Compression.
Introduction to Cryptography & Information Security - Encryption, Decryption, DES, RSA. Digital Signatures and Firewalls. Types of Security Attacks. Overview of security at application layer. Security Threats – Intruders, Viruses, Worms, and other Threats, Vulnerabilities, Cyber Crime, Phishing and Hacking, Security Assessment, Analysis and Assurance.

CSE 524 A - ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(CSE/IT)
3L, 1T **3 Hours, 80 Marks**

Fundamental Issues : AI problems, Examples, applications. Intelligent behavior. The Turing test. Rational versus non-rational reasoning. Nature of environments - Fully versus partially observable, Single versus multi-agent, Deterministic versus stochastic, Static versus dynamic, Discrete versus continuous. Nature of agents: Autonomous versus semi-autonomous, Reflexive, goal-based, and utility-based. The importance of perception and environmental interactions.
Basic Search: Strategies Problem spaces (states, goals and operators), problem solving by search, Uninformed search (breadth-first, depth-first, depth-first with iterative deepening).Heuristics and informed search (hill-climbing, generic best-first, A*), Space and time efficiency of search. Two-player games (Introduction to minimax search).

Basic Knowledge Representation and Reasoning Review of propositional and predicate logic (cross-reference DS/Basic Logic) Resolution and theorem proving (propositional logic only). First Order Logic resolution Review of probabilistic reasoning, Bayes theorem, inference by enumeration.

Review of basic probability (cross-reference DS/Discrete Probability), Random variables and probability distributions, Axioms of probability, Probabilistic inference, Bayes' Rule.

Basic Machine Learning Definition and examples of broad variety of machine learning tasks, including classification, Inductive learning, Statistical learning with Naive Bayes and Perceptrons Maximum likelihood and gradient descent parameter estimation, Cross validation, Measuring classifier accuracy, Confusion Matrices.

Advanced Search: Constructing search trees Stochastic search, Simulated annealing, Genetic algorithms, Implementation of A* search, Beam search, Minimax Search, Alpha-beta pruning. Expectimax search and chance nodes. Natural Language Processing Language models