PUNJABI UNIVERSITY, PATIALA

SYLLABI
OUTLINES OF TESTS AND
COURSES OF READINGS

FOR

MASTER OF COMPUTER APPLICATIONS (MCA)

FIRST YEAR (SEMESTER I & II)

(Sessions 2018-19 and 2019-20)

CHOICE-BASED CREDIT SYSTEM

(As per RUSA Guidelines)

PUNJABI UNIVERSITY,
PATIALA 147002

M.C.A. (MASTER OF COMPUTER APPLICATIONS)
FIRST YEAR - FIRST SEMESTER EXAMINATIONS
Sessions 2018-19 and 2019-20

Paper Code	Title of Paper	L	T	P	C	Internal Marks		External Marks	
						Max	Pass	Max	Pass
MCA-111	Discrete Mathematical Structures	4	0	0	4	50	20	50	20
MCA-112	Computer Organization and Architecture	4	0	0	4	50	20	50	20
MCA-113	Programming in C	4	0	0	4	50	20	50	20
MCA-114	Communication Skills	4	0	0	4	50	20	50	20
MCA-115	*Elective – I	4	0	0	4	50	20	50	20
MCA-116	Programming Lab – I (C Programming)	0	0	6	3	60	24	40	16
MCA-117	Communication and Soft Skills Lab – I	0	0	2	1	60	24	40	16
	Total	20	0	8	24	370		330	

***Elective – I**: Any one of the following papers:

Paper Code	Title of Paper
MCA-115 E1	Problem Solving and Program Design
MCA-115 E2	Fundamentals of Computer Science
MCA-115 E3	Business Management
MCA-115 E4	Accounting and Financial Management

***Note: The electives will be offered to the students depending upon the availability of the teachers. The decision of the Head of the Department in this respect will be final. Student can also opt for any MOOC as an elective in place of the above offered electives. The list of MOOCs must be passed by the ACD.**

CONTINUOUS ASSESSMENT (THEORY PAPERS)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Assignment/Quizzes	:	20% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.
4.	Class Participation and behaviour	:	10% of the total marks allotted for continuous assessment.

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
.	Attendance	:	10% of the total marks allotted for continuous assessment.

M.C.A. (MASTER OF COMPUTER APPLICATIONS)
FIRST YEAR-SECOND SEMESTER EXAMINATIONS
Sessions 2018-19 and 2019-20

Paper Code	Title of Paper	L	T	P	C	Internal Marks		External Marks	
						Max	Pass	Max	Pass
MCA-121	Data and File Structures	4	0	0	4	50	20	50	20
MCA-122	Software Engineering	4	0	0	4	50	20	50	20
MCA-123	Object Oriented Programming using C++	4	0	0	4	50	20	50	20
MCA-124	Information Systems	4	0	0	4	50	20	50	20
MCA-125	*Elective – II	4	0	0	4	50	20	50	20
MCA-126	Programming Lab – II (OOP using C++)	0	0	4	2	60	24	40	16
MCA-127	Programming Lab – III (Data and File Structures)	0	0	4	2	60	24	40	16
	Total	20	0	8	24	370		330	

***Elective – II:** Any one of the following papers:

Paper Code	Title of Paper
MCA-125 E1	Computer Oriented Statistical Methods
MCA-125 E2	ERP Systems and Processes
MCA-125 E3	Programming Languages
MCA-125 E4	Web Technologies

***Note: The electives will be offered to the students depending upon the availability of the teachers. The decision of the Head of the Department in this respect will be final. Student can also opt for any MOOC as an elective in place of the above offered electives. The list of MOOCs must be passed by the ACD.**

CONTINUOUS ASSESSMENT (THEORY PAPERS)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Assignment/Quizzes	:	20% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.
4.	Class Participation and behaviour	:	10% of the total marks allotted for continuous assessment.

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-I
Discrete Mathematical Structures (Subject Code: MCA-111)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

This course introduces the applications of discrete mathematics in the field of computer science. It covers sets, logic, proving techniques, combinatorics, functions, relations, graph theory and algebraic structures. These basic concepts of sets, logic functions and graph theory are applied to Boolean Algebra and logic networks, while the advanced concepts of functions and algebraic structures are applied to finite state machines and coding theory. Students completing this course will be able

- to express a logic sentence in terms of predicates, quantifiers, and logical connectives.
- to apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.
- to use tree and graph algorithms to solve problems
- to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.

Course content

SECTION A

Logic: Propositions, Implications, Precedence of Logical Operators, translating English Sentences, System Specifications. Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Order of Quantifiers, Sets, Power Set, Set Operations, Functions, One-to-One Functions and Onto Functions, Inverse and Composition of Functions, Floor Function, Ceiling Function.
Algorithms, Searching Algorithms, Sorting, Growth of Functions, Big-O Notation, Big-Omega and Big-Theta Notation, Complexity of Algorithms, Mathematical Induction, The Basic of counting, The Pigeonhole Principle.

SECTION B

Recurrence Relations, solving recurrence relations, Divide and Conquer Algorithms and Recurrence Relations, Generating functions for sorting recurrence relations, Inclusion-Exclusion.
Relations and their properties, n-any relations and their applications, representing relations, closure of relation, equivalence relations, partial ordering.
Graphs: Introduction, terminology, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths, Shortest Path Problems, Planar Graphs.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

1. Discrete Mathematics and its Applications, K.H. Rosen, TMH Publications.
2. Discrete and Combinatorial Mathematics, Ralph P. Grimaldi, Pearson Education.
3. Elements of Discrete Mathematics, C.L. Liu, D.P. Mohapatra, TMH Publications.
4. Discrete Mathematics, Richard Johnsonbaugh, Pearson Education.
5. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay & R. P. Manohar, MGH Publications.
6. Discrete Mathematical Structures, Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, PHI.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-I
Computer Organization and Architecture (Subject Code: MCA-112)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

This course will introduce students to the fundamental concepts underlying modern computer organization and architecture. Main objective of the course is to familiarize students about hardware design including logic design, basic structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user. The emphasis is on studying and analyzing fundamental issues in architecture design and their impact on performance. By the end of this course, students should be able to:

- understand the basics of computer hardware and how software interacts with computer hardware
- understand how computers represent and manipulate data
- understand computer arithmetic and convert between different number systems
- understand basics of Instruction Set Architecture

Course content

SECTION A

Number System: Number conversions, Arithmetical operations, Concepts about bits, bytes and word. Representation of Information: Integer and floating point representation, Complement schemes, Character codes (ASCII, EBCDIC, BCD, 8421, 2421, Excess-3, Grey, Hamming, Parity). Basic Building blocks: Boolean Algebra, K-maps. Combinational logic design: half-adder/subtractor, full adder/subtractor, parallel adder, Multiplexers, Demultiplexers, Decoders, Encoders. Sequential circuits- concept, flip-flops (RS, D, JK, JK-Master-Slave, T), counters (Asynchronous, Synchronous) Mod-3, Mod-5, Decade Counter.
Computer organisation: Structure of Computer, Instruction codes, Instruction formats, Instruction cycle, Addressing modes.

SECTION B

Register Transfer Language, Arithmetic, Logic and Shift micro-operations,
Control Memory: Design of control unit, Micro program Sequencer, Micro programmed and hardwired control unit (overview only), Features of RISC and CISC.
Memory organisation: Concepts of semiconductor memory, CPU- memory interaction, organization of memory modules, Cache memory and related mapping and replacement policies, Virtual memory.
I/O organisation: I/O interface, Modes of data transfer: Programmed - initiated, Interrupt initiated, DMA, I/O controllers. Architecture of 8085, Assembly language programming of 8085 machine.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:

Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

1. Digital Principles & Applications, D. P. Leach, A. P. Malvino, Goutam Saha, Tata McGraw-Hill.
2. Computer Organization and Architecture, William Stallings, Pearson Education.
3. Structured Computer Organization, A.S. Tanenbaum, Prentice-Hall of India.
4. Fundamentals of Computer Organization and Architecture, Jyotsna Sengupta, Deep and Deep Publications.
5. Computer System Architecture, M. Morris Mano, Prentice-Hall of India.
6. Computer Systems Design and Architecture, Vincent. P. Heuring, Harry. F. Jordan, T.G. Venkatesh, Pearson Education.
7. Computer Architecture, Nicholas Carter, Schaum's Outlines, Tata McGraw Hill.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-I
Programming in C (Subject Code: MCA-113)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future. At the end of the course student will be able to:

- Design an algorithmic solution for a given problem
- Write a maintainable C program for a given algorithm.
- Trace the given C program manually.
- Write C program for simple applications of real life using structures and files.

Course content

SECTION A

Programming process: Problem definition, Algorithms, Flow Charts, C Character set, Identifiers and keywords, Constant and Variables, Data types, Declarations, Statements and Symbolic Constants. C Program structure. Operators and Expressions: Arithmetic, relational, logical, unary operators, others operators. Bitwise operators: AND, OR, complement precedence and Associating bitwise shift operators, Input-Output: standard, console and string functions
Coding Standards: Inline documentation, indentation of code. Naming conventions: Variables, global variables, functions, structures. Debugging: Tracking defects, debugging by code inspection, debugging by logs, debugging using step-by-step execution, using break points.
Control statements: Branching, looping using for, while and do-while Statements, Nested control structures, switch, break, continue statements.
Arrays: Definition, Access of Elements, initialization; Multidimensional arrays, character arrays.
Pointers: address and dereferencing operators, declaration, assignment, initialization, arithmetic, precedence of address and dereferencing operators, pointer comparison, conversion, pointer arrays and pointers to pointers. Pointers and strings, void pointers, Dynamic memory management.

SECTION B

Functions: Definition, Call, prototypes, formal and actual parameters, passing arguments to functions, call by value and call by address, passing array elements as arguments and passing arrays as arguments, recursion, Recursion v/s Iteration.
Program structure: Storage classes, automatic, external and static variables.
Pre-processor directives: #include, #define, #undef, #if, #ifdef, #ifndef, #else, #elif, #endif, #error, #pragma. Predefine macros.
Structure: Variable, initialization, accessing members, assignment, size of structure, scope of a structure, nested structures, pointer to structures, scope of a structure type definition, structure as function arguments, Arrays of structures, structures containing arrays, self-referential structures. Bit fields. Union, Enumerated data type
File processing: opening and closing, data files, creation, processing & unformatted data files, random file access. Command line arguments.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

1. Programming with C, Byron S. Gottfried, Schaum's Outlines, Tata McGraw Hill Publications.
2. Programming with ANSI and Turbo C, Ashok N. Kamthane, Pearson Education.
3. Programming in ANSI C, E. Balagurusamy, Tata McGraw Hill Publications.
4. Programming Vol:1, Infosys Campus Connect Foundation Program, Infosys.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter
The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-I
Communication Skills (Subject Code: MCA-114)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

This foundational course teaches the basics of good writing and communication skills. Students learn how to write grammatically-correct reports and focus on the interactive processes of transmitting and/or exchanging messages, information and/or understanding within individuals, groups, and organizations. At the end of the course, students should be able to:

- Understand the necessity for accurate and effective written and verbal communication
- Recognise the difference between oral and written form of communication.
- Understand the basic concepts, principles, and techniques of writing technical reports.

Course content

SECTION A

Introduction to Communication: What is Communication, Levels of Communication, Importance of Technical Communication, Barriers to Communication, Non-Verbal Communication, Technology-Enabled Communication, Impact of Technology, Selection of Appropriate Communication Technology.

Prose Parables (Orient Black Swan, 2013) – The following stories are prescribed from the book:

(i) The Kabuliwallah by Rabindranath Tagore
(ii) The Eyes are Not Here by Ruskin Bond
(iii) The Death of a Hero by Jai Nimbkar
(iv) Grief by Anton Chekov
(v) Uncle Podger Hangs a Picture by Jerome K. Jerome
(vi) The Doctor's Word by R. k. Narayan

SECTION B

Effective Writing: Guidelines for Effectiveness, Paragraph Development, Precise Writing, Reading Comprehension.

Oxford Practise Grammar by John Eastwood (Ed. 2014):
Exercise – 4 to Exercise – 43 have to be studied.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

1. Technical Communication: Principles and Practice, Meenakshi Raman & Sangeeta Sharma, Oxford University Press.
2. Business Communication, Meenakshi Raman & Prakash Singh, Oxford University Press.
3. High School English Grammar and Composition, Wren & Martin, S. Chand & Company Ltd.
4. Effective Business Communications, Herta A. Murphy, Herbert W. Hildebrandt & Jane P. Thomas, Tata McGraw Hill Publication.
5. Effective Business Communication, Asha Kaul, Prentice-Hall India Pvt. Ltd.
6. Technical Writing, B.N. Basu, Prentice-Hall India Pvt. Ltd.
7. The Essence of Effective Communication, Ron Ludlow and Fergus Panton, Prentice Hall of India.
8. Developing Communication Skills, Krishna Mohan and Meera Banerji, MacMillan India Ltd.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 0 T 0 P 6 per week Credit 3

Masters in Computer Applications
Semester-I
Programming Lab - I (C Programming) (Subject Code: MCA-116)

Maximum Marks: 100* **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Practical units to be conducted: 55-65**

This course will mainly comprise of exercises on the basis of the theory paper: MCA-113: Programming in C.

*The splitting of marks is as under:

- Maximum Marks for Continuous Assessment: 60
- Maximum Marks for University Examination: 40

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

NOTE: The examiner will give due weightage to Logic development/ Program execution, Lab records and viva-voce of the student while awarding marks to the student during end-semester final practical examination.

L 0 T 0 P 2 per week Credit 1

Masters in Computer Applications
Semester-I
Communication and Soft Skills Lab – I (Subject Code: MCA-117)

Maximum Marks: 100* **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Practical units to be conducted: 25-35**

This course will mainly comprise of exercises on the basis of the theory paper: MCA-114: Communication Skills.

*The splitting of marks is as under:

- Maximum Marks for Continuous Assessment: 60
- Maximum Marks for University Examination: 40

CONTENTS TO BE COVERED UNDER THE LAB:

- Oral Forms of Communication: Effective listening, Active vs. Passive Listening, Effective Presentation Strategies, Effective Use of Visual Aids, Understanding the Nuances of Delivery, Interviews, Types of Interviews, Group Discussion, Meetings, Conferences
- Written Forms of Communication: Letter Writing, Memorandums, E-mails, Report Writing, Technical Proposals, Research Paper, Dissertation, Thesis, Instruction Manuals, Technical Description, CVs

DISTRIBUTION OF CONTINUOUS ASSESSMENT (Out of Max. Marks 60):

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Presentations by student	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

DISTRIBUTION OF UNIVERSITY EXAMINATION (Out of Max. Marks 40):

External examination will consist of VIVA only. The evaluation of students in VIVA will take place on the basis of the students' ability to communicate efficiently in grammatically correct English

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-I
Problem Solving and Program Design (Subject Code: MCA-115 E1)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

This is an introductory course designed for any student interested in using computation to enhance their problem solving abilities. It explores standard programming structures used to introduce fundamental algorithmic/programming concepts including variables, assignments, conditionals, loops, functions, and arrays and their role in problem solving. Upon successful completion of this course, the student will be able to

- Develop algorithms from user problem statements.
- Express the solutions to computer oriented problems using pseudocode.
- Determining specifications for a problem
- Designing a solution

Course content

SECTION A

An Overview of Computers and Logic: Understanding computer systems, simple program logic, program development cycle, Pseudo code statements, Flowcharts Symbols, Sentinel Values to end a program, Understanding programming and user environments, Evolution of programming models.
Working with Data, Creating Modules, and Designing Quality Programs: Declaring and using variables and constants, assigning values to variables, advantages of modularization, Modularizing a program, Creating hierarchy charts, Features of good program design.
Understanding Structure: Understanding unstructured spaghetti code, three basic structures, Input to a structure a program, Reasons for structuring a program, recognizing structure, Structuring and modularizing unstructured logic.

SECTION B

Making Decisions: Evaluating Boolean expressions to make comparisons, relational comparison operators, Logical operators: AND, OR, NOT, Making selections with ranges, Precedence Rules.
Looping: Advantages, Loop Control variables, Nested Loops, Common mistakes using loops, FOR Loop, Common Loop Applications.
Arrays: Understanding arrays and their memory occupancy, Manipulating arrays to replace nested decisions, using constants with arrays, Searching, Parallel Arrays, FOR Loop with arrays. Sorting (Bubble), Swapping Values, Multi-dimensional arrays.
File Handling: Understanding computer files, Data hierarchy, Performing file operations on Sequential Files, Introduction to Random Access Files.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:

Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

1. Programming Logic and Design Comprehensive, Joyce Farrell, Cengage Learning.
2. Fundamental of Computers, V. Rajaraman and N. Adabala**,** Prentice-Hall India Pvt., Limited.
3. Problem Solving and Program Design in C, Jeri R. Hanly, Pearson Education India.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-I
Fundamentals of Computer Science (Subject Code: MCA – 115 E2)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Making the students understand and learn the basics of computer how to operate it, to make familiar with the part and function of computer, its types , how to use computer in our day to day life, its characteristics, its usage, Limitations and benefits etc. After completing the subject, student should be able to:

- understand the meaning and basic components of a computer system,
- define and distinguish Hardware and Software components of computer system,
- explain the functions of a computer,
- identify and discuss the functional units of a computer system,
- identify the various input and output units and explain their purposes
- understand the concept and need of primary and secondary memory,

Course content

SECTION A

Computer Fundamentals: Block structure of a computer, characteristics of computers, problem solving with computers, generations of computers, classification of computers on the basis of capacity, purpose, generation, Introduction to Number System. Memory types: Magnetic core, RAM, ROM, Secondary, Cache, Bubble Memory. Input and Output Units: functional characteristics; Overview of storage devices: floppy disk, hard disk, compact disk, tape; Printers: Impact, non-impact. Graphical I/O devices: Light pen, joystick, Mouse, Touch screen; OCR, OMR, MICR

SECTION B

Computer languages: Machine language, assembly language, higher level language, 4GL. Introduction to Compiler, Interpreter, Assembler, Assembling, System Software, Application Software.
Operating system: Batch, multi-programming, time sharing, network operating system, on-line and real time operating system, Distributed operating system, multi-processor, Multi-tasking.
Computer Network and Communication: Network types, network topologies, network communication devices, physical communication media.
Internet and its Applications: E-mail, TELNET, FTP, World Wide Web, Internet chatting; Intranet, Extranet. Introduction to E-Commerce: Meaning, its advantages & limitations, Types of E-Commerce Applications

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

1. Computer Fundamentals, P.K. Sinha, BPB Publications.
2. Computers Today, D. H. Sanders, McGraw Hill.
3. Information Technology: Inside and Outside, David Cyganski, John A. Orr, Richard F. Vaz, Prentice Hall.
4. Fundamentals of Computers, V. Rajaraman and N. Adabala, Prentice-Hall of India.
5. Computer Fundamentals Architecture and Organization, B. Ram, New Age International Publishers.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-I
Business Management (Subject Code: MCA-115 E3)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

This competency-based course trains students in business administration & management. This course will provide students with an understanding of the basic theories and principles by which businesses are organized and managed in modern society. They will demonstrate competency by analyzing management functions, principles, and processes that contribute to the achievement of organizational goals. On completion of course, students will:

- Define and explain the major management functions.
- Compare and contrast a variety of organizational structures.
- Explain how economic and social changes affect businesses.
- Compare and contrast management styles.
- Describe the planning and problem-solving process.
- Demonstrate competency by preparing, describing and representing a business plan.

Course content

SECTION A

Introduction to Economic and non-economic activities, Distinction between Business, Profession and Employment. Concepts of Factors of production, resources, goals, Effectiveness versus Efficiency.
Introduction to Management: Definition and Nature of Management, Management as Science or art, Levels of management, Functions of management, Fayol's general principles of management.
Planning: Nature and purpose of planning, Planning versus forecasting, Planning process - steps in planning.
Organizing: Concept and purpose of organization, Process of organization, Elements of organization process: Depart mentation, Delegation, Decentralization. Formal and informal organizations. Concept of Span of management.

SECTION B

Staffing: Definition and importance, Staffing process, Components of Staffing: Recruitment, Selection and Training (Brief introduction).
Motivation and motivators: Need and role of motivation, Types of motivation. Theories of motivation: Maslow's hierarchy of needs theory, the carrot and the stick approach.
Leadership: Definition and characteristics, Leadership styles: Autocratic style, Democratic style, Laissez faire.
Communication: Meaning, characteristics and importance, Elements of communication, the communication process, Types of communication, Formal and informal communication, Barriers and breakdowns in communication.
Controlling: Nature and significance of controlling, the basic control process.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

1. Principles & Practice of Management, L. M. Prasad. Sultan Chand & Sons.
2. Essentials of Management, Harold Koontz and Heinz Weihrich, Tata McGraw-Hill Publishing.
3. Principles of Management, M. Govindarajan, S. Natarajan, Prentice-Hall of India Ltd.

Scheme of Examination

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- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter
The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-I
Accounting and Financial Management (Subject Code: MCA-115 E4)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
MinimumPass Marks: 40% **Lectures to be delivered: 45-55**

This course is designed to equip students with the critical skills and knowledge required to effectively manage resource costs associated with their projects while delivering quality outcomes on a timely basis. Specifically, the course introduces a number of management accounting concepts and techniques that can be used to anlayse how projects consume resources, create value for a firm and its customers, and how this value may be enhanced. Upon successful completion of this course students will be able to:

- explain the role of accounting as an information system and its use to make economic decisions;
- explain cost concepts, undertake cost estimation and cashflow forecasting for a project and subsequently translate this into project budgets and plans;
- apply management accounting tools for project cost and budgetary control, as well as performance evaluation;
- manage project cash flows and analyse financial statements;

Course content

SECTION A

Accounting concepts, conventions and principles, Double entry system of accounting, Introduction to basic books of accounts of sole proprietary concern, Journalizing of transactions, Closing of books of accounts and preparation of Trial Balance.
Final Accounts: Trading, Profit and Loss accounts and Balance sheet of sole proprietary concern (without adjustment).
Financial Management: Meaning, scope and role, a brief study of functional areas of financial management.
Introduction to various FM tools: Ratio Analysis, Funds Flow statement and Cash flow statement (without adjustments).

SECTION B

Costing: nature, importance and basic principles. Marginal costing: Nature, scope and importance, Break even analysis, its uses and limitations, construction of break even chart, Standard costing: Nature, scope and variances (only introduction).
Computerized accounting: Meaning and advantages, Computer Programs for accounting, Balancing accounts, Trial balance and final accounts in computerized accounting systems, Control and Audit in computerized accounting, Sub-modules of computerized accounting systems.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

1. Fundamentals of Accounting and Financial Analysis, Anil Chowdhary, Pearson Education.
2. Financial Accounting, A. Mukherjee and M. Hanif, Tata McGraw Hill.
3. Financial Accounting for Management, N. Ramachandran and Ram Kumar Kakani, Tata McGraw Hill.
4. Essentials of Financial Accounting, Asish K. Bhattacharyya, PHI.
5. Cost Accounting: A Managerial Emphasis, Charles T. Horngren, Pearson Education.
6. Management Accounting, M.Y. Khan and P.K. Jain, Tata McGraw Hill.
7. P.H. Barrett, Computerized Accounting, BPB.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-II
Data and File Structures (Subject Code: MCA-121)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Objective of this course is to introduce the concept of algorithm development, programming and program validation. It includes a special emphasis on the design and application of data and file structures. Upon completion of this course, students will:

- Be familiar with basic techniques of algorithm analysis
- Be familiar with writing recursive methods
- Master the implementation of linked data structures such as linked lists and binary trees
- Be familiar with advanced data structures such as balanced search trees, hash tables, priority queues and the disjoint set union/find data structure

Course content

SECTION A

Algorithmic Complexity and Time Space Trade-off.
Basic Data Structures and Operations on them: Arrays, Stacks and Queues (Circular queues, Priority queues, Double-ended queues) and their Applications. Linked List (singly, doubly, singly circular, doubly circular), Operations on

Lists – create, insert, delete, search. Applications of linked lists.

Binary Tree : Linked and static Representation, Binary Tree Traversals (Pre-order, In-order, Post-order). Binary Search Tree (create, delete, search, insert, display), AVL Trees. Heap and Heap Sort Algorithm.

SECTION B

Graphs and Their Application, Sequential and Linked Representation of Graph-Adjacency Matrix, Operations on Graph, Traversing a Graph, Dijkstra's Algorithm for Shortest Distance, DFS and BFS, Minimal Spanning Tree.

Searching and Sorting, use of Various Data Structures for Searching and Sorting, Linear and Binary Search, Bubble Sort, Insertion Sort, Shell Sort, Selection Sort, Merge Sort, Radix Sort, Quick Sort.

Hashing: Introduction to hash table, hash function, resolving collision by chaining and open addressing, deleting items from a hash table.
Fields, records and files. Sequential, direct, index-sequential and relative files. Inverted lists and multi-lists.
B trees and B+ trees. File Sorting Techniques: Sorting in External Memory, Merging Files

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.
The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

- Data Structures Using C, A. Tenenbaum, Y. Langsam and M.J. Augenstein, Pearson Education.
- Data Management and File Structures, Mary E.S. Loomis, PHI.
- Data Structures with C, Seymour Lipschutz, Schaum's Outlines, Tata McGraw-Hill.
- Algorithms in C: Fundamentals, Data Structures, Sorting, Searching, Parts 1-4, Robert Sedgewick, Pearson Education.
- File Structures: an object-oriented approach with C++, Michael J Folk, Bill Zoellick, Greg Riccardi, Pearson Education.
- Heilemau G. L. : *Data Structures, Algorithm and Object Oriented Programming*, T.M. H. Publications

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-II
Software Engineering (Subject Code: MCA-122)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

In this course, students will gain a broad understanding of the discipline of software engineering and its application to the development of and management of software systems. After completing this course, students will have

- knowledge of basic SW engineering methods and practices, and their appropriate application;
- A general understanding of software process models such as the waterfall and evolutionary models.
- An understanding of the role of project management including planning, scheduling, risk management, etc.
- An understanding of software requirements and the SRS document.
- An understanding of implementation issues such as modularity and coding standards.
- An understanding of approaches to verification and validation including static analysis, and reviews.
- An understanding of software testing approaches such as unit testing and integration testing.

Course content

SECTION A

Introduction to Software Engineering: Problem Domain, Challenges, Software Engineering Approach ; Software Development process: Process Characteristics, Process Models : Waterfall, Prototype, Spiral, Iterative Enhancement; Project Management Process, The Inspection process, Software Configuration Management Process, Requirements Change management
Software Metrics: Software Measurement and Metrics, Designing Software Metrics, Classification of Software Metrics, Issues in Software metrics, Risk Management
Software Process Planning, Effort Estimation, Cost estimation models, Project Scheduling and Staffing,
Software Requirements Analysis and Specification: Requirements Anticipation, Requirements Investigation, Requirements Specifications, Analysis Approaches, Characteristics and Components of SRS, Fundamental problems in defining requirements, requirements validation.
Decision Analysis Tools: Decision Tree, Decision Table, Structured English.
Entity Relationship Diagram: Identify entity and relationship, Data Dictionary

SECTION B

Software Design: Design Principles, Module level concepts, Design Notation and Specification, Structured Design Methodology, Verification, Metrics, OO Analysis and OO Design
User-Interface Design: Introduction to User-Interface Design, Elements, Design Principles, Design Tips and Techniques, Good v/s Bad Interface.
Coding: Programming practice, Verification: code reading, reviews, static analysis, symbolic execution.
Software Maintenance: Types of Maintenance, Maintenance Cost, Introduction to legacy systems, Role of documentation in maintenance and types of documentation
Software Testing: Objectives, Principles, Test case design, White-Box testing and Black-Box testing techniques.
Reverse Engineering: Basics of Software Re-engineering, Re-engineering Process Model.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

1. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publications.
2. E. Fairley, "Software Engineering Concepts", McGraw-Hill.
3. Rohit Khurana, " Software Engineering : Principles and Practices", Vikas Publishing House.
4. Ian Sommerville, " Software Engineering ", Pearson Education
5. Roger. S. Pressman, "Software Engineering - A Practitioner's Approach", McGraw Hill,
6. Designing User Interface, James E Powell, Galgotia Publications.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter
The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-II
Object Oriented Programming Using C++ (Subject Code: MCA-123)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

This module teaches the basic principles of object-oriented programming, design and testing. The main objective is to provide in-depth coverage of object-oriented programming principles and techniques using C++. Topics include classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, templates, exceptions, container classes, and low-level language features. On completion of course, Students should be able to:

- Understand the basic components of an object-oriented program including methods and attributes.
- Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
- Demonstrate adeptness of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
- Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching.
- Learn syntax, features of, and how to utilize the Standard Template Library.

Course content

SECTION A

Evolution of OOP: Procedure Oriented Programming, OOP Paradigm, Advantages and disadvantages of OOP over its predecessor paradigms. Characteristics of Object Oriented Programming: Abstraction, Encapsulation, Data hiding, Inheritance, Polymorphism, Code Extensibility and Reusability, User defined Data Types. Introduction to C++: Identifier, Keywords, Constants, data types, Modifiers. Reference variables. Operators: Arithmetic, relational, logical, conditional and assignment. sizeof operator, Operator precedence and associativity. Type conversion, Variable declaration, expressions, statements, manipulators. Input and output statements, stream I/O, Conditional and Iterative statements, breaking control statements. Storage Classes: Automatic, Static, Extern, Register.
Arrays, Arrays as Character Strings, Structures, Unions, Bit fields, Enumerations and User defined types. Pointers: Pointer Operations, Pointer Arithmetic, Pointers and Arrays, Multiple indirections, Generic pointers. Functions: Prototyping, Definition and Call, Scope Rules. Parameter Passing: by value, by address and by reference, Functions returning references, recursion, function overloading, Default Arguments, Const arguments. Pointer to functions, Inline functions. Command line arguments, Pre-processor directives: #define, #error, #include, #if, #else, #elif, #endif, #ifdef, #ifndef, #undef, Type casting: static_cast, const_cast, dynamic_cast, reinterpret_cast
Classes and Objects: Class Declaration and Class Definition, Defining member functions, making functions inline, Nesting of member functions, Members access control,const data members, Const member functions, this pointer. Union as space saving classes. Objects: Object as function arguments, array of objects, functions returning objects. Static data members and Static member functions. Friend functions and Friend classes: Global functions as friends of class, member functions as friends of another class, class as friend of another class. Constructors: properties, types of constructors (Default, parameterized and copy), Dynamic constructors, multiple constructors in classes. Destructors: Properties, Destroying objects. Rules for constructors and destructors. Array of objects. Dynamic memory allocation using new and delete operators, Nested and container classes. Scopes: Local, Global, Namespace and Class

SECTION B

Inheritance: Defining derived classes, inheriting private members, single inheritance, types of derivation, function redefining, constructors in derived class. Types of inheritance: Single, Multiple, Multilevel and Hybrid. Types of base classes: Direct, Indirect, Virtual, Abstract. Code Reusability. Polymorphism: Methods of achieving polymorphic behavior. Operator overloading: overloading binary operator, overloading unary operators, rules for operator overloading, operator overloading using friend function. Function overloading: early binding, Polymorphism with pointers, virtual functions, late binding, pure virtual functions and abstract base class.Virtual destructors. Difference between function overloading, redefining, and overriding. Templates: Generic Functions and Generic Classes,

Overloading of template functions. Exception Handling catching class types, handling derived class exceptions, catching exceptions, restricting exception, rethrowing exceptions, terminate and unexpected, uncaught exceptions. Files and streams: Classes for file stream operations, opening and closing of files, stream state member functions, binary file operations, structures and file operations, classes and file operations, I/O with multiple objects, error handling, sequential and random access file processing. STL: Containers, Algorithms, Iterators, RTTI

Pedagogy:
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Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

- Herbert Schildt, C++ : The Complete Reference, Tata McGraw-Hill.
- Paul Deitel and Harvey Deitel, C++ How to Program, Pearson Education.
- Robert Lafore, Object Oriented Programming in C++, Pearson Education.
- Bjarne Stroustrup, The C++ Programming Language, Addition Wesley Publication Co.
- Stanley B. Lippman, Josee Lajoie, Barbara E. Boo, C++ Primer, Addition Wesley Publication Co.
- E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw-Hill

Scheme of Examination

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Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-II

Information Systems (Subject Code: MCA-124)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

This course will focus on what MIS are, how they influence your current or prospective jobs, why they impose specific - and sometimes seemingly absurd - operational procedures, and how to use this knowledge to your advantage in your professional life. On completion of this course, students should be able to:

- Understand Management Information Systems (MIS) and their role in today's organizations
- Become familiar with the major trends in MIS and MIS infrastructures (Cloud, Big Data, ERPs, outsourcing) and how these evolutions will affect workplaces and business strategies

Course content

SECTION A

Introduction to Systems and Basic Systems Concepts, Types of Systems, Information Systems: Definition and Characteristics, Types of Information, Role of Information in Decision Making, Types of an Information system: Operations Support Systems and Management Support Systems, Comparison of EDP/MIS/DSS.
An overview of Management Information System: Definition and Characteristics, Components of MIS, Frame Work for Understanding MIS: Robert Anthony's Hierarchy of Management Activity, Information requirements and Levels of Management, Simon's Model of decision- Making.

SECTION B

Functional Information Systems: A Study of Marketing, Personnel, Financial and Production information systems, Input transaction documents, applications and reports of Marketing, Personnel, Financial and Production information systems. Models for functional information systems.
Concept of Knowledge: Definition and characteristics of knowledge, Difference between data, information and knowledge, Knowledge versus experience. Types of knowledge: Explicit and Tacit knowledge. Nonaka and Takeuchi theory of knowledge creation: Socialization, Externalization, Combination and Internalization (SECI) Model. Introduction to knowledge management and knowledge management systems. The process of knowledge management: Creation/ capture, storage and retrieval, transfer and application.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

- D.P. Goyal, Management Information Systems: Managerial Perspectives, Macmillan India Ltd.
- Jerome Kanter, Management Information Systems, Prentice Hall of India.
- Gordon B. Davis & M.H. Olson, Management Information Systems: Conceptual Foundations, structure & Development, McGraw-Hill Publishing.
- Robert G. Murdick, Joel E. Ross & James R. Claggett, Information Systems for Modern Management, Prentice Hall of India.
- W.S. Jawadekar, Management Information Systems, Tata McGraw Hill Publishing.
- Bryan Bergeron, Essentials of Knowledge Management, John Wiley and Sons.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 0 T 0 P 4 per week Credit 2

Masters in Computer Applications
Semester-II
Programming Lab - II (OOP using C++) (Subject Code: MCA-126)

Maximum Marks: 100* **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Practical units to be conducted: 35-45**

This laboratory course will mainly comprise of exercises on the basis of the theory paper: MCA-123 (Object Oriented Programming using C++)

*The splitting of marks is as under:

- Maximum Marks for Continuous Assessment: 60
- Maximum Marks for University Examination: 40

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

NOTE: The examiner will give due weightage to Logic development/ Program execution, Lab records and viva-voce of the student while awarding marks to the student during end-semester final practical examination.

L 0 T 0 P 4 per week Credit 2

Masters in Computer Applications
Semester-II
Programming Lab - III (Data and File Structures) (Subject Code: MCA-127)

Maximum Marks: 100* **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Practical units to be conducted: 35-45**

This laboratory course will mainly comprise of exercises on the basis of the theory paper: MCA-121 (Data and File Structures)

*The splitting of marks is as under:

- Maximum Marks for Continuous Assessment: 60
- Maximum Marks for University Examination: 40

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

NOTE: The examiner will give due weightage to Logic development/ Program execution, Lab records and viva-voce of the student while awarding marks to the student during end-semester final practical examination.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-II
Computer Oriented Statistical Methods (Subject Code: MCA-125 E1)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

The objective of this course is to provide conceptual understanding of various statistical methods, in particular, with reference to frequency distribution and measures of central tendency, measures of dispersion, skewness and kurtosis, theory of probability, linear programming problems, transportation, assignment and game problems. Important theorems and different formulae for various statistical and optimization methods in the field of Computer Sciences and Applications are to be covered. Students will be able to:

- Formulate and solve linear programming problems and operations with nonlinear expressions.
- Able to find the mean and the variance of a random variable.
- Able to find the confidence interval for the mean of a normal population from a sample.
- Able to find the sample regression line.
- Ability to solve financial math problems.
- Ability to solve basic problems in probability and statistics.

Course content

SECTION A

Basic Statistics: Preparing Frequency Distribution Table and Cumulative frequency,
Measure of Central Tendency: Types- Arithmetic mean, Geometric Mean, Harmonic Mean, Median, Mode. Measure of Dispersion: Range, Quartile Deviation, mean deviation, Coefficient of mean Deviation, Standard Deviation
Moments: Moments About mean, Moments about any point, Moment about origin, Moment about mean in terms of moment about any point, Moment about any point in terms of Moment about mean.
Probability Distribution: Random Variable- Discrete Random and Continuous Random variable, Probability Distribution of a Random Variable,
Mathematical Expectation Types: Binomial, Poisson, Normal Distribution, Mean and Variance of Binomial, Poisson, and Normal Distribution. Correlation: Introduction, Types, Properties, Methods of Correlation: Karl Pearson's Coefficient of Correlation, Rank Correlation and Concurrent Deviation method, Probable error.

SECTION B

Regression: Introduction, Aim of Regression Analysis, Types of Regression Analysis, Lines of Regression, Properties of Regression Coefficient and Regression Lines, Comparison with Correlation. Curve Fitting: Straight Line, Parabolic curve, Geometric Curve and Exponential Curve Bayes' Theorem in Decision Making, Forecasting Techniques. Sampling: Meaning, methods of Sampling,
Statistical Inference: Test of Hypothesis, Types of hypothesis, Procedure of hypothesis Testing, Type I and Type II error, One Tailed and two tailed Test, Types of test of Significance: Test of significance for Attribute-Test of No. of success and test of proportion of success, Test of significance for large samples - Test of significance for single mean and Difference of mean, Test of significance for small samples (t-test) – test the significance between the mean of a random sample, between the mean of two independent samples Chi square Test

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:

Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

1. Statistical Methods, S.P. Gupta, Sultan Chand and Sons.
2. An Introduction to Statistical Methods, C.B. Gupta and Vijay Gupta, Vikas Publishing House.
3. Fundamentals of Statistics, S.C. Gupta, Himalaya Publishing House.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter
The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-II
ERP Systems and Processes (Subject Code: MCA-125 E2)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

This course will explore the concepts, principles, and state-of-the-art methods in successfully integrating Enterprise Resource Planning (ERP) systems into extant enterprise architectures. At the completion of the course, students will be able to

- Describe the role of an ERP in carrying out business processes in a company
- Explain how 'best business practices' are incorporated in an ERP
- Strategize pricing, production and sales in a competitive commodity market
- Analyze sales data in an ERP to dynamically respond to changing market conditions to maximize profits
- Expedite production planning and control using tools provided in an ERP (e.g. MRP)

Course content

SECTION A

Introduction of ERP: Concept of Enterprise, ERP Overview, Integrated information system, The role of Enterprise, Business Modelling, Myths about ERP, Basic ERP Concepts, Intangible benefits of ERP, Justifying ERP investment, Risks of ERP, Benefits of ERP
ERP and related Technology: Business Intelligence, Data ware housing, Data mining, OLAP, Business Process Reengineering, SCM, CRM, ERP Security.
Modules of ERP: Basic modules of ERP Package, Human Resources Management, Financial Management, Inventory Management, Quality Management, Sales and Distribution

SECTION B

ERP for Industries: ERP for manufacturing Industry: ERP for petroleum, GAS companies, ERP for Automobile Industry, ERP for Pharmacy, ERP for FMCG, ERP for Mining industry; ERP for Service Industry: ERP for retail, ERP for healthcare, ERP for Educational Institution, ERP for Telecom, ERP for banks, ERP for Insurance companies.
ERP Implementation: ERP Lifecycle implementation, Implementation Methodologies, ERP package selection, Reasons for failure and reasons for success of ERP implementation.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

1. Alexis Leon, ERP Demystified, Tata McGraw-Hill.

2. Rajesh Ray, Enterprise Resource Planning - Text and Cases, Tata McGraw-Hill.
3. David L. Olson, Managerial Issues of Enterprise Resource Planning Systems, Tata McGraw Hill.
4. Ellen Monk and Bret Wagner, Concepts in Enterprise Resource Planning, Cengage Learning.
5. Ashim Raj Singla, Enterprise Resource Planning, Cengage Learning.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-II

Programming Languages (Subject Code: MCA-125 E3)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

The objective of the course is to develop a greater understanding of the issues involved in programming language design and implementation. It will help in developing an in-depth understanding of functional, logic, and object-oriented programming paradigms. On completion of this course, student will be able to:

- Implement several programs in languages other than the one emphasized in the core curriculum
- Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing
- Improve the background for choosing appropriate programming languages for certain classes of programming problems
- Increase the ability to learn new programming languages
- Increase the capacity to express programming concepts and choose among alternative ways to express things

Course content

SECTION A

Need of studying Programming Languages, Evolution of Programming Languages, Criterion for Language Design, Computer Hardware, Firmware Computers, Translators and Software Simulators, Virtual Computers and Binding Times.
Type Checking, Strong Typing, Type Compatibility, Scope and Lifetime, Referencing Environment. Elementary and Structured Data Type.
Sequence Control: Within Expression, Between Statements, Non-arithmetic Expressions.
Subprogram Control: Sequence Control, Data Control, Parameter Transmission, Explicit Common Environment, Co-routines. Storage Management: Elements Requiring Storage, Programmer and System Controlled Storage, Static Storage, Heap Storage Management. Exception Handling

SECTION B

Functional Programming: Functions, Recursion, Control Structures, Implementation,
Introduction to Logic Programming: Concepts, Computing with Relations; Rules, Facts and Queries.
Concurrent Programming: Concepts, Parallelism in H/W, Implicit Synchronization, Concurrency as Interleaving, Liveness Properties, Safe Access to Shared Data, Concurrency in ADA Synchronized Access to Shared Variables.
Object Oriented Programming: Concepts, Objects, Classes, Instances, Abstraction, Data Encapsulation, Information Hiding, Inheritance, Polymorphism its Implementation in C++.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

- T.W. Pratt, M.V. Zelkowitz, Programming Languages: Design and Implementation, Pearson Education.
- Robert W. Sebesta, Concepts of Programming Languages, Pearson Education.
- Ravi Sethi and K.V. Viswanatha, Programming Languages: Concepts and Constructs, Pearson Education.
- Michael Marcotty and Henry F. Ledgard, Programming Languages Landscape: Syntax, Semantics and Implementation, SRA Publishers.
- Allen B. Tucker, Robert E. Noonan, Programming Languages: Principles and Paradigms, Tata McGraw Hill.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter
The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.

L 4 T 0 P 0 per week Credit 4

Masters in Computer Applications
Semester-II
Web Technologies (Subject Code: MCA-125 E4)

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

The objective of this course is to develop an ability to design and implement static and dynamic website. A student will be familiar with client server architecture and able to develop a web application. At the end of the course, students should be able to:

- Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's.
- Have a Good grounding of Web Application Terminologies, Internet Tools, E – Commerce and other web services.
- Write a well formed / valid XML document.
- To write server side programs using PHP.

Course content

SECTION A

Internet Basics: Networks, Protocols, TCP/IP, Internet Addresses, Ports, Sockets, Name Resolution, Firewalls, Protocol Tunneling, Proxy Servers, Internet Standards, governing the web HTTP, MIME, Inside URLs, Web applications, Overview of clients/servers web communication, comparison of web servers, Common Gateway Interface CGI.
Web Page Designing: Introduction to markup languages;
HTML: list, table, images, frames, forms, pages style sheets CSS;
XML: DTD, XML Namespaces, XML schemes, Presenting XML with CSS and XSLT, XML-DOM, What is XHTML?

SECTION B

Client Side Scripting: Java script: Introduction, documents, forms, statements, functions, objects;
Event and event handling; Browsers and the DOM, JQuery: Syntax, Selectors, Events and AJAX methods.
Server Side Programming: PHP: Introduction, requirements, PHP syntax, data type, variables, strings, operators, if-else, control structure, switch, array, function, file handling, form, sending email, file upload, session/state management, error and exception, PHP Database for dynamic Web pages.
Introduction to Servlets: Servlet Basic Servlet Structure, Servlet Lifecycle, Servlet APIs. Writing thread safe Servlets. Setting Cookies and Session Management with Servlet API.

Pedagogy:
The Instructor is expected to use leading pedagogical approaches in the class room situation, research-based methodology, innovative instructional methods, extensive use of technology in the class room, online modules of MOOCS, and comprehensive assessment practices to strengthen teaching efforts and improve student learning outcomes.

The Instructor of class will engage in a combination of academic reading, analyzing case studies, preparing the weekly assigned readings and exercises, encouraging in class discussions, and live project based learning.

Case/Class Discussion Assignments:
Students will work in groups of up to four to prepare a brief write-up due before the start of each class covering the case study or class material to be discussed in the next session. Questions may include a quantitative analysis of the problem facing the decision-maker in the case.

Class Participation:
Attendance will be taken at each class. Class participation is scored for each student for each class.

Text and Readings: Students should focus on material presented in lectures. The text should be used to provide further explanation and examples of concepts and techniques discussed in the course:

- Jeffrey C. Jackson, Web Technology – A computer Science perspective, Pearson Education.
- Chris Bates, Web Programming – Building Internet Application, Wiley India.
- Xavier C., Web Technology and Design, New Age International.
- Ivan Bayross, HTML, DHTML, Java Script, Perl & CGI, BPB Publication.
- Ramesh Bangia, Internet and Web Design, New Age International.
- Mahesh Bhave and S.A. Patekar, Programming with Java, Pearson Education.
- Ullman, PHP for the Web: Visual Quick Start Guide, Pearson Education.
- Paul J. Deitel, Java for Programmers, Pearson Education.
- Dustin R. Callaway, Inside Servlets, Pearson Education.

Scheme of Examination

- English will be the medium of instruction and examination.
- Written Examinations will be conducted at the end of each Semester as per the Academic Calendar notified in advance
- Each course will carry 100 marks of which 50 marks shall be reserved for internal assessment and the remaining 50 marks for written examination to be held at the end of each semester.
- The duration of written examination for each paper shall be three hours.
- The minimum marks for passing the examination for each semester shall be 40% in aggregate as well as a minimum of 40% marks in the semester-end examination in each paper.
- A minimum of 75% of classroom attendance is required in each subject.

Instructions to the External Paper Setter

The external paper will carry 50 marks and would be of three hours duration. The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all. Candidates will be required to attempt four questions in all from section A and B selecting not more than two questions from each of these groups. Section C shall be compulsory.

Instructions for candidates

- Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
- Use of non-programmable scientific calculator is allowed.