Syllabus for

Master of Computer Applications

(MCA)

Semester: I - IV

Session: 2026-27

Directorate of Online Studies

Guru Nanak Dev University

(ESTABLISHED UNDER STATE LEGISLATURE ACT NO. 21 OF 1969)
Accredited by National Assessment and Accreditation Council (NAAC) At 'A++' Grade (Highest Level) As Per Modified Criteria Notified On 27/07/2017 And Conferred 'University with Potential for Excellence' Status and 'Category-I University' As Per University Grants Commission (F. No. 1-8-2017/(CPP-II) Dated 12/02/2018)

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Note:

(i) Copy rights are reserved. Nobody is allowed to print it in any form.Defaulters will be prosecuted.

(ii) The syllabi are subject to change therefore, visit the website from time to time to keep yourself updated.

(iii) This is a new syllabus applicable from the session 2023-24 for students admitted in 1st Semester in July 2023 and the syllabus for previous batches may please refer to the old syllabus for the session 2021-22 and 2022-23 depending upon the date of admission.

MASTER OF COMPUTER APPLICATIONS (SEMESTER SYSTEM) under Directorate of Online Studies, Guru Nanak Dev University, Amritsar

Eligibility:

BBA/ B.com. / B.Sc. (Regular/ Hons.) Economics or Graduate in any stream with Mathematics/ Statistics/ Computer Sciences/ Computer Applications/ IT/ Computer Maintenance/ Quantitative Techniques as one of the elective subjects with 50% marks (45% for SC/ST) in aggregate or any equivalent degree thereto.

OR

Bachelor's degree in any stream with 50% marks (45% for SC/ST) in aggregate with Mathematics as an elective subject at +2 level.

SEMESTER-I

			Marks			
Sr. No.	***Sub Code***	***Subject***	Internal Assessment	**End Term**	**Total**	Credits
1.	OLMCA111T	Design and Analysis of Algorithms	30	70	100	4
2.	OLMCA112T	System Software	30	70	100	4
3.	OLMCA113T	System Simulation	30	70	100	4
4.	OLMCA114T	Design of Programming Languages	30	70	100	4
5.	OLMCA115P	Programming Lab-I	30	70	100	4
6.	OLMCA116T	Secure software development	30	70	100	**4**
		Grand Total:	**180**	**420**	**600**	**24**

SEMESTER-II

			Marks			
Sr. No.	***Sub Code***	***Subject***	Internal Assessment	**End Term**	**Total**	Credits
1.	OLMCA211T	Open Source Software	30	70	100	4
2.	OLMCA212T	Distributed Systems	30	70	100	4
3	OLMCA213T	Web Technologies	30	70	100	4
4.	OLMCA214T	Microprocessor & its Applications	30	70	100	4
5	OLMCA215p	Programming Laboratory-II	30	70	100	4
6	OLMCA216T	Information Systems and Security	30	70	100	4
		Grand Total	**180**	**420**	**600**	**24**

SEMESTER-III

			Marks			
Sr. No.	*Sub Code*	*Subject*	Internal Assessment	End Term	Total	credits
1.	OLMCA311T	Advanced Software Engineering	30	70	100	4
2.	OLMCA312T	Soft Computing	30	70	100	4
3.	OLMCA313T	Data Warehousing and Data Mining	30	70	100	4
4.	OLMCA314T	Advanced Computer Architecture	30	70	100	4
5.	OLMCA315T	Cloud Native Application development	30	70	100	4
6.	OLMCA316P	Programming Lab-III	30	70	100	4
		Grand total	**180**	**420**	**600**	**24**

SEMESTER-IV						
			Marks			
Sr. No.	**Sub Code**	**Subject**	Internal Assessment	**End Term**	**Total**	**Credits**
1.	OLMCA411P	Major Project/Industrial Training/Dissertation	180	420	600	24

Master of Computer Applications (SEMESTER – I)

OLMCA111T: DESIGN AND ANALYSIS OF ALGORITHMS

Time: 03 Hours **Max. Marks: 100 Marks**
Internal Assessment: 30 Marks
End Term: 70 Marks

Instructions for the Paper-Setter/examiner:

1. Question paper shall consist of **Four sections**.
2. Paper setter shall set **Eight questions** in all by selecting **Two questions** of equal marks from each section. However, a question may have sub-parts (not exceeding four sub-parts) and appropriate allocation of marks should be done for each sub-part.
3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections.**
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

SECTION–A

A Revision of Algorithm concepts: Asymptotic notation, Design of efficient algorithms, complexity analysis of sorting and searching Algorithms, Complexity analysis of Iterative and Recursive algorithm.

Design Strategies: Brute Force Method, Divide-and-conquer.

SECTION–B

Greedy Method: Knapsack problem, Huffman coding, Job Sequencing with Deadline, Optimal Merge Pattern, Prim‟s Algorithm and Kruskal‟s Algorithm.

Dynamic Programming: Matrix Chain multiplication, 0/1 knapsack problem, Longest Common Subsequence, Travelling Salesman problem, Multistage Graph, All pair shortest path, optimal binary search trees.

SECTION–C

Back-tracking: 8 Queen‟s problem, Hamiltonian Circuit, Graph Coloring, Sum of subset.

Branch-and-bound: Assignment Problem, Knapsack problem, Travelling Salesman problem.

SECTION–D

Algorithms on Graphs: Depth/Breadth First search, Dijkstra Algorithm and Bellman Ford Algorithm

Problem Classes: P, NP, NP-Hard and NP- Complete.

References:

1. Cormen T.H., Leiserson C.E., Rivest R.L., Introduction to Algorithms, PHI, 2000.
2. Horowitz E., Sahni S., Rajasekaran S., Computer Algorithms, Galgotia Publications, 1999.
3. Aho A.V., Hopcroft J.E. Ullman J.D., The Design and Analysis of Computer Algorithms, Pearson Education Asia, 1998, 1974
4. Knuth D.E., The Art of Computer Programming, Volume 1 (Fundamental Algorithms), Narosa Publishing House, 1973

5. Knuth D.E., The Art of Computer Programming, Volume 3 (Sorting and Searching), Addison–Wesley, 1973.
6. http://swayam.gov.in/
7. http://edx.org formerly http://mooc.org/
8. http://epgp.inflibnet.ac.in/

Master of Computer Applications (SEMESTER – I)

OLMCA112T: SYSTEM SOFTWARE

Time: 03 Hours **Max. Marks: 100 Marks**

Internal Assessment: 30 Marks

End Term: 70 Marks

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3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections.**
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

SECTION A

Introduction to System Software Evolution of System Software, components of system software, Translators, loaders, interpreters, compiler, assemblers.

Assemblers Overview of assembly process, design of one pass and two assemblers.

SECTION B

Macroprocessors Macro definition and expansion, concatenation of macro parameters, generations of unique labels, conditional macro expansion, Recursive macro expansion.

SECTION C

Compilers Phases of compilation process, lexical analysis, parsing, storage management optimisation. Incremental compilers, cross compilers, P code compilers.

SECTION D

Loaders and Linkage editors Basic loader functions. Relocation, program linking, linkage, editors, dynamic linking, bootstrap loaders.

Operating System, Text Editor, Interactive debugging systems.

Other System Software

References :

1. Leland L. Beck : System Software, An introduction to system programming, Addison Wesley.
2. D.M. Dhamdhere : Introduction to System Software, Tata McGraw Hill.
3. D.M. Dhamdhere : System Software and Operating System, Tata McGraw Hill, 1992.
4. Madrich, Stuarte : Operating Systems, McGraw Hill, 1974.
5. Stern Nancy Assembler Language Programming for IBM and IBM compatible computers, John Wiley, 1991.
6. http://swayam.gov.in/
7. http://edx.org formerly http://mooc.org/
8. http://epgp.inflibnet.ac.in/

Master of Computer Applications (SEMESTER – I)

OLMCA113T**: SYSTEM SIMULATION**

Time: 03 Hours **Max. Marks: 100 Marks**
Internal Assessment: 30 Marks
End Term: 70 Marks

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3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections.**
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

SECTION-A

Introduction : Concept of a system, stochastic activities, continue and discrete system, system modeling, mathematical modeling, principle used in modeling.

Simulation of Systems : Concepts of simulation of continuous systems with the help of two examples; use of integration formulas; concepts of discrete system simulation with the help of two examples, Generation of random numbers, Generation of non-uniformly distributed numbers.

SECTION-B

Simulation of Queuing Systems : Rudiments of queuing theory, Simulation of Single-Server queue, two-server queue, general queues.

SECTION-C

Simulation in Inventory Control and Forecasting: Elements of inventory theory, inventory models, Generation of Poisson and Erlang variants, forecasting and regression analysis.

Design and Evaluation of Simulation Experiments: Experimental layout and validation.

SECTION-D

Simulation Languages: Continuous and discrete simulation languages, Block-Structured continuous simulation languages, expression based languages, discrete system simulation languages, Simscript, GPSS, SIMULA, factors in selection of a discrete system simulation languages.

References :

1. Narsingh Deo, "System Simulation with Digital Computer", Prentice-Hall of India Pvt. Ltd. - 1993.
2. Gordon, "System Simulation", Prentice Hall of India Pvt. Ltd. – 1993
3. http://swayam.gov.in/
4. http://edx.org formerly http://mooc.org/
5. http://epgp.inflibnet.ac.in/

Master of Computer Applications (SEMESTER – I)

OLMCA114T: Design of Programming Languages

Time: 03 Hours **Max. Marks: 100 Marks**
Internal Assessment: 30 Marks
End Term: 70 Marks

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3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections.**
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

SECTION–A

Study of Programming Languages: Brief History, Feature of a good language
Programming Language Processor: Translator and software simulator computer, syntax semantics and virtual computers.
Specifications and Implementation of Elementary and Structured Data Types. Type equivalence, checking and conversion. Vectors and Arrays, Lists, Structures, Sets, Files.

SECTION–B

Abstraction, encapsulation and information hiding subprograms, type definitions, abstract data types Sequence control with Expressions, Conditional Statements, Loops, Exception handling. Subprogram definition and activation, simple and recursive subprogram, subprogram environment.

SECTION–C

Scope – Static and Dynamic, Block structures, Local Data and Shared Data, Parameters and Parameter Transmission. Local and Common Environments, Tasks and Shared Data.
Static and Stack-Based Storage management. Fixed and Variable size heap storage management, Garbage Collection.

SECTION–D

Syntax and Translation: Syntactic elements of a language, stages in translation, formal definition of syntax
Operating and Programming Environment: Batch processing, interactive, embedded, programming environments

Text/References:

1. Programming languages: design and implementation, Terrence W. Pratt., Pearson
2. Programming languages: concepts and constructs, Ravi Sethi, ISBN 9780201590654.
3. Programming Language Pragmatics, Scott, ELSEVIER
4. http://swayam.gov.in/
5. http://edx.org formerly http://mooc.org/
6. http://epgp.inflibnet.ac.in/

Directorate of Online Studies (DOS)

Master of Computer Applications (SEMESTER – I)

OLMCA115P: PROGRAMMING LAB-I

Time: 03 Hours

Max. Marks: 100 Marks
Internal Assessment: 30 Marks
End Term: 70 Marks

Practical based on Design and Analysis of Algorithms.

Examples on: Sorting and Searching Algorithm, Brute Force Method, Divide and Conquer Technique, Greedy Method, Dynamic Programming, Backtracking method, Branch and Bound Method, Graph Problems.

Programming Languages

System Software

OLMCA116T**: Secure Software Development**

Master of Computer Applications (SEMESTER – I)

Time: 03 Hours **Max. Marks: 100 Marks**

Internal Assessment: 30 Marks

End Term: 70 Marks

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3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections.**
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

SECTION–A

Fundamentals and requirement level analysis: Introduction, background, How Does Software Fail, Characteristics of Secure and Resilient Software, Software security life cycle, Software quality attributes, Security requirement gathering principles and guidelines, A case Study.

SECTION–B

Vulnerabilities during implementation, consequences, and prevention: The Evolution of Software Attacks , Buffer overflow, Format string bug SQL Injection, Data Validation vulnerabilities mitigation techniques, Cross-site Scripting, Cross-site Request Forgery, Session management, Replication of vulnerabilities and exploitation, Secure programming for preventing BOF, FSB, SQLI, XSS, session.

SECTION–C

Mobile application security: Mobile application security, Security and cryptographic techniques, Malware classification and analysis.

SECTION–D

Design and testing for security, best practices: Secure software design principles, Static analysis techniques, Security testing of Software Applications.

Course Outcome:

- Analyze issues related secure software development methodologies.
- Apply a thorough understanding of secure coding principle.
- Select the most appropriate approach to secure software development.
- Judge and craft appropriate adaptations to the development process to make sure a secure deployment.
- Evaluate the implications and impact of secure architecture design.

References:

1. Secure and Resilient Software, Mark Merkow and LakshmikanthRaghavan, CRCPress, ISBN:9781439826973.
2. Software Security Engineering: A Guide for Project Managers , by Julia H. Allen, Sean J. Barnum Robert J. Ellison, Gary McGraw, Nancy R. Mead, Pearson Education ISBN13:9780321509178.
3. Iron-Clad Java: Building Secure Web Applications, Jim Manico and August Detlefsen, Oracle Press, ISBN-13:978-0071835886.
4. Security for Software Engineers, James N. Helfrich, Chapman and Hall/CRC, ISBN-13: 978-1138583825.
5. http://swayam.gov.in/
6. http://edx.org formerly http://mooc.org/
7. http://epgp.inflibnet.ac.in/

Directorate of Online Studies (DOS)

OLMCA211T: Open Source Software

Time: 03 Hours **Max. Marks: 100 Marks**

Internal Assessment: 30 Marks

End Term: 70 Marks

Instructions for the Paper-Setter/examiner:

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3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections.**
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

Section–A

Introduction to Free/Libre Open Source Software, Legal Aspects of Open source Software, Free/Libre Open Source Software Business Models, Free/Libre Open source Software Developers& Communities

Section–B

Assessment of Free/Libre Open source Projects, Tools and infrastructures for FLOSS Development, Humanitarian and Free Open Source Software, How to participate in Free/Libre Open Source Software Projects, Hands on training on using the Git version control system

Section–C

FLOSS Documentation, Free/Libre Open Source Software quality and measures of software quality, Free/Libre Open Source Software security and other issues

Section–D

Free/Libre Software Development Processes, Commercial firm support, OSS ecosystems, Mining software repositories, OSS research challenges

Course Outcome:

- Can identify the licensing of Open Source Systems (OSS) and make decisions on their use, based on an understanding of the legal, economical and technical issues.
- Develop the knowledge and skills to use a version control system to explore code repositories.
- Build their own or participate in an existing OSS project.
- Knowledge of community dynamics of OSS projects.

References:

1. Open Source for Business: A Practical Guide to Open Source Software Licensing, 2nd Edition by Heather Meeker
2. Managing 3rd-Party Software Licenses, by Giles Middleton (2016)
3. Open Sources: Voices from the Open Source Revolution, O‟Reilly Media, by Eric S. Raymond (1999)
4. The Art of Community: Building the New Age of Participation, O‟Reilly Media, by Jono Bacon (2012)
5. The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary, O‟Reilly Media, by Eric Raymond (1999)
6. The Software Paradox, O‟Reilly Media, by Stephen O‟Grady (2015)
    a. The Success of Open Source, by Steven Weber
7. http://swayam.gov.in/

8. http://edx.org formerly http://ocw.mit.edu/
9. http://epgp.inflibnet.ac.in/

Directorate of Online Studies (DOS)

OLMCA212T: DISTRIBUTED SYSTEMS

Time: 03 Hours **Max. Marks: 100 Marks**

Internal Assessment: 30 Marks

End Term: 70 Marks

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3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections.**
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

SECTION–A

Distributed Systems – Basic characteristics, benefits over centralized systems, challenges, Design Issues, fallacies; System Models – physical, architectural, and fundamental, client-server and peer to peer systems; Role of middleware;

SECTION–B

communication - message passing and distributed shared memory; Inter process communication – direct, multicast, indirect, RPC, RMI, IPC in Unix.

SECTION–C

Operating System support; Time and Global states; Coordination and agreement; Distributed transactions and concurrency control; Replication;
Security challenges – perimeter defence, authentication schemes, access control technologies;

SECTION–D

Reliable distributed computing – why do systems fail, how to overcome failures; Computing in the clouds, Google as a case study.

Prescribed Text:
Distributed Systems, Concepts and Design, by Coulouris, Dollimore, and Kindberg, 5th ed., 2012.

References:

1. Andrew S. Tanenbaum, Distributed Operating Systems, ACM Press.
2. Jie Wu, Distributed Systems, CRC Press.
3. Hagit Attiya, Jennifer Welch, Distributed Computing: Fundamentals, Simulations and Advanced Topics, McGraw-Hill.
4. Kai Hwang, Geoffrey Fox, Jack Dongarra, Distributed Computing and Cloud Computing – from parallel processing to Internet of Things, Morgan Kaufmann, Elsevier, 2012.
5. Kenneth P. Birman, Guide to Reliable Distributed Systems, Springer, 2012.
6. Mukesh Singhal and NiranjanShivaratri, Advanced Concepts in Operating Systems, McGraw-Hill.
7. Nancy Lynch, Distributed Algorithms, Morgan Kaufmann.

8. Sape Mullender (ed.), Distributed Systems, Addison-Wesley.
9. http://swayam.gov.in/
10. http://edx.org formerly http://mooc.org/
11. http://epgp.inflibnet.ac.in/

Master of Computer Applications (SE-MESTER – II)

Directorate of Online Studies (DOS)

Master of Computer Applications (SEMESTER – II)
OLMCA213T: WEB TECHNOLOGIES

Time: 03 Hours **Max. Marks: 100 Marks**
Internal Assessment: 30 Marks
End Term: 70 Marks

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3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections.**
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SECTION–A

Web Essentials, Markup languages, CSS
Basics of Client side programming, Java script language, java script objects, host objects, Browsers and DOM

SECTION–B

Basics of Server side programming, Java servlets- Life cycle, Servlet API, Reading Servlet parameters, Handling HTTP requests and responses, Cookies and Session Tracking ASP/JSP, Basics of ASP/JSP objects, simple ASP and JSP pages

SECTION–C

Representing Web data, Data base connectivity, JDBC, Dynamic web pages, XML, DTD, XML schema, DOM, SAX, XQuery, Building web applications, cookies, sessions, open source environment
Introduction to PHP, basics, PHP File handling, file upload, cookies, error handling, PHP MySQL introduction

SECTION–D

Middleware technologies, Ecommerce architecture and technologies, Ajax, Advanced web technologies and tools
Case Studies: PHP and MySQL case studies.

References:

1. Jeffery C Jackson, "Web Technology-A Computer Science Perspective", Pearson Education, 2007.
2. Chris Bates, "Web Programming- Building Internet Applications", Wiley India, 2006.
3. http://swayam.gov.in/
4. http://edx.org formerly http://mooc.org/
5. http://epgp.inflibnet.ac.in/

Master of Computer Applications (SEMESTER – II)
OLMCA214T Microprocessor and its Applications

Time: 03 Hours **Max. Marks: 100 Marks**
Internal Assessment: 30 Marks
End Term: 70 Marks

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SECTION A

Introduction: Introduction to Microprocessor, Microcontroller and Microcomputer, different types of microprocessors - Intel, AMD, Motorola, and their suitability to different types of applications. Evolution of the microprocessor product line.
Architecture of a Microcomputer: General Architecture of a microcomputer system. Microprocessor unit, input unit, output unit, memory unit and auxiliary storage unit.

SECTION B

Architecture of 8086/ 8088 Microprocessor: Description of various pins, configuring the 8086/8088 microprocessor for minimum and maximum mode systems description of maximum system mode interfaces, internal architecture of the 8086 / 8088 microprocessor, system clock, Bus cycle, instruction execution sequence.
Memory Interface of the 8086 / 8088 microprocessor: Address space and Date organization, generating memory addresses, hardware organization of the memory address space, memory bus status codes, memory control signals, read/write bus cycles, the role of stack in intrrupts and subroutine cells; demultiplexing the address data bus, program and data storage memory, dynamic RAM system.

SECTION C

Input /Output Interface of the 8086 / 8088 microprocessor: I/O Interface, I/O address space and data transfers, I/O instructions, I/O bus cycles, Output ports, 8255A Programmable Peripherals Interface (PPI), memory– mapped, I/O, serial communication interface (USART and UART) – the RS–232 C interface, 8251A programmable communication interface, special purpose interface controllers.
Interrupt Interface of 8086/8088 microprocessor: What is interrupt? Types of interrupt, Interrupt Vector Table (IVT)

SECTION D

8086/8088 assembly language programming: General structure of an assembly language program, steps in the development of an assembly language program, Assembly language V/S machine language, addressing modes, Instruction set: data movement instructions, arithmetic instructions, logical instructions, shift and rotate instructions, jumping and looping instructions, string processing, interrupt instructions, stack operations, subroutines, handling instructions, defining and using macros.
Programming exercises must be designed to show how the input/output is performed. How decisions are made and how loops can be set in an assembly language program.

References:

1. Walter Triebel: The 8086 Microprocessor – Architecture, Software and Interfacing Techniques, PHI, Delhi.
2. Walter Triebel: The 8088 Microprocessor – Architecture, Software and Interfacing Techniques, PHI, Delhi.
3. Douglas V. Hall: Microprocessors and Interfacing – Programming and Hardware, Tata McGraw Hill Publishing Company Ltd., New Delhi.
4. Peter Abel: IBM PC Assembly Language and Programming, PHI, Delhi.

Directorate of Online Studies (DOS)

Master of Computer Applications (SEMESTER – II)

OLMCA215P**: PROGRAMMING LAB-II**

Time: 03 Hours **Max. Marks: 100 Marks**

Internal Assessment: 30 Marks

End Term: 70 Marks

- Programming Exercises based on Machine Learning
- Web technologies

Directorate of Online Studies (DOS)

Master of Computer Applications (SEMESTER – II)
OLMCA216T: Information Systems and Security

Time: 03 Hours **Max. Marks: 100 Marks**
Internal Assessment: 30 Marks
End Term: 70 Marks

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3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections.**
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

SECTION–A

An Introduction to Information System: Information Concepts, System Concepts, Business Information Systems, Information Systems in society, business and Industry, Information Systems in Organizations

Management Information System

Decision Support Systems (DSS): Conceptual Foundations of DSS, Concepts of DSS, DSS Software, Strategies for DSS, Group Support Systems, Executive Support System (ESS)

SECTION–B

Knowledge Management systems: Fundamentals of Knowledge Based Decision Support; Artificial Intelligence and Expert systems, Expert System & its integration with DSS.

Other Information Systems like Supply chain management, Customer Relationship Management (CRM), Electronic Commerce and Mobile Commerce, Distributed Information System (DIS)

SECTION–C

Information Security for Business – threat landscape and risk of information exposure, legal, ethical, and privacy issues

Overview of computer security: threats, vulnerabilities, controls, risk, confidentiality, integrity, availability, security policies, security mechanisms, prevention, detection, deterrence, Malicious code, viruses, Trojan horses, worms

Network and Computer Security: Introduction, Network Security, Computer Security (kinds of data, Authentication and Authorization, access control, system vulnerabilities, system security tools),how to track and identify the packets involved in a simple TCP connection. to use networking tools such as WireShark, and network mapping tools, such as NMap

Biometric Security

SECTION–D

Cyber Security: Introduction of cybercrime, the evolution of cybercrime, challenges of cyber Crime, categorizing cybercrime, cyber terrorism, virtual crimes, and perception of Cyber criminals different threats and motivations as well as the types of cyber attacks.

Attacks covered in the course include, malware, protocol based attacks (spoofing, session hijacking, caches poisoning, etc.), Denial-of-Service, and attacks on the web. Also included in this course are psychological aspects of information security, vulnerabilities of computer networks, and cyber warfare.

Security Management: Security Management: why security management, Standards, Security Policies and Controls, Risk Management, Legal Regulations, Incident Management

Course Outcome:

- An understanding of key principles in the area of Information Systems.
- An understanding of fundamental concepts of Business Information Systems and theirintegration with organizations
- The skill to examine managerial and organizational matters, apply appropriatecomprehension to come up with resolutions, and make commendations.
- The ability to make use of Decision Support Systems concepts in decision making.
- The skill to use knowledge acquired from Distributed Information Systems,Knowledge Management Systems, Customer Relationship Management to improvedecision making and business administration.
- The skill to cooperate as a team associate in varying responsibilities in a diversegroup and communicate efficiently.
- An understanding of computer, network, and cyber security.

References:

1. Principles of Information Systems: A Managerial Approach, Ralph Stair and George Reynolds, Cenage Learning, 2008
2. Management Information Systems, Laudon C. Kenneth &Laudon P.Janes, Pearson Education, 2002
3. Decision Support Systems & Intelligent Systems Turban Ejraini& Aronson E. Jay, Pearson Education, 2001
4. Information Systems, Alter Steven, 3rd Edition, Pearson Education, 2000.
5. An Introduction to Information Security and ISO27001:2013, by Steve G Watkins, by IT Governance Publishing, 2013
6. Computer Security: Principles and Practice,W. Stallings, 2nd Edition, Prentice Hall, ISBN: 0132775069, 2011
7. Introduction to Computer Security, Matt Bishop, Addison-Wesley, 2005
8. Introduction to Information Security Risk Management, Prentice-Hall of India, 2000
9. Handbook of information Security,Bidgoli , John willy& sons.
10. http://swayam.gov.in/
11. http://edx.org formerly http://mooc.org/
12. http://epgp.inflibnet.ac.in/

Directorate of Online Studies (DOS)
Master of Computer Applications (SEMESTER – III)
OLMCA311T: ADVANCED SOFTWARE ENGINEERING

Time: 03 Hours **Max. Marks: 100 Marks**
Internal Assessment: 30 Marks
End Term: 70 Marks

Instructions for the Paper-Setter/examiner:

1. Question paper shall consist of **Four sections**.
2. Paper setter shall set **Eight questions** in all by selecting **Two questions** of equal marks from each section. However, a question may have sub-parts (not exceeding four sub-parts) and appropriate allocation of marks should be done for each sub-part.
3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections**.
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

SECTION– A

Software Project Management:
Fundamentals of Software project planning, Conventional Software Management, Evolution of Software Economics, Improvement of Software Economics, Comparison of old and modern ways of Software Management.

SECTION – B

Software Re-engineering: Introduction Re-engineering, Restructuring and Reverse Engineering, Re-engineering existing systems, Data Re-engineering and migration, Software Reuse and Re-engineering.

SECTION – C

Object-Oriented (OO) Measurements:
Introduction, Why metrics ?, Classification of OO metrics, Study of Design Metrics- method size, method internals, class size, class inheritance, Method inheritance, class intervals and class externals.

Object-Oriented Analysis and Design:
OOAD Methodologies (Booch, Rumbaugh and Jacobson), Unified Software Development Process (Rational Unified Process)

SECTION – D

Component Based Software Engineering:
Component Based Software Engineering: Basic Concepts, Specification of software components, Component Models (COM/COM+/DCOM/.NET, Enterprise JavaBeans)

References:

1. Walker Royce, Software Project Management, Pearson Education, ISBN: 9780201309584, 2004.
2. Robert S. Arnold, Software Re-engineering, IEEE Comp. Society, ISBN: 9780818632723, 2003.
3. Lorenz and Kidd, Object Oriented Software Metrics, Prentice Hall, ISBN 978- 0131792920, 2001.
4. Booch, Object-Oriented Analysis and Design with Applications, Addison-Wesley Professional, 3rd Edition, ISBN: 978-0201895513, 2007.
5. Pressman, "Software Engineering" Prentice Hall, ISBN 978-0131792920, 2001.
6. IvicaCrnKovics Magnus Larsson (eds.) "Building reliable component based software systems" Artech House, 2002 ISBN – 1-58053327-2.
7. http://swayam.gov.in/
8. http://edx.org formerly http://mooc.org/
9. http://epgp.inflibnet.ac.in/

Directorate of Online Studies (DOS)

Master of Computer Applications (SEMESTER – III)
OLMCA312T : SOFT COMPUTING

Time: 03 Hours **Max. Marks: 100 Marks**
Internal Assessment: 30 Marks
End Term: 70 Marks

Instructions for the Paper-Setter/examiner:

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2. Paper setter shall set **Eight questions** in all by selecting **Two questions** of equal marks from each section. However, a question may have sub-parts (not exceeding four sub-parts) and appropriate allocation of marks should be done for each sub-part.
3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections**.
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

SECTION–A

Introduction to Evolutionary Computing & Genetic Algorithms. Introductionto Genetic Algorithms, Goals of Optimization, How Genetic Algorithms work, A Simple Genetic Algorithm‟s Computer Implementation highlighting Reproduction by Selection,

SECTION–B

Crossover, Mutation. Advanced GA Techniques Mapping Objective Function to Fitness Form, Fitness scaling, discretization, Different types of Selection and Crossover techniques. A case study of Travelling Salesman Problem using GA Techniques. Introduction to other Evolutionary Techniques: PSO, Simulated Annealing and Ant Colony Optimization.

SECTION–C

Basics of Neural Networks: Fundamental concept, Model of an Artificial Neuron, Neural Network Architectures, Various types of Learning and Activation Functions. Supervised Learning: Perceptron learning, Linear Separability, Delta Rule or Widrow Hoff Rule, Back Propagation algorithm, ADALINE, MADALINE and Associative Memories.

SECTION–D

Un–supervised Learning: Kohonen Self Organization Feature maps and Adaptive Resonance Theory. Introduction to Fuzzy Logic and Fuzzy Sets, Fuzzy Relations, Fuzzy fication, Defuzzy fication. Introduction to Hybrid soft Computing. Applications of Advance Computing in Pattern Recognition, Signal Processing & Image Retrieval.

References:

1. David E. Goldberg, Genetic Algorithms in Search Optimization and Machine Learning, Pearson Education.
2. S. N. Sivanandam, S. N. Deepa, Principles of Soft Computing, Wiley Publications.
3. How to Solve It: Modern Heuristics, by Zbigniew Michalewicz, David B.Fogel, Second Edition Springer Verilag-2004, ISBN- 3-540-22494-7.
4. Gallant Stephen I , Neural Network Learning & Extent Systems, MIT Press, 1993.
5. Aleksander & Morton, Neural Computing, Chapman & Hall, 1991.
6. Kosko, Neural Networks & Fuzzy Systems, PHI, 1991
7. http://swayam.gov.in/
8. http://edx.org formerly http://mooc.org/
9. http://epgp.inflibnet.ac.in/

Master of Computer Applications (SEMESTER – III)
OLMCA313T: DATA WAREHOUSING AND DATA MINING

Time: 03 Hours **Max. Marks: 100 Marks**
Internal Assessment: 30 Marks
End Term: 70 Marks

Instructions for the Paper-Setter/examiner:

1. Question paper shall consist of **Four sections.**
2. Paper setter shall set **Eight questions** in all by selecting **Two questions** of equal marks from each section. However, a question may have sub-parts (not exceeding four sub-parts) and appropriate allocation of marks should be done for each sub-part.
3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections.**
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

SECTION –A

Data Warehousing: Concepts of Data Warehousing, Difference between operational database systems and Data warehousing, Need of a separate Data Warehouse. Multidimensional Data Model.

Data Warehousing Architecture: Steps for Design and Construction of Data-Warehouses, Three-Tier Data Warehouse Architecture, Characteristics of Data Warehousing Data, Data Marts and its types, OLAP Servers: ROLAP, MOLAP, HOLAP

Data Warehouse Implementation: Efficient Computation of Data Cubes, Indexing OLAP Data, Efficient Processing of OLAP Queries, Metadata Repository, Data Warehouse Back-End Tools and Utilities

SECTION -B

Data Mining: Data Preprocessing, Data Mining Primitives, Data Mining Query Languages.
Applications and Trends in Data Mining.

Data Mining Techniques: **Classification and Prediction**: Issues regarding classification and prediction, Classification byDecision Tree induction, Bayesian Classification, Classification by Back propagation, Associative Classification, Other Classification Methods.

SECTION C

Data Mining Techniques: **Cluster Analysis:** Types of Data in cluster Analysis, Categorization of Major Clustering Methods, K- means Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid Based Methods, Model-Based Clustering Methods

Outlier Detection:Distance Based Outlier Detection, Deviation Based Outlier Detection.

SECTION D

Data Science: Extracting meaning from data with data science–meaning, the data scienceprocess, three basic machine learning algorithms – Linear regression, K-Nearest Neighbours, K-means, spam-filtering, recommendation engines.

References:

1. Han, Kamber "Data Mining: Concepts and Techniques" Morgan Kaufmann
2. Romez Elmasri, Shamkant B.Navathe, „Fundamentals of Database Systems" Pearson
3. Education.
4. Silberschatz, Korth, Sudershan "Database System Concepts" 4th Ed. McGraw Hill
5. Connolly & Begg "Database Systems – A Practical Approach to Design, Implementation andManagement, 3rd Ed. Pearson Education.
6. Doing Data Scienceby Rachel Schutt and Cathy O"Neil, Published by O"Reilly Media, 2014.
7. http://swayam.gov.in/
8. http://edx.org formerly http://mooc.org/
9. http://epgp.inflibnet.ac.in/

Master of Computer Applications (SEMESTER – III)
OLMCA314T: ADVANCED COMPUTER ARCHITECTURE

Time: 03 Hours **Max. Marks: 100 Marks**
Internal Assessment: 30 Marks
End Term: 70 Marks

Instructions for the Paper-Setter/examiner:

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2. Paper setter shall set **Eight questions** in all by selecting **Two questions** of equal marks from each section. However, a question may have sub-parts (not exceeding four sub-parts) and appropriate allocation of marks should be done for each sub-part.
3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections**.
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

SECTION – A

Introduction to Computers: Basic Computer Organization: System Buses, Instruction Cycles **CPU Organization:** Design specifications for a Simple CPU, Fetching Instructions fromMemory, Decoding Instructions, Executing Instructions, Design of a Simple ALU, Designing the Control Unit Using Hardwired Control and Microprogrammed control approach.

Memory Subsystem Organization and Interfacing, Types of Memories I/O Subsystem
Organization and Interfacing

SECTION–B

Parallelism in Uniprocessor Systems: Trends in parallel processing, Basic UniprocessorArchitecture, Parallel Processing Mechanism.

Parallel Computer Structures: Pipeline Computers, Array Computers, Multiprocessor Systems **Architectural Classification Schemes:** Multiplicity of Instruction-Data Streams, Serial versusParallel Processing, Parallelism versus Pipelining

Pipelining: An overlapped Parallelism, Principles of Linear Pipelining, Classification ofPipeline Processors, General Pipelines and Reservation Tables
Principles of Designing Pipelined Processors: Instruction Prefetch and Branch Handling, DataBuffering and Busing Structures, Internal Forwarding and Register Tagging, Hazard Detection and Resolution

SECTION–C

Superscalar and Super pipeline Design: Superscalar Pipeline Design, Super pipelined Design
Structures and Algorithms for Array Processors: SIMD Array Processors, SIMD ComputerOrganizations, Masking and Data Routing Mechanisms, Inter-PE Communications

SIMD Interconnection Networks: Static versus Dynamic Networks, Mesh-Connected IlliacNetwork, Cube Interconnection Networks

SECTION–D

System Interconnect Architectures: Network Properties and Routing, Static ConnectionNetworks, Dynamic Connection Networks
Multiprocessor Architecture: Functional Structures: Loosely Coupled Multiprocessors, TightlyCoupled Multiprocessors
Interconnection Networks: Time Shared for Common Buses, Crossbar Switch and MultiportMemories.

References:

1. Computer Architecture and Parallel Processing, Faye A. Briggs, McGraw-Hill International Editions
2. Computer Systems Organization & Architecture, John d. Carpinelli, Addison Wesley.
3. http://swayam.gov.in/
4. http://edx.org formerly http://mooc.org/
5. http://epgp.inflibnet.ac.in/

Directorate of Online Studies (DOS)

Master of Computer Applications (SEMESTER – III)
OLMCA315T : CLOUD NATIVE APPLICATION DEVELOPMENT

Time: 03 Hours **Max. Marks: 100 Marks**
Internal Assessment: 30 Marks
End Term: 70 Marks

Instructions for the Paper-Setter/examiner:

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2. Paper setter shall set **Eight questions** in all by selecting **Two questions** of equal marks from each section. However, a question may have sub-parts (not exceeding four sub-parts) and appropriate allocation of marks should be done for each sub-part.
3. Candidates shall attempt **Five questions** in all, by at least selecting **One question** from each section and the **5th question** may be attempted from any of the **Four sections**.
4. The question paper should be strictly according to the instructions mentioned above. In no case a question should be asked outside the syllabus.

SECTION–A

Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public, Private, Hybrid and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference model Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing.

SECTION–B

A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients, IaaS, PaaS, SaaS, IDaaS, CaaS, Virtualization technologies: Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D), Hypervisors: Virtual machine technology and types, VMware vSphere.

SECTION–C

An introduction to Docker& Container, Docker Architecture, Docker Commands (version, pull, run, ps, exec, stop, kill, commit, login, push, images, rm, rmi, build, etc…), Setting up Docker on Windows, Containerize your application using Docker, Containerizing a MEAN Stack Application, Docker Swarm For Achieving High Availability, Container Network Model.

SECTION–D

An Introduction to Kubernetes clusters, Kubernetes Architecture, Installation and Views of Kubernetes Dashboard, Configuration Management using Puppet, Installation of Puppet, Using Puppet modules for infrastructure Automation, Master-Slave Architecture for Chef, Steps for Installation of Chef, Transforming Infrastructure into Code using Chef.

Course Outcomes:

- This course gives students an insight into the basics of cloud computing along with virtualization.
- Compare the advantages and disadvantages of various cloud computing platforms.
- Understand and analyze the architecture of Cloud
- Use Docker to package an application and distribute it
- Explore Kubernetes resources for an application deployment
- Develop an application in Cloud

References:

1. Mastering Cloud Computing by RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, McGraw Hill Education (India) Private Limited, 2013
2. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill
3. Using Docker: Developing & Deploying Software with Containers, by Adrian Mouat, Shroff/O'Reilly; First edition (2016), ISBN-13: 978-9352133024
4. Managing Infrastructure with Puppet, by Loope James, O'Reilly Media, Inc, USA, ISBN: 9781449307639, 9781449307639
5. Cloud Native DevOps with Kubernetes: Building, Deploying, and Scaling Modern Applications in the Cloud, by John Arundel, O'Reilly Media; 1 edition (8 March 2019), ASIN: B07PJ4HM92
6. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd, 2013.
7. https://onlinelibrary.wiley.com/doi /book/10.10 02/9780470 940105
8. http://swayam.gov.in/
9. http://edx.org formerly http://mooc.org/
10. http://epgp.inflibnet.ac.in/

Master of Computer Applications (SEMESTER – III)
OLMCA316P: PROGRAMMING LAB III

Time: 03 Hours

Max. Marks: 100 Marks
Internal Assessment: 30 Marks
End Term: 70 Marks

SOFT COMPUTING

Practical based on Soft Computing.

Master of Computer Applications (SEMESTER – IV)
OLMCA411P: MAJOR PROJECT/DISSERTATION/INDUSTRIAL TRAINING

Max. Marks: 600 Marks
Internal Assessment: 180 Marks
End Term: 420 Marks

MAJOR PROJECT/INDUSTRIAL TRAINING:

A candidate should work on the project for 5 months and 6-8 hours on each working day.

1st synopsis (containing mainly literature survey corresponding to the problem taken up for the project work and line of attack to solve the problem) within one month of joining the training is to be submitted and will be evaluated for 4 credits.

2nd synopsis (containing essentially the progress of work in comparative details) within three months of joining the training is to be evaluated will be evaluated for 4 credits.

Credits for Final Project Report & Viva Voce: 14

The evaluation shall be done as per the common ordinances for courses under Credit Based Continuous Evaluation Grading System

DISSERTATION:

The students opting for dissertation has to submit an exhaustive research based proposal incorporating the following:

1. Literature View
2. Research Objectives
3. Research Methodology
4. Experimental Setup
5. Analysis of the Findings