Structure & Curriculum

From

Academic Year 2021-22

Vision of Institute

To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

Mission of Institute

M1- To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.

M2- To provide facilities and services to meet the challenges of Industry and Society

M3- To facilitate socially responsive research, innovation and entrepreneurship

M4- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Vision of the Department

The department of Master in Computer Applications aims to generate groomed, technically competent and skilled intellectual professionals specifically from the rural area to meet the current challenges of the modern computing industry.

Mission of the Department

- To stimulate students to learn effectively and apply the knowledge in the field of Engineering and Technology.
- To undertake industry academic collaboration to enhance competency in graduates.
- To foster innovative ideas amongst students for becoming leaders.
- To create an environment of research culture.
- To impart social and ethical values for inculcating the culture of lifelong learning.

Program Educational Objectives (PEO)

- Providing a strong theoretical and practical background across the computer science discipline with an emphasis on software development.
- To provide technical solutions in the field of information technology to the local society.
- To provide need-based quality training in the field of information technology.
- Empowering the youth in rural communities with computer education.
- To provide students with the tools to become productive, participating global citizens and life-long learners.

Program Outcomes (PO)

PO – 1 Computational Knowledge: Apply knowledge of computing fundamentals, computing specialisation, mathematics, and domain knowledge appropriate for the computing specialisation to the abstraction and conceptualisation of computing models from defined problems and requirements.

PO – 2 Problem Analysis: Identify, formulate, research literature, and solve *complex* computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

PO – 3 Design /Development of Solutions: Design and evaluate solutions for *complex* computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO – 4 Conduct investigations of complex Computing problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO – 5 Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to *complex* computing activities, with an understanding of the limitations.

PO – 6 Professional Ethics: Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.

PO – 7 Life-long Learning: Recognise the need, and have the ability, to engage in independent learning for continual development as a computing professional.

PO – 8 Project management and finance: Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO – 9 Communication Efficacy: Communicate effectively with the computing community, and with society at large, about *complex* computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

PO – 10 Societal and Environmental Concern: Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.

PO – 11 Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

PO – 12 Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

CURRICULUM FRAMEWORK

The MCA Program is the based on the following type of course:

Sr. No.	Type of Course	Abbreviation's
1	Professional Core Course	PCC
2	Professional Elective Course	PEC
3	Open Elective Course	OEC
4	Project	PROJ
5	Audit Course	Audit

The Course and Credit Distribution is as under

Sr. No.	Type of Course	Number of Courses	Total Credit	
			No.	(%)
1	Professional Core Course	26	67	67.00%
2	Professional Elective Course	04	12	12.00%
3	Open Elective Course	01	03	03.00%
4	Project	02	18	18.00%
5	Audit Course	03	-	-
	Total	36	100	100%

Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

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Scheme of Instructions

Scheme of Instructions for First Year Master in Computer Application

MCA Semester – I (w.e.f.: AY 2021-22)

Sr.	Course Category	CourseCode	Course Title	L	T	P	Cont act Hrs / week	Credits	Exam Scheme				
									CT - 1	CT - 2	TA / CA	ESE	TOTAL
1.	PCC	MCA1101	Object Oriented Programming Using Java	3	-	-	3	3	15	15	10	60	100
2.	PCC	MCA1102	Computer Hardware & Network	3	-	-	3	3	15	15	10	60	100
3.	PCC	MCA1103	Software Engineering & Project Management	3	-	-	3	3	15	15	10	60	100
4.	PCC	MCA1104	Advance DBMS	3	-	-	3	3	15	15	10	60	100
5.	PCC	MCA1105	Distributed Operating System	3	-	-	3	3	15	15	10	60	100
6.	PEC	MCA1106-09*	Professional Elective – I	3	-	-	3	3	15	15	10	60	100
7.	PCC	MCA1110	OOP'S programming based on Java language Lab	-	-	4	4	2	-	-	25	25	50
8.	PCC	MCA1111	Computer Hardware & Network Lab	-	-	4	4	2	-	-	25	25	50
9.	PCC	MCA1112	Software Engineering & Project Management Lab	-	-	4	4	2	-	-	25	25	50
10	PCC	MCA1113	DBA Lab using Open-Source Database	-	-	4	4	2	-	-	25	25	50
11	MCC	MAU1101	Pedagogy Studies	2	-	-	2	Audit Course	-	-	-	-	-
			Total	20	00	16	36	26	90	90	135	435	800

L- Lecture   T-Tutorial   P-Practical   CT1- Class Test 1   CT2- Class Test 2   TA/CA- Teacher Assessment / Continuous Assessment

ESE- End Semester Examination (For Laboratory: End Semester Performance)

***Indicates out of the four course codes each student has to select any one PEC from the list provided at the end of structure.**

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Scheme of Instructions

Scheme of Instructions for First Year Master in Computer Application

MCA Semester – II (w.e.f.: AY 2021-22)

Sr.	Course Category	CourseCode	Course Title	L	T	P	Contact Hrs / week	Credits	CT - 1	CT - 2	TA / CA	ESE	TOTAL
1.	PCC	MCA1201	Mobile Application	3	-	-	3	3	15	15	10	60	100
2.	PCC	MCA1202	Python Programming	3	-	-	3	3	15	15	10	60	100
3.	PCC	MCA1203	Data Warehouse and Mining	3	-	-	3	3	15	15	10	60	100
4.	PCC	MCA1204	Internet Programming	3	-	-	3	3	15	15	10	60	100
5.	PCC	MCA1205	Artificial Intelligence & Machine Learning	3	-	-	3	3	15	15	10	60	100
6.	PEC	MCA1206-09*	Professional Elective - II	3	-	-	3	3	15	15	10	60	100
7.	PCC	MCA1210	Mobile Application Based on Android & IOS Programming Lab	-	-	4	4	2	-	-	25	25	50
8	PCC	MCA1211	Python Programming Lab	-	-	4	4	2	-	-	25	25	50
9.	PCC	MCA1212	Data Warehouse and Mining Lab	-	-	4	4	2	-	-	25	25	50
10	PCC	MCA1213	Internet Programming Lab using Advance Java	-	-	4	4	2	-	-	25	25	50
11	MCC	MAU1202	Research Paper Writing	2	-	-	2	Audit Course	-	-	-	-	-
			Total	20	-	16	36	26	90	90	185	485	800

L- Lecture   T-Tutorial   P-Practical   CT1- Class Test 1   CT2- Class Test 2   TA/CA- Teacher Assessment / Continuous Assessment

ESE- End Semester Examination (For Laboratory: End Semester Performance)

*Indicates out of the four course codes each student has to select any one PEC from the list provided at the end of structure.

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Scheme of Instructions

Scheme of Instructions for Second Year Master in Computer Application

MCA Semester – III (w.e.f.: AY 2021-22)

Sr.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs / week	Credits	CT - 1	CT - 2	TA / CA	ESE	TOTAL
1.	PCC	MCA2301	Software Testing and Quality Assurance	3	-	-	3	3	15	15	10	60	100
2.	PCC	MCA2302	Data Science	3	-	-	3	3	15	15	10	60	100
3.	PCC	MCA2303	Deep Learning	3	-	-	3	3	15	15	10	60	100
4.	PCC	MCA2304	ASP.NET using C#.NET	3	-	-	3	3	15	15	10	60	100
5.	PCC	MCA2305	Cloud Computing	3	-	-	3	3	15	15	10	60	100
6.	OEC	#	Open Elective – I	3	-	-	3	3	15	15	10	60	100
7.	PCC	MCA2306	Salesforce Lab	-	-	4	4	2	-	-	25	25	50
8.	PCC	MCA2307	Software Testing and Quality Assurance Lab	-	-	4	4	2	-	-	25	25	50
9	PCC	MCA2308	ASP.NET using C#. NET Lab	-	-	4	4	2	-	-	25	25	50
10	PROJ	MCA2309	Mini Project	-	-	4	4	2			25	25	50
			Total	18	-	16	34	26	90	90	135	435	800

L- Lecture   T-Tutorial   P-Practical   CT1- Class Test 1   CT2- Class Test 2   TA/CA- Teacher Assessment / Continuous Assessment

ESE- End Semester Examination (For Laboratory: End Semester Performance)

#: Indicates out of the six course codes each student has to select any one OEC from the list provided at the end of structure.

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Scheme of Instructions

Scheme of Instructions for Second Year Master in Computer Application

MCA Semester – IV (w.e.f.: AY 2021-22)

Sr.	Course Category	CourseCode	Course Title	L	T	P	Contact Hrs / week	Credits	Exam Scheme				
									CT - 1	CT - 2	TA / CA	ESE	TOTAL
1.	PROJ	MCA2401	Project Work Full Time & Seminar	-	-	32	32	16	-	-	300	300	600
2.	PEC	MCA2402-05*	Program Elective-III	3	-	-	3	3	15	15	10	60	100
3.	PEC	MCA2403#	MOOCs Course	-	-	-	-	3	-	-	-	-	-
			Total	3	-	32	35	22	15	15	310	360	700

L- Lecture   T-Tutorial   P-Practical   CT1- Class Test 1   CT2- Class Test 2   TA/CA- Teacher Assessment / Continuous Assessment

ESE- End Semester Examination (For Laboratory: End Semester Performance)

*Indicates out of the four course codes each student has to select any one PEC from the list provided at the end of structure.

#: Indicates at least one NPTEL/MOOCS Course is to add for which direct credit transfer scheme will be applicable. Student should register for the course during 3rd semester and earn the credits which will be credited in his/her 4th semester.

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Scheme of Instructions

Scheme of Instructions for Second Year Master in Computer Application

List of Professional Elective Courses

Semester - I		Semester – II		Semester - IV	
Course Code	Professional Elective-I	Course Code	Professional Elective-II	Course Code	Professional Elective-III
MCA1106	Management Information System	MCA1206	Enterprise Resource Planning	MCA2402	Business Process Domain
MCA1107	Big Data Analytics	MCA1207	Natural Language Processing	MCA2403	Soft Computing
MCA1108	Network Security	MCA1208	Social Network Analysis & Digital Marketing	MCA2404	Cyber Forensic
MCA1109	Parallel Programming	MCA1209	Digital Image Processing	MCA2405	Block Chain Technology

List of Open Electives Course

Semester III	
Course Code	Open Elective-I
MCSXX01	Business Analytics
MSEXX02	Cost Management of Engineering Projects
MSEXX03	Composite Materials
MIPXX04	Waste to Energy
MIPXX05	Industrial Safety
MMBXX06	Operation Research

Credits Distribution Semester-wise

Sem – I	Sem – II	Sem – III	Sem – IV	Total Credits
26	26	26	22	100

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Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA1101	Object Oriented Programming Using Java	3	-	-	3

Pre-Requisites: Basic concepts of C Programming

Course Contents

|	
Unit I	**Basic Concept of OOP**: Concept of a class, Access control of members of a class, instantiating a class, static and non-static members, Empty Constructor, Parameterized constructor, copy constructor, destructor.
Unit II	Constructor overloading, Unary & Binary Operator Overloading, Single, multiple, multi level, hierarchical, hybrid inheritance, Accessing Base Class Members in Derived Class, static polymorphism, function overloading dynamic polymorphism: virtual functions
Unit III	Java and Internet, Features of java: security, portability, multithreading, etc, Bytecode, Data types, variables and Arrays, Operators, Classes: declaring objects, methods, constructor, garbage collection, finalize () method, static variable and method, final variable, command line argument. Inheritance: super keyword, final with inheritance. Packages and Interfaces, `Wrapper classes
Unit IV	Exception handling: Overview, types, Uncaught exception, try -catch block, multiple catch, nested try, throw, throws, finally, bulit-in and user-defined exception. Interface, Multithreading: Life Cycle, Thread class and Runnable Interface, isAlive(), join(), Priorities, Synchronization : sleep() , run(). Inter thread communication: wait(), notify(), notifyAll(), deadlock.
Unit V	String Handling, Applet: Applet Class, Architecture, Life Cycle, Display methods, HTML APPLET Tag, Passing parameter to Applet, AWT: working with Windows, Controls, Listener interfaces, Layout Manager, Menus. Dialog boxes. Swings. Event handling.

Text Books	
1	Object Oriented Programming with C++ by E Balgurusamy 7th Edition [Tata McGraw Hill Publishing Company Limited, New Delhi]
2	C + + Programming - for absolute beginner by Henkemans Lee, 2nd Edition [PHI].
3	The Complete Reference of Java Herbert Schildt, 7th Edition, Tata McGraw Hill Publication
4	Effective JAVA, 3rd Edition Joshua Bloch

Reference Books

1	Object Orientation through C++ by Parimala N. 2nd Edition [Macmillan India Ltd., Publication]	
2	Programming with Java , C Muthu , 2nd Edition McGraw Hill	

Useful Links

1	https://nptel.ac.in/courses/106/105/106105153/
2	https://nptel.ac.in/courses/106/105/106105191/

	Course Outcomes	CL	Class Sessions
MCA1101.1	Apply object oriented concepts to get the clarity in class implementation.	3	9
MCA1101.2	Classify inheritance, polymorphism to develop Object Oriented applications.	4	9
MCA1101.3	Evaluate Exception handling, Threading concepts to create.	5	9
MCA1101.4	Design Applet, Frame based operations to create effective applications.	6	9
MCA1101.5	Create light weight applications swing handling concepts.	6	9
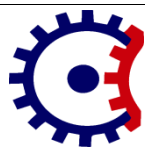
Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA1102	Computer Hardware & Network	3	0	-	3

Pre-Requisites: Computer hardware Interfacing, Digital communication & network, Software Engineering

Course Contents

Unit I	**Computer Hardware**: Subassembly of Motherboard with hardware components, familiarization with I/O cards, ports, connectors & cable and their identification. Installation of Operating System, Dual booting systems, Hardware Device Drivers & Application Software,Network structure and architectures, planning and Cabling Network, Serial data transmission methods &standards, Interconnection devices.
Unit II	**NetworkCommunication** (OSI Reference Model): Physical layer - Media dependent components, Media independent, Datalink layer functions, services, Logical link control (LLC), Medium access control (MAC), Network layer: functions, Addressing, Routing, Connection-Oriented service, Connectionless service, Circuit switching, Virtual Circuits, Packet switching (datagram)
Unit III	Transport Layer: Bandwidth and Multiplexing, Error detection and correction, Parity Bit-level error detection, Cyclic Redundancy Check (CRC), Sliding Window Protocol, Goback-N ARQ, Selective Repeat ARQ, User Datagram Protocol (UDP), Transmission Control Protocol (TCP)
Unit IV	Session layer: Design issues and remote procedure call. Presentation Layer: Design issues, data compression techniques, cryptography. Application Layer: Design issues, file transfer, access and management, virtual terminals.
Unit V	**Message Authentication** : Message Digests and Checksums, Hash Functions Public key Systems: RSA, DSS, **Intruders**: Intrusion Techniques, Intrusion Detection, Authentication, Password- Based Authentication, Address- Based Authentication, Certificates, Authentication Services, Packet Filtering, Access Control, Trusted Systems, Monitoring and Management.

Text Books

T.1	Inside the IBM PC Peter Norton, 3rd Edition
T.2	Data communication and Network by Forouzan, 2nd Edition, Tata McGraw Hill Publication

T.3	Computer Networks , Andrew S Tanenbum,2nd Edition, PHI

Reference Books

R.1	Network Security and Essentials: Application and standers,3rd Edition, Willam Stalling, Pearson

Useful Links

1	https://nptel.ac.in/courses/106/105/106105167
2	https://nptel.ac.in/courses/106/104/106104182
3	http://nptel.ac.in/courses/117103064

	Course Outcomes	CL	Class Sessions
MCA1102.1	construct the terminology of communication network and network functionality	3	9
MCA1102.2	Practice on Wired and wireless technology implementation for data communication	3	9
MCA1102.3	Differentiate Communication network model data flow and its protocol	4	9
MCA1102.4	Analyze the network security management and various methodology using algorithms	4	9
MCA1102.5	Evaluate the Application management of communication channels and hacking technology	5	9

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Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA1103	Software Engineering& Project Management	3	-	-	3

Pre-Requisites: System Analysis and Design

Course Contents

| Unit I	**Introduction to Software Engineering:** The evolving role of software, Changing Nature of Software, Software myths. **A Generic view of process:** Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models. **Process** models**:** The waterfall model, Incremental process models, Evolutionary process models, The Unified process.
Unit II	**Requirement Engineering:** Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document. **Requirements engineering process:** Feasibility studies, Requirement's elicitation and analysis, Requirement's validation, Requirements management. **System models:** Context Models, Behavioral models, Data models, Object models, structured methods. Modeling with UML.
Unit III	**Design Engineering:** Design process and Design quality, Design concepts, the design model. **Creating an architectural design:** Software architecture, Data design, Architectural styles and patterns, Architectural Design. **Object-Oriented Design:** Objects and object classes, An Object-Oriented design process, Design evolution. **Performing User interface design:** Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.
Unit IV	**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging. **Product metrics:** Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance. **Metrics for Process and Projects:** Software Measurement, Metrics for software quality. **Risk management:** Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.
Unit V	**Quality Management:** Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards. **Software Project Planning –** Project planning objectives, Project estimation, Decomposition techniques, Empirical estimation models, System Engineering, Software contract management, Procurement Management.

Text Books

1	Software Engineering, A practitioner's Approach, Roger S. Pressman, McGrawHill, 8th Edition
2	Software Engineering, Sommerville, Pearson education, 9th Edition.

Reference Books

	1	Software Engineering principles and practice,Waman S Jawadekar, McGraw-Hill, 2nd Edition.
	2	Fundamentals of Software Engineering, Rajib Mall, PHI, 2005, 4th Edition.

Useful Links

	1	https://nptel.ac.in/courses/106/101/106101061/
	2	https://nptel.ac.in/courses/106/105/106105182/

	Course Outcomes	CL	Class Sessions
MCA1103.1	Apply detailed knowledge of role of software in daily basis and identified different models for software engineering.	3	9
MCA1103.2	Select a detailed view of Requirement Engineering and system models	4	9
MCA1103.3	Use architectural design and object-oriented design for performance and maintainability.	3	9
MCA1103.4	Assess to test the developed software and perform product metrices.	5	9
MCA1103.5	Evaluate the software measure parameters for software quality.	5	9
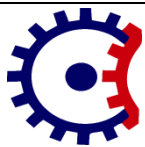
<table>
<tr><td colspan="7" align="center">Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)
(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)</td></tr>
<tr><td colspan="7" align="center">Program: Master in Computer Application</td></tr>
<tr><td>Semester</td><td>Course Code</td><td>Name of Course</td><td>L</td><td>T</td><td>P</td><td>Credits</td></tr>
<tr><td>I</td><td>MCA1104</td><td>Advanced DBMS</td><td>3</td><td>-</td><td>-</td><td>3</td></tr>
</table>

Pre-Requisites: Basic of Database Management Systems, Normalization's, Database concepts, Data models and Relational model.

<table>
<tr><td colspan="2" align="center">Course Contents</td></tr>
<tr><td>Unit I</td><td>Relational Database design: Functional dependencies, and Normalization Normal forms based on primary keys (1 NF, 2 NF, 3 NF, BCNF, 4 NF, 5 NF) Loss less joins and dependency preserving decomposition Query Processing: Query Processing Stages, Query Interpretation, Equivalence of Expressions, Query Resource Utilization, Query Execution Plan, Estimation of Query Processing Cost, Multiple Index Access, Methods for Joining Tables (Nested Loop, Multiple Join) Structure of a Query Optimizer.</td></tr>
<tr><td>Unit II</td><td>Transaction Processing & Concurrency Control: Concept and definition of transaction, ACID properties, serializability, Prioritization, states of transaction, Types of failure, desirable properties of transaction schedules and recoverability, serial usability of schedules, levels of transaction consistency, deadlocks, long duration transactions, transaction performance. Crash Recovery: failure classification, recovery concepts, database backup, recovery concepts based on deferred update and on immediate update. Shadow paging, check points, crash recovery techniques. Client/Server database: Evolution of client concept, Client/Server environment, characterization of Client/Server computing.</td></tr>
<tr><td>Unit III</td><td>Oracle SQL and PL/SQL
Basic SQL and PL/SQL concepts terminology and programming, Enhancements SQL, Enhancement to Globalization, writing queries, Using procedure builders, Data Manipulation language (DML), Data definition language (DDL).</td></tr>
<tr><td>Unit IV</td><td>Oracle Database Architecture and Administration: Oracle database architecture, Design, Creation, Management of Oracle Databases and related database schemes, Data Dictionary views and standard package Maintaining the control, Redo Log files, Managing Tablespaces and Data Files, Storage structure and relationships, managing rollback segment, Indexes, Managing data Integrity, Managing password security and resources, Managing users, Privileges, roles. Oracle Backup and Recovery Strategies: Backup and recovery considerations, Oracle recovery structure and processes, Oracle backup and recovery configuration, Physical backup, Complete recovery of an Oracle database, Oracle Export / Import utilities, Oracle standby database.</td></tr>
<tr><td>Unit V</td><td>Oracle Tuning and Troubleshooting: Oracle performance tuning methodology, Oracle alert and trace files, Tuning the shared pool, Buffer Cache, Redo Log buffer, Database configuration and I/O issues, Using Oracle Blocks efficiently, optimizing sort operations, Rollback segment tuning, Monitoring and detecting lock contention, SQL issues and tuning considerations for different application. Integrity, Security: Need for Database Integrity,</td></tr>
</table>

		Integrity Constraints, Introduction to Database, Security issues.
Text Books		
	1	Fundamental of Database Systems, R. ElmasriS. Navathe Benjamin Cummings, 2nd Edition
	2	Database system concept, Henry Korth, 7th Edition
	3	Oracle 9i Performance Tuning, Joseph C. Johnson, 2nd Edition
Reference Books		
	1	DBA Handbook oracle press, Loney, 2nd Edition.
	2	The Complete Reference SQL - Groff Weinberg (Tata McGraw Hill Publication), 2nd Edition.
Useful Links		
	1	https://nptel.ac.in/courses/106/105/106105175/
	2	https://nptel.ac.in/courses/106/106/106106093/

	Course Outcomes	**CL**	**Class Sessions**
MCA1104.1	Apply the knowledge of Normal forms and Query processing for handling multiple types of data.	3	9
MCA1104.2	Identify and understand a detailed view of handling parallel and distributed database.	3	9
MCA1104.3	Apply and write SQL and PL SQL queries for Data Manipulation and Data Definition languages.	3	9
MCA1104.4	Evaluate the internal data structure and analyze backup and recovery procedures.	5	9
MCA1104.5	Analyze deep visualization of realistic data into physical structure	4	9

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA1105	Distributed Operating System	3	-	-	3

Pre-Requisites: Operating System

Course Contents

Unit I	Distributed Operating System and its Evolutions, different types of Models of Distributed system, Distributed OS vs network OS, Issues in Designing Distributed Computing System, types of Computer Networks, Communication Protocols, concept of Internetworking
Unit II	MESSAGE PASSING:address processing, Issued in Message Passing and failure handling, Synchronization(Advantages Synchronization, Clock Synchronization, Event Ordering, Mutual Exclusion, Deadlock, Election Algorithm), handle Buffering, Multi datagram Messages, Encoding and Decoding in between network communication
Unit III	DISTRIBUTED SHARED MEMORY: Architecture of DSM System, Issues of DSM Design and Implementation, Granularity implementation, recommended Structure of Shared Memory Consistency Models,how to choose Replacement Strategy and Thrashing, order of Heterogeneous DSM
Unit IV	DISTRIBUTED FILE SYSTEM Introduction: Desirable Features, application of File Modes, File Accessing Models, assessment of File Sharing Semantics, Schemes of File Caching, File Replication methodology, planning for Fault Tolerance, Atomic Transaction design Principles
Unit V	SECURITY Introduction: Potential Attacks to Distributed Operating System,Security framework building, planning for security mechanism, decision on security management in DOS, Cryptography, Authentication, Access Control, Digital Signatures, Design Principles

Text Books

1	Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI
2	Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore,Ti Kindberg, Pearson
	Distributed Operating Systems by Andrew S Tannebaum, Pearson

Reference Books

1	Distributed Computing by Sunita Mahajan & Seema Shah OXFORD
2	Distributed Systems: Principles and Paradigms by Andrew S Tanebaum, Maarten Van Steen, PHI
3	Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, HagitAttiya and Jennifer Welch, Wiley India

	Course Outcomes	**CL**	**Class Sessions**
MCA1105.1	The use of terminology of network structure and topologies	3	9
MCA1105.2	Examine massage passing protocol for group communication with network system.	4	9
MCA1105.3	Classification of distributed shared memory issues and solve that issue	4	9
MCA1105.4	Access the file system using distributed operating system within network using design principle	5	9
MCA1105.5	Modify the sequence of security mechanism system using various security mechanism	5	9
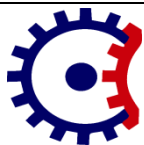
Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA1106	Management Information System	3	-	-	3

Pre-Requisites: System Analysis and Design, DBMS

Course Contents

Unit I	The meaning and use MIS, System View of Business, Process of MIS, Development of MIS within the organization, Management Process, Information Needs, System Approach in Planning Organizing and Controlling MIS.
Unit II	Managing Information Systems in Organizations: Introduction, Managing in the Internet Era, Managing Information Systems in Organization-the IT interaction model, Challenges for the manager-what information to build?-how much to spend on information systems?-what level of capabilities should be created with information systems?-how centralized should the services be?-what security levels are required?-what is technology road map for the organization?
Unit III	Fundamentals of Data Processing, Computer Operation of Manual Information System, Components of Computer Systems, Flow Chart, Conversion of Manual to Computer Based Systems, Computer Systems Software, Application Software, Telecommunication Modem
Unit IV	Decision making and communication: Introduction, Decision making with MIS-Tactical decisions-operational decisions-strategic decisions, communication in organisations- types of communication- examples of communications in organisations- decision making with communication technology
Unit V	System Design: System design consideration, input/output design, forms design, file organization and database, data management, file design, program design, control and security

Text Books

1	Kenneth C. Laudon & Jane P. Laudon. "Management Information Systems". Pearson Publishing. 2nd Edition.
2	Management Information System, Oz Thomson Learning 5th edition
3	Management Information System, W.S.Jawadekar, 3rd edition, TMH
4	Management Information System, James O'Brien, 7th edition, TMH

Reference Books

1	Information Systems the foundation of E-Business, Steven Alter, 4th Edition Person education
2	Information Technology for management, Turban, McLean, Wetherbe, 4th edition, Wiley

Useful Links

1	https://nptel.ac.in/courses/110/105/110105148/

	Course Outcomes	CL	Class Sessions
MCA1106.1	Understand why and how information technologies can be used to achieve operational, tactical, and strategic goals.	2	9
MCA1106.2	Demonstrate the use of communication and information technologies.	3	9
MCA1106.3	Demonstrate construction of a database application.	3	9
MCA1106.4	Analyze the impact of computing systems on people and the organization including privacy and ethical concerns.	4	9
MCA1106.5	Understand that knowledge is as an organizational resource and how information systems can be used to manage and leverage a firm's knowledge resources.	2	9

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Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA1107	Big Data Analytics	3	0	-	3

Pre-Requisites: Database Management System, Distributed Database Management System, Relational model of Database

Course Contents

Unit I	**Overview of Big Data:** What is Big Data, History of Data management, Structuring Big data, Elements of Big data, Big data Analytics, Advantages of Big data Analytics Exploring The Use of Big data. **Understanding Hadoop Ecosystem:** Physical organization of Compute Nodes, Large scale File System Organization, Limitations of existing distributing systems, Hadoop Approach, Internals of Hadoop, Hadoop Architecture: Core Components, Ecosystem, HDFS and GPFS, Hadoop Limitations, Yarn, Spark.
Unit II	**Big Data Technology Foundation:** Exploring The Big data Stack, Data SourceLayer, Ingestion Layer, Storage Layer, Physical Infrastructure Layer, Platform ManagementLayer, Security Layer, Monitoring Layer, Visualization Layer, Big Data Applications, Virtualization and Big Data, VirtualizationApproaches**Storing Data In Data Bases andDataWarehouses:** RDBMS and BigData,CAP Theorem,Issues with Relational Model,Non-Relational Database, Issues with Non-Relational Model, Integrating Big Data with TraditionalData Warehouses.
Unit III	**Exploring R:**Exploring Basic Features of R,Statistical Features,Packages,Graphical UserInterfaces,R Console,Developing a Program,Exploring R Studio,Basic Arithmetic inR,Variables and Functions in R,Handling Data in R Workspace **Reading DataSets andExporting Data from R:** Using c() Command,Using scan() Command,Reading Multiple Datavalues from Large Files,Reading Data from RStudio,Exporting Data from R.
Unit IV	**Manipulating andProcessing Data In R:** Creating Data Subsets, Merging Data Sets in R,Sorting Data, ManagingData in R using Matrices,Managing Data in R using Data Frames. **Data Visualization**: Ways ofRepresentingVisualData,Techniques,Types,Applications,Visualizing Big Data,Tools used in Data Visualization
Unit V	**Social Media Analytics and Text Mining:**Introducing Social Media**,** Introducing Text Mining,Understanding Text Mining Processes,Sentiment Analysis **Mobile Analytics**: IntroducingMobile Analytics, Define Mobile Analytics,Introducing Mobile Analytics Tools,PerformingMobile Analytics,Challenges of Mobile Analytics.

Text Books

T.1	Big Data (Covers Hadoop 2, MapReduce,Hive,YARN,Pig,R and Data Visualization)
T.2	Black Book, DT Editorial Services, Dreamtech Press.

T.3	Data Science & Big Data Analytics Discovering, Analyzing, Visualizing and PresentingData EMC Education Services, WILEY Publication

Reference Books

R.1	Data Analytics, Maheshwari, McGraw
R.2	Hands-On Programming with R by Grolemund and Garrett

Useful Links

1	https://nptel.ac.in/courses/106/104/106104189/
2	https://nptel.ac.in/courses/124/144/372604123/
3	https://nptel.ac.in/courses/125/128/139837364/

	Course Outcomes	**CL**	**Class Sessions**
MCA1107.1	The use of terminology of data cycle and its functionality using Hadoop platform	3	9
MCA1107.2	Examine data warehouse and its mechanism with corresponding database	4	9
MCA1107.3	Design various statistical vide for analyzing basic database that creates logical practice.	5	9
MCA1107.4	Creating and exploring the basic database which is use to design virtualization of the database.	5	9
MCA1107.5	Justification about social media and mobile analytics which creates various data structures.	5	9

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	**MCA1108**	Network Security	3	0	-	3

Pre-Requisites: Digital Electronics and Microprocessor, Digital Communication Networking

Course Contents

Unit I	**Internet Security & Encryption**: Basics of Cryptography, Encryption of static data, Key Exchange algorithm DSS, RSA, IPSec, AH, ESP, IKE, ISAKMP/Oakley, Tunnel mode, Transport mode, Virtual Private Networks (VPNs), SSH Tunneling, IP6 issues, Cloud Security Issues.
Unit II	**Firewalls:** Packet Filters, Stateful, Stateless, Bastion Host, Circuit Level, Application Gateway, SOCKS, DMZ, Host-Based Firewall, Egress Filtering, Network Address Translation (NAT), Multi-homing, IPTables/NetFilter, implementing NAT
Unit III	**Sniffers And Packet Crafting:** Libpcap, dSniff, Wireshark, tcpdump, Mitigation of Sniffer Attacks, ARP Cache Poisoning, Port Stealing, Switch flooding, DNS and IP Spoofing, Session Hijacking, Sequence Numbers, Ettercap, idle host scanning, Default TTLs, Countermeasures, Packet Crafting using eghping, scapy
Unit IV	**Wireless Security:**wireless local area networks (WLANs)IEEE 802.11, wardriving (Wi-Fi wireless networks), netstumbler(802.11b, 802.11a, 802.11g WLAN standards.), kismet, wellenreiter, WEP, WPA, cowpatty.
Unit V	**Intrusion Detection & Prevention:** Focus on NIDS, snort, Types of IDSs, Network IDSs, Anomaly based Detection, Signature based Detection, Evasion Techniques, False Positives, NIDS implementation using eg snort, Data Loss Prevention

Text Books

T.1	Eric Cole, Ronald L. Krutz, James Conley, "Network Security Bible", 2nd Edition, Wiley [ISBN: 0764573977], 2005
T.2	John R. Vacca, "Guide to Wireless Network Security", Springer, 3rd Edition [ISBN: 0387954252], 2006.
T.3	Johnny Long, Chris Hurley, SensePost, Mark Wolfgang, Mike Petruzzi, "Penetration Tester's Open Source Toolkit", Syngress [ISBN: 1597490210] 2005

Reference Books

R.1	Barrie Dempster, James Eaton-Lee, "Configuring IPCop Firewalls: Closing Borders with Open Source", Packet Publishing [ISBN: 1-904811-36-1], 2006.

Useful Links

1	https://nptel.ac.in/courses/106/105/106105162/
2	https://nptel.ac.in/courses/106/105/106105031/
3	https://nptel.ac.in/courses/106/106/106106178/

	Course Outcomes	CL	Class Sessions
MCA1108.1	Examine various encryption algorithms and authentication services	3	9
MCA1108.2	Planning and apply tools and mechanism for network security	4	9
MCA1108.3	preparation About implementation and working tools for network design and management	4	9
MCA1108.4	Implementation of wireless tools and create secure network mechanism for network	5	9
MCA1108.5	Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection.	5	9

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA1109	Parallel Programming	3	-	-	3

Pre-Requisites: Students are expected to know the C language, algorithms and data structures, and know basics on computer architecture.

Course Contents

Unit I	**FUNDAMENTALS OF PARALLEL COMPUTING** Need for Parallel Computing, Par allel Computer Models, ILP, TLP and Data Parallelism, Parallel Programming Overview, Processes, Tasks and Threads, Parallel Programming Models, Shared Memory Programming, Message Passing Paradigm, Interaction and Communication, Interconnection Networks.
Unit II	**CHALLENGES OF PARALLEL PROGRAMMING** Identifying Potential Parallelism, Techniques for Parallelizing Programs, Issues, Cache Coherence issues, Memory Consistency Models, Maintaining Memory Consistency, Synchronization Issues, and Performance Considerations.
Unit III	**SHARED MEMORY MODELS AND OPENMP PROGRAMMING** Open MP Execution Model, Memory Model and Consistency, Open MP Directives, Run Time Library Routines, Handling Data and Functional Parallelism, Performance Considerations.
Unit IV	**MPI PROGRAMMING** The MPI Programming Model, MPI Basics, Circuit Satisfy ability, Global Operations, Asynchronous Communication, Collective Communication, Other MPI Features, Performance Issues, Combining Open MP and MPI.
Unit V	**PROGRAMMING HETEROGENEOUS PROCESSORS** GPU Architecture, Basics of CUDA, CUDA Threads, CUDA Memories, Synchronization Handling, Performance Issues, Application Development. Introduction to Open CL.

Text Books

1	John L. Hennessey and David A. Patterson, "Computer Architecture – A quantitative approach", Morgan Kaufmann / Elsevier Publishers, 5th. Edition, 2012.
2	Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan Kaufmann, 2nd Edition, 2011.

Reference Books

1	Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 6th Edition, 2003.
2	David B. Kirk and Wen-mei W. Hwu, "Programming Massively Parallel Processors", Morgan Kaufmann, 2nd Edition, 2010.

Useful Links	
1	https://nptel.ac.in/courses/106/102/106102114/
2	https://nptel.ac.in/courses/106/102/106102163/

		Course Outcomes	**CL**	**Class Sessions**
MCA1109.1		Apply the fundamental of Parallel computing for shared memory and interconnection networks.	3	9
MCA1109.2		Analyze the challenges of Parallel Programming in support of memory consistency.	4	9
MCA1109.3		Analyze to shared memory models and OPENMP programming.	4	9
MCA1109.4		Evaluate the MPI programming and features of performance issues.	5	9
MCA1109.5		Apply for programming heterogeneous processors for performance issues.	3	9
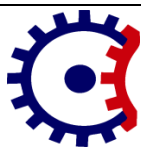
Program: Master in Computer Application						
Semester	**Course Code**	**Name of Course**	**L**	**T**	**P**	**Credits**
I	MCA1110	OOP'S programming based on Java language Lab	-	-	3	2

Pre-Requisites: C Language

Sr. No.	List of Experiment	CO Mapping
1	Develop application by using class & object concept	CO1
2	Develop application by using constructor.	CO1
3	Develop application by using constructor overloading.	CO2
4	Develop application by using inheritance.	CO2
5	Develop application by using command line arguments.	CO3
6	Develop application by using wrapper classes.	CO3
7	Develop application by using exception handling.	CO4
8	Develop application by using thread concept.	C04
9	Develop application by using AWT controls.	C05
10	Develop application by using swing concept.	C05

Text Books

1	The Complete Reference of Java Herbert Schildt, 7th Edition, Tata McGraw Hill Publication
2	Effective JAVA, 3rd Edition Joshua Bloch

Reference Books

1	Java 6 Black Book Steven Holzner 2nd Edition Coriolis Group
2	Programming with Java , C Muthu , 2nd Edition McGraw Hill

Useful Links

1	https://nptel.ac.in/courses/106/105/106105153/
2	https://nptel.ac.in/courses/106/105/106105191/

	Course Outcomes	CL	Lab Sessions
MCA1110.1	Apply object oriented concepts to get the clarity in class implementation.	3	2
MCA1110.2	Classify inheritance, polymorphism to develop Object Oriented applications.	4	3
MCA1110.3	Evaluate Exception handling, Threading concepts to create.	5	4
MCA1110.4	Design Applet, Frame based operations to create effective applications.	6	5
MCA1110.5	Create light weight applications swing handling concepts.	6	5

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Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA1111	Computer Hardware & Network Lab	-	-	3	2

Pre-Requisites: : Computer hardware Interfacing, Digital communication & networking, Software Engineering

Course Contents

Sr. No.	List of Experiment	CO Mapping
1	Develop application using Network Communication.	CO1
2	Develop application using various ports.	CO1
3	Develop application using multimedia concepts.	CO2
4	Develop application using LLC.	CO2
5	Develop application using RPC.	CO3
6	Develop application using UDP.	CO3
7	Develop application using Session Layer.	CO4
8	Develop application using Application Layer.	CO4
9	Develop application using RSA.	CO5
10	Develop application using DSS.	CO5

Text Books

1	Inside the IBM PC Peter Norton, 3rd Edition
2	Data communication and Network by Forouzan, 2nd Edition, Tata McGraw Hill Publication

Reference Books

1	Network Security and Essentials: Application and standers, 3rd Edition, Willam Stalling, Pearson

Useful Links

1	https://nptel.ac.in/courses/106/105/106105167
2	https://nptel.ac.in/courses/106/104/106104182

	Course Outcomes	CL	Lab Sessions
MCA1111.1	construct the terminology of communication network and network functionality	3	9
MCA1111.2	Practice on Wired and wireless technology implementation for data communication	3	9
MCA1111.3	Differentiate Communication network model data flow and its protocol	4	9
MCA1111.4	Analyze the network security management and various methodology using algorithms	4	9
MCA1111.5	Evaluate the Application management of communication channels and hacking technology	5	9
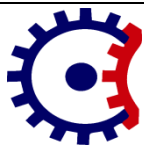
Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA1112	**Software Engineering & Project Management Lab**	-	-	3	2

Pre-Requisites:- Software Engineering, System Analysis and Design

Course Contents

Sr. No.	List of Experiments	CO
1.	Write the complete problem statement for software engineering.	CO1, CO3
2.	Write the software requirement specification documents.	CO2, CO3
3.	Draw the entity relationship diagram.	CO2,
4.	Draw the data flow diagram at level 0 and level 1.	CO3, CO4
5.	Draw use case diagram	CO3, CO4
6.	Draw activity diagram of all use cases.	CO4, CO5
7.	Draw state chart diagram of all use cases.	CO4, CO5
8.	Draw sequence diagram of all use cases.	CO4, CO5
9.	Draw collaboration diagram of all use cases.	CO4, CO5
10.	Assign objects in sequence diagram to classes and make class diagram.	CO4, CO5

Text Books

1	Software Engineering, A practitioner's Approach, Roger S. Pressman, McGrawHill International Edition.
2	Software Engineering, Sommerville, Pearson education.
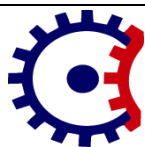
Reference Books

1	Software Engineering principles and practice,Waman S Jawadekar, McGraw-Hill.
2	Fundamentals of Software Engineering, Rajib Mall, PHI, 2005

Useful Links

1	https://nptel.ac.in/courses/106/101/106101061/
2	https://nptel.ac.in/courses/106/105/106105182/

	Course Outcomes	CL	Class Sessions	Lab Sessions
MCA1112.1	Analyse and implement software development models using UML through open-source tools.	4	9	4
MCA1112.2	Analyse and design software system using various UML constructs.	4	9	4
MCA1112.3	Use architectural design and object-oriented design for performance and maintainability.	3	9	2
MCA1112.4	Assess to test the developed software and perform product metrics.	5	9	4
MCA1112.5	Evaluate the software measure parameters for software quality.	5	9	2

Program: Master in Computer Application

Teaching Scheme:-Lectures- **06**   Tutorial-**00**   Total Credit- **03**

Semester	Course Code	Name of Course	L	T	P	Credits
I	MCA1113	DBA Lab using ORACLE	-	-	3	2

Pre-Requisites: Basic of Database Management Systems, Normalization's, Database concepts, Data models and Relational model.

Course Contents		CO
Sr. No.	**List of Experiment**	
1	Implement the Normalization (1NF, 2NF, 3NF)	CO1
2	Implementation of Nested loop and recovery of transaction.	CO1, CO2
3	SQL: DDL, DML, set operation, sub queries.	CO3
4	Intermediate SQL: Joins, Views, Abstract Data type, Advanced SQL: Functions,Procedures, PL-SQL.	CO1, CO3
5	SQL: Backup and Recovery, Indexes	CO3, CO4
6	SQL Tunning, rollback database, lock contention.	CO3, CO5

Text Books

1	Fundamental of Database Systems, R. ElmasriS. Navathe Benjamin Cummings, 2nd Edition
2	Database system concept, Henry Korth, 7th Edition

Reference Books

1	DBA Handbook oracle press, Loney, 2nd Edition.
2	The Complete Reference SQL - Groff Weinberg (Tata McGraw Hill Publication), 2nd Edition.

Useful Links
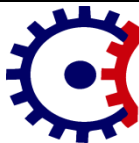
1	https://nptel.ac.in/courses/106/105/106105175/
2	https://nptel.ac.in/courses/106/106/106106093/

	Course Outcomes	CL	Class Sessions	Lab Sessions
MCA1113.1	Apply the knowledge of Normal forms and Query processing for handling multiple types of data.	3	9	2
MCA1113.2	Identify and understand a detailed view of handling parallel and distributed database.	3	9	3
MCA1113.3	To apply and write SQL and PL SQL queries for Data Manipulation and Data Definition languages.	4	9	4
MCA1113.4	Discuss the internal data structure and analyze backup and recovery procedures.	4	9	4
MCA1113.5	Discover deep visualization of realistic data into physical structure	3	9	4

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Semester	Course Code	Name of Course	L	T	P	Credits
II	MCA1201	Mobile Application	3	0	-	3

Pre-Requisites: Object Oriented Programming, Digital Communication Network

Course Contents

Unit I	Introduction to Mobile application Development Environment, Characteristics of Mobile Applications, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development, VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal UIs
Unit II	Intents and Services, Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right Storing and Retrieving Data, Working with a Content Provider, Communications Via Network and the Web, State Machine, Correct Communications Model, Wireless Connectivity and Mobile Apps
Unit III	Notifications and Alarms, Performance and Memory Management, Graphics Performance and Multithreading, Graphics and UI Performance, Graphics & Multimedia, Mobile Agents and Peer-to-Peer Architecture, Location Mobility and Location Based Services
Unit IV	Introduction to Android: The Android Platform, Android SDK, Android Installation, Android Activity Development, using widgets, building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.
Unit V	Overview of iOS and X-CODE: Installation, Create and manage project using XCode, Introduction to iPhone Architecture, Introduction to SWIFT, Developer Technology Overview: The Apple Developer Tool, Swift, Cocoa Touch, Model-View-Controller, Interface Builder, and Overview of latest iOS features.

Text Books

|	
T.1	Reto Meier, "Professional Android Application Development", Wrox Edition
T.2	Applications with UML and XML, Reza Behravanfar, 2nd Edition, Cambridge University Press
T.3	David Mark, Jack Nutting and Jeff LaMarche, "Beginning iOS 5 Development", Apress Edition.

	Reference Books
R.1	Baijian Yang, Pei Zheng, Lionel M. Ni, "Professional Microsoft Smartphone Programming", Wrox Edition.
R.2	Applications with UML and XML, Reza Behravanfar, 3rd Edition, Cambridge University Press
	Useful Links
1	https://nptel.ac.in/courses/106/106/106106147/

	Course Outcomes	CL	Class Sessions
MCA1201.1	Use of tools for mobile application at various sectors and its functionality.	3	9
MCA1201.2	Demonstrate technical constraints relative to storage capacity, processing capacity, display screen, communication interfaces.	3	9
MCA1201.3	Analyze and implement feature-rich mobile applications for smart phones.	4	9
MCA1201.4	Analyze various Android applications with standard tools and mechanism.	4	9
MCA1201.5	Determine the Application for mobile computing and installation using iOS.	5	9

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
II	**MCA1202**	Python Programming	3	0	-	3

Pre-Requisites: Programming logic and Techniques, Object Oriented Programming concepts.

Course Contents

Unit I	**Introducing Python:**What is Python? Python History, Similar Languages **Python Fundamentals: Extending Python programs:** Interactively, From a File, Other Methods, Script, program or module? **Components of a python programming: Built – In-Object types:** Python objects and other Languages, Operator's basics, Numbers, Strings, Lists, Tuples, Working with Sequences, Dictionaries, Files, object storage, type conversion, type comparisons **Statements:** statement format, comments, assignments, print, control statements, common traps. **Functions:** Function definition and execution, **scoping:** making objects global, the LGB Rule, scope traps, **Arguments:** Arguments are Objects, argument calling by Keywords, default arguments, argument tuples, argument dictionaries, function Rules, Return values,
Unit II	**Advanced Function calling:** The apply statement, the Map Statement, indirect function calls, anonymous functions, **Modules:** Importing a module, Packages. **Object orientation:** Creating a Class **Exceptions and error trapping:** Exception handling, Built in exceptions. **Python's Built-In Functions:** _import_(name[globals[locals[fromlist]]]), apply (function, args, [keywords]), getattr(object, name[,default]), hash(object), id(object), Isinstance (object, class), list(sequence),setattr (object , name , value) , str (object) , type(object).
Unit III	**Interfacing to the OS:** Working with the system (sy module), Working with the Operating system (os module), and Multithreading. **Processing Information:** Manipulating numbers, Text Manipulation, Time, Data types and Operator, Unicode strings. **Working with Files:** File processing: Reading, writing to file, changing position, Controlling File I/O:File Control, IO Control, File Locking, Basic File/Directory Management, Access and Ownership: Checking Access, Getting File information, Setting File Permissions, Manipulating File Paths**.**
Unit IV	**Communicating over a network:** Creating a network server, client modules, Handling internet data. **Using Python for multimedia**: Audio modules, Graphic Modules **Using Python as RAD Tool:** What RAD relay is, Why Python **Application development with Python:** Integrated Development Environment**,** Python standard Library. **Web Development Basics:** Writing HTML, Uniform Resource Locators, Dynamic Websites using CGI, Cookies, **and Security Standard Markup Language Processing**: Processing SGML, Processing HTML, Processing XML.
Unit V	**The Python Architecture**: **Namespaces, Code blocks and Frames**: Code Blocks, Frames, Namespaces, Trace backs, putting it together, **Built-in-types**: Callable object types, Modules, Classes, Class Instances, Internal Types, **Byte Code**: Python bytecode, bytecode disassembly, byte code instructions(opcodes)

Text Books	
T.1	The Complete Reference Python, Martin C.Brown , 2ndEdition,Tata McGraw Hill Publication
T.2	Programming in Python3, 2nd Edition, Mark Summerfield
T.3	Beginning Python From Novice to Professional, 1st Edition, Magnus Lie Hetland(Apress)

Reference Books	
R.1	Taming Python by Programming, 3rd Edition, Jeeva Jose, KhannaPubli.
R.2	Introduction to Computing and Problem Solving with Python, 3rd Edition, Jeeva Jose, Khanna Publi.

Useful Links	
1	https://nptel.ac.in/courses/106/106/106106145/
2	https://nptel.ac.in/courses/106/105/106105031/
3	https://nptel.ac.in/courses/106/106/106106178/

	Course Outcomes	CL	Class Sessions
MCA1202.1	Discover how to work with lists and sequence data.	3	9
MCA1202.2	Use Python to read and write files.	3	9
MCA1202.3	Preparation of core Python scripting elements such as variables and flow control structures.	4	9
MCA1202.4	Implementation of Python functions to facilitate code reuse.	5	9
MCA1202.5	Demonstrate Python to read and write files.	5	9
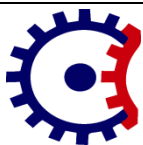
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Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
II	MCA1203	Data Warehousing and Data Mining	3	-	-	3

Pre-Requisites: Database Management System.

Course Contents

Unit I	**Introduction:** Fundamentals of data mining, Data Mining Functionalities, Major issues in Data Mining Data Preprocessing: Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Warehouse and OLAP Technology for Data Mining Data Warehouse, Multi-dimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation.
Unit II	**Clustering**: Similarity and Distance Measures, Hierarchical Algorithms, Clustering Large Databases, Clustering with Categorical Attributes Applications and other Data mining techniques Data Mining Applications, Mining Event Sequences, Mining, Web Mining, The WEKA data mining Workbench Visual DM, Text
Unit III	**Mining** Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.
Unit IV	**Decision Tree Induction** – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy.
Unit V	**Business Intelligence**: Introduction, Business Intelligence, Business Intelligence tools, Business Intelligence Infrastructure, Business Intelligence Applications, BI versus Data Warehouse, BI versus Data Mining, Future of BI.

Text Books

T.1	Data Mining- Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers Elsevier, 2nd Editions, 2006.
T.2	Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education, 2nd Edition.

	Reference Books	
R.1	Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.	
R.2	Data Ware Housing Fundamentals, PualrajPonnaiah, Wiley Student Edition	
Useful Links		
1	http://nptel.ac.in/courses/106106093/35	
2	http://nptel.ac.in/syllabus/syllabus_pdf/106106105	

	Course Outcomes	CL	Class Sessions
MCA1203.1	Apply the functionality of the various data mining and data warehousing component	3	9
MCA1203.2	Analyze the strengths and limitations of various data mining and data warehousing models.	4	9
MCA1203.3	Explain the analyzing techniques of various data	4	9
MCA1203.4	Apply appropriate classification and clustering techniques for data analysis.	3	9
MCA1203.5	Assess different approaches of data ware housing and data mining with Business Intelligence	5	9
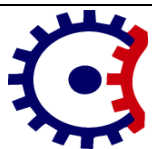
Program: Master in Computer Application						
Semester	**Course Code**	**Name of Course**	**L**	**T**	**P**	**Credits**
II	MCA1204	Internet Programming	3	-	-	3

Pre-Requisites: Object Oriented Programming Using Java

Course Contents

Unit I	JDBC - Introduction, SQL Syntax, Environment, Sample Code, Driver Types, Connections, Statements, Result Sets, Data Types, Transactions, Exceptions, Batch Processing, Stored Procedure, Streaming Data, Networking : Socket, Reserve socket, Internet Addressing, InetAddress, TCP/IP client socket, TCP/IP server socket, URL, URL Connection, Datagram,
Unit II	RMI : Introduction, Architecture, Remote Interface, java.RMIServer package, class naming, creating RMIServer and RMIClient,transmitting files using RMI, clientside callback, RMISecurity Manager.
Unit III	Servlet: Basics of Web, Servlet API, Servlet Interface GenericServlet, HttpServlet, Servlet Life Cycle, servlet in ServletRequest, ServletRequestmethods, RequestDispatcher, sendRedirect, ServletConfig, ServletConfig methods, ServletContext, ServletContext methods, Session Tracking
Unit IV	Session Tracking, Hidden Form Field, URL Rewriting, Cookies, HttpSession. Java Server Pages: Introduction to JSP, Comparison with Servlet, JSP Architecture,JSP Life Cycle, JSP Scripting Elements, JSP Directives, JSP Action, JSP Implicit Objects, JSP Expression Language, JSP Standard Tag Libraries, JSP Custom Tag, JSP Session Management, JSP Exception Handling, JSP CRUD Application.
Unit V	Hibernate: Introduction to Hibernate, Exploring Architecture of Hibernate, O/R Mapping with Hibernate, Hibernate Annotation, Hibernate Query Language, CRUD Operation using Hibernate API. Java Web Frameworks: Spring MVC Spring Introduction, Spring Architecture, Spring MVC Module, Life Cycle of Bean Factory, Explore: Constructor Injection, Dependency

Text Books

|	
1	J2EE: The complete Reference by Jim Keogh McGraw Hill 3rd Edition
2	Java Server Programming Java EE 7 (J2EE 1.7), Black Book by Kogent Learning So. Dream Tech publication 3rd Edition

Reference Books	
1	J2EE Made Easy By Das, Rashmi Kant. Vikas publication 2nd Edition
2	Core J2EE Patterns by Martin Fowler, Chief Scientist. Published by Prentice Hall. 2nd Edition
Useful Links	
1	https://nptel.ac.in/courses/106/105/106105153/
2	https://nptel.ac.in/courses/106/105/106105191/

	Course Outcomes	CL	Class Sessions
MCA1204.1	Apply concepts of Server Socket, Socket, Datagram Socket, Datagram Packet. Also apply Java Database Connectivity techniques.	3	9
MCA1204.2	Apply RMI to create methods remotely & create stub, skeleton layers.	3	9
MCA1204.3	Analyze & Apply Servlet concept Create Servlet based web applications by using GenericServlet, HttpServlet. Use cookies, session tracking mechanism to maintain information of client.	4	9
MCA1204.4	Evaluate the process of Web Servers and Web based applications by using Java Server Pages.	5	9
MCA1204.5	Create framework-based applications by using spring, Hibernate.	6	9

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
II	MCA1205	Artificial Intelligence & Machine Learning	3	-	-	3

Pre-Requisites: Computer science, Basic Math, C++

Course Contents

Unit I	**Introduction:** History and Definition of AI, Foundations Intelligent Agents - Agents and environments-Good behavior- the nature of environments, Structure of agents-Problem Solving agents, Example problems-Searching for solutions.
Unit II	**Searching Techniques:** Informed search and exploration- Informed search strategies, greedy best-first, A* Algorithm, Memory-bounded heuristic search, heuristic functions, Local search algorithms and optimization problems, searching in continuous space, CSP – backtracking search for CSPs, Backtracking search for CSPs, Local search for CSP-structure of problems.
Unit III	**Knowledge:** Representation Introduction to Logic, Syntax and semantics of first order logic, Using first order logic, assertions and queries in first-order logic, kinship domain, Wumpus world problem, Knowledge engineering in first order logic, Inference in first order logic- Propositional vs. first-order inference, Unification and lifting, Storage and retrieval, Forward chaining, Backward chaining, Resolution
Unit IV	**Learning:** Introduction, Learning from observations, Inductive learning, Learning decision trees, Ensemble learning, logical formulation of learning, Knowledge in learning, explanation based learning, Learning using relevance information, inductive logic programming, Statistics learning methods, learning with complete data
Unit V	**Applications:** Communication - Communication as action, A formal grammar for a fragment of English, Syntactic analysis Augmented grammars, Semantic interpretation, Ambiguity and disambiguation

Text Books

T.1	Stewart Russell and Peter Norvig. " Artificial Intelligence-A Modern Approach ", 2nd Edition, Pearson Education/ Prentice Hall of India, 2004

Reference Books

R.1	Elaine Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill, 2003
R.2	Stuart Russell & Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall, Third Edition (2009) .

	Course Outcomes	CL	Class Sessions
MCA2104.1	Apply these techniques in applications which involve perception, reasoning and learning.	3	9
MCA2104.2	Analyze the role of agents and how it is related to environment and the way of evaluating it and how agents can act by establishing goals.	4	9
MCA2104.3	Analyze and design a real-world problem for implementation and understand the dynamic behavior of a system.	4	9
MCA2104.4	Apply different machine learning techniques to design AI machine and enveloping applications for real world problems.	3	9
MCA2104.5	Evaluate the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.	5	9
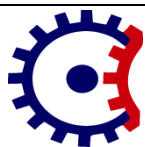
Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
II	MCA1206	Enterprise Resourcing Planning	3	-	-	3

Pre-Requisites: HR Management and E-Business

Course Contents

Unit I	**ERP Introduction:** Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, And the Structure of ERP. Supply chain and resource management, Integrated data model scope, Technology and benefits of ERP & the modern enterprise.
Unit II	**Business Process Reengineering:** Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management. Core process in a manufacturing company, Entities for data model in a manufacturing company, Extended ERP.
Unit III	**ERP Marketplace and Marketplace Dynamics:** Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.
Unit IV	**ERP Implementation Basics:** ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees. Barriers to successful SFA, SFA functionality, technological aspect of SFA: data synchronization, flexibility & performance, Reporting tools.
Unit V	**ERP & E-Commerce:** Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into or-generational culture. Using ERP tool: either SAP or ORACLE format to case study.

Text Books

|	
T.1	Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning Concepts and Practice", PHI.2nd Edition
T.2	Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology. 1st Edition

Reference Books

R.1	Rahul V. Altekar "Enterprise Resource Planning", Tata McGraw Hill, 2nd Edition
R.2	Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – A Concepts and Practice", PHI 4th Edition

	Course Outcomes	CL	Class Sessions
MCA1206.1	Apply a working knowledge of how data and transactions are integrated in an ERP system to manage the sales order process, production process, and procurement process.	3	9
MCA1206.2	Analyze the technical aspect of telecommunication systems, internet and their roles in business environment.	4	9
MCA1206.3	Analyze the strategic options for ERP identification and adoption.	4	9
MCA1206.4	Evaluate organizational opportunities and challenges in the design system within a business scenario.	5	9
MCA1206.5	Develop skills necessary for building and managing relationships with customers, and stakeholders.	6	9
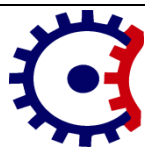
Program: Master in Computer Application						

Semester	Course Code	Name of Course	L	T	P	Credits
II	**MCA1207**	**Natural Language Processing**	**3**	**-**	**-**	**3**

Pre-Requisites: Basic Knowledge of Probability and Python Programming

Course Contents

Unit I	**Introduction: -**Origins and challenges of NLP, Language Modeling: Grammar-based LM, Statistical LM, Regular Expressions, Finite-State Automata, English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance
Unit II	**Word level analysis: -**Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Back off, Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging, Hidden Markov and Maximum Entropy models.
Unit III	**Syntactic analysis: -**Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar, Dependency Grammar, Syntactic Parsing, Ambiguity, Dynamic Programming parsing, Shallow parsing, Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs, Feature structures, Unification of feature structures.
Unit IV	**Semantics and pragmatics: -**Requirements for representation, First-Order Logic, Description Logics, Syntax-Driven Semantic analysis, Semantic attachments, Word Senses, Relations between Senses, Thematic Roles, selection restrictions, Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods, Word Similarity using Thesaurus and Distributional methods.
Unit V	**Discourse analysis and lexical resources:-** Discourse segmentation, Coherence, Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm, Coreference Resolution, Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Text Books

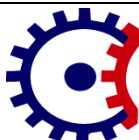|	
1	Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014, 2nd Edition.
2	Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python‖, First Edition, OReilly Media, 2009, 1st Edition.

Reference Books

1	Breck Baldwin, ―Language Processing with Java and Ling Pipe Cookbook, Atlantic Publisher, 2015, 2nd Edition.
2	Richard M Reese, ―Natural Language Processing with Java‖, OReilly Media, 2015, 2nd Edition.

Useful Links

1	https://nptel.ac.in/courses/106/101/106101007/
2	https://onlinecourses.nptel.ac.in/noc19_cs56/

	Course Outcomes	**CL**	**Class Sessions**
MCA1207.1	Apply a given text with basic Language features	3	9
MCA1207.2	Design an innovative application using NLP components	6	9
MCA1207.3	Evaluate a rule-based system to tackle morphology/syntax of a language	5	9
MCA1207.4	Design a tag set to be used for statistical processing for real-time applications	6	9
MCA1207.5	Compare and contrast the use of different statistical approaches for different types of NLP applications.	4	9

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
II	**MCA1208**	Social Network Analysis & Digital Marketing	3	0	-	3

Pre-Requisites: E-Commerce, Computer Graphics, Digital Communication Network

Course Contents

Unit I	Introduction to Digital Marketing and its Significance, Traditional Marketing Vs Digital Marketing, Digital Marketing Process, Website Planning and Development: Types of websites, Website Planning and Development, Keywords Understanding Domain and Webhosting, Building Website/Blog using CMS WordPress, Using WordPress Plug-ins
Unit II	Introduction to Search Engine Optimization, Keyword P lanner Tools, On Page SEO Techniques-Indexing and Key Word PlacementSEO Techniques-Indexing and Key Word Placement On Page SEO Techniques- Content Optimization, On Page SEO : Yoast SEO Plug-in, Off –Page SEO Techniques, Email Marketing- Introduction and Significance, Designing e-mail marketing campaigns using Mail Chimp Building E-mail List and Signup Forms, Email Marketing Strategy and Monitoring, Email –Atomization
Unit III	Pay Per Click Advertising, Google Adword, Types of Bidding strategies, Designing and Monitoring search campaigns, Designing and Monitoring Display campaigns, Designing and Monitoring Video campaigns, Designing and Monitoring Universal App Campaigns, Developing digital marketing strategy in Integration form, Advertising Account.
Unit IV	Marketing: Introduction and Significance, Understanding Audience and its Types, Analytics Interface and Setup, Understanding Goals and Conversions, Monitoring Traffic Behavior and preparing Reports, Social Media Marketing: Introduction and Significance, Social Network Analysis & Marketing: Basics, Designing SocialNetwork AdvertisingCampaigns, Types of Various Ad Formats
Unit V	Case Study: Facebook Linkdin, Twitter (Marketing, Designing Advertising, Campaigns, Analysis Audience behavior).

Text Books

T.1	V.K. Jain, "Cryptography and Network Security",2ndEdition, Khanna Publishing House.
T.2	Atul Kahate, "Cryptography and Network Security",2ndEdition, McGraw Hill.
T.3	Bothra Harsh, "Hacking", Khanna Publishing House, 3rd Edition, Delhi

	Reference Books
R.1	William Stallings, "Cryptography and Network Security", 2nd Edition, Pearson Education/PHI, 2006.

	Useful Links
1	https://nptel.ac.in/courses/106/105/106105162/
2	https://nptel.ac.in/courses/106/105/106105031/
3	https://nptel.ac.in/courses/106/106/106106178/

	Course Outcomes	CL	Class Sessions
MCA1208.1	Examine various types of alternatives for digital marketing	3	9
MCA1208.2	preparation of various tools for and services for digital marketing	4	9
MCA1208.3	preparation About Google search engine and its analysis	4	9
MCA1208.4	Implementation of analysis tools and marketing material at various platform of social media	5	9
MCA1208.5	Demonstrate digital marketing approach at face book platform	5	9

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Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
II	MCA1209	Digital Image Processing	3	-	-	3

Pre-Requisites: Mathematics, C/C++ programming skills

Course Contents

Unit I	**Introduction:** Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling and quantization
Unit II	**Image Restoration:** Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections.
Unit III	**Morphological Image Processing:** Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.
Unit IV	**Image Segmentation:** Boundary detection-based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding, Otsu's method, moving averages, Multivariable thresholding, Region based segmentation, Watershed algorithm, Use of motion in segmentation
Unit V	**Spatial Domain Filtering:** Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, smoothing filters, sharpening filters, gradient and Laplacian.

Text Books

T.1	R.C.Gonzalas and R.E.Woods, Digital Image Processing, Prentice Hall, 3rd Ed
T.2	Al Bovik (ed.), "Handbook of Image and Video Processing", Academic Press, 2000.

Reference Books

R.1	Digital Image Processing, 3rd Edition, by Rafael C Gonzalez and Richard E Woods. Publisher: Pearson Education.
R.2	A.K.Jain, Fundamentals of Digital Image Processing, Prentice Hall.

	Course Outcomes	CL	Class Sessions
MCA1209.1	Apply image processing algorithms in practical applications.	3	9
MCA1209.2	Analyze general terminology of digital image processing.	4	9
MCA1209.3	Analyze images in the frequency domain using various transforms.	4	9
MCA1209.4	Evaluate the techniques for image enhancement and image restoration.	5	9
MCA1209.5	Develop Fourier transform for image processing in frequency domain.	6	9

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
II	MCA1210	Mobile Application Lab Based on Android and IOS programming	0	0	4	2

Pre-Requisites: Java programming, Understanding of XML, IDE platforms, Mathematical aptitude, Object Oriented Programming

Course Contents		CO
1	Input checking Create an application which examine, that a phone number.	CO1
2	Create an application of Quiz interface.	CO1
3	Create an application by taking input and show a massage on screen.	CO2
4	Create a screen user information window.	CO2
5	Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity	CO3
6	Design an android application Send SMS	CO3
7	Create an android application with Fragments	CO4
8	Design an android application Using various objects	CO4
9	Design an android application for menu.	CO5
10	Create a user registration application that stores the user details in a database table.	CO5

Text Books

T.1	Mobile Computing, Raj Kamal, 2nd Edition, Oxford University Press
T.2	Applications with UML and XML, Reza Behravanfar, 2nd Edition, Cambridge University Press
T.3	Mobile Computing , Talukdar, 2nd Edition, TMH

Reference Books

R.1	Handbook of Wireless Networks and Mobile Computing, 2nd Edition, Stojmenovic and Cacute, Wiley
R.2	Applications with UML and XML, Reza Behravanfar, 3rd Edition, Cambridge University Press

	Useful Links	
1	https://nptel.ac.in/courses/106/106/106106212/
2	https://nptel.ac.in/courses/106/107/106107220/
3	https://nptel.ac.in/courses/106/105/106105186/

	Course Outcomes	CL	Lab Sessions
MCA1210.1	Use of tools for mobile application at various sectors and its functionality.	3	3
MCA1210.2	Demonstrate technical constraints relative to storage capacity, processing capacity, display screen, communication interfaces.	3	4
MCA1210.3	Design and implement feature-rich mobile applications for smart phones.	6	3
MCA1210.4	Create various Android applications with standard tools and mechanism.	6	4
MCA1210.5	Determine the Application for mobile computing and installation using iOS.	5	5

Program: Master in Computer Application					
Semester	Course Code	Name of Course	L	T	P	Credits
II	MCA1211	Python Programming Lab	-	-	4	2

Pre-Requisites: Conditional & control structures, loops, arrays, functions & Object oriented concepts.

Course Contents

Sr. No.	List of Experiment	CO Mapping
1	Develop application using user defined functions.	CO1
2	Develop application using Exception handling.	CO1
3	Develop application using built in functions.	CO2
4	Develop application using manipulation concepts.	CO2
5	Develop application using file handling techniques.	CO3
6	Develop application using communication over network.	CO3
7	Develop application using RAD Tool.	CO4
8	Develop application using dynamic web tools.	CO4
9	Develop application using cross platform development.	CO5
10	Develop application using blocks & frames.	CO5

Text Books

1	The Complete Reference Python by Martin C. Brown MC Graw Hill 2nd Edition
2	Core Python programming by Dr. R. NageswaraRao Dream Press India 2nd Edition

Reference Books

1	Learning Python Design Patterns by ZlobinGennadiyPackt publishing 2nd Edition
2	Programming & Problem solving with Python by Ashok NamdevKamthane MC Graw Hill 2nd Edition

Useful Links

1	https://nptel.ac.in/courses/106/106/106106212/
2	https://nptel.ac.in/courses/106/106/106106212/

	Course Outcomes	CL	Lab Sessions
MCA1211.1	Apply fundamental concepts to develop applications.	3	2
MCA1211.2	Analyze functions and built in tools to develop Python applications.	4	4
MCA1211.3	Evaluate input, output functions in file handling techniques to develop to maintain data back end.	5	5
MCA1211.4	Analyze HTML, CSS concepts to develop web based applications using Python.	4	6
MCA1211.5	Create Python Programming based applications using object orientation.	6	6

	First Year (Semester-I) Master in Computer Application					

Semester	Course Code	Name of Course	L	T	P	Credits
II	**MCA1212**	**Data Warehouse and Mining Lab**	-	-	4	2

Pre-Requisites: Database Management System, Structured Query Language

Course Contents

Sr. No.	List of Experiment	CO
1	Implementation of Varying Arrays	CO1
2	Implementation of Nested Tables	CO1
3	OLAP operations	CO1, CO2
4	Implement Apriori algorithm for association rule.	CO2
5	Write a program of cluster analysis using simple k-means algorithm using any programming language	CO2, CO3
6	Demonstration of preprocessing on dataset student.arff	CO3
7	Demonstration of preprocessing on dataset labor.arff	CO3
8	Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm	CO4
9	Demonstration of classification rule process on dataset student.arff using j48 algorithm	CO5
10	Demonstration of clustering rule process on data-set iris.arff using simple k-means.	CO5

Text Books

1	Data Mining-Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006.
2	Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education, 2nd Edition

Reference Books

1	Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2	Data Ware Housing Fundamentals, PualrajPonnaiah, Wiley Student Edition, 2nd Edition.

Useful Links

1	https://nptel.ac.in/courses/106/105/106105150
2	https://nptel.ac.in/courses/106/105/106105174/

	Course Outcomes	CL	Class Sessions	Lab Sessions
MCA1212.1	Apply the functionality of the various data mining and data warehousing component	3	9	2
MCA1212.2	Analyze the strengths and limitations of various data mining and data warehousing models.	4	9	4
MCA1212.3	Explain the analyzing techniques of various data	4	9	2
MCA1212.4	Evaluate appropriate classification and clustering techniques for data analysis.	5	9	2
MCA1212.5	Create different approaches of data ware housing and data mining with Business Intelligence	6	9	4

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Program: Master in Computer Application						
Semester	**Course Code**	**Name of Course**	**L**	**T**	**P**	**Credits**
II	MCA1213	Internet Programming Lab using Advance Java	-	-	4	2

Pre-Requisites: Core Java Programming

Sr. No.	List of Experiment	CO Mapping
1	Develop application by using JDBC.	CO1
2	Develop application by using Socket.	CO1
3	Develop application by using RMI.	CO2
4	Develop application by using RMI.	CO2
5	Develop application by using Servlet.	CO3
6	Develop application by using session tracking.	CO3
7	Develop application by using Java Server Pages.	CO4
8	Develop application by using Java Jserver Pages, JDBC.	CO4
9	Develop application by using Hibernate.	CO5
10	Develop application by using Spring.	CO5

Text Books

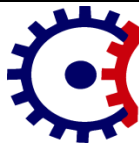|	
1	Complete Reference ,HerbertSchildt, TMH
2	Programming with Java , C Muthu ,McGraw Hill

Reference Books

1	Black Book on java
2	Head First JAVA by Kathy Sierra and Bert Bates

Useful Links

1	https://nptel.ac.in/courses/106/105/106105191

	Course Outcomes	CL	Lab Sessions
MCA1213.1	Apply concepts of Server Socket, Socket, Datagram Socket, and Datagram Packet along with JDBC.	3	2
MCA1213.2	Apply RMI to create methods remotely & create stub, skeleton layers.	3	3
MCA1213.3	Create web-based applications by usingServlet concepts.	6	4
MCA1213.4	Evaluate the process of Web Servers and Web based applications by using Java Server Pages.	5	5
MCA1213.5	Create framework-based applications by using spring, Hibernate.	6	5

Program: Master in Computer Application

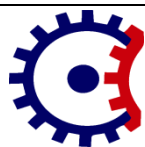| Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA2301	Software Testing and Quality Assurance	3	-	-	3

Pre-Requisites: System analysis and Design, Software Engineering.

Course Contents

Unit I	**TESTING TECHNIQUES & TEST CASE DESIGN** Using White Box Approach to Test design - Test Adequacy Criteria – Static Testing Vs.Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – Their Role in White box Based Test Design – CodeComplexity Testing – Evaluating Test Adequacy Criteria. Test Case Design Strategies – Using Black Box Approach to Test Case Design – Random Testing – Requirements basedtesting – Boundary Value Analysis –Decision tables – Equivalence Class Partitioning – Statebased testing – Cause-effect graphing – Error guessing – Compatibility testing – User documentation testing – Domain testing – Case study for Control Flow Graph and Statebased Testing.
Unit II	**LEVELS OF TESTING** The Need for Levels of Testing- Unit Test Planning –Designing the Unit Tests – The TestHarness – Running the Unit tests and Recording Results – Integration Tests – DesigningIntegration Tests – Integration Test Planning – Scenario Testing – Defect Bash Elimination.System Testing – Acceptance testing – Performance testing – Regression Testing -Internationalization testing - Ad-hoc testing – Alpha, Beta Tests- Testing OO systems – Usability and Accessibility Testing – Configuration Testing - Compatibility Testing – Testing the documentation – Website Testing - Case Study for Unit and Integration Testing.
Unit III	**TESTING FOR SPECIALIZED ENVIRONMENT** Testing Client / Server Systems – Testing in a Multiplatform Environment - Testing ObjectOriented Software – Object Oriented Testing – Testing Web based systems – Web basedsystem – Web Technology Evolution – Traditional Software and Web based Software – Challenges in Testing for Web-based Software – Quality Aspects – Web Engineering – Testing of Web based Systems. Case Study for Web Application Testing
Unit IV	**TEST AUTOMATION** Selecting and Installing Software Testing Tools - Software Test Automation – Skills needed for Automation – Scope of Automation – Design and Architecture for Automation – Requirements for a Test Tool – Challenges in Automation – Tracking the Bug – Debugging – Case study using Bug Tracking Tool.
Unit V	**SOFTWARE TESTING AND QUALITY METRICS** Six-Sigma – TQM - Complexity Metrics and Models – Quality Management Metrics - Availability Metrics - Defect Removal Effectiveness - FMEA - Quality Function Deployment –Taguchi Quality Loss Function – Cost of Quality. Case Study for Complexity and Object Oriented Metrics.

Text Books

1	Adithya P. Mathur, "Foundations of Software Testing – Fundamental's algorithms and techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008, 2nd Edition
2	Boris Beizer, "Software Testing Techniques" , Dream Tech Press, 2009, 2nd Edition.

	Reference Books
1	Dale H. Besterfiled, "Total Quality Management", Pearson Education Asia, Indian Reprint (2011), 3rd Edition.
2	Edward Kit, " Software Testing in the Real World – Improving the Process", Pearson Education,

	Useful Links
1	https://nptel.ac.in/courses/106/105/106105150
2	http://nptel.ac.in/courses/106/101/106101163/

	Course Outcomes	CL	Class Sessions
MCA2301.1	Apply the software testing techniques for test case design	3	9
MCA2301.2	Analyze the project and to test the entire computer-based systems at all levels.	4	9
MCA2301.3	Use the applications in the specialized environment using various automation tools.	3	9
MCA2301.4	Evaluate the web applications using bug tracking tools.	5	9
MCA2301.5	Apply quality and reliability metrics to ensure the performance of the software	3	9

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA2302	Data Science	4	-	-	4

Pre-Requisites: Data warehousing and Data Mining, Data Structure

Course Contents

Unit I	Introduction-What is Data Science -The steps in Doing Data Science-Skills needed to do Data Science storing data-combining bits into larger structures-Identifying Data Problems
Unit II	Getting Started with R-Installing R-Using R-Creating and Using Vectors-Follow the Data Understanding existing Data sources-Exploring Data Models-Rows and Columns-Creating Data frames-Exploring data frames-Accessing columns in a Data frame- Reading a CSV text file-Removing rows and columns-Renaming rows and columns-sorting data frames
Unit III	Onward with RStudio-Creating R scripts-Creating Functions using R-Testing Functions-Use of Statistics-Sampling a population-Understanding Descriptive statistics-Using Histograms to understand a distribution-Normal Distribution
Unit IV	Importing Data Using RStudio-Accesing Excel data-Accessing Database-Comparing SQL and R for accessing a data set - Visualization overview-Basic Plots in R-Using ggplot2-Advanced ggplot2 Visualizations-Map Mashup-Map Visualization with ggplot2-Showing points on a Map-Map Visualization example
Unit V	Data Mining Overview-Association Rule Mining-Text Mining-Supervised and Unsupervised Learning Supervised Learning via Support Vector Machines-Support Vector Machines in R-Creating Web Applications With R

Text Books

T.1	Jeffrey S.Saltz,Jeffre M. Stanton,"An Introduction to Data Science",Sage Publications,2018
T.2	Data Science for Beginners, by Andrew Park

Reference Books

R.1	Nina Zumal, John Mount (2014). Practical Data science in R, Managing Publication Company
R.2	V. Bhuvaneswari, T. Devi, (2016). Big Data Analytics: A Practitioner's Approach, Bharathiar University

Useful Links

1	https://www.digimat.in/nptel/courses/video/106107220/
2	https://nptel.ac.in/courses/106/106/106106179/

	Course Outcomes	CL	Class Sessions
MCA2302.1	Apply Data Evolution and analyze the data.	3	9
MCA2302.2	Analyze the basic concepts of Big data.	4	9
MCA2302.3	Apply the statistical measures of R in real time environment	3	9
MCA2302.4	Analyze the basic concepts of data science.	4	9
MCA2302.5	Evaluate the fundamental principles of R.	5	9

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA2303	Deep Learning	3	-	-	3

Pre-Requisites: Programming skills, Basic statistics, probability and optimization

Course Contents

Unit I	**Introduction:** Introduction to machine learning- Linear models (SVMs and Perceptions, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates
Unit II	**Deep Networks:** History of Deep Learning- A Probabilistic Theory of Deep Learning- Back propagation and regularization, batch normalization- VC Dimension and Neural Nets- Deep Vs Shallow Networks Convolution Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning
Unit III	**Dimensionality reduction**: Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convent - Architectures – Alex Net, VGG, Inception, ResNet - Training a Convent: weights initialization, batch normalization, hyper parameter optimization
Unit IV	**Optimization and generalization**: Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience
Unit V	**Case study and applications** :Image net- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection Bioinformatics- Face Recognition- Scene Understanding- Gathering Image Captions

Text Books

T.1	Deep Learning- Ian Goodfellow, YoshuaBenjio, Aaron Courville, The MIT Press
T.2	Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

Reference Books

R.1	CosmaRohillaShalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
R.2	Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning, MIT Press, 2016.

Useful Links

1	https://onlinecourses.nptel.ac.in/noc20_cs62/preview
2	https://nptel.ac.in/courses/106/106/106106184/

	Course Outcomes	CL	Class Sessions
MCA2303.1	Apply deep learning techniques to practical problems	3	9
MCA2303.2	Apply motivation and functioning of the most common types of deep neural networks	3	9
MCA2303.3	Analyze optimization and generalization in deep learning	4	9
MCA2303.4	Analyze the deep learning applications	4	9
MCA2303.5	Evaluate the high dimensional data using reduction techniques	5	9

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA2304	Asp Dot Net using C# Dot Net	3	-	-	3

Pre-Requisites:C# Programming; Database (DBMS); **C#** Syntax And Semantics,.**Net** framework

Course Contents

Unit I	**Introduction:** Introduction to .NET, the origins of .NET, .NET framework overviews (a common substrate for all development, key design goals, Mega Data, Multiple language integration and support, Name spaces), .NET framework Base classes, User and program interfaces (user Interface, Windows Forms, Web Forms, Console application), Program interface, Web Services Introduction to Common Language Runtime (CLR) Requirement of .NET application (Assembly, Module, Type), common type systems (Custom types, Boxing & Unboxing value types), Metadata (Attributes, Custom Attributes), Managed Data (Managed Heap, Garbagecollector), Garbage collector, optimization, pinning objects..
Unit II	**Introduction to C Sharp**, Value type, Default Constructor, Struct type, Enumeration type, Reference type, Class Type, Object Type, String Type, Interface type, Array type, Delegate type, Predefined types, Array types, Variables & Parameters, Operands, Statements. Expression, operators,C Sharp Objects, Classes and Methods, Inheritance, ,Class library and Name Space, Method overloading.
Unit III	**Introduction to ASP .NET -** About ASP .NET, Basic difference between C# and VB .NET, **Understanding Namespaces and Assemblies -** Importing Namespaces, Assemblies. **Web Server and user -** Installing IIS. IIS Manager - Creating a virtual Director, Virtual Directories andApplications, Folder Settings, Adding virtual directory to your Neighborhood.**Installing ASP .NET. ASP.NET Applications -** ASP .NET file Types, The bin directory, Code-Behind, The Global.asax Code-Behind,Understanding ASP. Net Classes, ASP .NET11Configuration,
Unit IV	**State Management Tracing, Logging and Error Handling -**Common errors, .NET ExceptionObject, Handling Exceptions,Throwing your own Exceptions, Logging Exceptions, Error pages,Page tracing.**Advanced ASP. NET -Component-Based Programming -** Components Jargon,Creating Simple Component, Properties andState, Database Components, Using COMComponents. Custom Controls-User Controls, Deriving Custom controls
Unit V	**Introduction to MVC3** The Model-View-Controller PatternDifferences Between MVC and Web Forms Applications Building a Simple MVC Application with Visual StudioWorking with Controllers and Actions Introduction to Controllers Using a Controller to Manage the Application Controller Actions Returning Action Results Creating MVC Models Data and Business Rules in MVC Applications Creating a Custom Data Model

Text Books

T.1	C#(CSharp) Programming, V. K. Jain, Dreamtech Press, New Delhi

Reference Books

R.1	C # (C Sharp) Complete Reference ,Schildt, Tata McGraw Hill
R.2	ASP .NET 4.5(Covers C# and VB codes),Black Book, dreamtech Publication

Useful Links

1	https://nptel.ac.in/courses/1104/108104139/
2	http://nptel.ac.in/courses/1095

	Course Outcomes	CL	Class Sessions
MCA2304.1	Apply concepts to create applications by using ASP.NET web controls. Apply concepts of arrays functions & use csharp as code behind file of ASP.Net	3	9
MCA2304.2	Analyze developing interactive web pages & create user defined controls.	4	9
MCA2304.3	Evaluate exception handling mechanism by using try, catch blocks to create applications.	5	9
MCA2304.4	Analyze session tracking mechanism for managing sessions, cookies.	4	9
MCA2304.5	Create applications by using Page class by using various events of Page class.	6	9

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Semester	Course Code	Name of Course	L	T	P	Credits
III	**MCA2305**	Cloud Computing	3	0	-	3

Pre-Requisites: Basics of Java Programming, Database Management System, Digital Communication & Networking

	Course Contents
Unit I	**Basic Concepts and Terminology** :-Origins and Influences,Cloud Characteristics, Cloud Delivery Models (IaaS, PaaS, SaaS), Cloud Deployment Models(private, public and hybrid cloud), public vs private clouds**Virtualization:-** Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.
Unit II	**Common Standards**: The Open Cloud Consortium, Open Virtualization Format, Standards for Application Developers: Browsers (Ajax), Data (XML, JSON), Solution Stacks (LAMP and LAPP),Syndication (Atom, Atom Publishing Protocol, and RSS), **Applications**: Moving application to cloud, Microsoft Cloud Services, Google Cloud Applications, Amazon Cloud Services, Cloud Applications (Social Networking, E-mail, Office Services, Google Apps).
Unit III	**Cloud Security:-** Cloud Security Threats and Attacks, Network level security, Host level security(SaaS, PaaS and IaaS), Application level security, Data Security, Data Confidentiality and Availability Cloud Security Encryption Mechanisms, Identity and Access Management, security virtual server protection, virtualization-based sandboxing, Storage Security.
Unit IV	**Introducing the Salesforce.com:** Salesforce releases, Analysing real time functional requirement, Converting functional requirement to technical specifications, Building Data model, Customer relationship management (CRM), Different Objects in CRM, CRM Functionality
Unit V	**Salesforce Platform:** Advantages, Products and Services, Registering Developer Edition with Salesforce.com Standard applications, Standard Tabs, Standard Objects and relationships, Links Setup page – (Personal Setup, Application Setup and Administration Setup) , Personal Setup – (Personal Information, Change Password, Reset my security Token, Change My Display, Grant Login Access, Calendar Access, Reminders, Email Settings)

Text Books

1	Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, 2nd Edition, TATA McGraw- Hill , New Delhi – 2010
2	Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller 3rd Edition
3	Jack J. Dongarra, Kai Hwang, Geoffrey C. Fox, Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Elsevier, ISBN :9789381269237, 9381269238, 1st Edition.

Reference Books

1	Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, 2nd Edition, TATA McGraw- Hill , New Delhi – 2010	

Useful Links

1	https://nptel.ac.in/courses/106/105/106105223/
2	https://nptel.ac.in/courses/106/104/106104182/
3	https://nptel.ac.in/courses/106/105/106105167/

	Course Outcomes	CL	Class Sessions
MCA2305.1	Practice the terminology of cloud computing and network functionality	3	9
MCA2305.2	Examine various cloud providers and service providing styles	4	9
MCA2305.3	Planning of Communication network model data flow and security issues	4	9
MCA2305.4	Evaluate about implementation and working with Salesforce.com	5	9
MCA2305.5	Create various models used in communication with Salesforce	6	9

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA2306	Salesforce Lab	-	-	4	2

Pre-Requisites: Basics of Java Programming, Database Management System, Digital Communication & Networking

	Course Contents	CO
1	Write a program to update customer salary by using transaction.	CO1
2	Write a program to create and fire update trigger	CO1
3	Write a program to create view up on employee details	CO2
4	Write a program to develop inner join using student table.	CO2
5	Write a program to show records in between dates	CO3
6	Write a program to create cursor up on employee table	CO3
7	Write a program to show students marks details	CO4
8	Write a program to update employees' salary by 5%	CO4
9	Write a program to show all records of employees who are in sales department	CO5
10	Write a program to create account using web page.	CO5

Text Books

1	Evan Bayross and Sharman Shah "PHP5.1 for beginners", SPD Publications, 2006.
2	Kevin Tatroe, Rasmus Lerdorf "Programming PHP: Creating Dynamic Web Pages" 2013

Reference Books

1	Steven Holzner "PHP: The Complete Reference" 2017
2	Vikram Vaswani "PHP: A BEGINNER'S GUIDE" 2008

Useful Links

1	https://nptel.ac.in/courses/106/105/106105084/
2	https://nptel.ac.in/courses/106/105/106105085/
3	http://www.nptelvideos.com/php/php_video_tutorials.php

	Course Outcomes	CL	Lab Sessions
MCA2306.1	Practice the terminology of cloud computing and network functionality	3	2
MCA2306.2	Examine various cloud providers and service providing styles	3	3
MCA2306.3	Planning of Communication network model data flow and security issues	4	4
MCA2306.4	Evaluate about implementation and working with Salesforce.com	5	6
MCA2306.5	Create various models used in communication with Salesforce	6	6

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First Year (Semester-I) Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA2307	Software Testing and Quality Assurance Lab	-	-	4	2

Pre-Requisites: Software Engineering, System Analysis and Design

Course Contents

Sr. No.	List of Experiment	CO
1	Write a program in any programming language to accept a number and generate a table. Draw a flow graph and design various test cases for testing all possible paths.	CO1
2	Write and test a program to login a specific web page.	CO1
3	Write and test a program to update 10 student records into table into Excel file.	CO2
4	Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects)	CO2
5	Write and test a program to provide total number of objects present / available on the page	CO3
6	Write and test a program to get the number of list items in a list / combo box.	CO3
7	Write and test a program to count number of check boxes on the page checked and unchecked count.	CO4
8	Write a program to find the sum of the matrices. Write all the test cases so as to verify the correctness of the logic.	CO4
9	Write the code for binary and linear search. Find the cyclomatic complexity of the two by drawing the flow graph.	CO5
10	Write a program to compute the factorial of a number and create du and dc graph for the same.	CO5

Text Books

|	
1	Adithya P. Mathur, "Foundations of Software Testing – Fundamental's algorithms and techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008
2	Boris Beizer, "Software Testing Techniques" , Dream Tech Press, 2009

Reference Books

1	Dale H. Besterfiled, "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2011).
2	Edward Kit, " Software Testing in the Real World – Improving the Process", Pearson Education, 1995

Useful Links

1	https://nptel.ac.in/courses/106/105/106105150
2	http://www.asknumbers.com/QualityAssuranceandTesting.aspx

	Course Outcomes	CL	Class Sessions	Lab Sessions
MCA2307.1	Apply the software testing techniques for test case design	3	9	2
MCA2307.2	Analyze the project and to test the entire computer-based systems at all levels.	4	9	4
MCA2307.3	Use the applications in the specialized environment using various automation tools.	3	9	2
MCA2307.4	Evaluate the web applications using bug tracking tools.	5	9	2
MCA2307.5	Apply quality and reliability metrics to ensure the performance of the software.	3	9	4
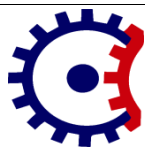
Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	MCA2308	ASP.NET using C#. NET Lab	-	-	4	2

Pre-Requisites:HTML, Csharp.Net

Sr. No.	List of Experiment	CO
1	Write a program in ASP.Net using C# that take a student name from the user, add that name to list-box control and delete the chosen name from the list box.	CO1
2	Write a program in ASP.Net using C# to calculate compound interest. Take compound frequency from drop-down list. For example Annual value-1, quarterly value-4, monthly value-12, daily value-365. Formula: Temp=(1+rate/period) Result=Principal amount + pow(Temp,(year*period))	CO1
3	Write a program in ASP.Net using C# that takes name and message from the user and choose a color by radio button, select font from drop down list , select a style (for ex : bold, italic, underline) from the checkbox and display in label control, when you clicked on display button. And clear the information when you clicked on clear button.	CO2
4	Write a program in ASP.Net using C# using Server controls that convert given currency into another selected currency. For that you need a drop-down-list.	CO2
5	Write a program in ASP.Net using C# that displays registration form. Fields are first name, last name, email, password, reenter password, age(dd-mm-yyyy), phone no, address, city with appropriate validation controls such as email validation, city to choose from combo box options. Show the summary of invalid validation.	CO3
6	Write a program in ASP.Net using C# to create a custom validation control that check even number.	CO3
7	Write a program in ASP.Net using C# that takes no. of rows and columns from the user and make a table using Grid Control.	CO4
8	Write a program in ASP.Net using C# to show the page events.	CO4
9	Write a program in ASP.Net using C# for getting view state.	CO5
10	Write a program in ASP.Net using C# to throw user defined exception.	CO5

Text Books

|	
1	Multimedia and Web Technology by Reeta Sahu.
2	Programming ASP.NET Core by Dino Esposito, PHP publisher 2016

Reference Books

1	ASP.NET complete reference by Matthew Macdonald Tata MC Graw Hill, 2015

Useful Links

1	https://nptel.ac.in/courses/1104/108104139/

2	http://nptel.ac.in/courses/1095

	Course Outcomes	**CL**	**Lab Sessions**
MCA2308.1	Apply concepts to create applications by using ASP.NET web controls. Apply concepts of arrays functions & use csharp as code behind file of ASP.Net	3	2
MCA2308.2	Analyze developing interactive web pages & create user defined controls.	4	3
MCA2308.3	Evaluate exception handling mechanism by using try, catch blocks to create applications.	5	4
MCA2308.4	Analyze session tracking mechanism for managing sessions, cookies.	4	4
MCA2308.5	Create applications by using Page class by using various events of Page class.	6	6
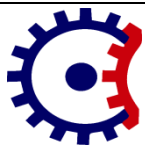
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Semester	Course Code	Name of Course	L	T	P	Credits
IV	MCA2402	Business Process Domain	3	0	-	3

Pre-Requisites: Management Information System, Software Engineering

Course Contents

Unit I	**IT Industry Fundamentals for Business Analysts:-**Software Development Life Cycle, Types of Software Projects – Greenfield, Migration, Product Customization, Maintenance etc.Software Testing, Test Plans, Test Automation, Black Box and White Box TestingIT ImplementationIT Deployment Environments – SAAS, On Premise, Client Server etc.Software Licensing, Subscription and Sale ModelsProject Development Vs Product DevelopmentRUP , MethodologiesCloud Service and Deployment Models - Public, Private, Hybrid, Community,
Unit II	**Business Process Analysis:-**Business Process Mapping and Modeling Software, Importance of Requirements for IT Projects, Requirement Software Companies - JIRA, Rational Requisite Pro, Stakeholder & their importance, Stakeholder Alignment and Sponsorship, Managing Internal stakeholders
Unit III	**Business Process Model and Notation:-**Types of Process Modeling – Process Maps, Models, Descriptions, BPMN Elements : Flow Objects, Data, Swim Lanes, Connecting Objects, Artifacts, BPMN Software (Bizagi, Oracle BPM, Calypso), Wireframes. Mockups and Prototypes Essentials, Preparing Wire-frames through MS Excel
Unit IV	**Enterprise IT Analysis:-**Mission, Vision, Values, Strategies, Objectives, Enterprise IT Analysis Activities & Task List, Defining the Business Need, Preparing Business and Enterprise IT Architecture, Enterprise IT Analysis Useful Techniques
Unit V	**Software Test Management & User Acceptance Testing for the IT Business Analyst:-**Software quality assurance, Software testing techniques, S/W testing fundamentals, White box testing,Black box testing, Validation testing, System testing, Debugging, software maintenance:maintainability, Maintenance tasks, Reverse engineering and reengineering.

Text Books

T.1	The Business Analyst's Handbook Howard Podeswa, 2nd Edition
T.2	The Art of Software Testing, 3rd Edition, Glenford J. Myers, Corey Sandler, Tom Badgett.
T.3	Business Process Management: Practical Guidelines Successful Implementations by John Jeston 3rd Edition

Reference Books

R.1	Business Process Reengineering, PHI, R. Radhakrishnan S.BalasubramanianEstern Economy Edition
R.2	Business Model Management Design-Process -Instruments by Bernd W. Wirtz 3rd Edition

	Useful Links	
	1	https://nptel.ac.in/courses/110/105/110105083/
	2	https://nptel.ac.in/courses/110/107/110107114/
	3	https://nptel.ac.in/courses/110/105/110105155/

	Course Outcomes	CL	Class Sessions
MCA2402.1	Practice of business and its internal activity protocol with human interaction skills.	3	9
MCA2402.2	Demonstrate flow of working discipline by utilizing the ability of employees.	3	9
MCA2402.3	Distinguish knowledge on customer relationship making and control over services.	3	9
MCA2402.4	Organize the concept of Business Process Reengineering and implementation.	4	9
MCA2402.5	Preparation of supply chain management and services to improve the testing ability.	5	9

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Semester	Course Code	Name of Course	L	T	P	Credits
IV	MCA2403	Soft Computing	3	0	-	3

Pre-Requisites: Object Oriented Programming, Digital Communication Network

Course Contents

Unit I	Introduction of soft computing, soft computing vs hard computing. Soft computing techniques. Computational Intelligence and applications, problem space and searching: Graph searching, different searching algorithms like breadth first search, depth first search techniques, heuristic searching Techniques like Best first Search, A* algorithm, AO* Algorithms. Game Playing: Minimax search procedure, adding alpha-beta cutoffs, additional refinements, Iterative deepening, Statistical Reasoning: Probability and Bayes theorem, Certainty factors and Rules based systems, Bayesian Networks, Dempster Shafer theorem
Unit II	Neural Network: Introduction, Biological neural network: Structure of a brain, Learning methodologies. Artificial Neural Network(ANN): Evolution of, Basic neuron modeling , Difference between ANN and human brain, characteristics, McCulloch-Pitts neuron models, Learning (Supervised & Unsupervised) and activation function, Architecture, Models, Hebbian learning , Single layer Perceptron, Perceptron learning, Windrow-Hoff/ Delta learning rule, winner take all , linear Separability, Multilayer Perceptron, Adaline, Madaline, different activation functions Back propagation network, derivation of EBPA, momentum, limitation, Applications of Neural network**.**
Unit III	Unsupervised learning in Neural Network: Counter propagation network, architecture, functioning & characteristics of counter Propagation network, Associative memory, hope field network and Bidirectional associative memory. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Introduction to Support Vector machine, architecture and algorithms, Introduction to Kohanan's Self organization map, architecture and algorithms
Unit IV	Fuzzy systems: Introduction, Need, classical sets (crisp sets) and operations on classical sets Interval Arithmetics,Fuzzy set theory and operations, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Membership functions.
Unit V	Fuzzy rule base system: fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic, fuzzification and defuzzification, Fuzzy associative memory. Fuzzy Logic Theory, Modeling & Control Systems

Text Books

T.1	S.N. Shivnandam, "Principle of soft computing", Wiley India.
T.2	David Poole, Alan Mackworth "Computational Intelligence: A logical Approach" Oxford.
T.3	Eiben and Smith "Introduction to Evolutionary Computing" Springer

	Reference Books
R.1	E. Sanchez, T. Shibata, and L. A. Zadeh, Eds., "Genetic Algorithms and Fuzzy Logic Systems: Soft Computing Perspectives, Advances in Fuzzy Systems - Applications and Theory", River Edge, World Scientific 30
Useful Links	
	https://www.javatpoint.com/what-is-soft-computing

	Course Outcomes	**CL**	**Class Sessions**
MCA2403.1	Analyze use of tools like Soft computing techniques and searching techniques in various sectors and its functionality.	4	9
MCA2403.2	Demonstrate Neural Network and difference between Neural Network and human brain.	5	9
MCA2403.3	Analyze Unsupervised learning in Neural Network and Adaptive Resonance Theory .	4	9
MCA2403.4	Analyze details of Fuzzy systems.	4	9
MCA2403.5	Determine Fuzzy rule base system.	5	9
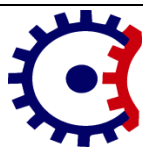
	Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 **NAAC Accredited (A+ Grade)** **(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)**	

Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
IV	MCA2404	Cyber Forensics	3	-	-	3

Pre-Requisites:Data Analysis, Data Science, Software Engineering

Course Contents

|	
Unit I	**Systems Vulnerability Scanning** Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet
Unit II	**Network Defense tools** Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful irewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System
Unit III	**Introduction to Cyber Crime and law** Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.
Unit IV	**Introduction to Cyber Crime Investigation** Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks
Unit V	**Computer forensic cases**: Developing Forensic Capabilities – Searching and Seizing Computer Related Evidence –Processing Evidence and Report Preparation – Future Issues.

Text Books

T.1	John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Cengage Learning, 2nd Edition, 2005.
T.2	Marjie T Britz, "Computer Forensics and Cyber Crime: An Introduction", Pearson Education, 2nd Edition, 2008.

Reference Books

R.1	Anti-Hacker Tool Kit (Indian Edition) , Mike Shema, Mc Graw Hill. The Unofficial guide to Ethical Hacking, Ankit Fadia, LaxmiPubli.
R.2	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives , Nina Godbole and SunitBelpure, Wiley

Useful Links	
1	https://nptel.ac.in/courses/106/106/106106178/
2	https://nptel.ac.in/courses/106/106/106105158/

	Course Outcomes	CL	Class Sessions
MCA2404.1	Apply and evaluate the cyber security needs of an organization.	3	9
MCA2404.2	Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.	4	9
MCA2404.3	Evaluate cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.	5	9
MCA2404.4	Design and develop security architecture for an organization.	6	9
MCA2404.5	Design operational and strategic cyber security strategies and policies.	6	9
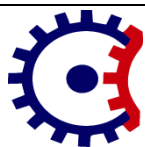
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<tr><td colspan="2">Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
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</table>

Program: Master in Computer Application

Teaching Scheme: -Lectures- **03** Tutorial-**00** Total Credit- **03**

Semester	Course Code	Name of Course	L	T	P	Credits
IV	MCA2405	Blockchain Technology	3	-	-	3

Pre-Requisites: Distributed systems and Networking, Cryptography, Data Structures

Course Contents

Unit I	**Introduction to Blockchain:-** Overview of Blockchain, Public Ledgers, Protocol, Currency, The Double-Spend and Byzantine Generals' Computing Problems, Permissioned Model of Blockchain, Distributed Ledger Technology (DLT), Crypto currency, eWallet Services and Personal Crypto security. Types of Blockchain: case study Bitcoin, Ethereum and Hyper ledger, Public and private Blockchain. **Bitcoin:** Bitcoin creation, transaction in Bitcoin, consensus, Bitcoin exchanges, Bitcoin limited supply, Scalability (1MB problem), Wallets Ethereum: Ethereum concept, account management, contracts and transactions , gas, solidity. **Hyperle ledger Fabric:** System architecture, ledger format, chain code execution, transaction flow and ordering, private channels, membership service providers.
Unit II	**Consensus Protocol:** Double spending issue, Requirements for the consensus protocols, Distributed Consensus, Proof of Work (POW), Proof of stake, Scalability aspects of Blockchain consensus protocols, Consensus protocols for Permissioned Blockchains, Proof of burn and Proof of elapsed time. **Cryptography for Blockchain:** History and Goal of Cryptography, Symmetric-key cryptography, Public-key cryptography, cryptographic Hash functions, Properties of hash functions, Hash Pointer and Merkle tree ,Digital signature, Elliptic curve cryptography.
Unit III	**Smart Contracts:** Financial Services Crowd funding Bitcoin, Prediction Markets Smart Property, Smart Contracts Blockchain, Protocol Projects Wallet, Development Projects, Blockchain Development Platforms and APIs, Blockchain Ecosystem: Decentralized Storage, Communication, and Computation, Ethereum: Turing-Complete Virtual Machine Counterparty, Re-creates Ethereum's Smart Contract Platform, Dapps, DAOs, DACs, and DASs: Increasingly Autonomous Smart Contracts, Dapps ,DAOs and DACs, DASs and Self-Bootstrapped Organizations.
Unit IV	**Cryptocurrency: Flat** currencies, property, equality, securities, Money as a store of value versus money for transactions, incentive mechanism-mining and transactions fees, Asset backed currency, hyperinflation. Supply and demand, Inflation and deflation, Exchanges, Decentralized exchanges. **Security: Bitcoin**: Sybil, DDOS, Majority (51%) attack, Ethereum: DOA hack, keeping secretes in smart contracts, state vulnerability, Hyperledger: RAT, Log injection, code injection.
Unit V	**Recent Advances in Blockchain Technology: Terminology** and Concepts, Currency, Token, Tokenizing Community coin: Hayek's Private Currencies Vie for Attention, Campus coin Drops as a Strategy for Public Adoption, Currency: New Meanings, Currency Multiplicity: Monetary and Nonmonetary Currencies, Demurrage Currencies: Potentially Incitory and Redistributable, Extensibility of Demurrage Concept and Features.

Text Books

1	Swan, Melanie. Blockchain: Blueprint for a new economy. " O'Reilly Media, Inc.", 2015, 3rd Edition
2	Bambara, Joseph J., et al. Blockchain: A practical guide to developing business, law, and technology solutions. McGraw Hill Professional, 2018, 2nd Edition

Reference Books

1	Blockchain Revolution by Don and Alex Tapscott, 1st Edition.
2	The Basics of Bitcoins and Blockchains by Antony Lewis, 1st Edition.

Useful Links

1	https://nptel.ac.in/courses/106/104/106104220/
2	https://nptel.ac.in/courses/106/105/106105184/

	Course Outcomes	CL	Class Sessions
MCA2405.1	Understand the basics of Blockchain and Ethereum.	2	9
MCA2405.2	Apply security features in blockchain technologies.	3	9
MCA2405.3	Analyze the smart contracts and virtual machine counterparty.	4	9
MCA2405.4	To analyze the Crypto currency and its security.	4	9
MCA2405.5	Apply to learn Recent Advances in Blockchain Technology.	3	9

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