Master of Computer Applications
Semester–II

Course Code	Course Title	L	T	P	Credits
MCA-102A	**Programming with Python** (Pre-requisite: None)	3	0	0	3
		CIE		SEE	Total
		40		60	100

Course Outcomes (COs): At the end of this course, students will be able to

MCA-102A.1	Understand the fundamentals of Python programming.
MCA-102A.2	Explore ordered and unordered data objects in Python.
MCA-102A.3	Create functions, packages, and process data files.
MCA-102A.4	Utilize Object oriented features, exceptions, assertions, and data base connectivity with SQLite

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
MCA-102A.1	3	-	2	2	-	-	-	3
MCA-102A.2	3	3	2	2	-	-	-	3
MCA-102A.3	3	3	3	3	-	-	-	3
MCA-102A.4	3	3	3	3	-	-	2	3

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

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UNIT – I   **Contact Hours: 12**

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Fundamentals of Python programming

Introduction: Overview and applications areas of Python, Python installation, Comments, Keywords, Identifiers, Variables declaration, Standard Data types, id(), type(), quotations for string literals, data type conversion methods, Input/Output statements, escape characters, round( ), importing 'math' package.

Operators: Arithmetic, Assignment, Comparison, Logical, Bitwise, Reference or identity (is/ is not), Membership (in /not in)

Control Statements: conditional statements (if, else, elif), loop statements (for, while), break, continue, pass statement.

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UNIT – II   **Contact Hours: 11**

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Ordered and Unordered data structures/objects in Python

Ordered Data Objects: String: declaration, indexing, len(), concatenation, repetition, 'in'/'not in' operator, slice, Traversal, Built-in functions; List: declaration, indexing, len(), creating list using range(), list with initial values, converting string to list, concatenation, repetition, 'in'/'not in' operator, slice, Traversal, Built-in functions; Tuple: declaration, indexing, len( ), creating tuple using range(), tuple with initial values, converting string to tuple, converting list to tuple, concatenation, repetition, 'in'/'not in' operator, slice, Traversal, Built-in functions;

Unordered Data Objects: Set: Roster and Rule form, len(), converting list to set and set to list, Built-in functions, Set operations;   Dictionary: declaration, len(), inserting and accessing a value, keys(), values(), items(), Built-in functions

UNIT – III   Contact Hours: 11

Designing functions, managing packages, and working with data files

Functions: defining a function, calling a function, keyword arguments, default arguments, variable length arguments, scope of variables, Recursive function, map(), Lambda function

Package: defining a package, importing a package and its functions.

Files Handling: Opening and Closing a data file, file opening modes, Reading and Writing operation, use of 'with' keyword, tell() and seek() function, Reading and writing of JSON file.

UNIT – IV   Contact Hours: 11

Object oriented concepts, handling exceptions, and connecting backend database

Object-Oriented Programming: Creating a Class and objects, 'self' keyword, constructor, destructor, inheritance, isinstance(), multiple inheritance, method overriding

Exception Handling: standard exceptions, try-except-else block, try-except-else-finally block, raise an assertion using 'assert' statement, user defined exceptions.

Working with SQLite Database: Python Database API interface, sqlite3 module, Establish connection with database, Creating a Table, Inserting records, Retrieving resultset/records, Processing resultset, Updating a record, Deleting a record.

Text Books:

1. E. Balagurusamy, *Introduction to Computing and Problem Solving Using Python*, McGrawHill Education
2. Yashavant Kanetkar, Aditya Kanetkar, *Let us Python*, BPB Publications
3. Vamsi Kurama, *Python Programming: A Modern Approach*, Pearson Education
4. Sheetal Taneja, Naveen Kumar, *Python Programming A Modular Approach*, Pearson
5. Rao R. Nageswara , *Core Python Programming*, Dream Tech, New Delhi

Reference Books:

1. Mark Lutz, *Learning Python*, 5th edition, O'Reilly
2. Allen B. Downey, *Think Python: How to Think Like a Computer Scientist*, Shroff/O'Reilly
3. Wes McKinney**,** *Python for Data Analysis*, O'Reilly
4. Eric Matthes, *Python: Crash Course A Hands-On, Project-Based Introduction to Programming*, No Starch Press, San Francisco
5. Martin C. Brown, *Python: The Complete Reference*, McGraw-Hill

Course Code	Course Title	L	T	P	Credits
	Programming with Python Lab	0	0	4	2
MCA-172A		CIE	SEE	Total	
	(Pre-requisite: Python)	50	50	100	

Course Outcomes (COs): At the end of this course, students will be able to

MCA-172A.1	Develop Python programs using data types, input/output, operators and control structures
MCA-172A.2	Implement ordered and unordered data objects in Python
MCA-172A.3	Design functions, packages, and process data files.
MCA-172A.4	Create Python programs using Object oriented, exceptions, assertions, and data base connectivity with SQLite

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
MCA-172A.1	3	–	–	–	-	–	–	3
MCA-172A.2	3	3	-	–	–	–	–	3
MCA-172A.3	3	3	3	–	-	-	–	-
MCA-172A.4	3	-	-	-	-	-	-	2

List of Experiments	
No.	**Experiment Detail**
1.	Assume you travel 80 km to and fro in a day. Fuel Cost is INR 80 per liter and your vehicle's Fuel Average is 18 km/litre. Write a Python program to calculate the Driving Cost per day.
2.	Write a Python program which iterates the integers from 1 to 30 (included). if number is divisible by 3 print "PIET", if number is divisible by 5 print "DCA". If number is divisible by both 3 and 5 print "PIET & DCA" and otherwise print the number itself.
3	Write a Python program to display the following pattern for the given input of no. of lines. 　　1 　　121 　12321 1234321
4.	Write a program to check whether the given integer number is Palindrome or not.
5.	Assuming your weight in kilogram and height in meters, calculate your Body Mass Index (BMI) value using the formula BMI=weight/(height*height) Height is given in (feet.inches) form and weight is given in kgs and to convert total height in meters consider 1 Feet = 0.3048 meter and 1 Inch = 0.0254 meter
6.	Create a list of city names from the given list where city name contains substring 'pur' cities=['Jaipur','Ambala','Nagpur','Kanpur','Karnal','Sholapur']
7.	Book order is given as list of sublists with the following items 　　　Order Number　Book Title　　　　　Author　　Quantity　Unit Price 　　　34587　　　　　Learning Python　　　Mark Lutz　4　　　　40.95 　　　98762　　　　　Programming Python　Mark Lutz　5　　　　56.80

	77226 Head First Python Paul Barry 3 32.95 Write a Python program to generate the Order summary in this List of tuple form [('34587', 163.8), ('98762', 284.0), ('77226', 108.85)] Where first item in the tuple is Order Number, second item is Net Price i.e. Quantity*Unit Price if Net Price < 100.00 it should be increased by Rs. 10.
8.	A string is given to you e.g. "aabaacdaadd". Create a dictionary of each character in the given string and its frequency, i.e. output={'a': 6, 'b': 1, 'c': 1, 'd': 3}
9.	In a shop store, data operator enters Item Name, Quantity sold and its Unit Price one by one till 'CLOSE' is entered. Create Python dictionary of Item Name and its Net Price. **Sample Input**: BANANA FRIES 2 20.60 POTATO CHIPS 3 15.50 APPLE JUICE 10 100.75 CANDY 5 2.50 APPLE JUICE 6 100.75 CANDY 5 2.50 CANDY 5 2.50 BANANA FRIES 3 20.60 CANDY 5 2.50 POTATO CHIPS 5 15.50 CLOSE **Sample Output:** {'BANANA FRIES': 103.0, 'POTATO CHIPS': 124.0, 'APPLE JUICE': 1612.0, 'CAND Y': 50.0}
10.	Write a function to make use of variable length arguments.
11.	Write a Recursive function to generate n terms of a Fibonacci Series 0,1,1,2,3,5,8,13,...
12.	Write a Python program to create and use user defined package.
13.	Write a Python program to read and write a JSON file.
14	Write a Python program to implement multiple inheritance.
15.	Write a Python program to handle 'ZeroDivisionError' exception.
16.	Write a Python program to raise an assertion using 'assert' statement
17.	Write a Python Program to connect with SQLite database and perform SQL operations.

Text Books:

1. E. Balagurusamy, *Introduction to Computing and Problem Solving Using Python*, McGrawHill Education
2. Yashavant Kanetkar, Aditya Kanetkar, *Let us Python*, BPB Publications
3. Vamsi Kurama, *Python Programming: A Modern Approach*, Pearson Education
4. Sheetal Taneja, Naveen Kumar, *Python Programming A Modular Approach*, Pearson

5. Rao R. Nageswara , *Core Python Programming*, Dream Tech, New Delhi

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2. Allen B. Downey, *Think Python: How to Think Like a Computer Scientist*, Shroff/O'Reill
3. Wes McKinney**,** *Python for Data Analysis*, O'Reilly
4. Eric Matthes, *Python: Crash Course A Hands-On, Project-Based Introduction to Programming*, No Starch Press, San Francisco
5. Martin C. Brown, *Python: The Complete Reference*, McGraw-Hill

Course Code	Course Title	L	T	P	Credits
MCA-104A	**Computer Networks and Data Communications** (Pre-requisite: None)	3	0	0	3
		CIE		SEE	Total
		40		60	100

Course Outcomes (COs): At the end of this course, students will be able to

MCA-104A.1	Understand the basics of computer networks, reference models, and transmission media.
MCA-104A.2	Learn functions, encoding, and multiplexing concepts in physical layer and protocols and error handing in data link layer.
MCA-104A.3	Explore network layer routing, addressing, congestion control, and transport layer protocols for reliable data delivery. .
MCA-104A.4	Analyse the advance concepts including protocols and security of session, presentation, and application layers.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
MCA-104A.1	3	2	–	2	–	–	–	1
MCA-104A.2	3	2	2	3	-	–	–	1
MCA-104A.3	3	3	3	2	2	–	2	2
MCA-104A.4	3	3	3	3	2	–	3	2

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

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UNIT – I   **Contact Hours: 11**

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Introduction of Computer Network, Reference models, and transmission media

Introduction: Introduction to Computer Networks, Application and advantages of Computer Network, Components of Computer Networks, Network Types**:** Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), VLAN, Wireless Networks: Bluetooth, 802.11.Network Topologies**:** Star, Bus, Ring, Tree, Mesh, Hybrid

Reference Models: Services and Protocols on each layer of OSI model, TCP/IP Reference Models. Comparison of OSI and TCP/IP models. Protocol Hierarchies, connection-oriented vs connectionless services.

Transmission Media: Transmission media, Broadcasting, Multicast, Unicast, Transmission mode, Transmission Impairments.

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UNIT – II   **Contact Hours: 12**

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Fundamental concepts and protocols of Physical and Data Link layer

Physical Layer: IEEE 802 standards for LAN: Ethernet, Token Ring, Peer-To-Peer network Digital to Digital Conversion: Line coding and Block Coding, Analog to Digital Conversion: Pulse code modulation, Digital to Analog conversion, Data Encoding Techniques: NRZ, NRZ-I, Manchester and Differential Manchester encoding, Multiplexing.

Data Link Layer: Digital Signals, Network Performance, Data Rate Limits, Framing, Physical Address, NIC Card, Sliding Window Protocols, DLL Protocol : HDLC, Flow Control, Error Detection and Error Correction, Hamming Distance, CRC, Checksum, ALOHA: Pure and Slotted, CSMA/CD,CDMA/CA

UNIT – III   Contact Hours: 12

Fundamental concepts and protocols of Network and Transport layer

Network Layer: Switching Techniques, Routing, Logical Addressing, Internet Protocols: IPv4, IPv6, Subnetting, Fragmentation, IP support protocols (ARP, DHCP, ICMP), Routing Algorithms: Static, Dynamic, Hybrid, Unicast, Multicast, Distance vector routing, Link state routing.

Transport Layer: Process to Process Delivery, Protocols: UDP and TCP, SCTP, Congestion Control and Flow Control, Error Control. Congestion Control Algorithm: Leaky bucket, token bucket. Congestion Control Techniques: Open loop, closed loop, QoS in Networks

UNIT – IV   Contact Hours: 10

Fundamental concepts and protocols of Application layer and techniques of wireless communication

Application Layer: Session Management, Network Management: SNMP, Cryptography and Compression, Client server Interface: Email, DNS, HTTP, HTTPS, FTP, TELNET, SSH protocols.

Wireless Communication: Cellular systems- Frequency Management and Channel Assignment- types of handoff and their characteristics, dropped call rates & their evaluation -MAC – SDMA – FDMA –TDMA – CDMA – Cellular Wireless Networks.

Text Books:

1. Andrew S. Tanenbaum and David Wetherall, *Computer Networks,* Pearson
2. Behrouz A. Forouzan, *Data Communications and Networking*, Tata Mac-Graw Hill
3. Asoke K. Talukdar, Mobile Computing, Tata McGraw-Hill Education

Reference Books:
1. William Stallings, *Data and Computer Communication,* Pearson Education
2. James F. Kurose & Keith W. Ross, *Computer Networking: A Top-Down Approach Featuring the Internet*, Pearson Education
3. S. Keshav, *An Engineering Approach to Computer Networks*, Pearson Education
4. Prakash C .Gupta, *Data communications and Computer Networks*, PHI
5. Vilas S. Bagad , *Mobile Computing Introduction*, Technical Publications

Course Code	Course Title	L	T	P	Credits
MCA-176A	**Networks and Data Communications Lab**	0	0	4	2
		CIE		**SEE**	**Total**
	(Pre-requisite: C/C++/Java)	50		50	100

Course Outcomes (COs): At the end of this course, students will be able to

MCA-176A.1	Introduce the fundamental types of computer networks.
MCA-176A.2	Implementing routing protocols in C / C++ / Java
MCA-176A.3	Studying client – server programming using TCP.
MCA-176A.4	Implementing networking protocols of various OSI layers in C / C++ / Java

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
MCA-176A.1	3	-	–	-	–	–	–	-
MCA-176A.2	3	-	2	3	-	–	–	2
MCA-176A.3	3	2	3	2	2	–	-	2
MCA-176A.4	3	3	3	3	-	–	2	2

List of Experiments	
No.	**Experiment Detail**
1.	To write a socket program for implementation of echo.
2.	Write a program for error detecting code using CRC-CCITT (16- bits).
3.	Write a program to find the shortest path between vertices using bellman-ford algorithm.
4.	Implement Dijkstra's algorithm to compute the shortest path through a graph
5.	Using TCP/IP sockets, write a client server program to make the client send the file name and to make the server send back the contents of the requested file if present.
6.	Write a program on datagram socket for client/server to display the messages on client side, typed at the server side.
7.	Write a program for simple RSA algorithm to encrypt and decrypt the data.
8.	Write a program for congestion control using leaky bucket algorithm
9.	Take a 64 bit plain text and encrypt the same using DES algorithm.
10.	Write a program to break the above DES coding.

Text Books:

1. Andrew S. Tanenbaum and David Wetherall, *Computer Networks,* Pearson
2. Behrouz A. Forouzan, *Data Communications and Networking*, Tata Mac-Graw Hill
3. Asoke K. Talukdar, Mobile Computing, Tata McGraw-Hill Education

Reference Books:
1. William Stallings, *Data and Computer Communication,* Pearson Education

2. James F. Kurose & Keith W. Ross, *Computer Networking: A Top-Down Approach Featuring the Internet*, Pearson Education
3. S. Keshav, *An Engineering Approach to Computer Networks*, Pearson Education
4. Prakash C .Gupta, *Data communications and Computer Networks*, PHI
5. Vilas S. Bagad , *Mobile Computing Introduction*, Technical Publications

Course Code	Course Title	L	T	P	Credits
MCA-106A	**Advanced Data Base Systems** (Pre-requisite: None)	3	0	0	3
		CIE	**SEE**		**Total**
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to

MCA-106A.1	Understand the fundamental concepts of databases and design databases using ER and EER models.
MCA-106A.2	Apply normalization techniques to eliminate redundancy, utilize SQL and PL/SQL for database operations, and enhance data manipulation and querying.
MCA-106A.3	Analyze transaction management, concurrency control techniques, and implement secure, recoverable database systems.
MCA-106A.4	Explore NOSQL databases to meet real life problem scenario.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
MCA-106A.1	3	2	1	2	1	–	–	1
MCA-106A.2	3	3	2	3	2	1	1	1
MCA-106A.3	3	3	3	3	2	2	3	2
MCA-106A.4	2	2	3	3	2	1	2	2

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT – I   Contact Hours: 10

DBMS architecture, Data models, Entity-Relationship and relational algebra

Basic Concepts of Database and Need for DBMS, Characteristics of DBMS, Database Users, 3-tier architecture of DBMS (its advantages over 2-tier), Data Models. Database Design using ER model Entities, Relationships, Representation of entities, attributes, relationship attributes, relationship set, Expressing M: N relation, Enhanced Entity Relationship Model (EER): Specialization, Generalization, Attribute inheritance, Constraints on generalization, Aggregation. Relational algebra.

UNIT – II   Contact Hours: 15

Normalization techniques and PL/SQL conceepts

Normalization: Need for Normalization, Inference Rules for Functional Dependencies, Minimal set of Functional Dependencies, Normal Forms: 1NF, 2NF, 3NF. Higher Level Normal Forms: Boyce/Codd Normal Form, multivalued dependency (MVD), Fourth Normal Form, Join dependencies and Fifth Normal Form.

SQL: Introduction to SQL, Types of SQL commands (DDL, DML, and DCL etc),SQL operators and their procedure, views and indexes, Queries and sub queries, group by and having clause, Aggregate functions, Joins, Unions, Intersection, Minus, Division, Cartesian product.PL/SQL: Architecture of PL/SQL, Basic Elements of PL/SQL, PL/SQL Transactions, Cursors and Triggers.

UNIT – III   Contact Hours: 12

Transaction handling, protocols, backup and recovery

Transaction and Schedules, desirable properties of transactions, concurrent execution of transaction, Conflict and View serializability, testing for serializability, concepts in Recoverable and Cascadeless schedules.Concurrency Control Techniques: Lock based protocols, time stamp based protocols, multiple Granularity and Multiversion techniques, enforcing serializablity by locks, locking system with multiple lock modes. Backup and Recovery. Database security, access Control based on grant and revoke.

UNIT – IV   Contact Hours: 8

NOSQL Database concepts

NOSQL Databases: Introduction to NOSQL Systems, Document based NOSQL systems and MongoDB, NOSQL Key-Value Stores, Wide Column NOSQL systems, NOSQL Graph Databases.

Text Books:

1. Ramez Elmasri and Shamkant B. Navathe, *Fundamentals of Database Systems,* Pearson Education
2. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, *Database System Concepts*, McGraw Hill Education
3. Ivan Bayross, *SQL, PL/SQL the Programming Language of Oracle,* BPB Publications

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems,* McGraw Hill Higher Education
2. Doug Bierer, *MongoDB Quick Start Guide*, Packt Publishing

Course Code	Course Title	L	T	P	Credits
MCA-174A	**Advanced Data Base Systems Lab**	0	0	4	2
		CIE		SEE	Total
	(Pre-requisite: PL/SQL, NoSQL)	50		50	100

Course Outcomes (COs): At the end of this course, students will be able to

MCA-174A.1	Implement the fundamental concepts of SQL and Databases.
MCA-174A.2	Demonstrate the use of operations, views and permissions.
MCA-174A.3	Apply PL/SQL to solve computational problems
MCA-174A.4	Case study based on NOSQL databases

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
MCA-174A.1	2	2	–	–	–	–	–	-
MCA-174A.2	3	2	2	2	–	–	–	2
MCA-174A.3	3	3	3	–	–	–	–	2
MCA-174A.4	3	3	2	3	2	2	1	2

List of Experiments	
No.	**Experiment Detail**
1.	Execute DDL, DML, DCL and TCL Commands.
2.	Demonstrate the use of ORACLE operators • Arithmetic operators • Comparison operators • Logical operators
3.	Demonstrate the use of DUAL table
4.	Demonstrate the use of Data Constraints.
5.	Execute Groupby, Orderby clause on Relations.
6.	Demonstrate the use of ORACLE functions • Aggregate functions • Numeric functions • String functions
7.	Demonstrate pattern matching and range searching functions.
8.	Demonstrate INTERSECTION, UNION and MINUS functions
9.	Execute Sub Queries and Co-Related Nested Queries on Relations.
10.	Perform the following join operations a. Cross b. Inner c. Outer (left, right, full) d. Self
11.	Demonstrate use of VIEWS in DBMS
12.	Demonstrate the use of Date conversion functions

13.	Demonstrate the use of INDEX in DBMS
14.	Demonstrate how PERMISSIONS are given on Database
15.	Write a PL/SQL code block that will accept an account number from the user and debit an amount of Rs. 2000 from the account, If the account has a minimum balance of Rs.5000, after the amount is debited. The process is to be fired on the accounts table.
16	Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the Corresponding values of calculated area in a table.
17	Write a PL/SQL code block for inverting a number 5639 to 9365.
18	Write a PL/SQL block that first insert a record in EMP table, update the salaries of John and Clark by Rs. 2000 andRs.1500 then check to see that the total salary does not exceed Rs. 20000. If the total salary is greater thanRs.20000 then undo the Updates made to salaries of John and Clark.
19	Demonstrate the use of NOSQL Database.

Text Books:

1. Ramez Elmasri and Shamkant B. Navathe, *Fundamentals of Database Systems,* Pearson Education
2. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, *Database System Concepts*, McGraw Hill Education
3. Ivan Bayross, *SQL, PL/SQL the Programming Language of Oracle,* BPB Publications

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems,* McGraw Hill Higher Education
2. Doug Bierer, *MongoDB Quick Start Guide*, Packt Publishing

Course Code	Course Title	L	T	P	Credits
MCA-108A	**Software Project Management** (Pre-requisite: None)	3	0	0	3
		CIE	**SEE**		**Total**
		40	60		100

Course Outcomes (COs): At the end of this course, students will be able to

MCA-108A.1	Understand the concepts of conventional and modern software project management.
MCA-108A.2	Estimate the Efforts and Costs in software project life cycle.
MCA-108A.3	Acquire knowledge about the risk management.
MCA-108A.4	Gain knowledge about the Process quality and configuration management.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
MCA-108A.1	2	2	–	–	2	2	–	2
MCA-108A.2	3	2	2	2	2	3	–	2
MCA-108A.3	3	3	-	–	–	2	–	2
MCA-108A.4	3	3	-	2	2	3	2	2

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

<div align="center">UNIT – I   Contact Hours: 12</div>

Introduction to Software Project Management and conventional software management

Introduction: What is Software Project Management? Importance of Software Projects, Problems in Project Management, Processes in Software Projects, Project Processes, People, and Technology, Software Project Manager Skills, Project Initiation, Project Planning, Project Monitoring and Control, Project Closure, Management Metrics

Conventional Software Management: Evolution of software economics. Improving software economics: reducing product size, software processes, team effectiveness, automation through software environments. Principles of modern software management.

<div align="center">UNIT – II   Contact Hours: 13</div>

Efforts and Cost Estimation, Software management life cycle phases

Software Project Efforts and Cost Estimation: Effort Estimation Techniques, Function Point Analysis, Wide Band Delphi, Basic, Intermediate and Detailed COCOMO; Cost Estimation, Activity based cost estimation, Schedule Estimation, Resource Estimation, Practical considerations in Effort and Cost Estimates

Software Management Process: Framework, Life cycle phases- inception, elaboration, construction and transition phase. Artifacts of the process- the artifact sets, management artifacts, engineering artifacts, pragmatics artifacts.

<div align="center">UNIT – III   Contact Hours: 10</div>

Software Risk management principles and planning

Risk Management: Major risks types, causes of risks, Risk categories-Budget, Schedule, Resource, Quality, and Technology risks, Risk analysis, Balancing Act, Seven principles of risk management, Risk identification, Risk Projection, The RMMM plan

UNIT – IV   Contact Hours: 10

Software Project Quality and Configuration management

Project Quality Management: Software Quality, Software Standards, Reviews and Inspections, Software measurement and metrics, product metrics, Elements of Software Quality Assurance

Software Configuration Management: Need and use of versions, Software Configuration Identification (SCI), Releases vs. version. Change Management, Version Management

Text Books:

1. Walker Royce, *Software Project management: A Unified Framework*, Pearson Educatio
2. R.S. Pressman, *Software Engineering – A Practitioner's Approach*, 6th Edition, Tata McGrawHill
3. Ian Sommerville, *Software Engineering¸* Pearson

Reference Books:

1. Ashfaque Ahmad, *Software Project management: A Process-Driven Approach*, CRC Press
2. Hughes B. and Cotterell M. and Mall R., *Software Project Management*, Tata McGraw Hill
3. K. K. Aggarwal, Yogesh Singh, *Software Engineering*, New Age International Ltd

Course Code	Course Title		L	T	P	Credits
MCA-277A	**Industrial Internship** (Pre-requisite: None)		0	0	0	4
			CIE		SEE	Total
			50		50	100

Course Outcomes (COs): At the end of this course, students will be able to

MCA-277A.1	Examine and evaluate problems given by industry.
MCA-277A.2	Learn professional skills such as teamwork, communication, and project management in an industry setting.
MCA-277A.3	Employ industry-standard tools and technologies to successfully complete assigned tasks and projects.
MCA-277A.4	Develop comprehensive documentation summarizing project outcomes, and detailing the skills acquired during the internship.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
MCA-277A.1	2	2	-	–	–	1	–	–
MCA-277A.2	2	–	–	3	2	3	–	3
MCA-277A.3	3	3	3	3	2	2	-	2
MCA-277A.4	2	–	3	3	2	–	2	3

Guidelines for Industrial Training/ Internship:

This course requires students to participate in professional employment-related activity or work experience or co-operative education activity with an entity external to the educational institution, normally under the supervision of an employee of an organization or an individual professional. A key aspect of the internship is induction into actual, formal, and organized work situation to provide opportunities for students to actively engage in on-site experiential learning.

a) The candidate shall be required to undergo industrial trainings /internships of the specified duration, provided in the Scheme of Studies and Examinations, in an industry/ business enterprise/ organization approved by the Head of the Department.

b) If the concerned Department perceives any limitations from the industry to accommodate all the enrolled students, a student may be permitted to complete a skill-oriented e-content course (of sufficient duration) relevant to the industry or undertake a project-based / research project under the supervision of a faculty of a premier Institute (such as I.I.T., I.I.Sc.) with prior approval from the competent authority.

c) The Training will be completed under the supervision of the officer (herein called Co. Training Supervisor) of the Company/ Organization under whose guidance and supervision the training was allotted to the candidate.

d) The industrial training/ internship shall be of 45-60 days duration after the second semester.

e) The candidates are required to submit a comprehensive report Training Supervisor within two weeks of completion of the training along with Co. Training Supervisor's Certificate in the beginning of the report stating that the report is an outcome of the work done by the candidate during his/her training.

f) The viva-voce shall be held by one External and one Internal Examiner within two weeks after submission of the report.

g) The CIE and SEE components of the industrial training/ internship shall be conducted as given in Table-1.

Table-1: Relative Weightages of Industrial Training/ Internship

Component	Description of the Component		Relative Weightage (Out of 100)
CIE	i)	Internship Synopsis Evaluation within 10 days of start of Internship	10
	ii)	Mid-Term Internship Evaluation	15
	iii)	Final Presentation and Internship Evaluation	25
		CIE Total	**50**
SEE	Performance in Presentation and External Viva-voce		**50**
		Grand Total	**100**