Scheme & Syllabus of
Master of Computer Applications
(MCA)
2 Years Batch 2020 onwards

By
Departmental Board of Study
(Master of Computer Applications)
Department of Master of Computer Application

Approved in XXIIIrd Academic
Council, Dated 23 June 2021

Government College of Engineering, Aurangabad

1. AFFILIATION

   The proposed programme shall be governed by the Department of Computer Application, Government College of Engineering, Aurangabad and is affiliated to Dr.Babasaheb Ambedkar Marathwada University, Aurangabad.

2. PROGRAMME STRUCTURE

   The Master of Computer Application Programme is divided into two parts as under. Each part will consist of two semesters to be known as Semester-1 and Semester-2.

Part	Year	Odd Semester	Even Semester
Part-I	First Year	Semester-I	Semester-II
Part-II	Second Year	Semester-III	Semester-IV

3. REQUIREMENTS FOR EARNING THE MCA DEGREE

   The total credits required for the MCA programme are 96. The credits are distributed over three categories:

Description	Credits
Humanities and Management	04
Core Departmental Courses	56
Elective Departmental Courses	09
Project / Dissertation / Seminar Courses	27
Total	96

4. COURSE CREDITS ASSIGNMENT

   Lectures and Tutorials: One lecture or tutorial hour per week per semester is assigned one credit.

   Practical/Laboratory: Two laboratory hours per week per semester is assigned one credit.

5. EXAMINATION:

   Performance of the students will be evaluated based on a comprehensive system of continuous evaluation. The student shall be continuously evaluated during the conduct of each course on the basis of his/her performance as follows:

   For Theory Courses-

Description	Syllabus to be covered	Time Allotted	Weightage of marks
Class Test	Up to 40%	1 Hour	20%
Teachers Assessment	100%	Throughout the semester	20%
End Semester Examination	100%	3 Hours	60%

   For Practical Courses-

Description	Syllabus to be covered	Time Allotted	Weightage of marks
Timely submission of practical records	--	--	80% of TW marks
Practical File	--	--	20% of TW marks
External Evaluation	100%	3 Hours	100% of ESE marks

Government College of Engineering, Aurangabad
Structure & Syllabus
Programme: Master of Computer Applications
First Year MCA (W.E.F. A.Y. 2020-21) [Two Years]

Sr. No	Course Code	Course Title	L	T	P	Contact Hrs/ Week	Course Credits	CT	TA/ TW	ESE	Total
		Semester – I									
		Theory Courses									
1	MC1101	Data Structures & Algorithms	3	-	-	3	3	20	20	60	100
2	MC1102	Computer Programming	3	1	-	4	4	20	20	60	100
3	MC1103	Data Base Management System	3	1	-	4	4	20	20	60	100
4	MC1104	System Software and Operating System	3	-	-	3	3	20	20	60	100
5	MC1105	Software Engineering	4	-	-	4	4	20	20	60	100
		Practical Courses									
6	MC1106	Lab: Data Structures & Algorithms	-	-	2	2	1		25	25	50
7	MC1107	Lab: Computer Programming	-	-	4	4	2		50	25	75
8	MC1108	Lab: Data Base Management System	-	-	4	4	2		50	25	75
9	MC1109	Lab: Communication Skills	-	-	2	2	1		25	25	50
		Total	16	2	12	30	24	100	250	400	750

Abbreviations-
L – Lecture   T- Tutorial   P- Practical
CT- Class Test   TA/TW- Teachers Assessment /Term Work   ESE- End Semester Examination

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Government College of Engineering, Aurangabad
Structure & Syllabus
Programme: Master of Computer Applications
First Year MCA (W.E.F. A.Y. 2020-21) [Two Years]

Sr No	Course Code	Course Title	L	T	P	Contact Hrs/ Week	Course Credits	Examination Scheme			
								CT	TA/ TW	ESE	Total
		Semester-II									
		Theory Courses									
1	MC1111	Object Oriented Programming with Java	3	1	-	4	4	20	20	60	100
2	MC1112	Internet of Things (IOT)	3	-	-	3	3	20	20	60	100
3	MC1113	Python Programming	3	1	-	4	4	20	20	60	100
4	MC1114	Information Security	4	-	-	4	4	20	20	60	100
5	MC1115 To MC1117	Elective- I	3	-	-	3	3	20	20	60	100
		Practical Courses									
6	MC1118	Lab: Object Oriented Programming with Java	-	-	4	4	2		50	25	75
7	MC1119	Lab: Internet of Things (IOT)	-	-	2	2	1		25	25	50
8	MC1120	Lab: Python Programming	-	-	4	4	2		50	25	75
9	MC1121	Seminar	-	-	2	2	1		50	-	50
		Total	-16	2	12	30	24	100	275	375	750

Elective- I	
MC1115	Data Science
MC1116	Soft Computing
MC1117	Big Data Analytics

Abbreviations-

L – Lecture   T- Tutorial   P- Practical

CT- Class Test   TA/TW- Teachers Assessment /Term Work   ESE- End Semester Examination

Government College of Engineering, Aurangabad
Structure & Syllabus
Programme: Master of Computer Applications
Second Year MCA (W.E.F. A.Y. 2020-21) [Two Years]

Sr No	Course Code	Course Title	L	T	P	Contact Hrs/ Week	Course Credits	CT	TA/ TW	ESE	Total
		Semester-III									
		Theory Courses									
1	MC2101	Advance Java	3	1	-	4	4	20	20	60	100
2	MC2102	ASP.Net and C#	4	-	-	4	4	20	20	60	100
3	MC2103	Cloud Computing	3	1	-	4	4	20	20	60	100
4	MC2104 To MC2106	Elective – II	3	-	-	3	3	20	20	60	100
5	MC2107 To MC2109	Elective – III	3	-	-	3	3	20	20	60	100
		Practical Courses									
6	MC2110	Lab: Advance Java	-	-	4	4	2		50	25	75
7	MC2111	Lab: ASP.Net and C#	-	-	2	2	1		25	25	50
8	MC2112	Lab: Cloud Computing	-	-	2	2	1		25	25	50
9	MC2113	Minor Project	-	-	4	4	2		50	25	75
		Total	-16	2	12	30	24	100	250	400	750

Elective- II		Elective – III	
MC2104	Software Quality Assurance	MC2107	Mobile Technology
MC2105	Enterprise Resource Planning	MC2108	Block Chain
MC2106	E-Governance	MC2109	Machine Learning

Abbreviations-
L – Lecture   T- Tutorial   P- Practical
CT- Class Test   TA/TW- Teachers Assessment /Term Work   ESE- End Semester Examination

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Government College of Engineering, Aurangabad
Structure & Syllabus
Programme: Master of Computer Applications
Second Year MCA (W.E.F. A.Y. 2020-21) [Two Years]

									Examination Scheme			
Sr No	Course Code	Course Title	L	T	P	Contact Hrs/ Week	Course Credits	CT	TA/ TW	ESE	Total	
1	MC2114	Dissertation	-	-	30	-	24	-	100	100	200	
		Total	**-**		**30**		**24**	**-**	**100**	**100**	**200**	

Abbreviations-
L – Lecture   T- Tutorial   P- Practical
CT- Class Test   TA/TW- Teachers Assessment /Term Work   ESE- End Semester Examination

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GOVERNMENT COLLEGE OF ENGINEERING, AURANGABAD
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Scheme & Syllabus of Master of Computer Applications (MCA) 2 Years Batch 2020 onwards

FYMCA Semester-I and Semester-II

By
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Department of Master of Computer Application
Government College of Engineering, Aurangabad

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Course Code- **MC1101**   Course Title- **Data Structures and Algorithms**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA	ESE	Total
3	--	--	3	20	20	60	100

Course Objectives
1 Understanding of fundamental data structures and algorithms
2 To familiarize students with basic data structures and their use in fundamental algorithms.
3 To understand and design efficient algorithms for sorting and searching

Course Outcomes- After studying this course, students will be able to:
CO 1 Demonstrate an understanding of basic data structures (such as an array-based list, linked list, stack, queue, binary search tree) and algorithms.
CO 2 Understanding of data structures.
CO 3 Apply data structures to algorithmically design efficient computer programs that will cope with the complexity of actual applications.
CO 4 Design and implementation of data structures and algorithms
CO 5 Analysis of data structures and algorithms.

Course Contents

Unit No	Detailed Contents	Contact Hours
1	Data types. Object, data structure and abstract data types (ADT), Arrays in C, Structures in C, Classes in C++, Primitive operations in stack, representing stacks in C, example- infix, postfix and prefix, efficiency of algorithm, algorithm analysis, Analysis – Big-Oh, Theta, Omega	6
2	Queues and its representation, priority queue, array implementation, stacks, operations in stack, array implementation of lists, linked lists using dynamic variables, examples of list operations in C, circular lists, header nodes, doubly linked list, examples.	6
3	Trees, applications of trees, operations in binary trees, tree traversals, evaluating an expression tree, binary search trees, optimal and average BST's trees and red-black trees Sorting: merge, quick, radix, selection, heap Introduction to Graphs, Breadth first search, Depth first search	6
4	Spanning trees: Prim's and Kruskal's algorithm, union-find datastructure, Dijkstra's algorithm for shortest path. shortest path tree. Shortest and longest paths in directed acyclic graphs	6
5	Searching and Hashing algorithms. Search algorithms – Sequential Search, Ordered lists, binary search. Searching using Hashing. Hash tables. Hash functions. Some examples of hash functions. Collision	6

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resolution.

Text Books

1. Aaron M. Tanenbaum, "Data Structures using C and C++"
2. E. Horowitz, S. Sahni, S.Anderson-freed, "Fundamentals of Data Structures in C", Second Edition, University Press, ISBN 978-81-7371-605-8

Reference Books

1. Jean-Paul Tremblay, Paul. G. Soresan, "An introduction to data structures with Applications", Tata Mc-Graw Hill International Editions, 2nd edition 1984, ISBN-0-07-462471-7
2. Data Structures and Algorithms. Aho, Ullman & Hopcroft
3. Purely Functional Data Structures, Chris Okasaki, Cambridge University Press; New Ed edition
4. Data & File Structures Using C, Reema Thareja, Oxford University Press

E Books/ Online learning material

1. https://nptel.ac.in/courses/106/102/106102064/

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	5	5	5	5	
Teachers Assessment 20 Marks		5	5	5	5
ESE Assessment 60 Marks	15	15	10	10	10

Teaching Strategies:

1. **Use of different technologies in classroom**
2. **Use of different pedagogical approaches like flipped classroom**
3. **Use share pair strategy**
4. **Student centric teaching learning**
5. **Use of different resources like NPTEL courses**
6. **Use ofMCQs, Assignments, Test etc.**

Teachers' Assessment:

Teachers assessment will be based on one or many of the following

1. **Multiple choice questions**
2. **Assignments**
3. **Power Point Presentation on allotted topics**
4. **Quiz**
5. **Surprise test**
6. **Interview / Viva**

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Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember		02	15
K2	Understand		04	15
K3	Apply		05	15
K4	Analyze		05	10
K5	Evaluate		04	05
K6	Create		-	-
Total		20	20	60

Course Code- **MC1102**　　　　　　Course Title- **Computer Programming**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA	ESE	Total
3	1	-	4	20	20	60	100

Course Objectives
  1 To provide complete knowledge of C programming language to the students.
  2 Students will be able to develop the logic to create programs.
  3 To provide exposure to problem solving through programming.

Course Outcomes- After studying this course, students will be able
  CO 1 To demonstrate an understanding of computer programming language concepts.
  CO 2 To define data types and use them in data processing applications.
  CO 3 To use the comparison and limitations of various programming constructs and choose the right one for the task.
  CO 4 To understand the dynamic behaviour of memory by use of pointers.
  CO 5 To write programs, edit, compile, debug, correct, recompile and run.

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Introduction to C Language:** The C character set, Identifiers and keywords, Data types, Variables and Constants, Statements, Symbolic constants, Operators and expressions, Type conversion, Data input and output	6
2	**Control statement:** Branching - if else statement, Looping, Nested control structure, Switch statement, Break statement, Continue statement, Goto statement. **Arrays:** Defining an array, one and two dimensional arrays, Strings: One dimensional character array, array of strings	6
3	**Functions:** Overview, function prototypes, function definition, passing arguments to a function, scope of variable names, recursion. **Program structure:** Storage classes, automatic variables, external variables, static variables, multifile program. **Arrays:** Passing array to functions, String manipulation.	6
4	**Pointers:** Fundamentals, operation on pointers, accessing arrays through pointers, dynamic memory allocation, pointers and strings, pointers to function. **Structures and unions:** Defining a structure, operations on structures, passing structuresas function arguments. Union.	6
5	**File Manipulation:** Opening and closing a data file, reading and writing a data file, processing a data file, unformatted data file, concept of	6

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binary file.

Low level programming: Register variable, bitwise operations, bit fields.

Additional features of C: Enumeration, Command line parameters, Macros.

Text Books

1 Programming in ANSI C, E. Balagurusamy, TMH

Reference Books

1 Programming with C, Gottfried, TMH
2 C The Complete Reference, Schildt, TMH
3 The c programming language,Brian W Kernighan & Dennis Ritchie, 2nd Edition Eastern Economy Edition, Prentice Hall.
4 Let us C, YashavantKanetkar, BPB publication
5 Programming in C, PradipDey, ManasGhosh ,Oxford Higher Education.

E Books/ Online learning material

1 **www.cprogramming.com**
2 **www.learn-c.org**
3 **www.coursera.org/specializations/c-programming**
4 **www.w3resource.com/c-programming/programming-in-c**.php
5 **http://nptel.ac.in/courses/106/104/106104128/**
6 **www.swayam.gov.in**

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	5	5	5		5
Teachers Assessment 20 Marks					
ESE Assessment 60 Marks	12	12	12	6	18

Teaching Strategies:

1. Utilizing technology in the classroom.
2. Co-operative learning
3. Questioning to check for understanding
4. Plenty of practice
5. Be flexible about how long it takes to learn
6. Get students working together.

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Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	5		12
K2	Understand	5		18
K3	Apply			12
K4	Analyze	5		6
K5	Evaluate	5		
K6	Create			12
Total		20		60

Course Code- **MC1103**   Course Title- **Database Management System**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA	ESE	Total
3	1	-	4	20	20	60	100

Course Objectives
  1 To understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation.
  2 To provide a strong formal foundation in database concepts, technology and practice
  3 To be familiar with the basic issues of transaction processing and concurrency control.

Course Outcomes- After studying this course, students will be able to:
  CO 1 To analyze database models & entity relationship models
  CO 2 To design and implement a database schema for a given problem-domain.
  CO 3 Assess data and information requirements
  CO 4 To populate and query a database using SQL DML/DDL commands.
  CO 5 To Evaluate the normality of a logical data model, and correct any anomalies

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Introduction to Databases:** Introduction, Characteristics of database approach,Advantages of using the DBMS approach, History of database applications. **Overview of Database Languages and Architectures:** Data Models, Schemas,and Instances. Three schema architecture and data independence, databaselanguages, and interfaces, The Database System environment. Conceptual Data **Modelling using Entities and Relationships:** Entity types, Entity sets,attributes, roles, and structural constraints, Weak entity types, ER diagrams examples, Specialization and Generalization.	6
2	**Relational Model:** Relational Model Concepts, Relational Model Constraintsand relational database schemas, Keys, referentialintegrity and foreign keys. Relational Algebra: Unary and Binary relationaloperations, additional relational operations (aggregate, grouping, etc.) Examplesof Queries in relational algebra. Mapping Conceptual Design into a LogicalDesign: Relational Database Design using ER-to-Relational mapping. SQL:SQL data definition and data types, specifying constraints in SQL, retrievalqueries in SQL, INSERT, DELETE, and UPDATE statements in SQL,Nested queries - correlated and uncorrelated, Notion of aggregation, Aggregation functions group by and having clauses, Embedded SQL	6
3	**Normalization**: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and	6

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Fifth Normal Form. **Normalization Algorithms**: Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions

4	**Disk Storage, Basic File Structures, and Hashing**: Secondary Storage Devices, Buffering of Blocks, Placing File Records on Disk, Operations on Files, Hashing Techniques, Indexing Structures for Files, Single-Level Ordered Indexes ,Multilevel Indexes, Dynamic Multilevel Indexes Using B-Trees and B+-Trees	6
5	**Transaction Processing:** Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL. **Concurrency Control in Databases:** Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. **Introduction to Database Recovery Protocols:** Recovery Concepts, NO-UNDO/REDO recovery based on Deferred update, Recovery techniques based on immediate update, Shadow paging,	6

Text Books

1 R. Elmasri and S. Navathe, Fundamentals of Database Systems8, Addison-Wesley.
2 Silberschatz A., Korth H., Sudarshan S, Database System Concepts, McGraw Hill Publication, Sixth Edition

Reference Books

1 S. K. Singh, Database Systems: Concepts, Design and Application, Pearson Publication,
2 An Introduction to Database System : Bipin Desai West Publications
3 R Ramakrishnan, J Gehrke, Database Management Systems, 3rd Ed., McGraw-Hill,
4 Thomas M. Connolly, Carolyn E. Begg, "Database Systems: A Practical Approach to Design, Implementation and Management", Addison Wesley,fifth Edition

E Books/ Online learning material

1 https://nptel.ac.in/courses/106/105/106105175/
2 http://www.nptelvideos.in/2012/11/database-management-system.html
3 https://freevideolectures.com/course/2668/database-management-system

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
Evaluation I (Class Test) 20 Marks	10	10			
Teachers Assessment 20 Marks	5	5		5	5
ESE Assessment 60 Marks	20	20		10	10

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Teaching Strategies:

1. Use of different technologies in classroom
2. Use of different pedagogical approaches like flipped classroom
3. Use share pair strategy
4. Student centric teaching learning
5. Use of different resources like NPTEL courses
6. Use ofMCQs, Assignments, Test etc.

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	10	05	20
K2	Understand	10	05	20
K3	Apply	00	05	10
K4	Analyze	00	05	10
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total		20	20	60

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Course Code- **MC1104**   Course Title- **System software and operating system**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA	ESE	Total
3	--	--	3	20	20	60	100

Course Objectives
1 To introduce students the concepts and principles of system programming and to enable them to understand the duties and scope of a system programmer.
2 To provide students the knowledge about both theoretical and practical aspects of system programming, teaching them the methods and techniques for designing and implementing system-level programs.
3 Understand basic concepts in systems programming.

Course Outcomes- After studying this course, students will be able to:
CO 1 To understand the components of Assembler, Compiler and Macro.
CO 2 To understand and apply the functions of Assembler, Compiler and Macro
CO 3 To understand the structure and design of assemblers, linkers and loaders.
CO 4 Understand the structure and design of assemblers, linkers and loaders.
CO 5 To be aware of understanding of design issues associated with operating systems.

Course Contents

Unit No	Detailed Contents	Contact Hours
1	Assemblers - General design procedure –design assembler, statement of problem, data structure, format of database, algorithm and flowchart of various passes of assembler. Macro-processor Macro-instruction, features of macro facility-Macro instruction argument, conditional macro expansion, macro calls within macros, macro instruction defining macros, implementation.	6
2	Loader- Loading schemes-compile and go ,general loader ,absolute loader ,subroutine linkages ,reloading loaders ,direct linking loaders ,blinders ,linking loaders ,overlays ,dynamic blinders ,design of an absolute loader and designing of direct linking loader	6
3	Compilers Introduction to design of compiler, phases of compiler. Data structures, recursion call and return statement, storage classes, implementation, block structure compiler writing tools.	6
4	Operating system structures System components, operating system services, system programs, system structures. Process Management: Process Concept, Process scheduling, operations on processes, cooperating processes, interprocess communication, threads overview.	6
5	CPU Scheduling Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Algorithm evaluation. Process Synchronization: The critical –Section problem,	6

synchronization hardware, and semaphore, classic problems of synchronization, critical regions.
Deadlock
System Model, Deadlock Characterization, Resource-Allocation Graph, Methods for Handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection. Memory Management: Concept, Memory Management Techniques, Swapping, Contiguous Memory Allocation, Memory Protection, Memory Allocation, Fragmentation, Paging, Basic Method, Segmentation with Paging, Virtual Memory Concept, Demand Paging, Page Replacement.

Text Books
1 System Programming by J.J.Donavan , TMH 2
2 Operating Systems: Concepts: By Abraham Siberschatz, Peter Galvin- Willey- Sixth edition.

Reference Books
1 Operating Systems: Andrew S. Tanenbaum-Pearson Education- Second Edition.
2 Introduction to system software by D.M.Dhamdhere, TMH
3 System Programming and Operating Systems by D.M. Dhamdhere-TMH –Second Edition.
4 Operating Systems: Internals and Design Principles, Seventh Edition by William Stallings, Pearson Publications

E Books/ Online learning material
1 Introduction to operating system https://nptel.ac.in/courses/106/106/106106144/

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	5	5	5		5
Teachers Assessment 20 Marks					
ESE Assessment 60 Marks	12	12	12	6	18

Teaching Strategies:

1. Use of different technologies in classroom
2. Use of different pedagogical approaches like flipped classroom
3. Use share pair strategy
4. Student centric teaching learning
5. Use of different resources like NPTEL courses
6. Use ofMCQs, Assignments, Test etc.

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Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	10	05	20
K2	Understand	10	05	20
K3	Apply	00	05	10
K4	Analyze	00	05	10
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total		20	20	60

Course Code- **MC1105**   Course Title- **Software Engineering**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA	ESE	Total
04	-	-	04	20	20	60	100

Course Objectives
1 To understand fundamental concepts of software engineering principles.
2 To understand and transform the basic customer requirements in to a feasible technical solution.
3 To understand how to design and implement software with the help of various standard prototypes and models.

Course Outcomes- After studying this course, students will be able to:
CO 1 Gather, Categorise and Interpret the user requirements and prepare SRS (System Requirement Specification) document.
CO 2 Transform SRS into design and then into ready to execute software to satisfy complete user needs accurately.
CO 3 Be agile software developers with a comprehensive set of skills appropriate to the needs of the dynamic global computing-based society.
CO 4 Capable of team and organizational leadership in computing project settings, and have a broad understanding of ethical application of computing-based solutions to societal and organizational problems.
CO 5 Acquire skills and knowledge to provide software maintenance to customer.

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Introduction to Software Engineering Basic Terminologies:** What is Software & its Characteristics, requirements, specifications, design, testing, validation, evolution and project management, Software Crises and Myths, Software Engineering as a Layered Technology, Software Development Lifecycle, Agile view of Process	8
2	**Software Process, requirements and specification:** Software Process, Process Framework, Generic and Umbrella activities, Process Patterns, Process Assessment, Various Process Models,Requirement Engineering -inception, elicitation, elaboration, negotiation, specification, validation & management, Analysis Modelling Techniques - UML Diagrams	8
3	**Software Design:** Translating analysis model into design model, Fundamental design Concepts and Principles, , Design Process, Quality Attributes, Software Architecture & Architectural Styles.	8
4	**Software Testing, Validation & Maintenance:** Testing Strategy for Conventional Software, Testing Fundamentals, Test	8

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Plan Creation and Test Cases Generation, Unit and Integration Testing, Black-box and White-box Testing Techniques, Validation, and System Testing.

5 **Software Evolution:**
Software Maintenance- Corrective, Adoptive, Perfective, Structured and Un-Structured, The Associated Disciples and the Role and the Nature of the Configuration Management, Characteristics of Maintainable Software, Software Re-use strengths and weaknesses, Re-engineering.   8

Text Books
1 Software Engineering" – Roger S. Pressman, TMH
2 K.K.Aggarwal , Yogesh Singh , "Software Engineering" , New Age International Publishers
3 Shrinivasan, Gopalaswamy, "Software Testing" – Pearson Education

Reference Books
1 William Perry, "Effective Methods for Software Testing", John Wiley & Sons, New York, 1995.
2 CemKaner, Jack Falk, Nguyen Quoc, "Testing Computer Software", Second Edition, Van Nostrand Reinhold, New York, 1993.
3 BorisBeizer, "Software Testing Techniques", Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
4 LouiseTamres, "Software Testing", Pearson Education Asia, 2002

E Books/ Online learning material
1 **NPTEL -** https://nptel.ac.in/courses/106/105/106105087/
2 **SWAYAM-** https://swayam.gov.in/nd1_noc19_cs69/preview
3 **COURSERA-**https://www.coursera.org/courses?query=software%20engineering

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	10	10	-	-	-
Teachers Assessment 20 Marks	5	5	-	5	5
ESE Assessment 60 Marks	18	12	12	6	12

Teaching Strategies:
1. Use of Conventional Black board/White board
2. Use of Power Point Presentations
3. Group Discussion
4. Group and Individual activities/tasks
5. Class room question-answer sessions

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Teacher's Assessment:
1. Evaluation I (20 Marks)– Conducting Mid Term Class Test for 20 marks (Subjective Type, based on first two units from syllabus)
2. Teacher's Assessment (20 Marks)–
3. Giving students timely assignments to solve on every unit.
4. Conducting MCQ type assignments.
5. Mini Application/Project to be developed by students (in groups) by applying the concepts learnt in theory.

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	10	5	18
K2	Understand	10	5	12
K3	Apply	-	-	12
K4	Analyze	-	5	6
K5	Evaluate	-	-	6
K6	Create	-	5	6
Total		20	20	20

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Course Code- **MC1106**   Course Title- **Lab: Data Structures and Algorithms**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TW	ESE	Total
--	--	2	1	--	25	25	50

Course Objectives
1 Student will be able to appreciate the choices and trade-offs which face a compare in a real situation.
2 To familiarize students to use fundamental algorithms.
3 To design efficient algorithms for sorting and searching

Course Outcomes- After studying this course, students will be able to:
CO 1 Implement data structures like stacks, queues, linked lists etc. using array and dynamic variables and compare these methods.
CO 2 Implement complex data structures like trees & graphs in High level language.
CO 3 Implement searching & sorting methods.

Course Contents

Sr. No   Suggestive list of programs
1   Write a program for implementing Stack and Queue.
2   Write a program for Singly Linked List and Doubly Linked List.
3   Write a program for Circular Queue using Linked List.
4   Write a program for Creation of Binary Tree and operations on it.
5   Write a program for Creation of Binary Threaded Tree.
6   Write a program for Depth First search and Breadth First search.
7   Write a program for Bubble Sort and Bucket Sort.
8   Write a program for Merge Sort and Heap Sort.
9   Write a program for Insertion Sort and Quick sort.
10   Write a program for Binary Search to search an element in the given sequence.

Practical Examination will consist of Performance and Viva-voice Examination. The assessment will be based on the following–
1. Performance in the practical examination.
2. Record of programs submitted by the candidate.

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Course Code-**MC1107**   Course Title- **Lab: Computer Programming**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TW	ESE	Total
-	-	04	02	-	50	25	75

Course Objectives
1 To understand the nature of programming as human activity.
2 To familiarize the students with basic concepts of computer programming and developer tools.
3 To get prepared for the more advanced programming courses.

Course Outcomes- After studying this course, students will be able to:
CO 1 Analyze a simple programming problem specification.
CO 2 Design a high-level (programming language independent) solution to the problem using functional abstraction and general imperative programming language constructs.
CO 3 Write, compile, execute and debug a C program which maps the high-level design onto concrete C programming constructs.

Course Contents

Suggestive List of Programs

1. Write a program to rotate values of variables X, Y, Z such that X→Y,Y→Z,Z→X.
2. Write a program to find factorial of a number.
3. Write a program to list prime numbers from 1 to 500 using for statement.
4. Write a program to test whether given number is palindrome using do while statement.
5. Write a program to test number is an Armstrong number using if and go to statement.
6. Write a program to find square, square root, cube, cube root using switch case
7. Write a program to test whether given number is prime using function.
8. Write a program to demonstrate call by value parameter passing technique.
9. Write a program to demonstrate call by reference parameter passing technique.
10. Write a recursive program to test whether given number is prime.
11. Write a program to display strong number from n to m by command line argument.
12. Write a program to search a number in the given array.
13. Write a program to multiply matrix A with B.
14. Write a program to sort an array using pointer.
15. Write a program to demonstrate nested structure.
16. Write a program to demonstrate bit fields in a structure.
17. Write a program to copy one file into another file.

Practical Examination will consist of Performance and Viva-voice Examination. The assessment will be based on the following–
1. Performance in practical examination.2. Record of programs submitted by the candidate.

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Course Code- **MC1108**   Course Title- **Lab Data Base Management System**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TW	ESE	Total
--	--	4	2	--	50	25	75

Course Outcomes- After studying this course, students will be able to:

CO 1   Know the scope of SQL and use it to query, update and manage a database

CO 2   Use PL/SQL

CO 3   Demonstrate competence with advanced functions.

Course Contents

Practical No	Suggestive List of Practicals
1	To execute all the Basic DDL (Data Definition language) commands (i.e. Create, Alter Drop, and Truncate) withexample
2	To execute all the Basic DML (Data Manipulation language) commands (i.e. Insert, Select, Update, and Delete) withexample
3	To Execute the Database Functions (i.e. Numeric, Date, Group, Character, and count function) withexample
4	To Execute the join Commands (i.e. Cartesian product, natural join, Inner join, left outer join, right outer join, equi join, non- equi join, and fulljoin).
5	Implement the Program for Arithmetic operations (likeaddition,Subtraction,Multiplication and Division) using PL/SQL (programming language inSQL
6	Implement the concept for cursors in PL/SQL and demonstrate competence for loop constructs.
7	To implement the program for updating the values usingcursor
8	To implement the Concept of Views and SqlSub-Queries

Practical Examination will consist of Performance and Viva-voice Examination. The assessment will be based on the following–

1. Performance in the practical examination.

2. Record of programs submitted by the candidate.

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Course Code-**MC1109**   Course Title- **Lab: Communication Skills**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TW	ESE	Total
-	-	02	01	-	25	25	50

Course Objectives
1. To help engineering students in acquiring adequate mastery of Communicative and Functional English
2. To provide language training to the students to enable them to understand and acquire knowledge in technical subjects.
3. To help students develop their personal and interpersonal skills to enable them to make their transition from college to workplace smoother and help them excel in their jobs.
4. To develop vocabulary and technical writing of the student in professional discipline.

Course Outcomes- After studying this course, students will be able to:
CO 1   To write technical reports and letters.
CO 2   To make presentations on technical & non-technical topics for the customers as per the company needs.
CO 3   Display competence in oral, written, and visual communication.

Course Contents

Suggestive List of Practicals
1. Different Communication Situation. (Formal, Informal, Upward, Downward . etc) Telephonic Communication. (Enquiry, Leaving Messageetc.)
2. JAM Sessions Group Discussion. Debate. Presentation Interview
3. Practical Based on the following Points:
   a. Parts of Speech,
   b. Types of Tense,
   c. Use of Articles,
   d. Synonyms and Antonyms,
4. Find out the Grammatical Errors in the given sentences
5. Practical Based on the following Points
   a. Letter Writing,
   b. Office documents like, Notices, Minutes, Agenda
   c. Report Writings.
   d. Resume Writing
6. Email Writing,
7. Listen to the Audio and Answer the Questions
8. Analyze the Data and answer The questions

Practical Examination will consist of Performance and Viva-voice Examination. The assessment will be based on the following– 1. Performance in the practical examination.
2. Record of programs submitted by the candidate.

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Course Code- **MC1111**   Course - **Object Oriented Programming with Java**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA	ESE	Total
03	01	-	04	20	20	60	100

Course Objectives
1   To identify issues related to the definition, creation and usage of classes, objects and methods.
2   To demonstrate the principles of inheritance and polymorphism and demonstrate through problem analysis assignments how they relate to the design of methods, abstract classes and interfaces.
3   Understand fundamentals of Object Oriented programming in java, including defining classes, invoking methods, using class libraries etc,
4   To use the java SDK environment to create, debug and run simple java programs.

Course Outcomes- After studying this course, students will be able to:
CO 1   To understand basic OOP concepts and Java programming environment.
CO 2   Create small Java application programs using sound OOP practices.
CO 3   Use testing and debugging tools to automatically discover errors of Java programs
CO 4   Develop programs using the Java Collection API as well as the Java standard class library.
CO 5   Develop Java Application Programs to create GUI

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Object Oriented Programming** An overview of OOP concepts: Class, object, message passing, inheritance, encapsulation, polymorphism, Difference between OOP and other conventional programming, advantages and disadvantages. Importance of Java in the internet, Java applets and applications, security, portability, the byte code.	6
2	**JavaFundamentals** Introduction to Java: History and evolution of Java,Java features, Java vs other popular languages, Java programming environment, Installing Java, Exploring the IDE, JVM, command line arguments,Bytecodes And The Java Virtual Machine, Application And Applets, The Java Class Libraries, The Java Development Kit (Jdk), Identifiers, Keywords &Types–Variables And Assignments, Strings And Characters, Arithmetic Operators And Expressions, Type Conversion and Casting,The New Operator, Garbage Collection, Other Wrapper Classes, The String Buffer Class, Arrays Of Objects, Command Line Arguments	6
3	**Java MemoryModel** Objects and classes, declaring objects, constructors, The General Form Of A Class, Creating Simple Classes, Method Overloading, Adding Constructors, The This Keyword, Instance Variables And Methods,	6

Static Variables And Methods, Local Variables And Variable Scope, Argument Passing, Introduction to Inner Classes Inheritance– Subclasses, Inheritance And Variables, Method Overriding, Inheritance And Methods,inheritance And Constructors, Class Modifiers, Variable Modifiers, Constructor Modifiers, Method Modifiers, Interface And Packages, Interfaces, Interface References, Interface Inheritance, The Instance Of Operator, Packages, Classpath, The Import Statement, Access Control And Packages,

4	**Multithreading, Exceptions handling, File handling** Multithreading:Lifecycle of Thread, Thread Scheduler, Thread Priority,Daemon Thread, Exception Handling :Try Catch Multiple Catch, throw,Difference between final, finally and finalize, File Handling : Java I/O, stream,Outputstream,Inputstream, Dataoutputstream, DataInputstream.	6
5	**GUI Programming** An Overview Of Applets, Your First Java Applet, The Life Cycle Of An Applet, The Graphics Class, Using Colors, Displaying Text, Using Applets In A Web Page Event Handling The Delegation Event Model, Event Classes, Event Listeners, Adapter Classes, Advance Language Features, Inner Classes, Anonymous Inner Classes, The Abstract Window Toolkit, Labels, Buttons, Canvases, Check Boxes, Choices, Text Fields And Text Areas, Lists, Scroll Bars, Grid Layout, Panels, Windows And Frames, Menus And Menu Bars, Overview Of JFC (Java Foundation Classes), Swings & AWT Component Hierarchy	6

Tools Used – JDK 1.4 / 1.5, TextPad / EditPlus, java, javac, jar, javaw, javap

Text Books
1 Programming with JAVA – E. Balgurusamy, 2nd Ed,TMH
2 Thinking in Java – Bruce Eckel - 3rd Edition Prentice-Hall
3 A Programmer's Guide to Java Certification – Khalid Mughal, Rolf Rasmussen

Reference Books
1 Java 2 Complete Reference – Herbert Schildt and Patrick Naughton McGraw Hill
2 Java Swing, 2nd Edition by Dave Wood, Marc Loy, James Elliott, Brian Cole, Robert EcksteInOReilly
3 Core Java – Part 1 – Sun Microsystems press

E Books/ Online learning material
1 **NPTEL -** https://nptel.ac.in/courses/106/105/106105191/
2 **SWAYAM-** https://swayam.gov.in/nd1_noc19_cs84/preview
3 **COURSERA-**https://www.coursera.org/courses?query=core%20java

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Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	10	10	-	-	-
Teachers Assessment 20 Marks	5	5	-	5	5
ESE Assessment 60 Marks	15	15	6	12	12

Teaching Strategies:
1. Use of Conventional Black board/White board
2. Use of Power Point Presentations
3. Group Discussion
4. Group and Individual activities/tasks
5. Class room question-answer sessions

Teacher's Assessment:
1. Evaluation I (20 Marks)– Conducting Mid Term Class Test for 20 marks (Subjective Type based on first two units)
2. Teacher's Assessment (20 Marks)–
3. Giving students timely assignments to solve probably on every unit.
4. Conducting MCQ type assignments.
5. Mini Application/Project to be developed by students (in groups) by applying the concepts learnt in theory.

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	10	5	15
K2	Understand	10	5	15
K3	Apply	-	-	6
K4	Analyze	-	5	-
K5	Evaluate	-	5	12
K6	Create	-		12
Total		20	20	20

Course Code- **MC1112**   Course Title- **Internet of Things(IoT)**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA	ESE	Total
3	-	-	3	20	20	60	100

Course Objectives
1   To understand basic concepts of IoT,
2   To understand use of python programming in IoT with different components.
3   To learn implementation of IoT projects.

Course Outcomes- After studying this course, students will be able to:
CO 1   Understand concepts of IoT basics with its different components.
CO 2   Know different network prototypes for Sensors connections.
CO 3   Know Python programming with Raspbian OS.
CO 4   Do database handling, File handling and data logging using RPi with Python
CO 5   Do IoTbased projects for different purpose.

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Introduction to IoT:** What is IoT, Features of IoT, Applications of IoT, Challenges in IoT **IoTComponants:** Raspberry Pi, Arduino, different Sensors, Actuators, Connectors.	6
2	**Basics of IoT Networking protocols:** Raspbian OS, Networking Protocols, Bluetooth, WSN, Sensor Web. **Connections with IoT components:** Connections with different Sensors(ultrasonic, temperature, vibration), Actuators, output devices(LED, Screen,Buzzer)	6
3	**Python Programming with RPi:** Basics of python programming, Python sensor libraries, python with Raspbian OS, Read data from Sensor, store data to Server, data logging using python.	6
4	**Network Programming in IoT:** Server connections, Database Handling, Runtime Data upload to Server, File Read-Write operations.	6
5	**Case Study :** 1) Smart Cities and Homes with IoT 2) Connected Vehicles	6

Text Books
1   Getting Started with the Internet of Things, By CunoPfister
2   IoT fundamentals , Author: David Hanes, Gonzalo Sangueiro

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Reference Books

1 Internet of Things: A Hands-On Approach, Author: By ArshdeepBahga, Vijay Madisetti

2 Internet of Things with Raspberry Pi 3: By ByManeeshRao, Packtpublucation

3 Raspberry Pi IoT Projects: Prototyping Experiments for Makers,By John C. Shovic,, Apress Publication

E Books/ Online learning material

1 NPTEL online course: Introduction to Internet of Things, By IIT Kharagpur

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	10	10	-	-	-
Teachers Assessment 20 Marks	5	5	-	5	5
ESE Assessment 60 Marks	15	15	6	12	12

Teaching Strategies:

1. Use of Conventional Black board/White board
2. Use of Power Point Presentations
3. Group Discussion
4. Group and Individual activities/tasks
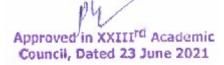5. Class room question-answer sessions

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	10	5	15
K2	Understand	10	5	15
K3	Apply	-	-	6
K4	Analyze	-	5	-
K5	Evaluate	-	5	12
K6	Create	-		12
Total		20	20	60

Course Code- **MC1113**   Course Title- **Python Programming**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA	ESE	Total
3	1	-	4	20	20	60	100

Course Objectives
1 To effectively use basics of Python Programming.
2 To understand how to use and implement object oriented features in python.
3 To understand how to deal with strings, files and database using python.

Course Outcomes- After studying this course, students will be able to:
CO 1 Describe and understand basics of python programming
CO 2 Implement python programs using conditional and loops blocks.
CO 3 Analyse and deal with strings with various functions and operators in python.
CO 4 Do database handling, File handling with Python
CO 5 Analyse, design and implement a project in python with various applications

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Introduction:** History, Features, Setting up and Installation, Working with Python, Understanding and working with Python Variables and Operators, Understanding python blocks, Understanding Python Data Types.	6
2	**Conditional and control statements:** Using if, else and elif, Simple for loops in python, For loop using ranges, string, list and dictionaries, Use of while loops in python, Loop manipulation using pass, continue, break and else, Programming using Python conditional and loops block.	6
3	**Object oriented concepts:**Classandobjects, Constructorand destructors, Inheritance , Overlapping and overloading operators, Organizing python codes using functions, Organizing python projects into modules, Importing own module as well as external modules, Understanding Packages, Powerful Lamda function in python.	6
4	**Understanding string:** In build methods, List manipulation using in build methods, Dictionary manipulation Avoiding code break using exception handling, Safe guarding file operation using exception handling, Handling and helping developer with error code, Programming using Exception handling.	6
5	**File and Database Handling:**Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek Programming using file operations, SQL Database connection using python, Creating and searching tables, Reading and storing information in Database.	6

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Text Books
1 The Complete Reference Python

Reference Books
1 Python Crash Course ,Eric Matthes (No Starch Press, 2016)
2 Learn Python 3 the Hard Way, Zed A. Shaw (Addison-Wesley, 2016)
3 Think Python First Edition, by Allen B. Downey, Green Tea Press

E Books/ Online learning material
1 https://nptel.ac.in/courses/106/106/106106182/
2 https://swayam.gov.in/nd1_noc19_cs41/preview
3 https://docs.python.org/3/tutorial/
4 http://www.codecademy.com/tracks/python
5 http://corepython.com/
6 http://www.python-course.eu/python3_course.php

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
Evaluation I (Class Test) 20 Marks	10	10	-	-	-
Teachers Assessment 20 Marks	5	5	-	5	5
ESE Assessment 60 Marks	15	15	6	12	12

Teaching Strategies:

1. Use of Conventional Black board/White board
2. Use of Power Point Presentations
3. Group Discussion
4. Group and Individual activities/tasks
5. Class room question-answer sessions

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

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Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	10	5	15
K2	Understand	10	5	15
K3	Apply	-	-	6
K4	Analyze	-	5	-
K5	Evaluate	-	5	12
K6	Create	-		12
Total		20	20	60

Course Code- **MC1114**   Course Title- **Information Security**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA	ESE	Total
4	-	-	4	20	20	60	100

Course Objectives
1 To Discuss the importance of IS security
2 To demonstrate protecting the privacy and confidentiality of data
3 To Know/understand the security and privacy and how to apply them
4 To identify management, technical, personnel, operational, and physical security controls
5 To expose students to the security requirements for protecting workstations and the
6 Information processed on them
7 To discuss general physical/environmental security requirements
8 General understanding of network security

Course Outcomes- After studying this course, students will be able to:
CO 1 Analyze external and internal threats to an organization
CO 2 Understanding of information security and its importance
CO 3 Understand how threats to an organization are discovered, analyzed, and dealt with
CO 4 Evaluate security solutions for network using available secure solutions (such as PGP, SSL, IPSec, etc)
CO 5 Understand original research in network security

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Information Security**: Introduction to information hiding, information hiding in noisy data, a survey of steganography techniques, watermarking	6
2	**Network Security Practice:** Authentication Application – Electronic Mail Security – IP Security Program Security and System Security: Secure programs – No malicious program errors – viruses and Worms – Memory and address protection – control access to general objects – File protection mechanism – user authentication – Trusted operating system design and assurance – Intrusion Detection system	6
3	**Symmetric Encryption and Message Confidentiality :** Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Random and Pseudorandom Numbers , Stream Ciphers and RC4 ,Cipher Block Modes of Operation ,Recommended Reading and Web Sites , Key Terms, Review Questions ,and Problems	6
4	**Public-Key Cryptography and Message Authentication :** Approaches to Message Authentication , Secure Hash Functions , Message Authentication Codes , Public-Key Cryptography Principles ,	6

Public-Key Cryptography Algorithms , Digital Signatures , Recommended Reading and Web Sites , Key Terms, Review Questions, and Problems

5 **Biometricssecurity: B**iometric identification, verification, authentication, different biometric techniques, biometric design steps, biometric template, and biometric template security.

6

Text Books

1. 1.Information Security and cyber laws, Saurabh Sharma, student series, VikaspublicationCharrles P. Pfleeger,
2. 2. Shari Lawrence Pfleegner, "Security in Computing", Prentice Hall of India, 2007.
3. William Stallings, "Cryptography and Network Security", 5th Edition, Pearson.
4. John W.Rittinghouse, James F.Ransome, "Wireless Operaional Security", Elsevier, 2004.
5. Ron Ben Natan,"Implementing Database Security and Auditing", Elsevier, 2005.
6. Lincoln D. Stein, "Web Security", Addison Wesley, 1999.
7. IngemarJ.Cox, Matthew L. Miller Jeffrey A.Bloom, Jessica Fridrich,TonKalker,"Digital Watermarking and Steganography", 2nd Edition, Elsevier.
8. Dr.R.K.Tiwari, P.K.Sastri, K.V.Ravikumar, "Computer Crime and Computer Forensics", 1st Edition, Selective Publishers, 2002.

Reference Books

1. Mark Rhodes-Ousley, "Information Security The Complete Reference", 2nd Edition
2. Keith Strassberg, Mark Rhodes-Ousley, and Roberta Bragg," Network Security: The Complete Reference"

E Books/ Online learning material

1. NPTEL - https://nptel.ac.in/courses/106/106/106106129/
2. YouTube IS Tutorials - https://bit.ly/3jAmS7k

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	10	10	-	-	-
Teachers Assessment 20 Marks	5	5	-	5	5
ESE Assessment 60 Marks	15	15	6	12	12

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Teaching Strategies:

1. Use of Conventional Black board/White board
2. Use of Power Point Presentations
3. Group Discussion
4. Group and Individual activities/tasks
5. Class room question-answer sessions

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	10	5	15
K2	Understand	10	5	15
K3	Apply	-	-	6
K4	Analyze	-	5	-
K5	Evaluate	-	5	12
K6	Create	-		12
Total		20	20	60

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Course Code- **MC1115**   Course Title- **Data Science**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA	ESE	Total
3	-	-	3	20	20	60	100

Course Objectives
1   To provide students with the Fundamental R programming skills
2   Demonstrate statistical concepts such as probability, inference, and modeling and how to apply them in practice
3   Gain experience with the tidyverse, including data visualization with ggplot2 and data wrangling with dplyr
4   Understand and get In-depth knowledge of fundamental data science concepts through motivating real-world case studies

Course Outcomes- After studying this course, students will be able to:
CO 1   Understand the concepts of Data Science and challenges in Data Science.
CO 2   Understand the concepts R programming.
CO 3   Gain conceptual understanding of data visualization, data wrangling.
CO 4   Understand statistical concepts in dealing with data.
CO 5   Identify appropriate techniques and tools and learn through real world case studied.

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Introduction:** What Is Data Science? Where Do We See Data Science?How Does Data Science Relate to Other Fields? The Relationship between Data Science and Information Science, Computational Thinking, Skills for Data Science, Tools for Data Science, Issues of [Ethics, Bias, and Privacy in Data Science]	6
2	**Data:** Introduction, Types of Data, Structured Data, Unstructured Data, Challenges with Unstructured Data, Data Collection, Data Preprocessing, Data Cleaning, Data Integration, Data Transformation, Data Reduction, Data Discretization.	6
3	**Techniques:** Data Analysis and Data Analytics, Descriptive Analysis, Diagnostic Analytics, Predictive Analytics, Prescriptive Analytics, Exploratory Analysis, Mechanistic Analysis.	6
4	**Tools for Data Science:** Introduction to R, Getting Access to R, Getting Started with R, R Basics, Control Structures, Functions, Importing Data, Graphics and Data Visualization, Installing ggplot,Loading the Data, Plotting the Data, Statistics and Machine Learning, Basic Statistics, Regression, Classification, Clustering.	6
5	**Applications, Evaluations, and Methods**	6

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Data Collection Methods: Introduction to Quantitative and Qualitative Methods

Evaluation: Comparing Models, Training–Testing and A/B Testing, Cross-Validation

Hands-On with Solving Data Problems: Collecting and Analyzing Twitter/Youtube Data

Text Books

1   Chirag Shah, "A Hands-On Introduction to Data Science", Second Edition, Cambridge Press.
2   Rafael A. Irizarry, "Introduction to Data Science", HardwardX CRC Press

Reference Books

1   The Data Science Handbook: Advice and Insights from 25 Amazing Data Scientists, Carl Shan, William Chen Data Science Bookshelf
2   Data Science (The MIT Press Essential Knowledge series), John D. Kelleher and Brendan Tierney , Part of: The MIT Press Essential Knowledge series
3   Foundations of Data Science 1st Edition, Avrim Blum , John Hopcroft, Ravindran Kannan Cambridge University Press; 1 edition

E Books/ Online learning material

1   Data Science for Engineers **https://swayam.gov.in/nd1_noc19_cs60/preview**

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	5	10	-	5	-
Teachers Assessment 20 Marks	-		5	10	5
ESE Assessment 60 Marks	15	20	10	15	-

Teaching Strategies:

1.   Use of Conventional Black board/White board
2.   Use of Power Point Presentations
3.   Group Discussion
4.   Group and Individual activities/tasks
5.   Class room question-answer sessions

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	5	-	15
K2	Understand	10	5	20
K3	Apply	5	10	15
K4	Analyze	-	5	10
K5	Evaluate	-	-	-
K6	Create	-	-	-
Total		20	**20**	**20**

Course Code- **MC1116**   Course Title- **Soft Computing**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA	ESE	Total
3	--	--	3	20	20	60	100

Course Objectives
1 Understanding of fundamental concepts of artificial neural network
2 To familiarize students with different algorithms for learning ANN
3 To illustrate the concepts of fuzzy logic and it's operations

Course Outcomes- After studying this course, students will be able to:
1 Demonstrate the concepts of ANN
2 Understand different ANN training algorithms
3 Design ANN using supervised and unsupervised learning algorithms
4 Apply ANN for different applications
5 Understand Fuzzy logic concepts and apply it for simple applications

Course Contents

Unit No	Detailed Contents	Contact Hours
1	Introduction to ANN, Basic terminology, Biological neurons and its working, Simulation of biological neurons to problem solving, Different ANNs architectures, Training techniques for ANNs, Applications of ANNs to solve some real life problems.	6
2	Pattern recognition and data classification, neuron signal functions, Non-linearly separable problems, XOR problem, perceptron learning algorithm	6
3	Multilayer network, Back propagation algorithm, function approximation and NN, applications of FFNN, learning from examples and generalization, radial basis function network	6
4	Self organization, competitive learning, vector quantization, Mexican hat networks, self organizing feature map, applications of self organizing feature map	6
5	Fuzzy sets and fuzzy systems, need for numeric and linguistic processing, fuzzy uncertainty and the linguistic variable, fuzzy sets, membership functions, simple operations on fuzzy sets, fuzzy rules, applications	6

Text Books
1 "Neural Network – A classroom approach", Satish Kumar, Tata McGraw hill
2 "Fuzzy logic", F. Martin McMeill

Reference Books
1 Artificial Neural Network, Yagnanarayana

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Council, Dated 23 June 2021

2 Soft Computing techniques, N.P. Padhy , S.P. Simon, Oxford University Press

3 Soft Computing: Neural Networks, Fuzzy Logic and Genetic Algorithms, , Sushil Kumar Singh, GALGOTIA PUBLICATIONS (P) LTD

E Books/ Online learning material

1 https://swayam.gov.in/nd1_noc20_cs17/preview

2 www.mathworks.com

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
Evaluation I (Class Test) 20 Marks	5	10	5		
Teachers Assessment 20 Marks		5	5	5	5
ESE Assessment 60 Marks	15	15	10	10	10

Teaching Strategies:

1. Use of different technologies in classroom
2. Use of different pedagogical approaches like flipped classroom
3. Use share pair strategy
4. Student centric teaching learning
5. Use of different resources like NPTEL courses
6. Use ofMCQs, Assignments, Test etc.

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	05	02	15
K2	Understand	10	04	15
K3	Apply	5	05	15
K4	Analyze		05	10
K5	Evaluate		04	05
K6	Create		-	-
Total		20	20	20

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Course Code- **MC1117**   Course Title- **Big Data Analytics**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TA/TW	ESE	Total
3	--	--	3	20	20	60	100

Course Objectives

1 To provide students with the fundamentals and essentials of Big Data and Hadoop.
2 Demonstrate various challenges in processing Big Data.
3 Demonstrate various concepts of Big Data and Hadoop.
4 Understand Hadoop Map Reduce Framework

Course Outcomes- After studying this course, students will be able to:

CO 1 Understand the concepts of Big data and challenges in processing Big Data.
CO 2 Understand Hadoop architecture and eco-system.
CO 3 Gain conceptual understanding of Hadoop Distributed File System.
CO 4 Understand the concepts of map and reduce and functional programming.
CO 5 Identify appropriate techniques and tools to solve actual Big Data problems.

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**UNIT-I : Introduction to Big Data and Hadoop:** What is Big Data, What are Challenges in processing Big data? What is hadoop, Data Storage and Analysis, Comparison with Other Systems: RDBMS, Grid Computing, Volunteer Computing; A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem.	6
2	**UNIT-II : HDFS: Hadoop Distributed File System:** Significance of HDFS in Hadoop, Features of HDFS, The Design of HDFS, HDFS Concepts: Blocks, Data replication, Namenodes and Datanodes; Accessing HDFS: CLI (Command line interface), Java based Approach.	6
3	**UNIT-III : Map Reduce:** Map Reduce Architecture, How map reduce works: Job Submission, Job Initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion. Failures, Job Scheduling.	6
4	**UNIT-IV :** **Pig:** Introduction to Apache Pig, Map-Reduce vs Pig, Pig Latin, Data Processing Operators.	6

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Hive: Hive introduction, Architecture, Comparison with Traditional Databases, HiveQL, Tables.

| 5 | **UNIT-V :** | 6 |

HBase:HBasics, Concepts, HBase Versus RDBMS.

ZooKeeper: The ZooKeeper Service.

Case Studies: Hadoop and Hive at Facebook, Log Processing at Rackspace.

Text Books

1 Tom White, "Hadoop: The Definitive Guide", Second Edition, O'Reilly Yahoo Press.
2 Robert D. Schneider, "Hadoop for Dummies", Wiley.

Reference Books

1 Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packt Publishing.
2 Big Data Analytics, Radha Shankarmani , M. Vijayalakshmi , Wiley
3 Big Data and Analytics, Subhashini Chellappan Seema Acharya, Wiley
4 BIG DATA ANALYTICS Kindle Edition, Parag Kulkarni , Sarang Joshi , Meta S. Brown, PHI Learning

E Books/ Online learning material

1 http://planetbigdata.com/
2 Big Data Computing https://swayam.gov.in/nd1_noc20_cs92/preview

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	5	10	5		
Teachers Assessment 20 Marks		5	5	5	5
ESE Assessment 60 Marks	15	15	10	10	10

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Teaching Strategies:

1. Use of different technologies in classroom
2. Use of different pedagogical approaches like flipped classroom
3. Use share pair strategy
4. Student centric teaching learning
5. Use of different resources like NPTEL courses
6. Use ofMCQs, Assignments, Test etc.

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	05	02	15
K2	Understand	10	04	15
K3	Apply	5	05	15
K4	Analyze	-	05	10
K5	Evaluate	-	04	05
K6	Create	-	-	-
Total		20	20	60

Course Code- **MC1118**   Course - **Lab. Object Oriented Programming with Java**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TW	ESE	Total
-	-	04	02	-	50	25	75

Course Objectives
1   To make students familiar with Object Oriented Programming concepts using Java Programming Language
2   To enable development of small user applications using Java.

Course Outcomes- After studying this course, students will be able to:
CO 1   Incorporate object oriented concepts like classes , objects , inheritance , polymorphism resembling real time situation.
CO 2   Familiarize with Java development Environment such as Eclipse, NetBeans etc.
CO 3   Execute JAVA programs based on simple constructs like arrays, loops , decision statements, functions etc

Course Contents
Suggestive List of Programs

1. Write a java program to demonstrate all the basic programming features such as if else condition, loops, switch case, break and continue statement, variables, data types and operators.
2. Write a java program to demonstrate
   a. Fibonacci series
   b. Factorial of a number
   c. Prime number
   d. Armstrong number
   e. Reverse number
   f. Palindrome number
3. Write a program in java to demonstrate typecasting concept on various primitive data type.
4. Write a java program to demonstrate the use of wrapper classes and its methods (3 methods).
5. Write a java program to accept 1 to 10 numbers and print their sum using command line arguments.
6. Write a java program for accepting 10 integer numbers and sort them in ascending order using bubble sort.
7. Write a java program to demonstrate two-dimensional array (matrix) by finding an addition of two 3*3 matrices.
8. Write a java program to demonstrate two-dimensional array (matrix) by finding multiplication of two 3*3 matrices.
9. Write a java program to demonstrate methods of string class and their use with example.
10. Write a java program to demonstrate various constructors in a single program.
11. Write a java program to demonstrate single inheritance.
12. Write a java program to demonstrate multilevel inheritance.

13. Write a java program to demonstrate multiple inheritance achieved using interface.
14. Write a java program to explain static and nonstatic inner classes.
15. Write a java program to demonstrate abstract class and abstract methods.
16. Write a java program for accepting user defined package and access the classes of these package in other program.
17. Write a java program to demonstrate use of threads by:
    a) by implementing runnable interface   b) by extending thread class
18. Write a java program to demonstratesuspend(), resume(), stop() methods of a thread.
19. Write a java program to demonstratesleep(), wait(), notify(), yield(), notifyAll() method of thread.
20. Write a java program to demonstrate thread priorities.
21. Write a java program to demonstrate the concept of deamon thread.
22. Write a java program to illustrate thread synchronization.
23. Write a java program to demonstrateexception handling mechanism
    a) Default throw and our catch
    b) Our throw and our catch
24. Write a java program for accepting user input through applet.
25. Create a java applet to demonstrate the various mouse event handlers.
26. Create a java applet to demonstrate the various keyboard event handlers.
27. Write a program to create I/O file operations
28. Create a java applet to demonstrate various graphics methods.

Practical Examination will consist of Performance and Viva-voice Examination.
The assessment will be based on the following–
1. Performance in the practicalexamination.
2. Record of programs submitted by thecandidate.

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Course Code- **MC1119**   Course Title- **Lab: Internet of Things (IoT)**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TW	ESE	Total
--	--	2	1	--	25	25	50

Course Objectives
1 To understand basic concepts of IoT,
2 To understand use of python programming in IoT with different components.
3 To learn implementation of IoT projects.

Course Outcomes- After studying this course, students will be able to:
CO 1   Use different components in IoT to make complete system.
CO 2   Create python programs with RPi to work with different sensors.
CO 3   Work with files, database and cloud data logging with IoT

Course Contents

Exp. No.   Suggestive list of experiments
1 Study RaspberryPi and Raspbian OS.
2 Study of different Sensors , Actuators, Connectors, LED with RPi
3 Write Python program in RPi to Glow LED with specific time interval.
4 Write Python program in RPi to Glow LED if Buzzer sound.
5 Create IoT circuit with python program to maintain Temperature data log.
6 Database connection with IoT using RaspberryPi
7 File read/Write operations with IoT using RaspberryPi
8 Using IoTsytem, send runtime data log to the cloud.
9 Case Study : Smart City or Smart Vehicle
10 Mini Project

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Course Code-**MC1120**   Course Title- **Lab: Python Programming**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TW	ESE	Total
-	-	04	02	-	50	25	75

Course Objectives
1   To understand basic concept of python.
2   To understand use of python programming in various application.
3   To learn implementation of python projects.

Course Outcomes- After studying this course, students will be able to:
CO 1   Use python programming basics.
CO 2   Implement OOPS concepts with python.
CO 3   Work with files and database with python.

Course Contents

Suggestive List of Programs

1. Introduction to Python and its Installation
2. Create a simple program of taking user input and print it using different data types variables.
3. Working with different conditional and looping statements, create functions in python.
4. Working with various string operations.
5. Implementing OOPS concept with Python (Class, Object, Inheritance, Polymorphism, Abstraction, Encapsulation).
6. Create own module/import external module in program.
7. Implementing Exception Handling, Lambda Function in Python.
8. Using File Handling in Python.
9. Working with Database using Python.
10. Mini Project.

Practical Examination will consist of Performance and Viva-voice Examination. The assessment will be based on the following–
1. Performance in the practicalexamination.
2. Record of programs submitted by thecandidate.

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Course Code-**MC1121** Course Title- **Seminar**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practicals	Credits	CT	TW	ESE	Total
-	-	02	01	-	50	-	50

Course Objectives
1 Gaining factual knowledge (Terminology, Classifications, methods etc)
2 Learning fundamental principles, generalizations or theories
3 Developing specific skills, competencies, and point of view required by MCA graduate.

Course Outcomes- After studying this course, students will be able:
CO 1 To develop and support a relevant and informed thesis, or point of view, that is appropriate for its audience, purpose, discipline, and theme.
CO 2 To demonstrate effective writing skills and processes by employing the rhetorical techniques of academic writing, including invention, research, critical analysis and evaluation, and revision.
CO 3 To incorporate and document appropriate sources in accordance with the formatting style proper for the discipline and effectively utilize the conventions of standard written English.

Course Contents

The aim of the seminar is to make the students study something extra other than curriculum. They are expected to go through the latest trend pertaining to computer and allied fields and deliver the seminar by preparing report.
The other important aim of the seminar is to encourage and develop the personality, aptitude and knowledge of the students.

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GOVERNMENT COLLEGE OF ENGINEERING, AURANGABAD
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Scheme & Syllabus of Master of Computer Applications (MCA) 2 Years Batch 2020 onwards

SYMCA Semester-III and Semester-IV

By Departmental Board of Study (Master of Computer Applications) Department of Master of Computer Application Government College of Engineering, Aurangabad

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Course Code- **MC2101**   Course Title- **Adv. Java**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA	ESE	Total
3	1	-	4	20	20	60	100

Course Objectives
1 Explain the use of advance Java in application development
2 Evaluate the role of servlets, swing and AWT for web application development.
3 Develop JSP applications as per the requirement of the IT industry.

Course Outcomes- After studying this course, students will be able to
CO 1 Develop distributed applications using RMI
CO 2 Develop web application using Java Servlet and JavaServer Pages technology.
CO 3 Gain the knowledge of MVC Architecture.
CO 4 Convert their project to layered MVC Architecture
CO 5 Implement the advanced environment using Hibernate, Struct, Spring in their Application

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Introduction to Networking and RMI** Basics Of Networking, Overview Of The OSI Model, Socket Programming, Client Sockets And ServerSocket, Multicast Sockets **RMI**: Introduction To Distributed Computing, RPC, Introduction To RMI, Stubs And Skeletons, The Process Of Creating A Simple RMI Application	6
2	**Servlets** Introduction To Web Application Development, Introduction of a 2 & 3 Tier Architecture, Server Side Programming, Introduction To Servlets, Comparing Servlets With CGI, Servlet Lifecycle, Servlet With Html, Server Side Includes, Servlet Chaining, HTTP Tunneling, Session Management, Servlets With JDBC, Inter Servlet Communication, Deployment Descriptor (web.XML), Servlet Context &Config Objects, Event Handling in Servlet, Jasper Report generation & Calling Using Servlet.	6
3	**Java Server Page and MVC Architecture** Introduction, Difference between Servlet &JSP ,Basic Tags (Scriptlet, expression, directives ,declaration), Basic Objects (out, session, request, application), Action tags(forward, include etc.), Java Server Tag Library **Introduction to MVC**, Role of MVC in Servlet and JSP architecture.	6
4	**Hibernate, Structs and Spring** Introduction, difference between hibernate &JDBC, Architecture of hibernate & ORM understanding, Steps to configure hibernate & create sample program, Introduction to HQL & work with database **Struct**: Introduction &History, Struts with Hibernate, Struts with Spring, Struts with JDBC, **Spring** :Spring Core Module, Spring J2EE module, Spring ORM, Spring JDBC, Spring AOP(Aspect Oriented Module),Spring Web MVC module	6

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| 5 | **Maven project and Web services** | 6 |

Maven :What is Maven, ANT Vs Maven, Install Maven, Maven Repository, Local Repository, Central Repository, Remote Repository, Maven Pom.xml, Maven Example, Maven Web App, Maven Plugin
Web service :WS Components, SOAP Web Service, RESTful Web Service, SOAP vs RESTSOA, Java Web Services
J-unit Testing: Types of JunitTesing, Assert Classes
JAXB : What is JAXB, features of JAXB, Object to XML, XML to Object

Text Books

1. C. Xavier, Java Programming: A practical approach, McGraw Hill India Education 2011.
2. 1. Herbert Schildt, ―The Complete Reference – Java 2, 8thEdition, Tata McGraw Hill, 2011.

Reference Books

1. E. Balagurusamy, PROGRAMMING WITH JAVA – A PRIMER, 4th Edition, Tata McGraw-Hill, 2010
2. Core Java Part 2 Advanced Features – Sun Microsystems press
3. J2EE™ Tutorial, The, 2nd Edition By Eric Armstrong, Jennifer Ball, Stephanie Bodoff, Stephanie Bodoff, Stephanie Bodoff, Debbie Carson, Ian Evans, Dale Green, Kim Haase, Eric Jendrock. Published by Addison Wesley
4. Java Design Patterns: A Tutorial by James W. Cooper Addison Wesley Pearson Press
5. Struts in Action – Ted Husted

E Books/ Online learning material

1. https://www.edureka.co/blog/advanced-java-tutorial
2. https://www.w3schools.in/java-tutorial/
3. https://nptel.ac.in/courses/106/105/106105191/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	3	2		1								1	1	
CO 2	1	3	2												
CO 3	1	3	2												
CO 4	1	3	2					1	1	1	1	1	1	1	1
CO 5	1	3	2		1			1							

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
Evaluation I (Class Test) 20 Marks	5	5	5		5
Teachers Assessment 20 Marks					
ESE Assessment 60 Marks	12	12	12	6	18

Teaching Strategies:
1. Utilizing technology in the classroom.
2. Co-operative learning
3. Questioning to check for understanding
4. Plenty of practice
5. Be flexible about how long it takes to learn
6. Get students working together

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	5		12
K2	Understand	5		18
K3	Apply			12
K4	Analyze	5		6
K5	Evaluate	5		
K6	Create			12
Total		20		60

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Course Code- **MC2102**   Course Title- **ASP.Net and C#**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA	ESE	Total
4	-	-	4	20	20	60	100

Course Objectives
1. Develop dynamic web applications, create and consume web services
2. Use appropriate data sources and data bindings in ASP.NET web applications
3. Provide the knowledge of Dot Net Frameworks along with C#

Course Outcomes- After studying this course, students will be able to
CO 1   Understand the ASP.NET web application execution model.
CO 2   Understand web application configuration and demonstrate the ability to manage basic configuration issues.
CO 3   Define and describe what a web service is and how web services are used.
CO 4   Create and consume libraries
CO 5   Building windows application

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Getting Started with .NET:** Introduction to .NET Framework and Visual Studio.NET, Kind of Applications that can be developed using Visual Studio.NET, Website v/s Web Application, Creating a new sample Web Project with Visual Studio **Creating Presentation Layer:** Creating Front-End with the HTML & CSS, Grid Layout v/s Liquid Layout, using Cascaded Style Sheets	6
2	**Introduction to C#**: Working with Variables, Data Types, Data Type Conversion, Operators and Expressions, Creating Classes and Objects in C#, Using Namespaces, Arrays, Exception Handling in C#, Navigating amongst Web Pages, Event Handling **Important Files and Folders in Web Application:** All System Folders, Web.Config, Global.asax, Building sites with Master Pages, Using User Controls	6
3	**Building ASP.NET Pages:** Standard Controls, Validation Controls, **State Management**: ASP.NET PageLife Cycle, Session Management, Managing Query String, View State in C#	6
4	**Working with Data:** ADO.NET Architecture, Connected & Disconnected Architectures, SQL Connection, SQL Command & important Classes for operating database related operations (CRUD), Using Datasets& Data Adapters **Working with Data Controls**: Grid View, Repeater Control	6
5	**AJAX:** Ajax Architecture, Script Manager, Update Panel, Ajax Control Toolkit **Web Services**: Creating and Consuming Web Services **Deploying ASP.NET Websites**: Installing and configuring website using IIS	6

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Text Books

1. Professional ASP.NET MVC 5 (WROX) – Jon Galloway and Brad Wilson
2. ASP.NET 3.5 unleashed – Stephan Walther
3. Programming ASP.NET CORE – Dino Esposito
4. C# in Depth – Jon Skeet

Reference Books

1. The Complete Reference ASP.NET – Tata McGrow Hill
2. The Complete Reference C#
3. ASP.NET Programming – Murach
4. Microsoft ASP.NET 4.0 Step by Step – George Shepherd , Microsoft Press
5. Mastering ASP.Net – BPB Publication

E Books/ Online learning material

1. https://www.tutorialspoint.com/asp.net_mvc/asp.net_mvc_useful_resources.html
2. https://www.w3schools.com/asp/default.ASP

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	2											1	1	
CO 2	1	2											1	1	
CO 3	1	2	3										1	1	
CO 4	1	2	3		2						1		1	1	
CO 5	1	2	3						1	1					

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	5	5	5		5
Teachers Assessment 20 Marks					
ESE Assessment 60 Marks	12	12	12	6	18

Teaching Strategies:

1. Utilizing technology in the classroom.
2. Co-operative learning
3. Questioning to check for understanding
4. Plenty of practice
5. Be flexible about how long it takes to learn
6. Get students working together.

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Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	5		12
K2	Understand	5		18
K3	Apply			12
K4	Analyze	5		6
K5	Evaluate	5		
K6	Create			12
Total		20		60

Course Code- **MC2103**   Course Title- **Cloud Computing**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA	ESE	Total
3	1	-	4	20	20	60	100

Course Objectives
1. Identify the technical foundations of cloud systems architectures.
2. Analyze the problems and solutions to cloud application problems.
3. Apply principles of best practice in cloud application design and management.
4. Identify and define technical challenges for cloud applications and assess theirimportance.

Course Outcomes- After studying this course, students will be able to
CO 1 Distinguish between different types of architectures and services in the Cloud Computing.
CO 2 Understanding management in cloud computing.
CO 3 Applying the cloud technology in real life application development.
CO 4 Analyze different security issues and challenges in cloud computing.
CO 5 Explain the core issues of cloud computing such as security, privacy, and interoperability.

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Basics of Cloud Computing:** Overview, Applications, Intranets and the Cloud. Your Organization and Cloud Computing- Benefits, Limitations, Security Concerns. Software as a Service (SaaS)- Understanding the Multitenant Nature Of SaaS Solutions, Understanding SOA. Platform as a Service (PaaS)- IT Evolution Leading to the Cloud, Benefits of PaaS Solutions, Disadvantages of PaaS Solutions. Infrastructure as a Service (IaaS)- Understanding IaaS, Improving Performance through Load Balancing, System and Storage Redundancy, Utilizing Cloud-Based NAS Devices, Advantages, Server Types.	6
2	**Data Storage and Security in Cloud:** Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo Cloud data stores: Data store and Simple DB, Cloud Storage-Overview, Cloud Storage Providers. Securing the Cloud- General Security Advantages of Cloud-Based Solutions, Introducing Business Continuity and Disaster Recovery. Disaster Recovery- Understanding the Threats.	6
3	**Virtualization:** Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Centre Automation. Common Standards: The Open Cloud Consortium, Open Virtualization	6

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Format, Standards for Application Developers: Browsers (Ajax), Data (XML, JSON), Solution Stacks (LAMP and LAPP), Syndication(Atom, Atom Publishing Protocol, and RSS), Standards for Security.

4	**Cloud Service Providers:**	6

Amazon Web Services-Elastic Compute Cloud (EC2), Simple Storage Service (S3), Simple Queue Service (SQS), Elastic Block Storage (EBS), Elastic Load Balancing (ELB), SimpleDB, Relational Database Service (RDS), Virtual Amazon Cloud, Google- AppEngine, Google Storage, Windows Azure, Rackspace Cloud

5	**Cloud Applications:**	6

Business and Consumer Applications- CRM & ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming, E-Commerce Applications, , Cloud for e-Governance, Scientific Applications- Healthcare, Biology, Geoscience etc.

Future of Cloud Computing:

How the Cloud Will Change Operating Systems, Location-Aware Applications, Intelligent Fabrics, Paints, and More, The Future of Cloud TV, Future of Cloud-Based Smart Devices, Faster Time to Market for Software Applications, Home-Based Cloud Computing, Mobile Cloud, Autonomic Cloud Engine, Multimedia Cloud, Energy Aware Cloud Computing, Jungle Computing. Future Research Directions and Challenges in Cloud Computing, Case Studies.

Text Books

1 Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more ,Dr. Kris Jamsa, Wiley Publications.
2 Cloud Computing: Principles and Paradims, RajkumarBuyya, James Broberg, AndrzejGoscinski, Wiley Publication, 1st Edition
3 Mastering Cloud Computing, RajkumarBuyya, Christian Vecchiola, S ThamaraiSelvi, McGraw Hill Publication, 1st Edition
4 ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications, GautamShrof ,Cambridge University Press, ISBN: 9780511778476

Reference Books

1 Cloud Computing Insight into New-Era Infrastructure, Dr. Kumar Saurabh,Wiley IndiaPvt. Ltd., 1st Edition
2 Cloud Computing: A Practical Approach, Anthony T. Velte, Tata McGraw Hill, 2009
3 Guide to Cloud Computing: Principals and Practices, Richard Hill, Laurie Hirsch, PeterLake, SiavashMoshiri,Springer, 1st Edition
4 Enterprise Cloud Computing,GautamShroff, Cambridge, 1st Edition
5 Cloud Security and Privacy, Tim Mather, Subra K, Shahid L.,Oreilly, 1st Edition

E Books/ Online learning material

1 http://nptel.ac.in/courses/106106129/28
2 https://cloudacademy.com/courses/
3 https://www.lynda.com/Cloud-Computing-training-tutorials/1385-0.html
4 http://scpd.stanford.edu/search/publicCourseSearchDetails.do?method=load&courseId=11815

Mapping of COs and POs

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PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	2											1	1	
CO 2	1	2											1	1	
CO 3	1	2	3										1	1	
CO 4	1	2	3		2						1		1	1	
CO 5	1	2	3						1	1					

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	5	5	5		5
Teachers Assessment 20 Marks					
ESE Assessment 60 Marks	12	12	12	6	18

Teaching Strategies:
1. Utilizing technology in the classroom.
2. Co-operative learning
3. Questioning to check for understanding
4. Plenty of practice
5. Be flexible about how long it takes to learn
6. Get students working together.

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	5		12
K2	Understand	5		18
K3	Apply			12
K4	Analyze	5		6
K5	Evaluate	5		
K6	Create			12
Total		20		60

Course Code- **MC2104**   Course Title- **Software Quality Assurance**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA	ESE	Total
3	-	-	3	20	20	60	100

Course Objectives
1 Introduce basic concepts of software testing
2 Understand the importance of software quality and assurance software systems development.
3 Demonstrate Software Quality Tools and analyze their effectiveness.

Course Outcomes- After studying this course, students will be able
CO 1 Describe fundamental concepts of software quality assurance
CO 2 Utilize the concepts in software development life cycle.
CO 3 Assess the quality of software product and Configure and carry out automatic testing of software
CO 4 Apply the concepts in preparing the quality plan & documents.
CO 5 Demonstrate the skill set as a tester to neutralize the consequences of wicked problems by narrating effective test cases and test procedures and to Demonstrate their capability to adopt quality standards.

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**INTRODUCTION TO SOFTWARE QUALITY & ARCHITECTURE** Need for Software quality – Quality challenges – Software quality assurance (SQA) – Definition and objectives – Software quality factors- McCall quality model – SQA system and architecture – Software Project life cycle Components – Pre project quality components – Development and quality plans.	6
2	**SQA COMPONENTS AND PROJECT LIFE CYCLE** Software Development methodologies – Quality assurance activities in the development process- Verification & Validation – Reviews – Software Testing – Software Testing implementations – Quality of software maintenance – Pre-Maintenance of software quality components – Quality assurance tools – CASE tools for software quality – Software maintenance quality – Project Management.	6
3	**SOFTWARE QUALITY INFRASTRUCTURE** Procedures and work instructions - Templates - Checklists – 3S development - Staff training and certification Corrective and preventive actions – Configuration management – Software change control – Configuration management audit - Documentation control – Storage and retrieval.	6
4	**SOFTWARE QUALITY MANAGEMENT & METRICS** Project process control, Computerized tools, Software quality metrics, Objectives of quality Measurement, Process metrics, Product metrics, Implementation, Limitations of software metrics, Cost of software quality, Classical quality cost model, Extended model, Application.	6

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5 **STANDARDS, CERTIFICATIONS & ASSESSMENTS**   6
Quality management standards – ISO 9001 and ISO 9000-3 – capability
Maturity Models – CMM and CMMI assessment methodologies -
Bootstrap methodology – SPICE Project – SQA project process
standards – IEEE st 1012 & 1028 – Organization of Quality Assurance –
Department management responsibilities – Project management
responsibilities – SQA units and other actors in SQA systems.

Text Books
1 Daniel Galin, "Software Quality Assurance", Pearson Publication, 2009.
2 Effective Methods for Software Testing, Third edition, William E. Perry, Wiley India, 2009
3 Software Testing – Principles and Practices, NareshChauhan, Oxford University Press, 2010.
4 Software Quality Assurance, MilindLimaye, Tata McGraw-Hill, 2011.

Reference Books
1 Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.
2 Software Testing and Quality Assurance Theory and Practice by KshirsagarNaik, PriyadarshiTripathy
3 Software Quality Engineering – Testing, Quality Assurance and Quantifiable Improvement, Jeff Tian, Wiley India, 2006.
4 Software Quality – A Practitioner's approach, Kamna Malik, Praveen Choudhary, Tata McGraw-Hill, 2008.
5 Total Quality Management, Prentice Hall, 2003. Dale H. Besterfield

E Books/ Online learning material
1 https://www.udemy.com/course/introduction-to-software-testing-or-software-qa/
2 https://nptel.ac.in/courses/106/105/106105150/
3 https://nptel.ac.in/courses/106/101/106101061/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1		1	2		1								1	1	
CO 2	1	1	2									1			
CO 3	1	1	2							1					
CO 4	1	1	2					1	1				1	1	1
CO 5	1		2		1			1			1				

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Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	5	5	5		5
Teachers Assessment 20 Marks					
ESE Assessment 60 Marks	12	12	12	6	18

Teaching Strategies:

1. Utilizing technology in the classroom.
2. Co-operative learning
3. Questioning to check for understanding
4. Plenty of practice
5. Be flexible about how long it takes to learn
6. Get students working together.

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	5		12
K2	Understand	5		18
K3	Apply			12
K4	Analyze	5		6
K5	Evaluate	5		
K6	Create			12
Total		20		60

Course Code- **MC2105**   Course Title- **Enterprise Resource Planning**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA	ESE	Total
3	-	-	3	20	20	60	100

Course Objectives
1 To provide a contemporary and forward-looking on the theory and practice ofEnterprise Resource Planning Technology.
2 To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills
3 To train the students to develop the basic understanding of how ERP enriches thebusiness organizations in achieving a multidimensional growth.

Course Outcomes- After studying this course, students will be able
CO 1 Make basic use of Enterprise software, and its role in integrating business functions
CO 2 Analyze the strategic options for ERP identification and adoption.
CO 3 Design the ERP implementation strategies.
CO 4 Create reengineered business processes for successful ERP implementation.
CO 5 Describe the importance of integrated information system in organization

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Introduction** What is ERP, Why ERP, Need for Enterprise Resource Planning, Definition of ERP, Evolution of Enterprise Resource Planning, Pre material requirement planning (MRP stage) Material requirement planning, MRP- II, ERP, Extended ERP, ERP Planning –II, ERP-A manufacturing perspective, Risks and benefits – ,Risk implementation, Fundamental technology of ERP Issues to be consider in planning design and, implementation of cross functional integrated ERP systems.	6
2	**ERP Solution and Functional Modules** Overview of ERP software solutions, Small, medium and large enterprise vendor solutions, Business process Reengineering, Business process Management, Steps of BPM, Functional Modules, ERP Production planning module, ERP purchasing module, ERP Inventory control module, ERP Sales module, ERP Marketing module, ERP Financial module, ERP HR module	6
3	**ERP Implementation** Planning Evaluation and selection of ERP systems, ERP Implementation life cycle, Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap-Analysis, Reengineering, Configuration Implementation Team Training, Testing, Going Live, End-user training, Post – implementation, ERP implementation, Methodology and Frame work, Training, Data Migration, People Organization in implementation, Consultants and Vendors, Employees.	6
4	**Post Implementation** ERP Implementation, Maintenance of ERP, Organizational and Industrial impact, Success factors of ERP Implementation, Key success factors, Failure	6

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factors of ERP Implementation.

5 **Emerging Trends on ERP**   6
C Extended ERP systems and ERP add-ons, CRM, Benefits of ERP Module,
Supply Chain Management (SCM), Business analytics & Intelligence, Wireless
Technology used in ERP, Future trends in ERP, Cloud Computing, SAP and the
Internet

Text Books

1 Enterprise Resource Planning – Alexis Leon – Second Edition – TMH
2 Enterprise resource planning, Vinod Kumar Garg, N. K. Venkita Krishna, 2nd Edition , PHI, 2003
3 ERP in practice – Vaman – TMH

Reference Books

1 ERP in practice – Vaman - TMH
2 Enterprise Resource Planning Systems, Daniel E.O'Leary, Cambridge University Press,2002
3 Concepts in Enterprise resource planning, Ellen Monk, Bret Wagner, Cengage learning, Third edition, 2009.
4 Essentials of Business Processes and Information Systems, by *Simha R. Magal and Jeffrey Word* ,2010,
5 ERP-A Managerial Perspective, S. Sadagopan, McGraw Hill

E Books/ Online learning material

1 www.oracle.com/ERP
2 www.sap.com
3 www.openerp.com
4 https://nptel.ac.in/courses/110/105/110105083/
5 https://www.coursera.org/lecture/enterprise-systems/1-1b-introduction-to-enterprise-resource-planning-erp-LneSo

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1											1	1	
CO 2	1														1
CO 3	1	1	2										1		
CO 4		1	2		2						1		1	1	
CO 5	1	2							1	1					1

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Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
Evaluation I (Class Test) 20 Marks	5	5	5		5
Teachers Assessment 20 Marks					
ESE Assessment 60 Marks	12	12	12	6	18

Teaching Strategies:
1. Utilizing technology in the classroom.
2. Co-operative learning
3. Questioning to check for understanding
4. Plenty of practice
5. Be flexible about how long it takes to learn
6. Get students working together.

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	5		12
K2	Understand	5		18
K3	Apply			12
K4	Analyze	5		6
K5	Evaluate	5		
K6	Create			12
Total		20		60

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Course Code- **MC2106**   Course Title- **E-Governance**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA	ESE	Total
3	-	-	3	20	20	60	100

Course Objectives
1 To develop knowledge of e-governance and e-government.
2 To know different e-governance models and infrastructure development
3 To implement security and use data warehousing and mining in e-governance

Course Outcomes- After studying this course, students will be able to
CO 1 Gain a familiarity with the basic concepts, terminology and technology ofe-government.
CO 2 In-depth understanding of e-governance and the necessary experience to ensure successful implementation of the same
CO 3 Increased confidence to drive change and operate online management through e-governance within your organization
CO 4 A more secure career by introducing the newest form of governance within the organization, in turn, building one's competency and competitiveness with market standards
CO 5 Develop skills to critically evaluate E-readiness and strategies

Course Contents

Unit No	Detailed Contents	Contact Hours
1	Overview of E-Government and E-Governance, Stages of E-Governance, National E- Governance Plan (NeGP), Mission Mode Projects and their implementation status, E-Governance , Introduction to E-governance, Role of ICT's in e-governance, Need, importance of E-governance	6
2	Categories of E-governance, Key Issues of E-Governance, Technology, Policies, Infrastructure, Training, Copyrights , Consulting Funds, E-governance Models, Model of Digital Governance, Broadcasting /Wider Dissemination Model	6
3	Critical Flow Model, Interactive-service model/Government –to-Citizen-to-Government Model (G2C2G), Major areas of E-governance Services, Public Grievances: Telephone, Ration card, transportation, Rural services Land Records, Police: FIR registration, Lost and found, Social services: Death, domicile, school certificates	6
4	Public information: employment, hospitals, railway, Agricultural sector: Fertilizers, Seeds, Utility payments Electricity, water, telephone, Commercial: income tax, custom duty, excise duty-Governance Infrastructure, stages in evolution and strategies for success, -Governance Infrastructure, stages in evolution and strategies for success	6
5	Human Infrastructural preparedness, Challenges against E-governance, Study of E-governance initiatives in Indian states, E-readiness, Legal Infrastructural preparedness	6

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Text Books

1 Governance.Com: Democracy in the Information Age, Elaine CiullaKamarck
2 Egov: E-business Strategies for Government by Douglas Holmes

Reference Books

1 Electronic Government: Design, Applications and Management, AkeGronlund (Editor).
2 Gordon, E. (2013). Beyond Participation: Designing for the Civic Web. Journal of Digital and Media Literacy, 1(1). Available at: http://www.jodml.org/2013/02/01/design-for-civic-web/
3 Reinventing Government in the Information Age : International Practice in IT-enabled Public Sector Reform, Richard Heeks(Editor),Routledg,January 2001
4 Silcock, R. (2001). What is e-government?. Parliamentary Affairs, 54, 88-101
5 Wong, K., Fearon, C. & Philip, G. (2007). Understanding e-government and e-governance: Stakeholders, partnerships and CSR.

E Books/ Online learning material

1 Visit: http://www.blogs.state.gov/, http://www.ready.gov,
2 Review: issue briefs and other information regarding libraries and e-government at http://ipac.umd.edu/survey/analysis/e-government-public-libraries.

Mapping of COs and Pos

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1											1	1	
CO 2	1														1
CO 3	1	1	2										1		
CO 4		1	2		2						1		1	1	
CO 5	1	2						1	1						1

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	5	5	5		5
Teachers Assessment 20 Marks					
ESE Assessment 60 Marks	12	12	12	6	18

Teaching Strategies:

1. Utilizing technology in the classroom.
2. Co-operative learning
3. Questioning to check for understanding
4. Plenty of practice
5. Be flexible about how long it takes to learn

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6. Get students working together.

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	5		12
K2	Understand	5		18
K3	Apply			12
K4	Analyze	5		6
K5	Evaluate	5		
K6	Create			12
Total		20		60

Course Code- **MC2107**   Course Title- **Mobile Technology**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA	ESE	Total
3	-	-	3	20	20	60	100

Course Objectives
1 To know the evolution of Mobile communication and cell concept to improve capacity of the system.
2 Describe basic principles of the modern mobile andwireless communication systems.
3 Describe the development and implementation of mobile communication system.

Course Outcomes- After studying this course, students will be able to
CO 1 To understand concepts of Mobile Communication.
CO 2 To analyse next generation Mobile Communication System.
CO 3 Analyse various protocols of all layers for mobile and ad hoc wireless communication network
CO 4 Explain the principles and theories of mobile computing technologies.
CO 5 Describe the possible future of mobile computing technologies and applications.

Course Contents

Unit No	Detailed Contents	Contact Hours
1	**Introduction to Mobile Computing** Concept of Mobile Communication, Different generations of wireless technology, Basics of cell, cluster and frequency reuse concept, Noise and its effects on mobile, Understanding GSM and CDMA, Basics of GSM architecture and services like voice call, SMS, MMS, LBS, VAS, Different modes used for Mobile Communication, Architecture of Mobile Computing(3 tier),	6
2	**Mobile computing architecture**: Characteristics of Mobile Communication, Application of Mobile Communication, Security Concern Related to Mobile Computing, Middleware and Gateway required for mobile Computing, Making Existing Application Mobile Enable, Mobile IP, Basic Mobile Computing Protocol, Mobile Communication via Satellite • Low orbit satellite • Medium orbit satellite • Geo stationary satellite Satellite phones.	6
3	**Introduction to Android**: Overview of Android, What does Android run On – Android Internals?, Android for mobile apps development, Environment setup for Android apps Development, Framework – Android SDK, Eclipse, Emulators – What is an Emulator / Android AVD? Android Emulation – Creation and set up, First Android Application	6
4	**Introduction to iOS:**iOS Architecture, Environment Setup, Delegates, UI Controls, UI Views, UI Bars, Graphics, Audio & Video, Accessing Maps in Applications, File Handling, Notifications, Location	6
5	**Introduction to Mobile Networks(Telecom Fundamentals & 2G, 3G)** Telecom Basics & Cellular principles, Analog& digital modulations and	6

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multiple access Techniques, GSM(2G), GSM Air interface &channel structure, Protocol Basics, Call Processing: Message and signalling flows, Handover Scenarios Migration from 2G to 3G, UMTS Services and Applications, Air Interface dynamics and various Concepts, Call Processing, High Speed Packet Access (HSDPA, HSUPA)

Long Term Evolution (LTE), VOIP, SIP, IMS and OSS(Billing):
Improvements & Evolution from 3G, LTE Architecture, LTE protocol architecture, services and applications, LTE Protocols, LTE Interfaces, LTE Air Interfaces, LTE Call Sequences, Handover Scenarios, LTE Integration with IMS, WLAN, WiFi, Wimax, 3GPP, non-3GPP access systems, Voice solutions in LTE: CSFB and VOLTE. Introduction to VOIP, Introduction to H.323, SIP, MGCP, Session Initiation protocol (SIP) & SDP, RTP, RTCP, IP Multimedia Subsystem (IMS), Kenon (online & offline) billing

Text Books
1 Reto Meier Professional ANDROID 4 Application Development, WROX Latest Edition
2 Mobile Computing (Technology, Applications and Service Creation) Asoke. K Talukder and Roopa R. Yavagal.TATAMcGRAW HILL, 2nd Edition
3 Frank Adelstein, Fundamentals of Mobile and Pervasive Computing, TATAMcGRAW HILL, 3rd Edition

Reference Books
1 Neil Smyth, 'Android Studio Development Essentials', 6th edition by Neil Smyth
2 Michael Owens, ' The Definitive Guide to SQL Lite' 2nd ApressBerkely, CA, USA 2010
3 L Murphy , 'Beginning Android Mark',1st edition, Wiley India Pvt Ltd
4 Y Hashimi and SatyaKomatineni, 'Pro Android Sayed,1st edition, Wiley India Pvt Ltd
5 Reto Meier, 'Professional Android to Application Development',2nd edition, Wiley India Pvt Ltd

E Books/ Online learning material
1 **https://nptel.ac.in/courses/106/106/106106147/**
2 http://www.tutorialpoints.com/android/
developer.android.com/training/basics/firstapp
3 http://pl.cs.jhu.edu/oose/resources/android/Android-Tutorial.pdf
4 https://www.tutlane.com/tutorial/ios/ios-tutorial

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1			1								1	1	
CO 2	2	1	1									1			
CO 3	2	1								1			1	1	
CO 4	2	1	1					1	1						1
CO 5	2				1			1			1				

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	5	5	5		5
Teachers Assessment 20 Marks					
ESE Assessment 60 Marks	12	12	12	6	18

Teaching Strategies:

1. Utilizing technology in the classroom.
2. Co-operative learning
3. Questioning to check for understanding
4. Plenty of practice
5. Be flexible about how long it takes to learn
6. Get students working together.

Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	5		12
K2	Understand	5		18
K3	Apply			12
K4	Analyze	5		6
K5	Evaluate	5		
K6	Create			12
Total		20		60

Course Code- **MC2108**   Course Title- **Block Chain**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA	ESE	Total
3	-	-	3	20	20	60	100

Course Objectives
1 Understand how Blockchain systems.
2 To securely interact with them,
3 Integrate ideas from Blockchain technology into their own projects.

Course Outcomes- After studying this course, students will be able
CO 1   To understand the basic fundamentals of Blockchain
CO 2   To introduce Bit Coin Block chain
CO 3   To explain Blockchain creation process
CO 4   To know the importance of Hyper-ledger
CO 5   To discuss the emerging trends in Blockchain and Use cases

Course Contents

Unit No	Detailed Contents	Contact Hours
1	Introduction – Basic ideas behind Blockchain, how it is changing the landscape of digitalization, introduction to cryptographic concepts required, Hashing, public key cryptosystems, private vs public, Blockchain and use cases, Hash Puzzles, Introduction to Bitcoin Blockchain	6
2	Bitcoin Blockchain and scripts, Use cases of Bitcoin Blockchain scripting language in micropayment, escrow etc Downside of Bitcoin – mining: Mining explained, The Bitcoin network, The Bitcoin Minning Process, Mining Developments	6
3	Asymmetric key cryptography: AES structure, Analysis of AES , Key distribution Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Analysis of RSA, Diffie-Hellman Key exchange	6
4	Alternative coins – Ethereum and Smart contracts,Alternative coins – Ethereum continued, IOTA, The real need for mining – consensus – Byzantine Generals Problem, and Consensus as a distributed coordination problem – Coming to private or permissioned block chains	6
5	Introduction to Hyperledger, Permissioned Blockchain and use cases – Hyperledger, Corda Uses of Blockchain in E-Governance, Land Registration, Medical Information Systems,and others	6

Text Books
1 Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
2 Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
3 Blockchain by Melanie Swa, O'Reilly

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Reference Books

1   Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
2   Blockchain Applications: A Hands-on Approach by ArshdeepBahga and Vijay K. Madisetti,
3   Nicola Atzei, Massimo Bartoletti, and TizianaCimoli, A survey of attacks on Ethereum smart contracts
4   Mastering Bitcoin: Programming The Open Blockchain, Andreas M. Antonopoulos, O'Reilly,
5   Matthew Connor, "Blockchain: UltimateBeginner's Guide to Blockchain Technology- Cryptocurrency, Smart Contracts,Distributed Ledger, Fintech, andDecentralized Applications" Kindle Edition,2017

E Books/ Online learning material

1   Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
2   https://nptel.ac.in/content/syllabus_pdf/106104220.pdf
3   https://www.coursera.org/courses?query=blockchain&page=1

Mapping of COs and Pos

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1			1								1	1	
CO 2	2	1	1									1			
CO 3	2	1								1			1	1	
CO 4	2	1	1					1	1						1
CO 5	2				1			1			1				

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
Evaluation I (Class Test) 20 Marks	5	5	5		5
Teachers Assessment 20 Marks					
ESE Assessment 60 Marks	12	12	12	6	18

Teaching Strategies:

1. Utilizing technology in the classroom.
2. Co-operative learning
3. Questioning to check for understanding
4. Plenty of practice
5. Be flexible about how long it takes to learn
6. Get students working together.

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Teachers' Assessment:

Teachers' assessment will be based on one or many of the following

1. Multiple choice questions
2. Assignments
3. Power Point Presentation on allotted topics
4. Quiz
5. Surprise test
6. Interview / Viva

Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	5		12
K2	Understand	5		18
K3	Apply			12
K4	Analyze	5		6
K5	Evaluate	5		
K6	Create			12
Total		20		60

Course Code- **MC2109**   Course Title- **Machine Learning**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA	ESE	Total
3	-	-	3	20	20	60	100

Course Objectives

1 Have a good understanding of the fundamental issues and challenges of machine learning
2 Have an understanding of the strengths and weaknesses of many popular machine learning approaches
3 Be able to design and implement various machine learning algorithms in a range of real-world applications.

Course Outcomes- After studying this course, students will be able to

CO 1 To understand basics of machine learning techniques
CO 2 To become aware of various parametric and non-parametric methods in machine learning
CO 3 Devise/develop machine learning model for real time applications
CO 4 To understand basics of neural networks.
CO 5 Develop skills of using recent machine learning techniques and solve practical problems.

Course Contents

Unit No	Detailed Contents	Contact Hours
1	Probability Theory, Linear Algebra, Convex Optimization, Statistical Decision Theory - Regression, Classification, Bias Variance, Linear Regression, Multivariate Regression, Subset Selection, Shrinkage Methods, Principal Component, Regression, Partial Least squares, Linear Classification, Logistic Regression, Linear Discriminant Analysis, Perceptron, Support Vector Machines	6
2	Neural Networks - Introduction, Early Models, Perceptron Learning, Back-propagation, Initialization, Training & Validation, Parameter Estimation - MLE, MAP, Bayesian Estimation, Decision Trees, Regression Trees, Stopping Criterion & Pruning loss functions, Categorical Attributes, Multi-way, Splits, Missing Values, Decision Trees - Instability Evaluation Measures	6
3	Bootstrapping & Cross Validation, Class Evaluation Measures, ROC curve, MDL, Ensemble Methods - Bagging, Committee Machines and Stacking, Boosting, Gradient Boosting, Random Forests, Multi-class Classification, Naive Bayes, Bayesian Networks	6
4	Undirected Graphical Models, HMM, Variable Elimination, Belief Propagation, Partition Clustering, Hierarchical Clustering, Birch Algorithm, CURE Algorithm, Density-based Clustering	6
5	Gaussian Mixture Models, Expectation Maximization, Learning Theory, Introduction to Reinforcement Learning, Optional videos (RL framework, TD learning, Solution Methods, Applications)	6

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Text Books

1 Ethem Alpaydın, Introduction to Machine Learning, PHI, Third Edition, ISBN No. 978-81-203- 5078-6.

2 Shaishalev-Shwartz and Shai Ben-David, Understanding Machine Learning(From Theory to Algorithms), Cambridge University Press, First Edition, ISBN No. 978-1-107-51282-5.

Reference Books

1 Christopher M. Bishop, Pattern Recognition and Machine Learning, Mcgraw-Hill, ISBN No. 0- 07-115467-1 .

2 Tom Mitchell, Machine Learning, Mcgraw-Hill, First Edition, ISBN No. 0-07-115467-1.

3 Ian Goodfellow and YoshuaBengio, Deep Learning (Adaptive Computation and machine Learning Series), Massachusetts London, England, ISBN No. 9780262035613.

E Books/ Online learning material

1 https://nptel.ac.in/courses/106/106/106106139/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	**1**	**2**											**1**	**1**	
CO 2	**1**	**2**											**1**	**1**	
CO 3	**1**	**2**	**3**										**1**	**1**	
CO 4	**1**	**2**	**3**		**2**						**1**		**1**	**1**	
CO 5	**1**	**2**	**3**						**1**	**1**					

Assessment Table:

Assessment Tool	Course Outcomes				
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
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Teachers Assessment 20 Marks					
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Assessment Pattern:

Level No.	Knowledge Level	Evaluation-I	Teachers Assessment	End Semester Examination
K1	Remember	5		12
K2	Understand	5		18
K3	Apply			12
K4	Analyze	5		6
K5	Evaluate	5		
K6	Create			12
Total		20		60

Course Code- **MC2110**   Course Title- **Lab: Adv. Java**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA / TW	ESE	Total
-	-	4	2	-	50	25	75

Course Objectives
1 Design and develop Web applications
2 Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
3 Develop web application using Java Servlet and Java Server Pages technology.

Course Outcomes- After studying this course, students will be able
CO 1 Develop and use Eclipse to create new project
CO 2 Develop Database & its related Operations using Servlet.
CO 3 Convert their project to layered MVC Architecture
CO 4 Implement the advanced environment using Hibernate, Struct, Spring in their Application
CO 5 Create dynamic web pages, using Servlets and JSP.

Course Contents (Suggestive List of Experiments)

Expt No   Title
1 Write a program for creating mini chat application using socket programming.
2 Write a program for Addition and Subtraction using concept of RMI programming
3 Write a program to implement CRUD operation in JDBC
4 Create Exam Registration Form using JDBC Connectivity
5 WRITE A PROGRAM for creating Edit menu for Notepad using Frame
6 WAP for creating simple servlet with JDBC.
7 Create Employee information Form using JSP
8 Write a program for implementing concept of MVC Architecture.
9 Write a program for implementing concept of Hibernate, Stuct, Spring
10 Write a program for implementing concept of Maven Project
11 Write a program for implementing concept of Web Service
12 Write a program for implementing concept of Junit Testing.
13 Write a program for implementing concept of JAXB

Mapping of COs and Pos

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1											1	1	
CO 2	1														1
CO 3	1	1	2										1		
CO 4		1	2		2						1		1	1	
CO 5	1	2							1	1					1

Course Code- **MC2111**   Course Title- **Lab: ASP .Net and C#**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA / TW	ESE	Total
-	-	2	1	-	25	25	50

Course Objectives
1 To install the ASP .Net framework and get familiar to it.
2 To develop small programs for using controls
3 To understand how to create and use web services through ASP.NET

Course Outcomes- After studying this course, students will be able to
CO 1 Understand HTML and CSS for ASP.NET
CO 2 Remember Web pages using master pages and various control
CO 3 Understand Database using ASP.NET & SQL Server
CO 4 Understand web services using AJAX
CO 5 Work individually and in a team effectively

Course Contents (Suggestive List of Experiments)
List of Experiments:
1 To Study the ASP.Net Framework
2 To Study &Create Presentation Layer using HTML & CSS
3 To Study &Create Master Page, User Control etc
4 To Study& Use Standard Controls in ASP.NET
5 To Study& Use Validation Controls in ASP.NET
6 To Study, Create and Connect with Database using ASP.NET & SQL Server
7 To Study & Implement Web Services
8 To Study &Implement AJAX in ASP.NET
9 To Study & Deploy Project on IIS
10 Mini Project

Term work shall consist of record of minimum eight experiments based on performance, software modeling and study from the above list.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1												1	
CO 2	2														1
CO 3	2	1	1										1		
CO 4		1			2						1			1	
CO 5	1	2	1						1	1			1		1

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Course Code- **MC2112**   Course Title- **Lab: Cloud Computing**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA / TW	ESE	Total
-	-	2	1	-	25	25	50

Course Objectives
1 To install cloud computing environments
2 To develop any one type of cloud
3 To explore future trends of cloud computing

Course Outcomes- After studying this course, students will be able
CO 1   Understanding of Cloud Computing for and the skillset needed to be a Cloud.
CO 2   Understanding different kinds of Cloud services IaaS, PaaS, SaaS.
CO 3   To Apply basic operations on different types of clouds.
CO 4   To handle data using clouds with different operations.
CO 5   Attempt to generate new ideas, innovations in cloud computing.

Course Contents (Suggestive List of Experiments)

Expt. No   Title
1   Introduction to cloud computing.
2   Installing ubuntu(Server Edition) using virtual box, and study virtualization.
3   Writing Sample applications on cloud using Google App Engine.
4   Implementation of SOAP web service in C#/JAVA application
5   Understanding Software as a service: SalesForce
6   Understanding private clouds: Openstack, Eucalyptus
7   Setting up using an instance on public Iaas Cloud, using Amazon AWS.
8   Exploring GitHub to learn features such as 1. How to create repositories 2.How to upload/download sourcecode 3. Making code commits 4. GitHub issues tracking features.
9   To study cloud security challenges.
10   To study various applications of cloud computing.

Mapping of COs and Pos

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1			1								1	1	
CO 2	2	1	1									1			
CO 3	2	1								1			1	1	
CO 4	2	1	1					1	1						1
CO 5	2				1			1			1				

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Course Code- **MC2113**   Course Title- **Minor Project**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA / TW	ESE	Total
-	-	4	2	-	50	25	75

Course Objectives
1. Design the problem solution as per the requirement analysis
2. Improve the team building, communication and management skills of the students
3. Build and test the mini project

Course Outcomes- After studying this course, students will be able
- CO 1 Demonstrate knowledge of the distinction between critical and noncritical systems.
- CO 2 Demonstrate the ability to manage a project including planning, scheduling and risk assessment/management.
- CO 3 Demonstrate proficiency in rapid software development techniques.

Course Contents

1. The project batches of 2-3 students should be formed, which will work on the project allocated by the department. Term work submission should be done in the form of a joint report. The term work assessment will be done jointly by teachers appointed by Head of the Institution. The oral examination will be conducted by an internal and external examiner as appointed by the Institute.
2. Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.
3. The mid-term evaluations should be done, which includes presentations and demos of the work done.
4. Project report should be of 35 to 40 pages (typed on A4 size sheets). For standardization of the project reports the following format should be strictly followed.
5. **Format of Project Report-**
   1. Page Size: Trimmed A4
   2. Top Margin: 1.00 Inch
   3. Bottom Margin: 1.32 Inches
   4. Left Margin: 1.5 Inches
   5. Right Margin: 1.0 Inch
   6. Para Text: Times New Roman 12 Point Font
   7. Line Spacing: 1.5 Lines
   8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
   9. Headings: Times New Roman, 14 Point Bold Face
   10. Certificate: All students should attach standard format of Certificate as described by the department. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal/ Director.
   11. Index of Report:
      a. Title Sheet

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b. Certificate
c. Acknowledgement
d. Table of Contents
e. List of Figures
f. List of Tables
12. References: References should have the following format
For Books: "Title of Book", Authors, Publisher, Edition
For Papers: "Title of Paper", Authors, Journal/Conference Details, Year

Useful
Links:

1   http://www.geeksforgeeks.org/
2   https://in.udacity.com/
3   https://graphics.stanford.edu/~seander/bithacks.html
4   https://www.youtube.com/results?search_query=mycodeschool
5   https://www.hackerrank.com/

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Course Code: **MC2114**   Course Title- **Dissertation**

Teaching Scheme				Examination Scheme			
Lectures	Tutorials	Practical	Credits	CT	TA / TW	ESE	Total
-	-	30	24	-	100	100	200

Course Objectives
   1   Design the problem solution as per the requirement analysis
   2   Improve the team building, communication and management skills of the students
   3   Build and test the mini project

Course Outcomes- After studying this course, students will be able
   CO 1   Demonstrate knowledge of the distinction between critical and noncritical systems.
   CO 2   Demonstrate the ability to manage a project including planning, scheduling and risk assessment/management.
   CO 3   Demonstrate proficiency in rapid software development techniques.

Course Contents

   1   The project work to be carried out individually which commences in the Semester IV as per the project assigned to the each individual by the respective industry. It shall include the problem definition, literature survey, approaches for handling the problem, finalizing the methodology for the project work and system design etc.

   2   Term work submission should be done in the form of an individual report. Assessment of the term work will be done by the internal guide.The oral examination will be conducted by an internal and external examiner as appointed by the Institute.

   3   Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.

   4   The mid-term evaluations should be done, which includes presentations and demos of the work done.

   5   Project report should be of 35 to 40 pages (typed on A4 size sheets). For standardization of the project reports the following format should be strictly followed. **Format of Project Report-**
   1. Page Size: Trimmed A4
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Useful Links:
    1 http://www.geeksforgeeks.org/
    2 https://in.udacity.com/
    3 https://graphics.stanford.edu/~seander/bithacks.html
    4 https://www.youtube.com/results?search_query=mycodeschool
    5 https://www.hackerrank.com/

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