DATTA MEGHE INSTITUTE OF MEDICAL SCIENCES

(Declared As deemed to be university under section 3 of UGC Act,1956)Conferred 'A' Grade Status by HRD Ministry, Govt. of India

Re-accredited by NAAC (3rd cycle) with A+ Grade (Score 3.53 on 4 Point Scale) Placed under Group-I category (Autonomous Deemed to be University) by UGC

Semester	Course I	Course II	Course III	Course IV	Course V	Course VI	Course VII	Course IX	L	T	P	C
I	Core Course	Core Course	Core Course	Core Course	Generic Elective Course	Skill Enhancement Compulsory Course (SEC)(30 hours)	Skill Enhancement Compulsory Course (SEC)(30 hours)	Ability Enhancement Compulsory Course(AECC)				
	TotalMarks100	TotalMarks100	TotalMarks100	TotalMarks100	TotalMarks100	TotalMarks100	TotalMarks100	TotalMarks100	15	5	5	25
	L T P C: 3 1 0 **4**	L T P C: 3 1 0 **4**	L T P C: 3 1 0 **4**	L T P C: 3 1 0 **4**	L T P C: 2 0 2 **3**	L T P C: 0 0 4 **2**	L T P C: 0 0 4 **2**	L T P C: 1 1 0 **2**				
	Mathematical Logic Combination & Graph Theory	**Advanced Software Engineering**	**UI Frameworks**	**Front End Development & Programming**	**Database Design Development**	**Front End Development & Programming Lab**	**Database Design Development Lab**	**Business Communication**				
II	Core Course	Core Course	Discipline Specific Electives	Discipline Specific Electives	Generic Elective Course	Skill Enhancement Compulsory Course (SEC)(30 hours)	Skill Enhancement Compulsory Course (SEC)(30 hours)	Ability Enhancement Compulsory Course(AECC)				
	TotalMarks100	TotalMarks100	TotalMarks100	TotalMarks100	TotalMarks100	TotalMarks100	TotalMarks100	TotalMarks100	16	4	5	25
	L T P C: 3 1 0 **4**	L T P C: 3 1 0 **4**	L T P C: 3 1 0 **4**	L T P C: 3 1 0 **4**	L T P C: 2 0 2 **3**	L T P C: 0 0 4 **2**	L T P C: 0 0 4 **2**	L T P C: 2 0 0 **2**				
	Applied Machine Learning	**Statistical Data Analytics with R**	**Reinforcement Learning** **Develop Enterprise Application**	**Deep Learning** **Application integration**	**Software Testing and Quality Assurance**	**Machine Learning Lab**	**R programming Lab**	**Research Methodology with Writing Research Paper**				

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Semester	Course I				Course II				Course III				Course IV				Course V				Course VI				Course VII				Course IX				L	T	P	C
III	Core Course				Core Course				Discipline Specific Electives				Discipline Specific Electives				Generic Elective Course				Skill Enhancement Compulsory Course (SEC)(30 hours)				Skill Enhancement Compulsory Course(SEC)(30 hours)				Ability Enhancement Compulsory Course(AECC)							
	TotalMarks100				TotalMarks100				TotalMarks100				TotalMarks100				TotalMarks100				TotalMarks100				TotalMarks100				TotalMarks100							
	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C				
	0	0	40	**20**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**40**	**20**
	AI implementation Capstone				--				--				--				--				--				--				--							
IV	Core Course				Core Course				Core Course				Core Course				Generic Elective Course				Skill Enhancement Compulsory Course (SEC)(30 hours)				Skill Enhancement Compulsory Course (SEC)(30 hours)				Ability Enhancement Compulsory Course(AECC)							
	TotalMarks100				TotalMarks100				TotalMarks100				TotalMarks100				TotalMarks100				TotalMarks100				TotalMarks100				TotalMarks100							
	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C				
	0	0	46	**23**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**	**46**	**23**
	In plant Project Work and Seminar / Company Internship				--				--				--				--				--				--				--							

Summary of the Program : MCA

Sr. No	Particulars	Total Courses	Total Credits	Total Marks
1	Core Courses	6	24	600
2	Ability Enhancement Compulsory Course (AECC)	2	4	200
3	Skill Enhancement Compulsory Course (SEC)	4	8	400
4	Generic Elective Course (GE)	2	6	200
5	Discipline Specific Electives	2	8	200
6	Capstone - AI Implementation	1	20	400
7	In plant Project Work and Seminar / Company Internship	1	23	400
	Total	**18**	**93**	**2400**

LTPC Analysis

Sem	L	T	P	C
Sem I	15	5	5	25
Sem II	16	4	5	25
Sem III	0	0	20	20
Sem IV	0	0	23	23
Total	31	9	53	93

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Master of Computer Applications (MCA): SEMESTER I

Course: Mathematical Logic, Combinatorics and Graph Theory	Course Code: MCA 101

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
3	1	0	4	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives	
1	To understand the concepts of mathematical logic and its representations.
2	To know about the predicate logic through variables and quantifiers.
3	To gain knowledge on the basic counting techniques in Combinatorics.
4	To understand Boolean algebra and its functions.
5	To be familiar with graph theory and trees.

Course Content			
Unit No.	Module No.	Content	Hours
1.	Mathematical Logic:	Introduction, Conjunction, Disjunction & negation, Propositions and truth table, Tautologies and contradictions. Equivalence of formulas, Duality law	12
2	Predicate Logic:	Disjunctive Normal form, Conjunctive Normal form, Predicate Calculus: Predicates, the statement function. Variables and quantifiers, predicate formulas, Methods of proof (Inference Theory).	12
3	Combinatorics:	Introduction to basic counting principles, Sum rule Principle, Product rule principle, Factorial Notation, Binomial Coefficients, Permutations, Permutations with repetitions, Combinations, The pigeon hole principle.	12
4	Boolean Algebra:	Introduction, Some Useful Operations, Definition of Boolean Algebra, Basic Theorems of Boolean Algebra, Duality in a Boolean Algebra, Definition of Boolean Functions, Application of Boolean Algebra.	12

5	Graph Theory:	Introduction, Basic Terminology, Some Special Simple Graphs, Representation of Graph, Graph Isomorphism, Connectivity of a Graph, Eulerian and Hamiltonian Graph, Trees and its Different Properties	12
		Total No. of Hrs	60

Course Outcome	
Students should able to	
CO1	Solve problems of mathematical logic using truth tables
CO2	Analyse various forms of disjunction and conjunction.
CO3	Apply the counting techniques in problems of permutations and combinations
CO4	Identity the representations in using Boolean algebra
CO5	Understand terminologies in graph theory and trees.

RecommendedResources	
Text Books	1. Semyour Lipschutz, Marc Lipson: Discrete Mathematics, Tata McGraw-Hill Publishing Company Limited. 2. Sengadir, T.: Discrete Mathematics and Combinatorics, Pearson Education. 3. Kolman, Busby, Ross: Discrete Mathematical Structure, Pearson Education, 5th Edition.
Reference Books	1. Kenneth, H. Rosen: Discrete Mathematics and Its Applications, Mc GRAW Hill, International Edition. 2. Deo, N.: Graph Theory with Applications to Engineering and Computer Science, PHI. 3. Clark, John & Hetlan: A First Look at Graph Theory, Allied Publishers Limited.

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Advanced Software Engineering	Course Code: MCA 102

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
3	1	0	4	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives	
1	To provide an advanced understanding and knowledge of the software engineering techniques.
2	To provide techniques to collect software requirements from client.
3	To provide CASE tools.
4	To understand the importance of these case tools in software development.

Course Content			
Unit No.	**Module No.**	**Content**	**Hours**
1.	Life Cycle Models:	Waterfall Model, Prototying Models, Incremental Development, Spiral Model, Rapid Application Development, Componant Model, Agile Software Development, Selection of appropriate development process	12
2	Formal Methods:	Basic concepts, Mathematical Preliminaries, Mathematical notations for Formal Specification, Formal Specification Languages, Z-Notations, Ten commandments of formal methods, Formal Methods- The Road Ahead	12
3	Component-Based Software Engineering:	Component-Based Software Engineering: Engineering of Component-based Systems, CBSE Process, Domain Engineering, Component-based Development, Classifying and Retrieving Components, Economics of CBSE Cleanroom Software Engineering, The Cleanroom Approach, Functional Specification, Cleanroom Design Cleanroom Testing.	12
4	Client/Server Software Engineering:	Client/Server Software Engineering, The Structure of Client/Server Systems, Software Engineering for Client Server Systems, Analysis Modeling Issues, Design for Client Server Systems, Testing Issues. Web Engineering. The Attributes of Web-based Applications, WebE Process, Framework for WebE, Formulating/Analyzing Web-based Systems, Design for Web-based Applications, Testing Web-based Applications, Management Issues. Service Oriented Software Engineering,	12

		Services as Reusable Components, Service Engineering, and Software Development with Services.	
5	Reengineering and CASE:	Business Process Reengineering, Software Reengineering, Reverse Reengineering, Restructuring, Forward Reengineering, Economics of Reengineering, Introduction, Building Blocks for CASE, Taxonomy of CASE Tools, Integrated CASE Environments, Integration Architecture, CASE Repository, Case Study of Tools like TCS Robot.	12
		Total No. of Hrs	**60**

Course Outcome	
Students should able to	
CO1	Visualize and analysis statistical data.
CO2	Identify the importance of the software development process.
CO3	Analyse the importance of CASE tools.
CO4	Design and develop correct and robust software products using advanced software engineering techniques.
CO5	Able to understand business requirements pertaining to software development.

RecommendedResources	
Text Books	1. Roger S. Pressman, Software Engineering a Practitioners Approach, McGraw-Hill (2008). 2. J. Bowan, Formal Specification and Documentation using Z - A Case Study Approach, International Thomson Computer Press (2003). 3. Antoni Diller, Z., An Introduction to Formal Methods (second edition), Wiley, 2nd edition (1994).
Reference Books	1. M. Dyer, The Cleanroon Approach to Quality Software Development, Wiley (1992). 2. Prowell, S., Trammell, C.J. and Poore, J.H, Cleanroom Software Engineering: Technology and Process, Addison-Wesley, Massachusetts (1999). 3. Allen, Frost, Yourdon, Component-Based Development for Enterprise Systems: Applying the Select Perspectives, Cambridge University Press (1998). 4. Zantinge and Adriaans, Managing Client/Server, Addison-Wesley (1996).

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: UI Frameworks	Course Code: MCA 103

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
3	1	0	4	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives	
1	To enhance the students for implementing UI Frameworks.
2	To apply basic programming using CSS.
3	To implement Bootstrap JavaScript.
4	To learn a variety of useful tools.
5	To be able to apply JQuery.

Course Content			
Unit No.	Module No.	Content	Hours
1.	Front-end Web UI Frameworks Overview: Bootstrap	How to Use the Learning Resources, What is Full-Stack Web Development? Node.js and NPM Front-end Web UI Frameworks, Introduction to Bootstrap, Responsive Design, Bootstrap Grid System	12
2	Bootstrap CSS Components	Navigation and Navigation Bar, Icon Fonts, User Input, Bootstrap Tables and Cards, Images and Media Alerting Users Navigation and Navigation Bar: Objectives and Outcomes Navigation and Navigation Bar: Additional Resources User Input: Buttons and Forms: Objectives and Outcomes User Input: Additional Resources Displaying Content: Tables and Cards: Objectives and Outcomes Displaying Content: Additional Resources Images and Media: Additional Resources Alerting Users: Objectives and Outcomes Alerting Users: Additional Resources	12

		UI Design and Prototyping: Objectives and Outcomes UI Design and Prototyping Report Template UI Design and Prototyping: Additional Resources	
3	Bootstrap Javascript Components	Bootstrap JavaScript Components Tabs, Pills and Tabbed Navigation Tooltips, Popovers and Modals Carousel Bootstrap JavaScript Components	12
4	Web Tools	Bootstrap and JQuery CSS Preprocessors: Less and Sass Bootstrap, JQuery and Sass Building and Deployment NPM Scripts Task Runners	12
5	**Bootstrap and JQuery**	Objectives and Outcomes Bootstrap and JQuery : Additional Resources CSS Preprocessors: Objectives and Outcomes CSS Preprocessors: Additional Resources Building and Deployment: Objectives and Outcomes Building and Deployment: NPM Scripts: Additional Resources Building and Deployment: Task Runners Building and Deployment: Task Runners: Additional Resources Front-End Web UI Frameworks and Tools: Bootstrap 4: Conclusions Project Implementation: Objectives and Outcomes Final Report Template.	12
		Total No. of Hrs	60

Course Outcome	
Students should able to	
CO1	enhance the students for implementing UI Frameworks.
CO2	apply basic programming using CSS.
CO3	implement Bootstrap JavaScript.
CO4	learn a variety of useful tools.
CO5	be able to apply JQuery.

Recommended Resources

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Text Books	Modular Design Frameworks: A Projects-based Guide for UI/UX Designers September 2017 by James Cabrera.
Reference Books	

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Front End Development & Programming using Java	Course Code: MCA 104

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
3	1	0	4	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives	
1	To understand the basic concepts of Java.
2	To apply basic programming using java.
3	To implement interfaces and exception handling.
4	To apply the programming using java applet.
5	To implement swing and advance concepts in java.

Course Content			
Unit No.	Module No.	Content	Hours
1.	Unit I	Object oriented and Java Basics: Need for oop paradigm, summary of oop concepts, History of Java, Java buzzwords, JVM –The heart of Java , Java's Magic Bytecode. data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, using final with variables, garbage collection.	12
2	Unit II	Overloading methods and constructors, recursion, nested and inner classes, exploring string class. Extending Classes and Inheritance, Use and Benefits of Inheritance in OOP, Types of Inheritance in Java, Inheriting Data members and Methods, Role of Constructors in inheritance, Overriding Super Class Methods, Use of "super", Polymorphism in inheritance.	12

3	Unit III	Interfaces: differences between classes and interfaces, Packages & Interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exception handling: Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. String handling, Exploring java.util	12
4	Unit IV	Java applets- Life cycle of an applet – Adding images to an applet – Adding sound to an applet. Passing parameters to an applet. Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. AWT classes, window fundamentals, working with frame window, creating frame window in applet, working with, graphics, colors, font, AWT controls.	12
5	Unit V	Swing: Introduction, limitations of AWT, components & containers, exploring swing-JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables. Handling menus, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.	12
		Total No. of Hrs	60

Course Outcome	
Students should able to	
CO1	understand the basic concepts of Java.
CO2	apply basic programming using java.
CO3	implement interfaces and exception handling.
CO4	apply the programming using java applet.
CO5	implement swing and advance concepts in java.

Recommended Resources

Text Books

1. Java the complete reference, Herbert schildt, 7th editon, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, pearson eduction.

Reference Books

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley and sons.
2. An Introduction to OOP, T. Budd, 3rd edition, pearson education.
3. Introduction to Java programming, Y. Daniel Liang, pearson education.
4. An introduction to Java programming and object oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary
6. Cornell, 8th Edition, Pearson Education.
7. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, 8th Edition, Pearson Education
8. Object Oriented Programming with Java, R.Buyya,S.T.Selvi,X.Chu,TMH.
9. Java and Object Orientation, an introduction, John Hunt, 2nd edition, Springer.
10. Maurachs Beginning Java2 JDK 5 , SPD.
11. Programming and Problem Solving with Java, JM Slack, B S Publications.

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Database Design Development	Course Code: MCA 105

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
2	0	2	3	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives	
1	To implement basic concepts of database management systems.
2	To apply concurrency control transactions.
3	To create parallel and distributed databases.
4	To create object database systems.
5	To apply the concepts of data warehousing.

Course Content			
Unit No.	Module No.	Content	Hours
1.	**Introduction to DBMS :**	Review of Database Concepts, File Organization concepts, Normalization. Physical Database Design and Tunning. Index Selection, Overview of Database Tunning, Choices in tuning the conceptual schema. Choices in tunning queries and views, DBMS Benchmarking. Security. Query Processing and Optimization: Overview, Measures of Query Cost Selection Operation, Sorting, Join Operation, Other Operations Evaluation of Expressions. Query Optimization Overview, Transformation of Relational Expressions Estimating Statistics of Expression Results Choice of Evaluation Plans	6
2	**Concurrency control transactions and schedule**:	Concurrency control, schedule, Serializability, Recoverability, Levels of Consistency, Transaction Models, Lock based councurrency control lock management, specialized locking techniques, control without locking. Two-Phase Locking Protocol. Graph-Based Locking Protocols. Tree Protocol & multiple granularity. Deadlock Handling, detection & Recovery. Crash Recovery, Introduction to crash recovery, Log, Check pointing, Recovery from a system crash. Nested transactions. Transactions on objects.	6

3	**Parallel and distributed databases**:	Architectures for parallel databases, Parallel query Evaluation and optimization, Parallelizing individual operations. Distributed Databases Introduction: Distributed Data Processing, What is a Distributed Database System? Characteristics of Distributed DDBMS. Design Issues. Distributed DBMS Architecture. Fragmentation and Replication, Catalog management. Distributed Database Design: Top-Down Design Process, Distribution Design Issues, Fragmentation, Allocation, updating distributed data. Overview of Query Processing: Query Processing Problem, Objectives of Query Processing, Complexity of Relational Algebra Operations, Characterization of Query Processors, Layers of Query Processing, Query Optimization in Distributed Databases; Distributed Query processing, Distributed transaction management, Distributed Concurrency control, Distributed recovery.	6
4	**Advanced Data Management:**	Advanced Data Management techniques. Advanced Database Access protocols: Discretionary Access Control Based on Granting and Revoking Privileges; Mandatory Access Control and RoleBased Access Control. Overview of Advanced Database models like Mobile databases, Temporal databases, Spatial databases. **Object database Systems:** Objects, Identity, inheritance, Database Design for an ORDBMS, Storage and access methods, Query processing and optimization, Comparing RDBMS with OODBMS and ORDBMS.	6
5	**Data Warehousing**	Data Warehousing, Dimensional Modeling and OLAP The Need for Data Warehousing; Data Warehouse Defined; Benefits of Data Warehousing; Features of a Data Warehouse; Data Warehouse Architecture; Data Warehouse and Data Marts; Data Warehousing Design Strategies. Dimensional Model Vs ER Model; The Star Schema; How Does a Query Execute? The Snowflake Schema; Fact Tables and Dimension Tables; Factless Fact Table; Updates To Dimension Tables, Primary Keys, Surrogate Keys & Foreign Keys; Aggregate Tables; Fact Constellation Schema or Families of Star Need for Online Analytical Processing; OLTP vs OLAP; OLAP Operations in a cube: Roll-up, Drilldown, Slice, Dice, Pivot ; OLAP Models: MOLAP, ROLAP, HOLAP.	6
		Total No. of Hrs	30

Course Outcome	
Students should able to	
CO1	implement basic concepts of database management systems.
CO2	apply concurrency control transactions.
CO3	create parallel and distributed databases.
CO4	create object database systems.
CO5	apply the concepts of data warehousing.

Recommended Resources	
Text Books	1. Database Management System -Raghu Ramkrishna McGraw Hill, International Editions.
Reference Books	1. Silberschatz, A., Korth, H.F., Sudarshan, S., Database System Concepts, McGraw-Hill International Edition, 2006 (5 th Edition) 2. Elmasri, R., Navathe, S.B., Fundamentals of Database Systems, Fourth Edition, Pearson Education, 3. Desai, B.C., An Introduction to Database Systems, Galgotia Publications, 4. Date, C.J., An Introduction to Database Systems, Pearson Education, 7 th Edition 5. Garcia-Molina, H., Ullman, J.D., Widom, J., Database Systems: The Complete Book, Pearson Education, 2002.

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Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Front End Development & Programming Lab	Course Code: MCA 106

Teaching Scheme (Hrs/Week)				Continuous In- Course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Lab participation/ Attendance)	CIA-2 (Written Practical Logbook)	CIA-3 (Viva/Oral)	Written Performance	Viva / Oral	
0	0	4	2	10	10	10	50	20	100
Max. Time, End Semester Exam (Practical) – 3Hrs.									

Course Objectives	
1	To teach fundamentals of object oriented programming in Java. Understand various concepts of JAVA.
2	To familiarize Java environment to create, debug and run simple Java programs.
3	To demonstrate java compiler and eclipse platform and learn how to use Net Beans IDE to create Java Application.

List of Programs

1. Write a Java program that prints all real solutions to the quadratic equation ax2 +bx + c = 0. Read in a, b, c and use the quadratic formula. If the discriminate b2 -4ac is negative, display a message stating that there are no real solutions.
2. The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it.
3. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.
4. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
5. Write a Java program to multiply two given matrices.
6. Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use String Tokenizer class of java.util)
7. Write a Java program to create a Student class with following fields i. Hall ticket number ii. Student Name iii. Department Create ‘n’ number of Student objects where ‘n’ value is passed as input to constructor.
8. Write a Java program to demonstrate String comparison using == and equals method. Department of Computer Science and Engineering MLR Institute of Technology- UG - Autonomous-Regulations

9. Write a Java program to read copy content of one file to other by handling all file related exceptions.
10. Write a Java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

Course Outcome	
Students should able to	
CO1	Implement Object oriented features using Java.
CO2	Apply the concept of polymorphism and inheritance.
CO3	Implement exception handling 4. Develop network and window application using awt and swings.

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Database Design Development Lab	Course Code: MCA 107

Teaching Scheme (Hrs/Week)				Continuous In- Course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Lab participation/ Attendance)	CIA-2 (Written Practical Logbook)	CIA-3 (Viva/Oral)	Written Performance	Viva / Oral	
0	0	4	2	10	10	10	50	20	100
Max. Time, End Semester Exam (Practical) – 3Hrs.									

Course Objectives

1	To teach fundamentals of object oriented programming in Java. Understand various concepts of JAVA.
2	To familiarize Java environment to create, debug and run simple Java programs.
3	To demonstrate java compiler and eclipse platform and learn how to use Net Beans IDE to create Java Application.

List of Programs

1. Distributed Database for Bookstore
2. DeadlockDetectionAlgorithmfordistributeddatabaseusingwait-forgraph.
3. Object Oriented Database–Extended Entity Relationship(EER).
4. ParallelDatabase–UniversityCounsellingforEngineeringcolleges.
5. ParallelDatabase–ImplementationofParallelJoin&ParallelSort.
6. ActiveDatabase–ImplementationofTriggers&AssertionsforBankDatabase.
7. Deductive Database–Constructing Knowledge Database for Kinship Domain (Family Relations).
8. StudyandWorkingofWEKATool.
9. Query Processing–Implementation of an Efficient Query Optimizer.
10. Designing XML Schema for Company Database

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: **Semester** **Course Structure:** **MCA** **AY - 2021-22**

Course Outcome	
Students should able to	
CO1	Implement Object oriented features using Java.
CO2	Apply the concept of polymorphism and inheritance.
CO3	Implement exception handling 4. Develop network and window application using awt and swings.

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Business Communication	Course Code: MCA 208

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
1	1	0	2	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives	
1	To make the students aware about business communication.
2	To understand written and oral communication.
3	To gain knowledge of current trends and communication technologies and its business application.
4	To understand the corporate communication.
5	To know business protocols and international communication.

Course Content			
Unit No.	**Module No.**	**Content**	**Hours**
1.		Introduction to Business Communication - What is business communication - Why communication matters - Principles of effective communication - Reading Skills - Listening – Feedback - Barriers of communication - Social communication model Audience profiling - Target group profile - Social communication model - Perception & communication - Attitude & Communication - Collaboration - Interpersonal communication - Business etiquette Communicating effectively in teams - Collaborative writing - Communication for meetings – Non- verbal communication - Professional dressing and body language - Developing business etiquette Communication in a global marketplace - Cultural competency - Recognizing variations in a diverse world - Other Aspects of Communication - Cross Cultural Dimensions of Business Communication - Technology and Communication - The emergence of mobile & its impact in business communication - Ethical & Legal Issues in Business Communication.	6
2		Written & Visual Business Communication: Types of written business communication - Digital Media - Email - Text messaging - Website content - Blogs - podcast - Social media strategies - Microblogging -	6

		Reports - Proposals - Case studies - Executive summaries - Internal communication through - notices, circulars, memos, agenda & minutes, press releases Planning business messages - Three step writing process - Selecting media & channels - Organize information Writing business messages - Audience analysis & adaptation - Message composition - Choice of words - Effective sentences - Editing messages - Review & distributing messages - Introduction to visual communication - Power of images - Design principles - Ethics of visual communication Visuals for presenting information - Integrating visuals with text - Business videos - Visuals for presenting data - Data visualization.	
3		Nuances of Written Communication : Brief messages - Routine requests & messages – Strategy - Examples Negative messages - Three step process for negative messages - Direct & indirect approach to negative messages - Maintaining ethics & etiquettes - Negative messages under different contexts – Regular business communication - Organisational news - Communicating a crisis - Negative performance reviews Persuasive messages - Three step process for persuasive messages - Developing persuasive messages - examples - Strategies for marketing & sales messages - Promotional messages Reports & Proposals - Purposes of a report - Primary & secondary research - Data collection - Findings - Summarizing results - Types of reports - Types of proposals - Drafting & completing reports and proposals	6
4		Business Presentations :Business presentation milestones - Planning a presentation - Developing a presentation - Delivering a presentation - Incorporating technology Effective presentations - Enhancing presentations - Designing effective slides - Creating effective slide content - Support materials Types of business presentations - Building business presentations for various scenario.	6
5		Communication for Interviews & Employment : Employers perspective - Identifying employment strategy - Writing employment messages - Job descriptions Candidates perspective - Building CVs - network building - designing portfolios Interviews – Types of interviews - Web /video conferencing - Tele-meeting - Preparing for a job interview – Follow-up communication .	6
		Total No. of Hrs	30

Course Outcome	
Students should able to	
CO1	make the students aware about business communication.
CO2	understand written and oral communication.

CO3	gain knowledge of current trends and communication technologies and its business application.
CO4	understand the corporate communication.
CO5	know business protocols and international communication.

Recommended Resources	
Text Books	1. Business Communication Today, L. Bovee Courtland, Thill John, Lal Raina Roshan, 13th Edition, Pearson 2. Essentials of Business Communication, Rajendra Pal, J.S. Korlahalli, 13th Edition, Sultan Chand & Sons 3. Excellence in Business Communication, John V. Thill, Courtland L. Bovee, Pearson
Reference Books	1. Business Communication, Meenakshi Raman, Prakash Singh, 2nd Edition, 2012, Oxford 2. 2. Supplementary Reading Material Business Communication - Harvard Business Essentials Series, HBS Press

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

MCA: SEMESTER II

Course: Applied Machine Learning	Course Code: MCA 201

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
3	1	0	4	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives	
1	To understand various key paradigms for machine learning approaches.
2	To familiarize with the mathematical and statistical techniques used in machine learning.
3	To understand and differentiate among various machine learning techniques.

Course Content			
Unit No.	Module No.	Content	Hours
1.	Introduction:	Definitions, Datasets for Machine Learning, Different Paradigms of Machine Learning, Data Normalization, Hypothesis Evaluation, VC-Dimensions and Distribution, Bias-Variance Tradeoff, Regression.	12
2	Bayes Decision Theory:	Bayes decision rule, Minimum error rate classification, Normal density and discriminant functions.	12
3	Parameter Estimation:	Maximum Likelihood and Bayesian Parameter Estimation. Discriminative Methods: Distance-based methods, Linear Discriminant Functions, Decision Tree, Random Decision Forest and Boosting.	12
4	Feature Selection:	Feature Selection and Dimensionality Reduction: PCA, LDA, ICA, SFFS, SBFS. Clustering: k-means clustering, Gaussian Mixture Modeling, EM-algorithm.	12
5	Kernel Machines:	Kernel Tricks, SVMs (primal and dual forms), K-SVR, K-PCA. Artificial Neural Networks: MLP, Backprop, and RBF-Net. Foundations of Deep Learning: DNN, CNN, Autoencoders.	12

	Total No. of Hrs	60

Course Outcome	
Students should able to	
CO1	To formulate a machine learning problem.
CO2	Select an appropriate pattern analysis tool for analyzing data in a given feature space.
CO3	Apply pattern recognition and machine learning techniques such as classification and feature selection to practical applications and detect patterns in the data.

Recommended Resources

Text Books

1. Shalev-Shwartz,S., Ben-David,S., (2014), Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press
2. R. O. Duda, P. E. Hart, D. G. Stork (2000), Pattern Classification, Wiley-Blackwell, 2nd Edition.

Reference Books

1. Mitchell Tom (1997). Machine Learning, Tata McGraw-Hill.
2. C. M. BISHOP (2006), Pattern Recognition and Machine Learning, Springer-Verlag New York, 1st Edition.

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Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Statistical Data Analytics with R	Course Code: MCA 202

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
3	1	0	4	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives	
1	To learn the computational approaches to Modelling and Feature Extraction.
2	To Learn the need and application of Map Reduce.
3	To learn the various search algorithms applicable to Big Data.
4	To analyse and interpret streaming data.
5	To learn how to handle large data sets in main memory.

Course Content			
Unit No.	Module No.	Content	Hours
1.	Data Mining and Large-Scale Files:	Introduction to Statistical modelling, Machine Learning, Computational approaches to modelling, Summarization, Feature Extraction, Statistical Limits on Data Mining, Distributed File Systems, Map-reduce, Algorithms using Map Reduce, Efficiency of Cluster Computing Techniques.	12
2	Mining Data Streams:	Stream Data Model, Sampling Data in the Stream, Filtering Streams, Counting Distance Elements in a Stream, Estimating Moments, Counting Ones in Window, Decaying Windows Clustering Introduction to Clustering Techniques, Hierarchical Clustering, Algorithms: K-Means, CURE, Clustering in Non-Euclidean Spaces, Streams and Parallelism, Case Study: Advertising on the Web-Recommendation Systems	12
3	Introduction to NOSQL:	Definition of NOSQL, History of NOSQL and Different NOSQL products, Exploring MondoDB Java/Ruby/Python, Interfacing and Interacting with NOSQL	12
4	Introduction to	NOSQL Basics NOSQL Storage Architecture, CRUD operations with MongoDB, Querying, Modifying and Managing NOSQL Data stores, Indexing and ordering datasets (MongoDB/CouchDB/Cassandra)	12

	Basics of NOSQL:	Creation of parallelized collections and external datasets, Resilient Distributed Dataset (RDD) operations, shared variables and keyvalue pairs.	
5	Spark application programming:	Spark application programming Purpose and usage of the Spark Context, Initialize Spark with the various programming languages, Describe and run some Spark examples, Pass functions to Spark, Create and run a Spark standalone application, Submit applications to the cluster, Introduction to Spark libraries.	12
		Total No. of Hrs	60

Course Outcome	
Students should able to	
CO1	Design algorithms by employing Map Reduce technique for solving Big Data problems.
CO2	Design algorithms for Big Data by deciding on Features set.
CO3	Design algorithms for handling big size datasets and propose solutions for Big Data by optimizing main memory consumption.
CO4	Design solutions for problems in Big Data by suggesting appropriate clustering techniques.
CO5	Design spark application program for Big Data.

Recommended Resources	
Text Books	1. Mining of Massive Datasets, Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, Cambridge University Press, Second Edition, 2014. 2. Data Mining Concepts and Techniques, Jiawei Han, MichelineKamber, Jian Pei, Morgan Kaufman Publications, Third Edition, 2011. 3. Data Mining – Practical Machine Learning Tools and Techniques, Ian H.Witten, Eibe Frank, Morgan Kaufman Publications, Third Edition, 2011.
Reference Books	1. Principles of Data Mining, David Hand, HeikkiMannila and Padhraic Smyth, MIT PRESS. 2. Dan Sullivan, NoSQL for Mere Mortals,1st Edition, Pearson Education, 2015. (ISBN-13: 978-9332557338) 6. https://cognitiveclass.ai/courses/what-is-spark

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Reinforcement Learning (Elective 1)	Course Code: MCA 203

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
3	1	0	4	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives	
1	To archive a goal by interacting with their environment.
2	To implement in code common algorithms following code standards and libraries used in RL (as assessed by the assignments and final project)
3	To provide Training to the students to frame reinforcement learning problems.
4	To tackle algorithms from dynamic programming, Monte Carlo and temporal-difference learning.
5	To Progress towards larger state space environments using function approximation, deep Q-networks and state-of-the-art policy gradient algorithms.

Course Content			
Unit No.	Module No.	Content	Hours
1.	Introduction	Course logistics and overview. Origin and history of Reinforcement Learning research. Its connections with other related fields and with different branches of machine learning. **Probability Primer** Brush up of Probability concepts - Axioms of probability, concepts of random variables, PMF, PDFs, CDFs, Expectation. Concepts of joint and multiple random variables, joint, conditional and marginal distributions. Correlation and independence	12

2	Markov Decision Process	Introduction to RL terminology, Markov property, Markov chains, Markov reward process (MRP). Introduction to and proof of Bellman equations for MRPs along with proof of existence of solution to Bellman equations in MRP. Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations.	12
3	Prediction and Control by Dynamic Programming	Overiew of dynamic programing for MDP, definition and formulation of planning in MDPs, principle of optimality, iterative policy evaluation, policy iteration, value iteration, Banach fixed point theorem, proof of contraction mapping property of Bellman expectation and optimality operators, proof of convergence of policy evalutation and value iteration algorithms, DP extensions.	12
4	Monte Carlo Methods for Model Free Prediction and Control	Overiew of Monte Carlo methods for model free RL, First visit and every visit Monte Carlo, Monte Carlo control, On policy and off policy learning, Importance sampling. **TD Methods** Incremental Monte Carlo Methods for Model Free Prediction, Overview TD(0), TD(1) and TD(λ), k-step estimators, unified view of DP, MC and TD evaluation methods, TD Control methods - SARSA, Q-Learning and their variants.	12
5	Function Approximation Methods	Getting started with the function approximation methods, Revisiting risk minimization, gradient descent from Machine Learning, Gradient MC and Semi-gradient TD(0) algorithms, Eligibility trace for function approximation, Afterstates, Control with function approximation, Least squares, Experience replay in deep Q-Networks. **Policy Gradients** Getting started with policy gradient methods, Log-derivative trick, Naive REINFORCE algorithm, bias and variance in Reinforcement Learning, Reducing variance in policy gradient estimates, baselines, advantage function, actor-critic methods.	12
		Total No. of Hrs	60

Course Outcome

Students should able to	
CO1	Learn to archive a goal by interacting with their environment.
CO2	Implement in code common algorithms following code standards and libraries used in RL (as assessed by the assignments and final project)
CO3	Traine students to frame reinforcement learning problems.
CO4	Tackle algorithms from dynamic programming, Monte Carlo and temporal-difference learning.
CO5	Progress towards larger state space environments using function approximation, deep Q-networks and state-of-the-art policy gradient algorithms.

Recommended Resources

Text Books

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition, MIT Press, 2019
2. Li, Yuxi. "Deep reinforcement learning." arXiv preprint arXiv:1810.06339 (2018).
3. Wiering, Marco, and Martijn Van Otterlo. "Reinforcement learning." Adaptation, learning, and optimization 12 (2012)

Reference Books

3. Russell, Stuart J., and Peter Norvig. "Artificial intelligence: a modern approach."Pearson Education Limited, 2016.
4. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. "Deep learning." MIT press, 2016.

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Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Enterprise Application Development (Elective 2)	Course Code: MCA 203

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
3	1	0	4	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives	
1	To Introduce Enterprise Application.
2	To learn about Web Tier and its implementation.
3	To study and perform Enterprise Information Systems Tier.
4	To study and implement Business Tier system.
5	To learn Enterprise Mobility.

Course Content			
Unit No.	Module No.	Content	Hours
1.	Introduction to Enterprise Application	Enterprise Architecture – life cycle, development framework, architectural model, conceptual layers, enterprise IT architecture domain. Enterprise Server – introduction, different types of enterprise servers, set up clusters. Enterprise Resource Planning (ERP) - Customer Relationship Management (CRM) - SCM – HRM. Enterprise Java – Introduction to web application and its lifecycle; Different containers.	12
2	Web Tier	XML and Java API for XML processing – Introduction to JAXP; DOM, SAX and StAX interface; XSLT, Servlets – Introduction; servlet life cycle; sessions; session tracking using hidden fields, user authentication, URL rewriting and Cookies; Inter-servlet communication , Java Server Pages (JSP) – introduction to JSP tags; JSP Life Cycle; Directives; Custom JSP tags, Java Server Faces Technology – Introduction; Page Navigation; Tags; Life Cycle and Architecture.	12

3	Enterprise Information Systems Tier	Java Database Connectivity – Introduction; Different types of drivers; Steps to establish a connection and query it, Java Persistence API – JPA Architecture; Entities; Entity Relationship; Managing Entities, Java Transaction API (JTA) – Transactions in J2EE; Serializability; Concurrent transactions; Distributed transaction and transaction manager, Mobile Database – Need for mobile database; Architecture; different products; Mobile transactions	12
4	Business Tier	Enterprise JavaBeans (EJB) – EJB container; enterprise beans; Session beans; Message-driven beans, JAX-WS Web service endpoints – introduction to creating web services and client, Business Intelligence and Data warehousing – Data model, Data integrity, OLAP, Application in an enterprise, Model-View-Controller (MVC) Architecture – Introduction, Model1 and Model 2 architecture	12
5	Enterprise Mobility	Introduction to Enterprise Mobility : Trends and benefits; Drivers; Risks and analysis, Enterprise Mobility Architecture – High level architecture; Building Units; Capability Model; Meta Model – Mobile Device Security; Enterprise Mobility infrastructure : Secure VOIP, Enterprise Mobility Middleware and Solutions - MEAPs, Native Apps, HTML5., Use Cases .	12
		Total No. of Hrs	60

Course Outcome	
Students should able to	
CO1	Introduce Enterprise Application.
CO2	learn about Web Tier and its implementation.
CO3	study and perform Enterprise Information Systems Tier.
CO4	study and implement Business Tier system.
CO5	learn Enterprise Mobility.

Recommended Resources	
Text Books	Head First Servlets and JSP by Bryan Basham, Kathy Sierra, and Bert Bates from O'Reilly Media, INC, 2008
Reference Books	1. Java Server Faces: The Complete Reference by Chris Schalk, Ed Burns and James Holmes, 2006 2. A Practical Guide to Enterprise Architecture by James McGovern, 2003. 3. Java EE 6 Development using GlassFish Application Server by David R. Heffelfinger, Packt Publishing, 2009.

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Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Deep Learning (Elective 1)	Course Code: MCA 204

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
3	1	0	4	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives	
1	To understand the basic concepts of Neural Network.
2	To apply Neural Network architectures.
3	To implement Applications of Deep Learning to computer vision.
4	To apply Applications of Deep Learning to NLP.
5	To implement Parsing and Sentiment Analysis.

Course Content			
Unit No.	Module No.	Content	Hours
1.	Introduction	Feedforward Neural networks. Gradient descent and the backpropagation algorithm. Unit saturation, aka the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima. Heuristics for faster training. Nestors accelerated gradient descent. Regularization. Dropout.	12
2.	Neural Networks:	Convolutional Neural Networks: Architectures, convolution / pooling layers. Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures. Deep Unsupervised Learning: Autoencoders (standard, sparse, denoising, contractive, etc), Variational Autoencoders, Adversarial Generative Networks, Autoencoder and DBM. Attention and memory models, Dynamic memory networks.	12

3	Applications of Deep Learning to Computer Vision:	Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models. Attention models for computer vision tasks.	12
4	Applications of Deep Learning to NLP:	Introduction to NLP and Vector Space Model of Semantics. Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-ofWords model (CBOW), Glove, Evaluations and Applications in word similarity, analogy reasoning. Named Entity Recognition, Opinion Mining using Recurrent Neural Networks.	12
5	Parsing and Sentiment Analysis:	Parsing and Sentiment Analysis using Recursive Neural Networks. Sentence Classification using Convolutional Neural Networks. Dialogue Generation with LSTMs. Applications of Dynamic Memory Networks in NLP. Recent Reseearch in NLP using Deep Learning: Factoid Question Asnwering, similar question detection, Dialogue topic tracking, Neural Summarization, Smart Reply.	12
		Total No. of Hrs	60

Course Outcome	
Students should able to	
CO1	understand the basic concepts of Neural Network.
CO2	apply Neural Network architectures.
CO3	implement Applications of Deep Learning to computer vision.
CO4	apply Applications of Deep Learning to NLP
CO5	implement Parsing and Sentiment Analysis.

Recommended Resources	
Text Books	1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book in preparation. (2015). 2. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009): 1127. 3. Hochreiter, Sepp, and Jargen Schmidhuber. "Long short-term memory." Neural computation 9.8 (1997): 17351780.
Reference Books	1. Oquab, Maxime, et al. "Learning and transferring midlevel image representations using convolutional neural networks." Proceedings of the IEEE conference on computer vision and pattern recognition. 2014.

2. Bengio, Yoshua, et al. "A neural probabilistic language model." journal of machine learning research 3. Feb (2003).

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Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Application Integration	Course Code: MCA 104

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
3	1	0	4	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives	
1	To understand the features and tools used in Android programming.
2	To understand the concept developing tools.
3	To write a program using Android.
4	To understand the User Interface Architecture.
5	To use User Interface Design.

Course Content			
Unit No.	Module No.	Content	Hours
1.	Introduction to Android:	Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation.	12
2	Building Application:	Building your First Android application, Understanding Anatomy of Android Application, Android Manifest file.	12
3	Introduction to Android:	Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation.	12
4	Managing Application Resources:	Managing Application Resources: Resource Value Types, Accessing Resources Programmatically, Working with Different Types of Resources: Working with String Resources, Working with String Arrays, Colors	12

5	Android User Interface Design:	Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation. Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources. Mini Project	12
		Total No. of Hrs	60

Course Outcome	
Students should able to	
CO1	Understands the working of Android OS Practically.
CO2	Develop Android user interfaces.
CO3	Develop, deploy and maintain the Android Applications.
CO4	Utilize Resources
CO5	Implement user Interface and design implementations.

Recommended Resources	
Text Books	1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012. 2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.
Reference Books	1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Software Testing and Quality Assurance	Course Code: MCA 205

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
2	0	2	3	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives

1	To understand the basic view of software quality and quality factors.
2	To understand the Software Quality Assurance (SQA) architecture and the details of its components.
3	To understand of how the SQA components can be integrated into the project life cycle.
4	To be familiar with the software quality infrastructure.

Course Content

Unit No.	Module No.	Content	Hours
1.		Introduction to software Quality and Assurance The software quality challenge, Software quality, Software quality factors Management and its role in software quality assurance	12
2		Components of SQA The components of the software quality assurance system – overview Pre-project Software Quality Components Contract review, Development and quality plans	12
3		SQA Components in the Project Life Cycle and Strategies Integrating quality activities in the project life cycle, Reviews, Software testing – strategies	12
4		Software Testing – Implementation: Software Quality Implementation, Assuring the quality of software maintenance components, Assuring the quality of external participants' contributions, CASE tools and their effect on software quality	12
5		Software Quality Infrastructure Components Procedures and work instructions, Staff training and certification, Corrective and preventive actions, Documentation control. Software Quality Metrics Software Quality metrics, Cost of Quality.	12
		Total No. of Hrs	60

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Pattern: **Semester** **Course Structure:** **MCA** **AY - 2021-22**

Course Outcome	
Students should able to	
CO1	understand the basic view of software quality and quality factors.
CO2	understand the Software Quality Assurance (SQA) architecture and the details of its components.
CO3	understand of how the SQA components can be integrated into the project life cycle.
CO4	familiar with the software quality infrastructure.
CO5	Understand software quality infrastructure.

RecommendedResources	
Text Books	1. Daniel Galin, “Software Quality Assurance”, Pearson Publication, 2009.
Reference Books	1. Kshirsagar Naik and Priyadarshi Tripathy, Software Testing & Quality Assurance Theory and Practice, Wiley Student edition 2. William E. Perry, Effective Methods for Software Testing, WILLEY, 3rd Edition. 3. Alan C. Gillies, “Software Quality: Theory and Management”, International Thomson Computer Press, 1997. 4. M G Limaye, Software Testing, Tata McGraw-Hill Education, 2009

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Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Machine Learning Lab	Course Code: MCA 206

Teaching Scheme (Hrs/Week)				Continuous In- Course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Lab participation/ Attendance)	CIA-2 (Written Practical Logbook)	CIA-3 (Viva/Oral)	Written Performance	Viva / Oral	
0	0	4	2	10	10	10	50	20	100
Max. Time, End Semester Exam (Practical) – 3Hrs.									

Course Objectives

1.	Make use of Data sets in implementing the machine learning algorithms.
2.	Implement the machine learning concepts and algorithms in any suitable language of choice.

List of Programs

1. Implement and demonstratethe FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge toclassify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct aBayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regressionalgorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

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Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course Outcome	
Students should able to	
CO1	Make use of Data sets in implementing the machine learning algorithms.
CO2	Implement the machine learning concepts and algorithms in any suitable language of choice.

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Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course:	R programming Lab	Course Code: MCA 207

Teaching Scheme (Hrs/Week)				Continuous In- Course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Lab participation/ Attendance)	CIA-2 (Written Practical Logbook)	CIA-3 (Viva/Oral)	Written Performance	Viva / Oral	
0	0	4	2	10	10	10	70	30	100
Max. Time, End Semester Exam (Practical) – 3Hrs.									

Course Objectives	
1	Lear to Develop programming logic using R – Packages.
2	Understand datasets using R – programming capabilities
3	Understand the implementation of various applications using python.

List of Programs

1. Download and install R-Programming environment and install basic packages using install.packages() command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,)
3. Write a program to find list of even numbers from 1 to n using R-Loops.
4. Create a data set and do statistical analysis on the data using R.
5. Implement different data structures in R.
6. Create pie chart and bar chart using R.
7. Write a program to demonstrate different number data types , arithmetic operations in python.
8. Write a program to create, concatenate and print a string and accessing substring from a given string.
9. Write a program to demonstrate working with dictionaries in python.
10. Write a python program to define a module and import a specific function in that module to another program.

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: **Semester** **Course Structure:** **MCA** **AY - 2021-22**

Course Outcome	
Students should able to	
CO1	Setup R Programming Environment.
CO2	Understand and use R – Data types.
CO3	Able to Write, Test and Debug Python Programs
CO4	Read and write data from & to files in Python and develop Application using Pygame

DATTA MEGHE INSTITUTEOF MEDICAL SCIENCES

Faculty of Science and Technology

Pattern: Semester **Course Structure:** MCA **AY -** 2021-22

Course: Research Methodology with Writing research Paper	Course Code: MCA 208

Teaching Scheme (Hrs/Week)				Continuous In- course Assessment (CIA) (30%)			End Semester Examination (70%)		Total
L	T	P	C	CIA-1 (Class participation)	CIA-2 (Assignment)	CIA-3 (Prelim- MCQ)	Theory	T/P	
2	0	0	2	10	10	10	70	00	100
Max. Time, End Semester Exam (Theory) -3Hrs.									

Course Objectives

1	Understand various concepts & terms associated with scientific business research application.
2	Know various types of measurement scales & attitude scaling techniques.
3	To be able to apply the principles of sampling and sample size determination to contemporary business research problems.
4	To be able to construct different types of testable hypotheses and interpret the statistical test Outcomes.
5	To be able to formulate alternative research designs for a real-life business research problem and discuss the pros and cons of each design.

Course Content

Unit No.	Module No.	Content	Hours
1.		Definition of Research, Need of business research, Characteristics of scientific research method, Typical Research applications in business and management. Questions in Research: Formulation of Research Problem – Management Question – Research Question – Investigation Question. The process of business research: Literature review - Concepts and theories - Research questions - Sampling - Data collection - Data analysis - Writing up - The iterative nature of business research process, Elements of a Research Proposal.	06
2		Research Design & Sampling Design: Meaning & Requirement of Research Design, Types of Research Design, Factors Affecting Research Design, Feature of Good Research Design, Sampling Design, Sample, Sampling, Steps in Sampling Design, Criterion of selecting sampling procedure, Sampling Methods.	06

3		Measurement & Scaling Technique, Scale characteristic, Measurement Scales: Nominal, Ordinal, Interval, Ratio, Criterion for good Measurement: Validity, Reliability, Sensitivity, Scaling Techniques: Rating Scales, Ranking Scales., Factors in selecting appropriate measurement scale	06
4		Data Collection, Types & Sources of Data: Primary & Secondary, Methods of Primary Data Collection, Observation: Characteristic, Merits. Demerits, Interview: Characteristic, Types, Steps, Merits Questionnaire: Wording Questions, guidelines for constructing questions, best questions, sequence formulating Questionnaire, Merits & Demerits, Schedule, Schedule vs Questionnaire, Qualitative research: Meaning, Uses of qualitative research, Qualitative vs Quantitative research, Orientations: Phenomenology, Ethnography, Grounded theory, Case studies. Techniques in qualitative research: Focus groups, Depth interviews, conversations, semi structured interviews, Social Networking, Observations, collages, Free Association technique, projective techniques. Methods of Secondary Data	06
5		Testing of Hypotheses & Report Writing, Basic Concept Concerning Testing of Hypotheses, Procedure for Hypotheses Testing, Advanced Tools For Hypothesis Testing Using SPSS,Introduction to SPSS package, creating data files, Multiple Response sets, Recoding, visual binning etc. Multivariate Data Analysis: Factor Analysis, Cluster analysis, (Numerical are not Expected in Exam), Interpretation & Report Writing, Interpretation: Meaning, Techniques, Precautions, Effective use of graphic aid: Tables, charts, pie charts, line graphs, bar charts, Organization of the written report	06
		Total No. of Hrs	30

Course Outcome

Students should able to

CO1	Enumerate and define various concepts; terms associated with scientific business Research.
CO2	Explain the various types of measurement scales; attitude scaling techniques and their application in the context of business research.
CO3	Design a variety of data collection instruments for contemporary business research issues and apply the principles of sampling and sample size determination to contemporary business research problems.
CO4	Analyse and graphically present quantitative data and derive actionable inferences from the same from a decision making perspective and construct different types of testable hypotheses and interpret the statistical test outcomes.
CO5	Formulate alternative research designs for a real-life business research problem and discuss the pros and cons of each design.

RecommendedResources	
Text Books	1. Research Methods for Social Work, Allen, Earl R. Babbie, Cengage 2. Research Methods in Business Studies: A Practical Guide, Pervez Ghauri, Dr Kjell Gronhaug, FT Prentice Hall
Reference Books	1. Business Research Methods, William G. Zikmund, Barry J. Babin, Jon C. Carr, Mitch Griffin, Cengage Learning 2. Approaches to social research, Royce Singleton, Bruce C. Straits, Margaret Miller Straits, Oxford University Press