MASTER OF COMPUTER APPLICATIONS

(AICTE Approved Two Year Programme)

CURRICULUM FRAMEWORK AND SYLLABI

(Under Choice Based Credit System- Outcome Based Education)

**(For the students joining in the
Academic year 2024–2025 and afterwards)**

**DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS
THE GANDHIGRAM RURAL INSTITUTE
(Deemed to be University)
Gandhigram - 624 302
Dindigul District
Tamil Nadu**

THE GANDHIGRAM RURAL INSTITUTE
(Deemed to be University)
DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

MASTER OF COMPUTER APPLICATIONS
(Under Choice Based Credit System- Outcome Based Education)

<u>Vision</u>

To provide quality-assured academic, research and extension services in the domain of Computer Science and Applications, to promote dissemination of knowledge in Information and Communication Technologies for Rural Development.

<u>Mission</u>

Empower the rural youth by transforming them into proficient and socially responsible computer professionals and cater them to the envisaged demand in the operational and functional domains of the industries and service sectors.

<u>Graduate Attribute</u>

The graduates of our institute are expected to possess the following attributes.

1. *Informed*

   The graduates of GRI are well-informed and are able to retrieve, analyse and assimilate complex information. They understand the local and global issues and are able to apply their knowledge. They are able to work in tandem with the rural community.

2. *Problem solver*

   The graduates of GRI have the ability to work on development issues. They are capable of being creative, logical and critical thinking which in turn help them to respond to challenges and opportunities effectively. They are also capable of making and implementing decisions.

3. *Active learners and critical thinkers*

   Graduates of this university are active learners and are capable of critically analyzing issues. They are capable of under taking critical enquiry and reflection, find and evaluate information using a variety of sources and technologies. They do possess the attitude of acknowledging the works and ideas of others.

4. *Effective communication*

   The graduates have good communication skills and are capable of articulating their ideas effectively. They can negotiate and engage with people in varied settings.

5. *Rural Minded*

   The graduates of GRI are well-informed and are able to retrieve, analyze and assimilate complex information. They understand the local and global issues and are able to apply their knowledge. They are able to work in tandem with the rural community.

The Gandhigram Rural Institute
(Deemed to be University)
Gandhigram – 624 302

DEPARTMENT OF COMPUTER SCIENCE ANDAPPLICATIONS

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PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1: To prepare the graduates with strong technical competence to progress in their career as a computing professional.

PEO 2: To create an academic environment to gain strong knowledge in technical and programming fundamentals to pursue higher studies.

PEO 3: To enable the students to become entrepreneurs in Information Technology (IT) enabled ventures.

PEO 4: To prepare the students to continue the process of lifelong learning through professional activities that contributes to personal and social development.

PEO 5: To train the students to apply current tools and technologies to develop software solutions for social needs.

PEO 6: To imbibe strong human, professional and ethical values to become a socially responsible citizen.

PROGRAMME OUTCOME (PO)

PO 1: Become proficient in the subject of Computer Science and apply the principles of the same to the needs of the Employer/Institution/Enterprise/ Society.

PO 2: Gain Analytical skills in the field/ area of Computer Science and Applications.

PO 3: Apply modern Hardware and Software tools in the development of innovative software solutions.

PO 4: Practice professional ethics, community living and Nation Building initiatives.

PO 5: Disseminate the knowledge in Information and Communication Technologies for Rural Development.

PO 6: Develop skills to communicate effectively among the IT community.

PO 7: Kindle interests to critically review, analyse and develop solutions through active research.

PO 8: Execute the imbibed skills to become a successful entrepreneur.

PROGRAMME SPECIFIC OUTCOME(PSO)

PSO 1: Apply the knowledge of Computer Science in the domain of Academic / Industry/ Institutions/ Society.

PSO 2: Solve the complex problems in the field of Computer Science with an understanding of the societal, legal, cultural impacts of the solution.

PSO 3: Lay foundation to apply the knowledge to become active researcher in the field of the Computer Science.

PSO 4: Create solutions for integrated rural development through Information and Communication Technologies.

PSO 5: Empower with self-sustainable rewarding career opportunities in IT and IT enabled service sectors.

Mapping of PEOs with PSOs & POs:

PEO/PO/ PSO	PO								PSO				
	1	2	3	4	5	6	7	8	1	2	3	4	5
PEO1	3	3	3	1	3	2	3	2	3	3	3	3	3
PEO2	3	3	3	1	3	1	3	-	3	3	3	2	1
PEO3	3	3	3	2	2	3	3	3	3	3	-	3	2
PEO4	3	3	3	2	3	2	3	1	3	3	3	2	2
PEO5	3	3	3	2	3	2	3	2	3	3	3	3	3
PEO6	-	-	-	3	1	1	-	2	-	1	-	-	3

Strongly Correlating (S)　　　- 3 marks

Moderately Correlating (M)　　- 2 marks

Weakly Correlating (W)　　　- 1 mark

No Correlation (N)　　　　　- 0 mark

CO & PO Attainment Rubrics

Direct Assessment:

i)　　CFA & ESE　　　　　　　- 30 %

ii)　　Assignment/Reports/Case Study　　- 40%

Indirect Assessment:

i)　　Exit Survey　　　　　　　-30 %

THE GANDHIGRAM RURAL INSTITUTE (DEEMED TO BE UNIVERSITY)
Ministry of Education (Shiksha Mantralaya), Govt. of India
Accredited by NAAC with A Grade (3rd Cycle)
DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

MASTER OF COMPUTER APPLICATIONS
(AICTE APPROVED TWO YEAR PROGRAMME)
(Under Choice Based Credit System-Outcome Based Education)

CURRICULUM FRAME WORK AND SYLLABI
(For the students joining in 2024-2025andafterwards)

Course Code	Title of the Course	Credits	Hours		Max. Marks		
			Theory	Practical	CFA	ESE	Total
SEMESTER I							
24MCAP0101	**Core I:** Advanced Algorithms	4	4	-	40	60	100
24MCAP0102	**Core II:** Advanced Java Programming	4	4	-	40	60	100
24MCAP0103	**Core III:** Accounting for Decision Making	4	4	-	40	60	100
24MCAP0104	**Core IV:** Maths I: Mathematical Foundation for Computer Science	4	4	-	40	60	100
24MCAP0105	**Core V:** Machine Learning Using Python	4	4		40	60	100
24MCAP0106	**Lab I:** Machine Learning using Python	1	-	3	60	40	100
24MCAP0107	**Lab II:** Advanced Java & Algorithms	1	-	3	60	40	100
24GTPP0001	Gandhi in Everyday Life	2	2	-	50	-	50
	Total	**24**	**22**	**6**			
SEMESTER II							
24MCAP0208	**Core VI:** Advanced Database Management Systems	4	4	-	40	60	100
24MCAP0209	**Core VII:** Deep Learning for Computer Vision	4	4	-	40	60	100
24MCAP0210	**Core VIII:** Internet of Things and Robotics	4	4	-	40	60	100
24MCAP0211	**Core IX:** Advanced Computer Networks	4	4	-	40	60	100
24MCAP0212	**Lab III:** IoT and Robotics	1	-	3	60	40	100
24MCAP0213	**Lab IV:** Advanced DBMS	1	-	3	60	40	100
24MCAP02DX	**Generic Elective**	3	3	-	40	60	100
24MCAP02MX	**Modular Course - I**	2	2	-	50	-	50
24ENGP00XX	Communication Skills for Computer Technocrats	2	2	-	50	-	50
	Total	**25**	**23**	**6**			

Course Code	Title of the Course	Credits	Hours		Max. Marks		
			Theory	Practical	CFA	ESE	Total
SEMESTER III							
24MCAP0314	**Core X:** Advanced Web Programming	4	4	-	40	60	100
24MCAP0315	**Core XI:** Maths II: Optimization Techniques	4	4	-	40	60	100
24MCAP0316	**Core XII:** Compiler Design	4	4	-	40	60	100
24MCAP0317	**Core XIII:** Bigdata Analytics and R Programming	4	4	-	40	60	100
24MCAP03DX	**Discipline Centric Elective - I**	3	3	-	40	60	100
24MCAP03DY	**Discipline Centric Elective - II**	3	3	-	40	60	100
24MCAP03MX	**Modular Course -II**	2	2	-	50	-	50
24MCAP0318	**Lab V:** Advanced Web Programming	1	-	3	60	40	100
24MCAP0319	**Mini Project:** Apps for Rural Development	1	-	1	50	-	100
24EXNP03V1	Village Placement Programme	2	-	-	50	-	50
	Total	**28**	**24**	**4**			
SEMESTERIV							
24MCAP0420	Dissertation	16	-	-	75	75+50	200
	Total	**16**					
	Total Credits I to IV Semester	**93**					

CFA–Continuous Formative Assessment (Internal Evaluation)

ESE – End Semester Examination (External Evaluation)

**Evaluatedfor200marksasbelow:

75 marks for the valuation of the Dissertation by the Internal Examiner

75 marks for the valuation of the Dissertation by the External Examiner

50 marks for the Viva-Voce jointly by the Internal and External Examiners

Generic Elective: (24MCAP02DX)

24MCAP02E1	Bio-Inspired Computing
24MCAP02E2	Marketing Analytics
24MCAP02E3	Soft Computing

Discipline-Centric Elective-I:(24MCAP03DX)

24MCAP03E1	Natural Language Processing
24MCAP03E2	Organizational Behaviour
24MCAP03E3	Design Thinking

Discipline-Centric Elective-II:(24MCAP03DY)

24MCAP03E4	Virtual and Augmented Reality
24MCAP03E5	Essentials of Data Science
24MCAP03E6	Drone Technology

List of Modular Course

Modular Course: I (24MCAP02MX)

24MCAP02M1	Large Language Model
24MCAP02M2	Wireless Ad-hoc Networks
24MCAP02M3	Web Services

Modular Course: II (24MCAP03MX)

24MCAP03	M1BlockChainTechnology
24MCAP03	M2Professional Ethics
24MCAP03	M3Network Security

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DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

Audit Courses for MCA in MOOC/Spoken Tutorials

based on the availability

S. No.	Name of the Course	Semester
1.	Advanced CPP	I
2.	Introduction to Internet of Things	I
3.	R	II
4.	Introduction to Machine Learning	II
5.	Scilab	III
6.	Python for Data Science	III
7.	PH & MySQL	IV
8.	Big Data Computing	IV

Course Code & Title	24MCAP0101 CORE I: Advanced Algorithms Credits:4		
Class	MCA	Semester	I
Course Objectives	**The Course aims to** • Demonstrate the procedures for analyzing and comparing the performance of different algorithms. • Impart an overview of Algorithms and their applications • Describe the basic algorithm design strategies. • Prepare the students to write effective algorithms for solving a given problem.		
Cognitive Levels	**K-1** Describe the fundamental strategies of algorithm design **K-2** Apply the appropriate algorithm strategy for finding efficient solution to a given problem **K-3** Analyse and compare the performance of different algorithms.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction** Definition – Algorithm Specification –Recursive Algorithms - Performance Analysis – Space Complexity – Time Complexity – Asymptotic Notations. Graphs – Introduction – Definitions – Graph Representations	13
II	**Greedy Method** General Method-Binary Search – Merge Sort, Quick Sort. The Greedy Method: General Method -Knapsack Problem, Minimum Cost Spanning Trees: Prim's Algorithm - Kruskal's Algorithm - Single Source Shortest Paths	13
III	**Dynamic Programming** The General Method – Multistage Graphs – All Pairs Shortest Paths – Optimal Binary Search Trees –Travelling Salesman Problem.	13
IV	**Backtracking** The General Method – The 8 Queens Problem – Sum of Subsets -Graph Coloring -Hamiltonian Cycles.	12
V	**Randomized Algorithms** Randomized Algorithms: Introduction- Classification of Randomized Algorithms - Randomized Quick Sort – Karger's Miinium Cut Algorithm	13
Total Contact Hours		**64**

Text Books
1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni & Sanguthe var Rajasekaran, 2nd Edition, University Press, 2017.
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 2nd Edition, Prentice Hall of India Pvt Ltd, 2006

References
1. Data Structures and Algorithms in Python, The Complete Beginners Guide, DS Publishing, 2019.
2. Dr. Basant Agarwal, Hands-On Data Structures and Algorithms with Python, Second Edition, 2018.
3. Design and Analysis of Algorithms, Prabhakar Gupta, Vineet Agarwal, Manish Varshney, Phi learning Pvt. Ltd, New Delhi, 2012.
4. Algorithm and Data Structures, Levitin, Anany, 2nd Edition, Pearson Publication, Delhi, 2013.
5. Algorithms and Data Structures, M. M. Raghuwanshi, Narosha Publishing House, 2016.

E-Reference
> https://www.tutorialspoint.com/data_structures_algorithms/index.htmlhttps://onlinecourses.nptel.ac.in/noc20_cs70/preview

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Analyze the time and space complexity of given Algorithms. **CO2:** Apply Divide & Conquer and Greedy strategies in solving problems. **CO3:** Illustrate and apply the Dynamic Programming technique to solve the problems. **CO4:** Demonstrate the principle of Backtracking and its applications in solving typical problems like 8-Queens problem and Sum of Subsets problem. **CO5:** Analyse the application of randomized algorithms for solving problems.

Mapping of COs with PSOs:

COVs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	3
CO2	3	3	1	2	3
CO3	3	3	1	1	3
CO4	3	3	1	1	3
CO5	3	3	1	2	3

Course Code & Title	**24MCAP0102** **CORE II: ADVANCED JAVA PROGRAMMING** **Credits:4**		
Class	**MCA**	**Semester**	**I**
Course Objectives	**The Course aims to** • To make learners a good Java programmer for developing advanced applications • To import skills and knowledge to create and run Java programs for solving real time problems		
Cognitive Levels	**K1:** Remember the basic concepts of Java Programming **K2:** Illustrate the Event-Handling Modules with Swing Component. **K3:** Apply the various Swing-2 GUI Components. **K4:** Analyze the JDBC Connectivity. **K5:** Evaluate the Working model using JSP and Servlet.		

UNIT	CONTENTS	Lecture Schedule
I	**Basics** **Basics:** Introduction, Literals, Data types, Variables, Operator, Control Statements, Arrays, Class and Objects, Inheritance, Exception Handling.	12
II	**EventHandling-Swing-1(Graphics)** **Event Handling:** Model, Event, Event Listeners, Registering Listener with Source, Example programs, Adapter Classes. **Swing-1(Graphics):** JComponent, JFrame	13
III	**GUI Components** **Swing-2 (GUI Components):** Jbutton, JLabel, JToggleButton, JCheckBox, JRadioButton, JList, JScrollBar, JTextField, JPasswordField, JTextArea, JComboBox, JMenuItem, JMenu, JMenuBar, Jdialog, JProgressBar, LayoutManager.	13
IV	**JDBC** **JDBC:** Introduction, Driver Manager, Connection Interface, Statement Interface, Prepared Statement Interface, Callable Statement Interface, Result Set Interface.	12
V	**Servlet** **Servlet:** Introduction, HTML, Interface Servlet, Http Servlet Class, Servlet Programs, Servlet with I/O Files, Servlet with JDBC, Session Handling, Session Tracking. **JSP:** Introduction, JSP Working Model, Syntax of a JSP Page with Sample Programs.	14
Total Contact Hours		**64**

Text Book:
1. Advanced Programming in Java2, K.Somasundaram, Jaico publishing Company Limited, New Delhi, 2008.

References:
1. Herbert Schildt, Java2-The complete reference, 7th Edition Mc Grawill, 2018.
2. Naughton and Herbert Schildt, Java The complete reference, 7th Edition McGraw Hill, 2007.
3. Jim Keogh, The Complete Reference J2EE, Tata McGraw Hill Edition, New Delhi, 2002.
4. Marty Hall, and Larry Brown, CORE Servlets and Java Server Pages, 2nd Edition, Pearson Education, 2004.

E-References
1. Advanced Programming in Java 2, https://www.researchgate.net/publication/315894230_Advanced_Programming_in_Java2
2. JDBC, Java Database Connectivity, K. Somasundaram, Jaico Publishing House, Mumbai, India, First Edition, 2013. JDBC Connectivity in Java JDK16, June 2021, DOI: 10.13140/RG.2.2.19415.60325.
3. https://www.researchgate.net/publication/352172393_JDBC_Connectivity_in_Java_JDK16
4. Installing Eclipse 2019-12- R and Tomcat 9.0 and Develop a Servlet, June 2021, DOI: 10.13140/RG.2.2.12123.08487
   https://www.researchgate.net/publication/352785295_Installing_Eclipse_2019-12-R_and_Tomcat_90_and_Develop_a_Servlet\
5. JSP, Java Server Pages, In book: Server Side Programming Chapter: Chapter 25, K.Somasundaram, 2012, DOI: 10.13140/2.1.1715.9365

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Interactive applications by capturing events activities
	CO2: GUI oriented applications by using several graphical components
	CO3: Database connectivity and handling
	CO4: Server-side programming
	CO5: Web applications in a client-server architecture

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	2	2
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Code & Title	24MCAP0103 CORE III: Accounting for Decision Making Credits:4		
Class	MCA	Semester	I
The syllabus will be provided by the respective department			

Course Code & Title	24MCAP0104 CORE IV: Maths I: Mathematical Foundation for Computer Science Credits:4		
Class	MCA	Semester	I
The syllabus will be provided by the respective department			

Course Code & Title	24MCAP0105 CORE V: Machine Learning using Python		
			Credits:4
Class	MCA	Semester	I
Course Objectives	**The Course aims to** • To impart knowledge on core concepts and techniques of machine learning. • To impart a skill on data representation, processing and inference. • To have a thorough understanding of the regression and classification • To familiar with a set of well-known machine learning algorithms • To develop the skills in using recent machine learning software for solving practical problems		
Cognitive Levels	**K1:** Remembering the mathematical concepts of machine learning approaches. **K2:** Understand the fundamentals of linear algebra and probability theory to the machine learning problems. **K3:** Apply the concepts of regression analysis and vector calculus to the machine learning models. **K4:** Analyze the role of dimensionality reduction and density estimation for machine learning problems **K5:** Evaluate and test the significance of machine learning results statistically.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to Machine Learning using Python** Introduction to analytics and machine learning– Framework for developing ML models- Python stack for data science - Introduction to python. Descriptive Analytics: Working with Data Frames in python - Handling missing values - Exploration of data using visualization.	13
II	**Linear Regression** Simple Linear Regression-steps in building a regression model- Building simple linear regression model-model diagnostics- multiple linear regression.	10
III	**Classification Problems** Classification overview- Binary logistic regression- credit classification-classification tree-decision tree learning- Benefits of decision tree.	13
IV	**Advanced Machine Learning** Introduction - Gradient Descent algorithm- Scikit-learn library for ML- applying regularization - advanced machine learning algorithms - dealing with Imbalanced datasets - Logistic regression model-Support Vector Machine(SVM)-K-nearest neighbours- Ensemble methods -Random Forest– Boosting.	16

	Recommender Systems	
V	Introduction - datasets -Association Rules - collaborative filtering - user-based similarity - item-based similarity - using Surprise library.	12
	Total Contact Hours	**64**

Text book:
1. "Machine Learning with Python", U Dinesh Kumar, Manaranjan Pradhan, Wiley, 2020.

References:
1. "Machine Learning", Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson Education, 2018.
2. "Advanced Machine Learning with Python: Solve data science problems with state-of-the-art machine learning models", John Hearty, 2nd Edition, Packt Publishing, 2023.
3. "Pattern Recognition and Machine Learning", C. M. Bishop, 2nded, springer, 2011.
4. "Hands-On Machine Learning with Scikit-Learn, Keras, and Tensorflow", Aurélien Géron, O' reilly Media, 2019.
5. "Machine Learning Engineering", Andriy Burkov, 2020.

E-resources:
1. http://nptel.ac.in/
2. https://www.pdfdrive.net/machine-learning-d31767902.html
3. https://ggnindia.dronacharya.info/Downloads/Sub-info/Related Book/4thSem/Fundamentals-of-AIML-text-book-4.pdf

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Understand the distribution and diversity of Data.
	CO2: Extract features useful for building predictive models.
	CO3: Understand the important learning algorithms pertaining to classification and regression.
	CO4: Design efficient algorithms with trained models, Contact experiments, and deliver ML-based applications.
	CO5: Understand the performance evaluation of learning algorithms and model selection.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	1	3
CO2	3	2	2	1	2
CO3	3	3	2	1	2
CO4	2	3	2	2	3
CO5	3	2	3	1	3

Course Code & Title	24MCAP0106 LAB I: Machine Learning using Python		
			Credit:1
Class	MCA	Semester	I
Course Objectives	The Course aims to • Understandtheusageof.csv/.xlsx files for organizing data in the form of datasets. • Introduce basic machine learning techniques. • Design and analyze the performance of various machine learning algorithms. • Identify suitable machine learning algorithms for solving real world problems.		
Cognitive Levels	K1- K5		

UNIT	CONTENTS	Lecture Schedule
1.	Familiarizing with Anaconda Jupyter/ Google Colab for importing modules and dependencies for ML.	
2.	Basic exercises on Python Machine Learning Packages such as Numpy and Pandas.	
3.	Demon strate various data preprocessing techniques like Handling missing values, Anomaly Detection.	
4.	Demonstrate various Data Visualization Techniques using matplotlib.	
5.	Implement covariance and correlation of attributes for a given dataset.	64
6.	Implement Simple and Multiple Linear Regression Models	
7.	Develop Logistic Regression Model for a given dataset.	
8.	Develop Decision Tree Classification model for a given dataset to solve real-world problems.	
9.	Build KNN and Naïve Bayes classification using python for a given dataset and identify correct and wrong predictions.	
10.	Implement Random Forest ensemble method on a given dataset.	
11.	Build Recommendation System for real-world datasets.	
Total Contact Hours		**64**

Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Generate .csv files for organizing data in the form of datasets. **CO2:** Implement and compare the performance metrics of various machine learning algorithms. **CO3:** Apply suitable data sets to the Machine Learning algorithms. **CO4:** Outline predictions using machine learning algorithms. **CO5:** Select appropriate algorithms for solving a of real-world problems.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	1	3
CO2	3	2	2	1	2
CO3	3	3	2	1	2
CO4	2	3	2	2	3
CO5	3	2	3	1	3

Course Code & Title	24MCAP0107 LAB II : Advanced Java & Algorithms		
			Credit:1
Class	MCA	Semester	I
Course Objectives	**The Course aims to** • This course aims to train the students for developing Java programs for advanced concepts such as GUI based applications, database handling, server-side programming and client-server applications.		
Cognitive Levels	K1- K5		

Unit	Content	Lecture Schedule
1.	**Sample Programs** 1. Using Control Structure 2. Creating Class and Objects 3. Using Constructors 4. Using Inheritance 5. Using Exception Handling	10
2.	**Event Handling & Swing-1(+Graphics)** 6. Create applet with default Panelin Japplet 7. Create Appleton JFrame 8. Applet with data 9. Draw, line, rectangle, filled rectangle 10. Drawoval, arc, polygon, polyline 11. Eventhandling-ouse Event, KeyEvent, ActionEvent, WindowEvent 12. Swing with JFrame 13. JButton, JText, JTextfield (onJApplet and JFrame)	10
3.	**Swing-2** 14. JLabel, JCheckBox, JRadio Button and using them 15. JList and using it 16. JScrollBar, JScrollPane, 17. TexField, JPassword, JText Area 18. JCombo Box, JMenuItem, JMenu, JMenuBar 19. JDialog, JOptionPane, JFileChooser, JProgressBar 20. BorderLayout, FlowLayout, GridLayout, CardLayout	10
4.	**JDBC** 21. Configuring ODBC in the system 22. Creating connection and identifying Drivers 23. Creating and using a database 24. Use of Statement interface and database 25. Use of Prepared Statement and database 26. Use of Callable Statement and database 27. Use of Result Set interface and database	9

5.	**Servlet**	9
	28. Simple Servlet 29. Servlet-HTML form with GET and Servlet with do Get() method 30. Servlet-HTML form with POST and Servlet with do Post() method 31. Servlet with do Get() and do Post() methods 32. Servlet receiving numbers and processing and sending the result (Factorial, Sum of numbers) 33. Servlet with JDBC 34. Creating cookies and reading them **JSP** 35. Creating HTML with various formats, superscript, subscript 36. HTML with Tables, images, link tootherpage 37. HTML with different forms-input, button, select, text area 38. Creating a simple JSP with welcome note 39. JSP with page directive 40. JSP with Scriptlet-finding factorial, JSP with expression 41. JSP with declaration 42. JSP with implicit object 43. JSP with action element-Java beans	
6.	**Advanced Algorithms** 1. Knapsack Problem. 2. Prim's Algorithms. 3. Multistage Graph. 4. All pairs shortest path. 5. 8Queensproblem 6. Sum of subsets 7. Hamiltonian cycle. 8. Randomized Algorithm (Quick select).	
Total Contact Hours		**48**

Course Outcomes	On completion of the course, students should be able to
	CO1: Develop programs using delegation vent models
	CO2: Design GUI based applications
	CO3: Develop application using packages and store the data in the database.
	CO4: Demonstrate server-side programming
	CO5: Design client-server based applications for all real-time problems.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	2	2
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Code & Title	**24GTPP0001**		
	Gandhi in Everyday Life		**Credits:2**
Class	**MCA**	**Semester**	**I**
The Syllabus will be provided by the respective department			

Course Code & Title	24MCAP0208 CORE VI: Advanced Database Management Systems Credits:4		
Class	M.C.A	Semester	II
Course Objectives	The Course aims to • Explore the emerging database management systems and their architecture and applications • Provide an overview of NoSQL, its features, characteristics, paradigms and challenges • Illustrate the usage of MongoDB for real time applications.		
Cognitive Levels	**K1:** Describe the architectures of the emerging database systems **K2:** Understand the characteristics and applications of different data models **K3:** Choose the data models for real time applications. **K4:** Analyze the NoSQL storage types and MangoDB **K5:** Review the techniques used to criticize and improve the database design.		

UNIT	CONTENTS	Lecture Schedule
I	**Advanced Database Techniques and System Architecture** Concept of Advanced Database Techniques, Impact of Emerging Database Standards. Database System Architecture: Overview – Centralized Database Systems Architectures – Server System Architectures - Parallel Systems – Distributed Systems–Transaction Processing in Parallel and Distributed Systems–Cloud-Based Services.	11
II	**Emerging Database Models, Technologies and Applications** Emerging database Models, technologies and Applications –Object-Based Databases – NoSQL databases – Distributed databases – Parallel databases – Cloud databases – Multimedia databases – Personal databases – Operational databases – Enterprise databases – End User databases – Commercial databases – Graph databases – Open source databases–OLTP databases–Document databases– Blockchain Databases.	13
III	**Overview of NoSQL** An Overview of NoSQL database–Defining NoSQL– What NoSQL is and what it is not–List of NoSQL Databases–Characteristics of NoSQL–RDBMS approach– Challenges –NoSQL approach.	12

	NoSQL Storage Types and Comparative Study	
IV	NoSQL Storage Types –Storage types –Column- oriented databases –Document store – Key value store –Multi storage type databases –Advantages and Drawbacks – Transactional application – Computational application – Web-scale application. Comparative Study of NoSQL Products–Technical comparison–Nontechnical comparison.	14
	Working with Mongo DB	
V	Working with Mongo DB: Create Database – Create Collection – Insert Document – Find Data – Update Document – Query Operators – Update Operators – Aggregations–Indexing/Search–Validation–Data API–Drivers–Charts	14
	Total Contact Hours	**64**

Text Books:

1. Avi Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, 7th Edition, 2019
2. Ramez Elmasri and Shamkant B.Navathe, Fundamental of Database Systems, Seventh Edition, Pearson Publication, 2018.
3. Gaurav Vaish, "Getting Started with NoSQL", Packt Publishing Ltd., 2013.

References:

1. Dan Sullivan, NoSQL for Mear Mortals, Pearson Publishing India Ltd., 2016.
2. Lee Chao, Database Development and Management, AuerbachPublications,2010.
3. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Education, 2013.
4. Luc Perkins, Eric Redmond, et al. Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement, 1st Edition, O'Reilley Publishers, 2018.
5. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 6th Edition, McGraw Hill International Edition, 2011.
6. Wilfried Lemahieu, Seppe vanden Broucke, Bart Baesens, :Principles of Database Management: Practical Guide to Storing, Managing and Analyzing Big and Small Data, Cambridge University press (1st Ed), 2018.
7. Martin Kleppmann : Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems (1st Ed), O'Reilly 2017.
8. Paul Done, Practical MongoDB Aggregations: The official guide to developing optimal aggregation pipelines with MongoDB 7.0, Packt Publishers, 2023

E-Resource:
1. www.w3schools.com
2. https://www.geeksforgeeks.org/introduction-to-nosql/
3. https://www.javatpoint.com/nosql-databases
4. https://www.mongodb.com/docs/manual/tutorial/

Course Outcomes	On completion of the course, students will be able to
	CO1: Revise the architectures of the emerging database systems
	CO2: Examine the types of database models, their technologies and its applications.
	CO3: Understand the concept of NoSQL databases, its features and characteristics.
	CO4: Analyze the NoSQL storage types and techniques to criticize and improve the database design.
	CO5: Have a practical experience to master the MongoDB.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	3	3	3	2	3
CO3	3	3	2	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Code &Title	24MCAP0209 CORE VII: Deep Learning for Computer Vision Credits:4		
Class	MCA	Semester	II
Course Objectives	The Course aims to • To acquire knowledge on the basics of neural networks. • To impart skills on problem formulation over deep learning frameworks • To train on how to fine tune hyper parameters of Deep Learning algorithms. • To study the fundamental concepts of computer vision in deep learning perspective. • To explore various deep learning architectures and transfer learning. • To impart concepts that help identify suitable applications for Generative Adversarial Networks		
Cognitive Levels	**K1:** Remembering the basic mathematical concepts **K2:** Understand the mathematics behind functioning of artificial neural networks **K3:** Apply the mathematics to deep learning models. **K4:** Analyze the given data set for designing a neural network based solution **K5:** Evaluating the Design and Implementation of deep learning models for signal/image processing applications.		

UNIT	CONTENTS	Lecture Schedule
I	**Deep Learning** Understanding Deep Learning and its application: Introduction to Deep Learning (DL) – DL Applications in various domains - Supervised and unsupervised learning - Multi-layer Perceptrons – Back propagation- Artificial Neural Networks - Activation function - Gradient Descent - Model training – over fitting - model deployment.	16
II	**Convolutional Neural Networks** Convolutional Neural Networks(CNN): Introduction to Deep Supervised Learning - Convolution & Pooling – Kernels – Dropout – LeNet – AlexNet – ZFNet – VGGNet– GoogleNet –ResNet -DenseNet and other State-of-the-art CNNs.	12
III	**Transfer Learning** Transfer Learning: Transfer Learning Scenarios - Applications of Transfer Learning– Transfer Learning Methods - Fine Tuning and Data Augmentation.	11

	CNN for Computer Vision	
IV	CNN for Computer Vision: Image Classification and Localization - Object Detection: R-CNN, F- RCN, YOLO-Semantic Segmentation-Instance Segmentation.	13
	Deep Generative Models	
V	Introduction - Understanding Generative Adversarial Networks - Applications: Image Editing, In painting, Super Resolution, 3D Object Generation, Security - Variants: Cycle GANs, Progressive GANs, Stack GANs, Pix2Pix.	12
Total Contact Hours		**64**

Text Book:
1. "Deep Learning", IanGoodfellow, Yoshua Bengio and Aaron Courville, MIT Press, 2016.
2. "Deep Learning for Computer Vision - Image Classification, Object Detection and Face Recognition in Python", Jason Brownlee, 2019.
3. "Deep Learning for Computer Vision with Python", Dr.Adrian Rose brock, PyImage Search, 2017.

References:
1. "Fundamentals of deep learning", Nikhil Buduma, O'Reilly Media, 2017.
2. "Deep Learning for Computer Vision: Expert techniques to train advanced neural networks using TensorFlow and Keras", Rajalingappaa Shanmugamani, PacktPublisher, 2018.

E-resources:
1. http://nptel.ac.in/
2. https://github.com/tallamjr/iit-madras-DLCV
3. https://www.pdfdrive.com/search?q=deep+learning+for+computer+vision&page count=&pubyear=&searchin=&em=

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Learn the fundamental principles of deep learning.
	CO2: Explore the essentials of Deep Learning and Deep Neural Network architectures.
	CO3: Evaluate the fundamentals of computer vision using deep learning.
	CO4: Choose appropriate Deep Learning algorithm with appropriate hyper parameter setting to solve the problem.
	CO5: Implement deep learning algorithms to solve real-world problems.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	3	2	3
CO2	3	3	3	3	2
CO3	2	2	3	3	3
CO4	3	3	3	1	2
CO5	2	3	3	3	3

Course Code &Title	24MCAP0210 CORE VIII: Internet of Things and Robotics		
			Credits:4
Class	MCA	Semester	II
Course Objectives	The Course aims to • To import skills and knowledge on internet of things for solving real time problems • To create robots for local and internet based environments • To make learners a good AI system developer		
Cognitive Levels	**K1** - Define the Architecture and applications of IOT System. **K2** - Summarize the basics of Electronics and Microcontrollers. **K3** - Develop the IDE with Arduino **K4** - Analyze the Implementation of Raspberry PI **K5** – Evaluate the application of the IoT and robotics		

UNIT	CONTENTS	Lecture Schedule
I	**Fundamentals** IoT - Building Blocks of an IoT System -Architecture of IoT – Applications of IoT - IoT protocols (MQTT, UDP, MQTT brokers, publish subscribe modes, HTTP, COAP,AMQP, XMPP)- Wireless technologies (LoWPAN, Zigbee, WIFI, BT, BLE, SIG, NFC, LORA, Lifi, Widi)- Challenges (Privacy and Security) in IoT, IoT Levels	14
II	**Design** Design Methodology - Basics of Electronics - Embedded computing logic - Microcontrollers and its Key features-OS for Microcontrollers, System on Chips, Architecture of Arduino and Raspberry PI Micro Controller	13
III	**Building with Arduino** Arduino Uno - Setup the IDE - Arduino Libraries - Basics of Embedded C programming for Arduino - Interfacing Arduino with LED, LCD, push button and buzzer. - Overview of Sensors working-Analog and Digital Sensors - Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino - Interfacing of Actuators with Arduino-Interfacing of Relay Switch and Servo Motor with Arduino	13
IV	**Building with Raspberry PI** Raspberry PI – Installing OS in Raspberry PI- Installing Cisco PL-APP –Python programming basics and packages-Interfacing with LED, LCD, Button and Sensors	12
V	**Internet of Robotic Things (IoRT)** Robotics–Introduction, Major components, Types IoRT Concept and Technologies - Applications and Challenges – Case Study: Internet of Things and Robotics in Transforming Current-Day Healthcare Services.	12
	Total Contact Hours	64

References:

1. David Hanes, Gonzalo Salgueiro, Rob Barton, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Released June 2017, Publisher(s): Cisco Press, ISBN: 9780134307091
2. Jan Holller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand, David Boyle, ―From Machine-to-Machine to the Internet of Things -Introduction to a New Age of Intelligence‖, Second Edition, Publisher: Academic Press, November 2018, Paperback ISBN: 9780128144350, eBook ISBN: 9780128144367
3. Perry Lee, ―IoT and Edge Computing for Architects: Implementing edge and IoTsystems from sensors to clouds with communication systems, analytics, and security‖, 2nd Edition, Packt, 2018, ISBN-13: 978-1839214806, ISBN-10: 1839214805
4. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach‖, Universities Press, 2015
5. Fundamentals of Internet of Things, Sudhir Kumar, Taylor &Francies Group, CRC Press, First Edition, November 2021
6. Network Fundamentals, Mark A. Dye Rick McDonald Antoon W. Rufi, , CCNA Exploration Companion Guide, Cisco Press
7. Fundamentals of Electrical Circuits by Charles K.Alexander, Mattew N.O.Saidiku, Tata, McGraw Hill company.
8. Internet of things, Shriram K. Vasudevan, Abhishek S Nagarajan, RMD Sundaram, 2nd Edition, Wiley Publications

E-Resources:

1. https://www.embedded-robotics.com/robotics-for-beginners/
2. https://www.arduino.cc/en/guide/introduction
3. https://www.tutorialspoint.com/arduino/index.htm
4. https://projects.raspberrypi.org/en/projects/raspberry-pi-getting-startedhttps://www.hindawi.com/journals/jhe/2021/9999504/
5. https://www.analyticssteps.com/blogs/internet-robotic-things-robotics-iot

Course Outcomes	On completion of the course, students will be able to
	CO1: Understand the concepts of Internet of Things and robotics
	CO2: Explore the basics of electronics to work with IoT and Robots
	CO3: Develop programming skills on smart systems
	CO4: Design applications in different domain and be able to analyze their performance
	CO5: Implement applications on embedded platform

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Code & Title	21MCAP0211 CORE IX: Advanced Computer Networks		
			Credits:4
Class	MCA	Semester	II
Course Objectives	**The Course aims to** - Introduce the advance concepts in Computer Networks - Understand the principles in Protocol Layering - Explain the functionalities of the CORE TCP/IP Protocols - Learn the concepts in internet working		
Cognitive Levels	**K1:** Remember the functionality of layers **K2:** Understand the various protocols and their functionalities **K3:** Demonstrate the working of Mobile IP **K4:** Analyze network simulation tools **K5:** Evaluate the performance of various network protocols		

UNIT	CONTENTS	Lecture Schedule
I	**Protocol Layering** Introduction - Need for multiple protocols - Functionality of layers - Reference Models - Protocol Layering Principle - Applications Optimizations– Multiplexing and De-multiplexing	**12**
II	**IP and ICMP** Internet Protocol: IP Architecture – Principle – IP Datagram- Types of Service – Encapsulation – TTL – Options. ICMP: Error Reporting – Correcting – ICMP Format – Echo – Checksum – Error Reports – Route Change Request – Other Problems.	**14**
III	**UDP and TCP** UDP: UDP Protocol - Message format - Checksum - Pseudo Header - Encapsulation - Layering - Ports. TCP: Need for reliable service - Properties - Sliding window paradigm - Layering - Ports - Connections - TCP segment format - Options - Checksum - Acknowledgement - Retransmission - Response to congestion.	**14**
IV	**BGP and RIP** BGP: Scope of Routing update – Determining limit – Fundamental Idea – Autonomous System – Exterior Gateway Protocol – BGP – Characteristics – Functionality – Message Header – Update Messages – Path Attributes – Keep alive messages – Restrictions – Notifications.RIP: Static Vs Dynamic Interior Routes – RIP –Slow Conversion Problem – Solving – RIP Format – Fields – RIP for IPv6 – Disadvantages of using Hop count.	**12**

	Mobile and Simulation	
V	Mobility and Mobile IP: Mobility – Addressing – Routing – Change in Datagram format – Mobile IP Technology – Mobile IP4 addressing – Agent discovery – Registration – IPv6 Mobility support. Simulation Tool: ARP – IP forwarding – Spanning Tree – Connection Establishment in TCP–Packet Loss probability modeling.	**12**
	Total Contact Hours	**64**

References Book(s):
1. Douglas E. Comer, Internet working with TCP/IP Vol: 1 Sixth Edition, OReilly Publications.
2. Tetcos, NetSim Accelerate Network R&D Experimental Manual, 2017
3. William Stallings, "Wireless Communications and Networks", Pearson Education, 2010
4. J.Schiller, "Mobile Communications", Pearson Education, 2010.

Course Outcomes	On completion of the course, students will be able to **CO1:** Define the Advance concepts in Computer Networks **CO2:** Understand the Layering Principles. **CO3:** Describe the CORE protocols in TCP/IP architecture **CO4:** Evaluate the performance of the protocols **CO5:** Apply the concepts in a simple tool.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	1
CO2	3	3	2	2	1
CO3	3	2	2	2	1
CO4	2	2	2	3	2
CO5	1	2	2	3	3

Course Code & Title	24MCAP0212 Lab III: IoT & Robotics		
			Credits:1
Class	MCA	Semester	II
Course Objectives	The Course aims to • This course aims to train the students for developing their own intelligent and communication systems using sensors, internet, robots and advance computing techniques.		
Cognitive Levels	K1–K5		

Sl. No.	Contents	No. of Hours
1	**USING CISCO PACKET RACER** 1. Design a simple LAN topology using different network devices and configure static IP addresses for communication. Verify the connection using ping command. 2. Assign IP addresses dynamically to all the devices in the network using DHCP protocol 3. Design a network with different VLAN and establish communication between them. 4. Connect and Configure IoT devices in the LAN network and register the IoT service in the Server. 5. Design a smart home and access the home appliances through smart phone from remote place. 6. Blinking an LEDB link using Arduino (SBC) 7. Interface different sensors and actuator with SBC **Case Study:** Design a Fire Alarm System for a factory/Home	48
2	**USING TINKERCAD** 1. LEDRGB Simulation in Tinkercad 2. Push Button Simulation in Tinkercad 3. Servo Motor Simulation inTinkercad 4. Buzzer Simulation in Tinkercad	
3	**USINGREAL DEVICES** 1. LEDB linking using Raspberry PI/Arduino 2. Home Weather display using Raspberry PI 3. Design arobo car to follow the track.	

4	**SIMULATION:**	
	1. Cisco Packet Tracer	
	2. Tinkercad: https://www.tinkercad.com/https://www.javatpoint.com/arduino-simulator#:~:text=The%20Arduino%20simulator%20is%20a,the%20need%20for%20any%20hardware.	
	HANDS-ON:	
	1. Spark Funkit	
	3. Raspberry With Grove PIKit	
	Total Contact Hours	**48**

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Design a simple wireless communication models **CO2:** Build Raspberry PI/Arduino based programming models **CO3:** Develop simple comment based robots **CO4:** Demonstrate some real time internet of robotic systems **CO5:** Interface different sensors and actuators

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Code & Title	24MCAP0213 Lab IV: Advanced DBMS		
			Credit:1
Programme	MCA	Semester	II
Course Objectives	**The Course aims to** • Explore the creation and usage of NoSQL databases. • Performing simple and complex database operations using MongoDB.		
Cognitive Level	**K1–K5**		

Sl. No.	CONTENTS	No. of Hours
1. 2. 3. 4. 5. 6. 7. 8. 9. 10	Create Database Creation of Collection Insert/Find/Update/Delete Documents Using Query Operator and Aggregation Operations Implementing Indexing and Searching on Documents Performing Schema Validation Operations using Data API Working with Language Drivers Data Visualization using Charts Connecting Databases to Server-side Web Frameworks	48
Total Contact Hours		**48**
Course Outcomes	**On completion of the course, students will be able to** **CO1:** Design and create different types of databases **CO2:** Perform basic and complex operations **CO3:** Implementing validation, indexing and searching on databases **CO4:** Usage of language drivers in databases **CO5:** Designing and using databases for server-side frame works	

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	3	3	3	2	3
CO3	3	3	2	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Code & Title	24MCAP02DX Generic Elective		
			Credits:3
Class	MCA	Semester	II

Course Code & Title	24MCAP02M Modular Course-I		
			Credits:2
Class	MCA	Semester	II

Course Code & Title	24ENGP00XX Communication Skills for Computer Technocrats		
			Credits:2
Class	MCA	Semester	II
The syllabus will be provided by the respective department			

Course Code & Title	**24MCAP0314** **CORE X: Advanced Web Programming** **Credits:4**		
Class	**MCA**	**Semester**	**III**
Course Objectives	**The Course aims to** • Provide insight into the basics of the Web Programming • Design and implement dynamic web applications using XML, JSON Angular J S, NodeJS and MongoDB		
Cognitive Levels	**K1 -** Remember the Fundamentals of Web programming. **K2** - Explain the basic structure of XML and JSON. **K3** - Demonstrate use of various Angular JS controls. **K4** – Examine the different types of Modulus in Node JS **K5** – Evaluate the NoSQL Database Connectivity.		

UNIT	CONTENTS	Lecture Schedule
I	Web Programming Fundamentals–Origin of the Internet– WWW – Web Browser – TCP/IP Basics –Internet Protocols Web application framework: Introduction–Advantages– Types of Frontend and Backend frameworks. Web servers: Introduction – Types of servers – Apache HTTP Server – IIS (XAMPP – LAMPP) and Tomcat servers	12
II	XML: Introduction – XML Basics-Structuring Data– Document Type Definitions –XML Schema JSON: Introduction-Syntax-JSON vs XML-Data Types- Parse– Stringly-Objects– Arrays– Replacing XML with JSON	10
III	Angular JS: Introduction– Expression– Modules– Directives– Model–Data Binding–Controllers–Scopes– Filters–Services– HTTP– Tables– Select– SQL– DOM– Events– Forms– Validation	16
IV	Node JS: Introduction – Modulus – HTTP Modules – File System – URL Module – NPM – Events – Uploaded Modules – Email	14
V	NoSQL Database connectivity: Introduction to Open Sources NoSQL Databases–Connect NodeJS with NoSQL Database, – Operations on data (Insert, Find, Query, Sort, Delete, Update) using Node JS	12
Total Contact Hours		**64**

26

Text Books:
1. Steven A. Gabarro, Web Application Design and Implementation: Apache2, PHP5, MySQL, JavaScript, and Linux/UNIX, Wiley Publications, 2006.
2. Joshua Johanan, Talha Khan and Richard Zea, Web Developer's Reference Guide. Packet Publisher, 2016
3. Lindsay Basselt, Introduction to Java Script Object Notation: A To-the-Point Guide to JSON, 1st Edition, Kindle Edition, 2015.
4. Kozlowski, Pawel, "Mastering Web Application Development with Angular JS", Packet Publishing Ltd., 2013.
5. Ethan Brown, Web Development with Node and Express: Leveraging the Java Script Stack 2nd Edition, Oreilly Publication, 2019.
6. AzatMardenan, Practical Node.js, 2nd edition, A press, 2018.

References:

1. Deitel, Internet and World Wide Web - How to Program, Fourth Edition, Pearson Prentice Hall, 2009
2. Achyut S Godole & Atul Kahate, Web Technologies, TCP/IP Architecture and Java Programming, Second Edition, Tata Mc Graw Hill, 2010.
3. Jeffery C Jackson, Web Technologies–A Computer Science Perspective, Pearson Prentice Hall, 2009
4. Internet and World Wide Web–How to Program, Deitel, , Pearson Prentice Hall, 2011
5. Lee Chao, Database Development and Management, Auerbach Publications, 2010.
6. Ann Navarre, Chuck White, Mastering XML, BPB Publications, 2000.
7. Paul Done, Practical Mongo DB Aggregations: The official guide to developing optimal aggregation pipelines with MongoDB 7.0, Packt Publishers, 2023.

E-Resources:
- www.w3schools.com
- https://www.seu1.org/files/level6/IT230/Book/(web.tech%201st%20book)%20Web%20Technologies%20-%20A%20Computer%20Science%20Perspective.pdf
- https://www.pearson.ch/HigherEducation/Pearson/EAN/9780273764021/Internet-and-World-Wide-Web-How-to-Program
- https://download.e-bookshelf.de/download/0000/5864/10/L-G-0000586410-0002361771.pdf
- https://www.pdfdrive.com/atul-kahate-books.html
- https://books.google.co.in/books/about/Developing_Web_Applications_in_PHP_and_A.html?id=rb5VXDLjFOoC&redir_esc=y
- http://feedebook.blogspot.com/2016/11/developing-web-applications-in-php-and.html

Course Outcomes	On completion of the course, students should be able to
	CO1: Have experience on handling data with XML and JSON
	CO2: Generate dynamic content to webpages using AngularJS and NodeJS
	CO3: Develop online web applications with database connectivity using NodeJS and MongoDB
	CO4: Design and update webpages using AngularJS, NodeJS and NOSQL
	CO5: Have practical experience in working with Web servers and Web Application Framework

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	1	3
CO2	3	3	1	1	3
CO3	3	3	2	2	3
CO4	3	3	2	2	3
CO5	3	3	2	2	3

Course Code & Title	24MATP02A1 CORE XI: MATHS II: OPTIMIZATION TECHNIQUES Credits:4		
Class	**MCA**	**Semester**	**I**
The syllabus will be provided by the respective department			

Course Code & Title	24MCAP0316 CORE XII: Compiler Design		
			Credits:4
Class	MCA	Semester	III
Course Objectives	**The Course aims to** • Define the design and intrinsic functioning of compilers • Identify the purpose and functions of phases of the compiler • Describe the Contents and data structures for Symbol table with errors • Identify the Problems in code generation and register allocation and assignment • Explain the process of compilation of a source program with reference to common programming languages.		
Cognitive Levels	**K1:** Outline the phases of a compilers **K2:** Understand the role of each phase in the process of compilation **K3:** Implement single pass compiler **K4:** Analyze the different parsing techniques **K5:** Evaluate the process of Intermediate Code Generation		

Unit	Contents	Lecture Schedule
I	**Introduction to Compilers**	12
	Compilers -Analysis - Synthesis model of compilation - Analysis of the source program - The phases of a compiler - Cousins of the compiler - Compiler construction tools - Error handling.	
II	**Lexical Analyzer**	13
	Lexical analysis - Role of lexical analyzer - Tokens, Patterns and lexemes - Input buffering - Specification of tokens - Regular expressions - Recognition of tokens - Transition diagrams - Implementing a transition diagram - Finite Automata-Regular expression to NFA-Conversion of NFA to DFA	
III	**Syntax Analyzer**	13
	Syntax analysis - Role of parser - Context-free grammars - Derivations - Writing a grammar - Top Down parsing - Recursive descent parsing - Predictive parsers - Non-recursive predictive parsers - Construction of predictive parsing tables - Bottom up parsing - Handles - Shift reduce parser - Operator precedence parsing - LR parsers - Canonical collection of LR (0) items - Constructing SLR parsing tables.	
IV	**Intermediate Code Generation**	14
	Intermediate code generation - Intermediate languages - Graphical Representation - Three Address Code - Assignment statements - Boolean expressions - Flow of Control Statements - Case Statements	

V	**Code Optimization and Code Generation**	12
	An Organization for an Optimizing Compiler - the principle sources of optimization - Optimization of basic blocks -The use of Algebraic identities - Loops in flow graphs - Code generation-issues in the design of a code generator-The Target machine.	
	Total Contact Hours	**64**

Text Book:
1. Compilers: Principles, Techniques, and Tools, Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D. Ullman, Second Edition, Pearson Addison Wesley, 2007.

References:
2. Compiler Construction Principles and Practice – D.M.Dhamadhere, McMillan India Ltd., Madras, 1983.
3. Alfred V. Aho, Ravi Sethi and Jeffrey DU llman," Compilers, Principles, Techniques and Tools", Addison Wesley Longman (Singapore Pvt. Ltd.), 2011.
4. Alfred V. Aho, Jeffrey DU llman," Principles of CompilerDesign", Addison Wesley, 1988.
5. David Galles, "Modern Compiler Design", Pearson Education, 2008

Course Outcomes	**On completion of the course, students will be able to**
	CO1: Explain the fundamentals of a compiler.
	CO2: Discuss about the context-free grammars and various parsing techniques.
	CO3: Describe the lexical analyzer and syntax analyzer of Compiler.
	CO4: Explain about the types and sources of errors, from the compilers perspective.
	CO5: Criticize the procedures and principles involved in the machine Code generation.

Mapping COs with PSOs:

COVs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	3
CO2	3	3	1	2	3
CO3	3	3	1	1	3
CO4	3	3	1	1	3
CO5	3	3	1	2	3

Course Code & Title	24MCAP0317 CORE XIII: Big Data Analytics and R Programming Credits:4		
Class	MCA	Semester	III
Course Objectives	The Course aims to • Provide over view of approach facilitating data analytics on Big Data • Demonstrate the application of big data analytics technologies • Discuss about Big Data Tools and R Packages.		
Cognitive Levels	**K-1:** Describe the fundamental strategies of R programming. **K-2:** Choose the appropriate R data structure for data storage. **K-3:** Demonstrate how data is analysed and visualized using statistic functions.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to Bigdata** Data, classification of Digital Data--structured, unstructured, semi-structured data, characteristics of data, evaluation of bigdata, definition and challenges of bigdata, what is bigdata and why to use bigdata?, business Intelligence Vs. bigdata.	12
II	**Big data Analytics** What is and isn't big data analytics? Why hype around big data analytics? Classification of analytics, top challenges facing bigdata, importance of bigdata analytics, Technologies needed to meet challenges of bigdata.	13
III	**Introduction to R and getting started with R** What is R? Why R?, advantages of R over other programming languages, Data types in R logical, numeric, integer, character, double, complex, raw, ls() command, expressions, variables and functions, control structures, Array, Matrix, Vectors	13
IV	**Exploring Data in R** Data frames-data frame access, ordering data frames, R functions for data frames dim(), nrow(), ncol(), str(), summary(), names(), head(), tail(), edit() .Load data frames—reading from. CSV files, reading from tab Separated value files, reading from tables.	13
V	**Data Visualization using R** Reading and getting data into R (External Data): XML files, Web Data, JSON files, Databases, Excel files. Working with R Charts and Graphs: Histograms, Bar Charts, Line Graphs, Scatter plots, Pie Charts.	13
Total Contact Hours		**64**

Text Books:
1. Seema Acharya , Subhashini Chellappan --- Big Data And Analytics second edition, Wiley
2. Seema Acharya- -Data Analytics using R, McGraw Hill education (India) Private Limited.
3. Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning, Rajkamal, Preeti Saxena, McGraw Hill, 2018.
4. Big Data, Big Analytics: Emerging Business intelligence and Analytic trends for Today's Business, Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, John Wiley &Sons, 2013

References:
1. An Introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics. W.N. Venables, D.M. Smithand the R Development CORE Team.
2. https://www.tutorialspoint.com/big_data_analytics/index.htm
3. https://www.geeksforgeeks.org/what-is-big-data-analytics/

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Understand data and classification of digital data.
	CO2: Load data in to R.
	CO3: Organize data in the form of R objects and manipulate them as needed.
	CO4: Perform analytics using R programming.
	CO5: Visualize data using R.

Mapping COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	3
CO2	3	3	1	2	3
CO3	3	3	1	1	3
CO4	3	3	1	1	3
CO5	3	3	1	2	3

Course Code & Title	24MCAP03DX		
	DISCIPLINE CENTRIC ELECTIVE-I		
			Credits:3
Class	MCA	Semester	III

Course Code & Title	24MCAP03DY		
	DISCIPLINE CENTRIC ELECTIVE-II		
			Credits:3
Class	MCA	Semester	III

Course Code & Title	24MCAP03MX		
	MODULAR COURSE-II		
			Credits:2
Class	MCA	Semester	III

Course Code & Title	24MCAP0318		
	LAB V: Advanced Web Programming		
			Credit:1
Programme	MCA	Semester	III
Course Objectives	**The Course aims to** • Explore the designing of web applications • Design and implement a dynamic web applications using XML, JSON, AngularJS, NodeJS and NoSQL databases		
Cognitive Levels	**K1–K5**		

UNIT	CONTENTS	Lecture Schedule
1	Handling data using XML and JSON	2
2	AngularJS • Programs in AngularJS using Modules-Directives-Model-Data Binding—Controllers-Scopes-Filters-Services- Events-Forms-Validation	4
3	NodeJS • Programs based on NodeJS	4
4	NoSQL • Working with AngularJS, NodeJS and NoSQL to access databases	3
5	Working with Web Servers and Web Application Frameworks	3
6	Project on Development of micro services	
Total Contact Hours		**16**

Course Outcomes	On completion of the course, students should be able to
	CO1: Design webpages using Angular JS, XML and JSON **CO2:** Write scripts using Node JS and Angular JS to develop dynamic webpages **CO3:** Develop online web applications with database connectivity using Angular JS, Node JS and NoSQL **CO4:** Develop web application project using web designing tools and Techniques **CO5:** Hosts the web application in the internet

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	3
CO2	3	2	3	3	3
CO3	3	2	3	3	3
CO4	3	2	3	3	3
CO5	3	2	3	3	3

Course Code & Title	24MCAP0319 MINI PROJECT: APPS FOR RURAL DEVELOPMENT Credits:1		
Class	MCA	Semester	III

Course Code & Title	24EXNP03V1 VILLAGEPLACEMENTPROGRAMME Credits:2		
Class	MCA	Semester	III

SEMESTER IV

Course Code & Title	24MCAP0420 DISSERTATION Credits:16		
Class	MCA	Semester	IV

Course Code & Title	24MCAP02E1 Generic Elective: BIO-INSPIRED COMPUTING Credits:3		
Class	MCA	**Semester**	II
Course Objectives	**The Course aims to** • Learn bio-inspired • Understand random walk and simulated annealing • Learn genetic algorithm and differential evolution • Learn swarm optimization and ant colony for feature selection • Understand Frontiers of bio-inspired		
Cognitive Levels	**K-1** Define the basic concepts of bio-inspired algorithms **K-2** Understand the fundamental principles of Genetic and swarm optimization algorithms **K-3** Apply appropriate bio-inspired computing strategies for solving real-life problems		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction** **Introduction**: Introduction to bio-inspired computing- Artificial Neural Networks – Pattern classification – Single and Multilayer perceptrons–Kohenen's Self Organizing Maps.	9
II	**Random Walk and Annealing** Random variables - Isotropic random walks - importance of randomization- Eagle strategy- Annealing and Boltzmann Distribution - Parameters - Simulated Annealing algorithm	10
III	**Genetic Algorithms** Genetic algorithms – Representation – Reproduction – Crossover and Mutation Operators – Crossover and Mutation rates – Selection mechanisms – Fitness proportionate – ranking and tournament selection	10
IV	**Swarm Optimization** Swarm Intelligence – Stigmergy – Competition and Cooperation – Particle Swarm Optimization – Anatomy of a particle – Velocity and Position updation– PSO topologies – Control parameters –Ant Colony Optimization – Pheromone updation and evaporation.	10
V	**Frontiers of bio-inspired** Metabolic scaling: Predicting power consumption on chips. Molecular computing: DNA storage technologies.	9
Total Contact Hours		48

Text Books:
1. Leandro Nunes De Castro, Fernando Jose Von Zuben, "Recent Developments in Biologically Inspired Computing", Idea Group Publishing, 2005.

References:
1. Xin-She Yang, "Recent Advances in Swarm Intelligence and Evolutionary Computation", Springer International Publishing, Switzerland, 2015.
2. Eiben, A.E.,Smith, James E, "Introduction to Evolutionary Computing", Springer 2015.
3. Helio J.C. Barbosa, "Ant Colony Optimization - Techniques and Applications", Intech 2013
4. Xin-She Yang , Jaao Paulo papa, "Bio-Inspired Computing and Applications in Image Processing", Elsevier 2016

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Implement and apply bio-inspired
	CO2: Explain random walk and simulated annealing
	CO3: Implement and apply genetic algorithms
	CO4: Explain swarm intelligence and ant colony for feature selection
	CO5: Apply bio-inspired techniques in Frontiers.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	3
CO2	3	3	1	2	3
CO3	3	3	1	1	3
CO4	3	3	1	1	3
CO5	3	3	1	2	3

Course Code &Title	24MCAP02E2 Generic Elective: Marketing Analytics		
			Credits:3
Class	MCA	Semester	II
Course Objectives	The Course aims to • Provide key marketing concepts and skills. • Understand decision making. • Learn to positioning products. • Strategize and plan market. • Understand Ecommerce metrics.		
Cognitive Levels	**K1:** Outline the models and metrics used for Marketing Analytics **K2:** Understand the competitive analysis and various marketing analytics **K3:** Employ methods for different Marketing Analytics **K4:** Categorize Marketing Analytics **K5:** Assess the performance of various models used for Marketing Analytics		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction** Marketing Analytics, Models and metrics- Market Insight – Market data sources, sizing, PESTLE trend analysis, and porter five forces analysis–Market Segment identification and positioning	9
II	**Competitive Analysis and Business Strategy** Competitor identification, Intelligence gathering, analysis and strategy- Analytics based strategy selection, with strategic models and metrics, Forecasting, balanced scorecard, and critical success factors.	10
III	**Product, Service and Price Analytics** Conjoint analysis model, decision tree model, portfolio resource allocation, Pricing techniques, pricing assessment, pricing for business markets, price discrimination.	10
IV	**Distribution and Promotion Analytics** Retail location selection, distribution channel evaluation, and multi-channel distribution, Promotion budget estimation and allocation, promotion metrics for traditional media and social media.	10
V	**Sales Analytics** E Commerce sales mode, sales metrics, profitability metrics and support metrics.	9
Total Contact Hours		**48**

Reference Books:

1. Stephan Sorger, Marketing Analytics-Strategic Models and Metrics, Admiral Press, 2013.
2. Mark Jeffery, Data Driven Marketing: The 15 Metrics Everyone in Marketing should know‖, Wiley, 2013.
3. Paul W. Farris, Neil T. Bendle, Phillip E. Pfeifer, David J. Reibste in ―Marketing Metrics: The Definitive Guide to Measuring Marketing Performance‖, Pearson FT press, 2012.

Course Outcomes	On completion of the course, students will be able to
	CO1: Understand the key marketing concepts and skills. **CO2**: Identify and demonstrate the dynamic decision making. **CO3:** Ability to targeting and positioning products. **CO4:** Understand the concepts and strategies according to the goals. **CO5:** Develop marketing plans and understand E commerce metrics.

Mapping of COs with PSOs:

COVs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	2	3	2
CO2	2	2	2	3	3
CO3	2	2	2	2	3
CO4	1	2	3	2	2
CO5	2	2	2	3	1

Course Code &Title	**24MCAP02E3** **Generic Elective: Soft Computing** **Credits:3**		
Class	MCA	**Semester**	**II**
Course Objectives	**The Course aims to** • Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory • Introduce students to artificial neural networks and fuzzy theory from an engineering perspective		
Cognitive Levels	**K1:** Remembering the characteristics of soft computing and its applications **K2:** Understand the fundamental theory and concepts of neural Networks, fuzzy logic and genetic algorithms **K3:** Apply fuzzy rules for real time applications **K4:** Integrate different soft computing models **K5:** Criticize the effectiveness of different soft computing models		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction** Soft Computing Constituents – Soft Computing Vs. Hard Computing – Characteristics – Applications – Artificial Neural Network (ANN): Fundamental Concept – Application Scope – Basic Terminologies – Neural Network Architecture – Learning Process–Basic Models of ANN: McCulloch–Pitts Model–Hebb Network–Linear Separability.	9
II	**Supervised Learning Networks** Perception Networks – Adaline and Madaline Networks – Back Propagation Network – Radial Basis Function Network. Associative Memory Networks – BAM – Hopfield Network – Boltzmann Machine. Unsupervised Learning Networks: Kohonen Self Organizing Network–Counter Propagation Network–ART Network.	10
III	**Fuzzy Sets** Basic Concept – Crisp Set Vs. Fuzzy Set – Operations on Fuzzy Set – Properties of Fuzzy Sets – Fuzzy Relations: Concept – Fuzzy Composition–Fuzzy Equivalence and Tolerance Relation – Membership Functions: Features – Fuzzification – Methods of Membership value assignments – De – fuzzification – Methods.	10
IV	**Fuzzy Arithmetic** Fuzzy Arithmetic – Extension Principle – Fuzzy Measures – Fuzzy Rules and Fuzzy Reasoning: Fuzzy Propositions – Formation of Rules – Decomposition of Rules- Aggregation of Rules – Approximate Reasoning – Fuzzy Inference and Expert Systems–Fuzzy Decision Making–Fuzzy Logic Control Systems.	10

	Genetic Algorithm	
V	Fundamental Concept–Basic Terminologies–Traditional Vs. Genetic Algorithm–Elements of GA–Encoding–Fitness Function–Genetic Operators: Selection–Cross Over– Inversion and Deletion–Mutation–Simple and General GA–The Schema Theorem–Classification of Genetic Algorithm– Genetic Programming – Applications of GA.	9
Total Contact Hours		**48**

Text Book:
1. S.N.Sivanandam, S.N.Deepa, "Principles of Soft Computing", 3rd Edition, WileyIndia, 2018.

References:
1. S.Rajasekaran, G.A.V.Pai, "Neural Networks, Fuzzy Logic, Genetic Algorithms", Prentice Hall India, 2004.

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Understand the need and basics of soft computing.
	CO2: Understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications, and their limitations.
	CO3: Understand the concepts of fuzzy sets, knowledge representations and methods.
	CO4: Understand fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic.
	CO5: Understand the genetic algorithm concepts, elements, algorithm, programming and applications.

Mapping of COss with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	1	2
CO2	3	3	3	1	2
CO3	3	3	3	1	2
CO4	3	3	3	1	2
CO5	3	3	3	1	2

Course Code & Title	24MCAP03E1 Discipline Centric Elective–I: Natural Language Processing Credits:3		
Class	MCA	Semester	III
Course Objectives	**The Course aims to** • To study, fundamental concepts of Natural Language Processing • Natural Language Processing, the study of computing systems that can process, understand, or communicate in human language • The primary focus of the course will be on understanding various NLP tasks as listed on the course syllabus, algorithms for effectively solving the problems, and methods for Evaluating the performance		
Cognitive Levels	**K1:** Define the origin and fundamental concepts of Text processing. **K2:** Summarize the Raw text analysis and parts of speech tagging. **K3:** Develop various algorithms and approaches for the given task, dataset and stage of the NLP. **K4:** Examine the Sentiment Analysis. **K5:** Evaluate the benefits of Chatbot and Dialog Systems.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction** **Origin**–Stages–Approaches of NLP-Regular Expressions-Basic Regular Expression Patterns-Disjunction, Grouping and Precedence - More Operators-Substitutions, Capture, Groups and ELIZ-Look ahead Assertions, Words, Corpora, Text Normalization-Tools for Crude Tokenization and Normalization - Word Tokenization – Byte Pair Encoding for Tokenization-Word Normalization, Lemmatization and Stemming- Sentence Segmentation, Minimum Edit Distance **Language Processing:** Computing with Language: Text and Words, Text as Lists of Words, Simple Statistics, Making Decisions and Taking Control, Automatic Natural Language Understanding, Accessing Text Corpora, Conditional Frequency Distributions, Lexical Resources, Word Net	10
II	**Word Level Analysis** **Processing Raw Text:** Accessing Text from the Web and from Disk, Strings: Text Processing at the Lowest Level, Text Processing with Unicode, Regular Expression for Detecting word patterns, Useful applications of Regular Expressions, Normalizing Text, Regular Expression for Tokenizing text, Segmentation, Formatting: From List to Strings. **Parts of Speech Tagging:** Using a Tagger, Tagged Corpora, Mapping words to Properties Using Python Dictionaries, Automatic Tagging, N-Gram Tagging, Transformational Based Tagging, Named Entities and Named Entity Tagging, Hidden Markov Model for POS Tagging, Conditional Random Fields	10

	Classification	
III	**Supervised Classification**-Gender Identification-Choosing Right Features-Document Classification-Parts of Speech Tagging-Exploiting Context-Sequence Classification- Other methods of classification-Examples of Supervised Classification, Evaluation- The Test set-Accuracy- Precision and Recall-Confusion Matrix-Cross Validation, Decision Trees, Naïve Bayes Classifiers **Extraction:** Information Extraction-Information Extraction Architecture, Chunking-Noun Phrase Chunking-Tag Patterns - Chunking with Regular Expression-Exploring Text Corpora, Developing and Evaluating Chunkers, Recursion in Linguistic Structure, Named Entity Recognition, Relation Extraction	**9**
	Semantics	
IV	**Natural Language Understanding**-Querying a Database-Natural Language, Semantics and Logic, Propositional Logic, First Order Logic-First Order Theorem Proving-Summarizing the language of First Order Logic, The Semantics of English Sentences, Discourse Semantics **Sentiment Analysis:** Defining Emotions, Available Sentiments and Affect Lexicons, Creating Affect Lexicons by Human Labeling, Semi-supervised Induction of Affect Lexicons, Supervised Learning of Word Sentiment, Using Lexicons for Sentiment Recognition, Other Tasks-Personality, Affect Recognition, Lexicon-based methods for Entity-Centric Affect, Connotation Frames	**10**
	COREference Resoultion	
V	Linguistic Background, COREference Tasks and Datasets, Mention Detection, Architectures for COREference Algorithms, Classifier susingh and-built features, Aneural mention-ranking algorithm, Evaluation of COREference Resolution **Chatbot and Dialog Systems:** Properties of Human Conversation, Chatbots-Rule Based Chatbots-Corpus based Chatbots-Hybrid Architectures, Simple Frame Based Dialog Systems, The Dialog State Architecture, Evaluating Dialog Systems, Dialog System Design	**9**
Total Contact Hours		**48**

Text Books:
1. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python, First Edition, OReilly Media, 2009.
2. Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, Third Edition, 2020.

References:
1. James Allen, "Natural Language Processing with Python", First Edition, O'Reilly Media, 2009.
2. Christopher D.Manningand Hinrich Schutze, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.

E-Resources:
1. https://web.stanford.edu/~jurafsky/slp3/
2. https://nptel.ac.in/courses/106/101/106101007/

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Understand Natural Language Processing **CO2:** Probabilistic model of defining language and techniques **CO3:** Applying Hidden Markov model and Speech Recognition **CO4:** Application of context free grammar and language parsing **CO5:** Implement probabilistic and language parsing

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	3	2	2
CO3	3	3	1	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Course Code &Title	24MCAP03E2 **Discipline Centric Elective–I: Organizational Behaviour** **Credits:3**		
Class	MCA	**Semester**	III
Course Objectives	The Course aims to • Exhibit organizational behaviour • Recognise the management practices • Provide ability to examine psychological principles • Facilitate a critical evaluation of organizational practices • Analyse the impact of work behaviours, attitudes and performance		
Cognitive Levels	**K1:** Identify the scope of Organizational Behaviour (OB) and its framework **K2:** Understand the factors that influence a person's personality and their impact on work behaviour **K3:** Practice group dynamics **K4:** Analyze the potential effectiveness of leadership **K5:** Criticize the factors affecting organizational climate		

UNIT	CONTENTS	Lecture Schedule
I	**Focus and Purpose** Definition, need and importance of organizational behaviour –Nature and scope–Framework–Organizational behaviour models.	9
II	**Individual Behaviour** Personality – types – Factors influencing personality – Theories – Learning – Types of learners – The learning process – Learning theories – Organizational behaviour modification. Misbehaviour – Types – Management Intervention. Emotions - Emotional Labour – Emotional Intelligence – Theories. Attitudes – Characteristics – Components – Formation – Measurement- Values. Perceptions – Importance – Factors influencing perception – Interpersonal perception- Impression Management. Motivation–Importance–Types–Effects on work behavior.	10
III	**Group Behaviour** Organization structure – Formation – Groups in organizations–Influence–Group dynamics–Emergence of informal leaders and working norms – Group decision making techniques–**Team building-**Interpersonal Relations – Communication – Control.	10
IV	**Leadership and Power** Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.	9

	Dynamics of Organizational Behaviour	
V	Organizational culture and climate – Factors affecting organizational climate – Importance. Job satisfaction – Determinants – Measurements – Influence on behavior. Organizational change–Importance–Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change. Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life. Organizational development – Characteristics – objectives Organizational effectiveness - Developing Gender sensitive workplace	10
Total Contact Hours		**48**

References:
1. Stephen P. Robins, Organisational Behaviour, 17/e, PHI Learning/ Pearson Education, 2016.
2. VGK on dalkar, Organizational Behaviour, New Age Publishing House, First Edition, 2018.
3. Fred Luthans, Organisational Behaviour, 11/e, McGraw Hill, 2001.

Course Outcomes	On completion of the course, students should be able to
	CO1: Evaluate the importance of Organizational Behaviour (OB) and various OB models
	CO2: Identify the factors that influence a person's personality and their impact on work behaviour
	CO3: Explain the organization structure and Group Dynamics
	CO4: Evaluate the potential effectiveness of leadership styles within a Specific organizational context
	CO5: Assess complexity and uncertainty in organizations and apply Organizational behaviour concepts to managing behaviours in the workplace.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	3	2	1
CO2	3	2	3	2	1
CO3	1	2	2	2	3
CO4	1	2	3	2	1
CO5	2	3	3	3	2

Course Code & Title	24MCAP03E3 Discipline Centric Elective-I: Design Thinking Credits:3		
Programme	MCA	Semester	III
Course Objectives	**The Course aims to** • Understand the principles of Design Thinking, a creative solution-based approach to problem solving, • To practice the designing thinking proves in development cycles, IT Operations and faster innovation.		
Cognitive Levels	**K1:** Outline the basic principles of design thinking **K2:** Describe the various approaches of design thinking for new product development **K3:** Apply tools for design thinking process **K4:** Investigate the performance of design thinking approaches		

UNIT	CONTENTS	Lecture Schedule
I	Introduction to Design Thinking and Innovation: Overview – Origin and Purpose of Design and Innovation – Design Thinking and its Benefits – Applications of Design Thinking	12
II	Design Thinking Approach for New Product Development: Overview Innovation Models – Ideas and Opportunities for Innovation – Framework for Design Thinking – Tools Used in the Design Thinking Process–Visualisation in the Design Thinking Process	12
III	Design Thinking Approach for Deciphering Needs: Overview– Value Chain Analysis–Mind Mapping-Design Thinking Approach for Idea Generation	11
IV	Design Thinking Approach for Concept Development –Design Thinking Approach for Concept Evaluation–Design Thinking Approach for Obtaining User Feedback	10
Total Contact Hours		**45**

Reference Books:
1. Maurício Vianna, Ysmar Vianna, Brenda Lucena and Beatriz Russo," Design thinking: Business innovation", MJV Technologies and innovation press, 2011.
2. Design Thinking: Integrating Innovation, Customer Experience, and Brand Valueby Thomas Lockwood (Editor), Published February 16th 2010 by Allworth Press.
3. Kallori Vikram, Introduction to DevOps, 1st Edition, Kallori Vikram Publication, 2016.
4. Jaokim Verona, Practical DevOps, 2nd Edition, Packt. Publication, 2018.
5. Stephen Fleming, Pravin, DevOps Handbook: Introduction of DevOps Resource Management, 1st Edition, Create space Independent Pub., 2010.
6. Len Bass, Ingo Weber, LimingZhu, G., DevOps: A Software Architect's Perspective, 1st Edition, Addison Wesley Professional, 2015.
7. Alistair Cockburn, "Agile Software Development", 2nded, Pearson Education, 2007.
8. Michael Lewrick, Patrick Link, Larry Leifer, The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods, John Wiley &Sons, 2020.

E-Resources: • https://www.nngroup.com/articles/design-thinking-study-guide/ • https://www.slideshare.net/slideshow/design-thinking-notes-249480093/249480093 • https://www.ideou.com/pages/design-thinking-resources	
Course Outcomes	**On completion of the course, students should be able to** **CO1:** Apply design thinking concepts to give solution for the problems identified **CO2:** Practice designing thinking approaches for product development **CO3:** Customize the needs of the customer through innovative approaches **CO4:** Use design thinking approach do concept development and evaluation **CO5:** Design innovative products

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

	24MCAP03E4
Course Code & Title	**Discipline Centric Elective–II: Virtual and Augmented Reality** **Credits:3**

Class	MCA	**Semester**		III

Course Objectives	**The Course aims to** • Learn the fundamental Computer Vision, Computer Graphics and Human-Computer interaction Techniques related to VR/AR • Review the Geometric Modeling Techniques • Review the Virtual Environment • Discuss and Examine VR/AR Technologies • Use of various types of Hardware and Software in Virtual Reality systems • Simulate and Apply Virtual/Augmented Reality to varieties of Applications
Cognitive Levels	**K1:** Define the basic concepts of Virtual Reality. **K2:** Illustrate the various models and Transformation methods. **K3:** Demonstrate the various Input/ Output devices in the generic VR System

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to Virtual Reality (VR)** Virtual Reality and Virtual Environment, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark	9
II	**Computer Graphics and Geometric Modelling** The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Color theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms, Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision	10
III	**Virtual Environment** **Input/ Output Devices:** Input (Tracker, Sensor, Digital Gloves, MovementCapture,VideobasedInput,3DMenus&3D Scanner, etc.), Output (Visual/Auditory/Haptic Devices) **Generic VR system:** Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems, Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system	11

	Augmented Reality (AR)	
IV	Taxonomy, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments, Evaluating AR Systems	9
	Development Tools and Frameworks	
V	Human factors: Introduction, the eye, the ear, the somaticsenses Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction toVRML	9
	Total Contact Hours	**48**

Text Books:
1. Coiffet, P., Burdea, G. C., (2003), "Virtual Reality Technology," Wiley-IEEE Press, ISBN: 9780471360896
2. Schmalstieg, D., Höllerer, T., (2016), "Augmented Reality: Principles & Practice," Pearson, ISBN: 9789332578494
3. Norman, K., Kirakowski, J., (2018), " Wiley Handbook of Human Computer Interaction," Wiley-Blackwell, ISBN: 9781118976135
4. LaViola Jr.,J.J., Kruijff, E., McMahan, R. P., Bowman, D. A., Poupyrev, I., (2017), "3D User Interfaces: Theory and Practice," Pearson, ISBN: 9780134034324
5. Fowler, A., (2019), "Beginning iOS AR Game Development: Developing Augmented Reality Apps with Unity and C#," Apress, ISBN: 9781484246672
6. Hassanien, A. E., Gupta, D., Khanna, A., Slowik, A., (2022), "Virtual and Augmented Reality for Automobile Industry: Innovation Vision and Applications," Springer, ISBN: 9783030941017

References:
1. Craig, A. B., (2013), "Understanding Augmented Reality, Concepts and Applications," Morgan Kaufmann, ISBN: 9780240824086
2. Craig, A. B., Sherman, W. R., Will, J. D., (2009), "Developing Virtual Reality Applications, Foundations of Effective Design," Morgan Kaufmann, ISBN: 9780123749437
3. John Vince,J.,(2002),"Virtual Reality Systems, "Pearson, ISBN: 9788131708446
4. Anand, R., "Augmented and Virtual Reality," Khanna Publishing House
5. Kim, G. J., (2005), "Designing Virtual Systems: The Structured Approach", ISBN: 9781852339586
6. Bimber, O., Raskar, R., (2005),"Spatial Augmented Reality: Merging Real and Virtual Worlds," CRC Press, ISBN: 9781568812304
7. O'Connell, K., (2019), "Designing for Mixed Reality: Blending Data, AR, and the Physical World," O'Reilly, ISBN: 9789352138371
8. SanniSiltanen,S.,(2012),"Theoryandapplicationsofmarker-basedaugmented reality," Julkaisija –Utgivare Publisher, ISBN: 9789513874490.

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Understand fundamental Computer Vision, Computer Graphics and Human Computer Interaction Techniques related to VR/AR **CO2:** Understand Geometric Modeling Techniques **CO3:** Understand the Virtual Environment **CO4:** Analyze and Evaluate VR/AR Technologies **CO5:** Apply various types of Hardware and Software in Virtual Reality systems

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	3	3	1	3	3
CO3	3	2	3	2	3
CO4	2	3	3	3	3
CO5	3	3	3	3	3

Course Code & Title	24MCAP03E5 Discipline Centric Elective–II: Essentials of Data Science Credits:3		
Class	MCA	Semester	III
Course Objectives	The Course aims to • Understand common careers and industries that use advanced data analytics • Investigate the impact data analysis can have on decision-making • Explain how data professionals preserve data privacy and ethics • Develop a project plan considering roles and responsibilities of team members		
Cognitive Levels	**K1:** Outline the Data science process **K2:** Understand the various types of Data **K3:** Employ methods to describe relationships in data **K4:** Analyze the process of Data Wrangling **K5:** Review the data visualization techniques		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction** Data Science: Benefits and uses –facets of data– Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation – Exploratory Data analysis – build the model– presenting findings and building applications – Data Mining–Data Warehousing–Basic Statistical descriptions of Data	9
II	**Describing Data** Types of Data–Types of Variables-Describing Data with Tables and Graphs–Describing Data with Averages–Describing Variability– Normal Distributions and Standard(z) SCOREs	9
III	**Describing Relationships** Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r^2–multiple regression equations–regression towards the mean	10
IV	**Python Libraries for Data Wrangling** Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing–combining datasets– aggregation and grouping–pivot tables	10

V	Data Visualization	10
	Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting – Geographic Data with Base map – Visualization with Sea born.	
Total Contact Hours		48

References:

1. Wiley., Dietrich, D., Heller, B., & Yang, B, "Data science & bigdata analytics: discovering, analyzing, visualizing and presenting data", Wiley, First Edition, 2015.
2. Eliot P. Rezno, "BigData: A Beginner's Guide to Using Data Science for Business", Create Space Independent Publishing Platform, 2017.
3. Fahl, J, "Data Analytics: A Practical Guide To Data Analytics For Business, Beginner To Expert", Create Space Independent Publishing Platform, 2017.

Course Outcomes	**On completion of the course, students will be able to** **CO1:** Learn new concepts from industry trends. **CO2:** Gain a foundational understanding of a subject or tool using data. **CO3:** Develop skill to analyze and apply data models and relations. **CO4:** Ability to visualize the data according to needs. **CO5:** Evaluate the process of Data wrangling.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	3	2
CO3	2	3	2	3	2
CO4	3	2	2	3	2
CO5	3	3	3	3	2

Course Code &Title	**24MCAP03E6** **Discipline Centric Elective–II: Drone Technology**		**Credits:3**
Class	MCA	**Semester**	**III**
Course Objectives	**The Course aims to** • To familiarize the students with the concepts and techniques used in the design of small drones • To cover the various applications of these drones.		
Cognitive Levels	**K1:** Identify the fundamentals of Drones and its guidelines **K2:** Understand the design and working of Drone **K3:** Demonstrate the working of Drone motors **K4:** Analyze real-time applications of Drone technology **K5:** Review the applications of Drone		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to Drones** Definition and history of drones, Types of drones and their applications, Drone components and terminology, Regulations and Guidelines for drone usage.	10
II	**Drone Design and Assembly** Design considerations for drone airframe and propulsion systems, Selecting and assembling drone components such as motors, batteries, flight controllers, and cameras, Basic wiring and soldering techniques.	10
III	**Drone Motors and ESC** Working, Types: Brush and Brush less Motors, motor sizing and identification, mounting patterns and thread size, Thrust to Weight ratio, KV ratings, advanced motor selection, Electronic Speed Controller (ESC).	10
IV	**Flight Mechanics and Dynamics** Basic principles of flight mechanics, flight controller board, Selection of drone controller with example, Factors affecting drone flight performance and efficiency.	9
V	**Applications of Drone** Overview of commercial and industrial drone applications, Case studies and examples of successful drone deployments, GPS based navigation system, Drone Camera Systems, Agro application, Drone Delivery, Future trends and developments in the drone industry	9
	Total Contact Hours	**48**

Text Books:
1. M. LaFay, Building Drones for Dummies, John Wiley & Sons, Inc.,n.d.
2. E. Tooley, Practical Drones: Building, Programming, and Applications, Apress, 2021.
3. D.Levy, Drone Programming: A Guide to Code Your Own Drones, Packt Publishing, n.d.
4. S.K. Kopparthy, Drone Technology: Theory and Practice, Springer, 2020.
5. P.Horowitz and W.Hill, The Art of Electronics, Cam bridge University Press, 2015.
6. K. Sundarand R.V. Rajakumar, Multicopters: Principles and Applications, Springer, 2021.

References:
1. D.Saxby, Drone Aerial Photo graphy and Video: Techniques and Stories from the Field, Cengage Learning, 2018.
2. D.McLeod, Getting Started with Drone: How to Build, Fly, and Program Your Own Drone, Apress, 2019.
3. M.A.Banks, Building and Flying Electric Model Aircraft, O'Reilly Media, Inc., 2014.
4. G.C.Camara Leal, Flying Robots: An Introduction to Autonomous Aerospace Systems, Springer, 2017.

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Learn about the various types of Drones, its basic sand guidelines.
	CO2: Learn about the various components of drone design.
	CO3: Design basic types of drone systems.
	CO4: Learn about the working of drone motors.
	CO5: Learn about the real-time applications of drone technology

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	3
CO2	3	3	2	2	3
CO3	3	3	2	2	3
CO4	3	3	2	2	3
CO5	3	3	2	3	3

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MODULAR COURSES

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Course Code & Title	**24MCAP02M1** **Modular Course–I: Large Language Model** **Credits:2**		
Class	MCA	**Semester**	**II**
Course Objectives	**The Course aims to** • To study, fundamental concepts of Large Language Models • To understand the Transformers, Language Models and its implementations in Recurrent Neural Networks		
Cognitive Levels	**K1:** Outline the basics of Transformers and its implementation **K2:** Understanding the functionalities of Large Language Models **K3:** Apply Large Language Models to solve complex problems **K4:** Analyze the bidirectional encoders **K5:** Evaluate the performance of Large Language Models		

UNIT	CONTENTS	Lecture Schedule
I	**The Transformer** A Self-Attention Network - The Intuition - Causal or backward - looking self – attention – Self-Attention more formally - Parallelizing self-attention using a single matrix X- Masking out the future - Multi Head Attention - Transformer Blocks - The residual stream view of the Transformer Block-The input: embeddings for taken and position	8
II	**Large Language Models** The Language Modeling Head – Large Language Models with Transformers- Generation by sampling: Top-K Sampling, Nucleus or top-p sampling, Temperature Sampling–Training Transformers: Self-supervised training algorithm, Training corpora for language models, Scaling laws – Potential Harm from Language Models	8
III	**Bidirectional Transformer Encodes** The architecture – Training Bidirectional Encoders – Masking Words – Next Sentence Prediction – Training Regimes – Contextual Embeddings – Word Sense Disambiguation- Word Similarity	8
IV	**Fine-Tuning Language Models** Sequence Classification – Pairwise Sequence Classification – Sequence Labelling – Span-based Masking – Masking spans–Fine-tuning for Span-based Applications–RNNs as Language Models – Training an RNN Language model – RNN for other NLP Tasks. Real- Time Applications &Uses Cases	8
Total Contact Hours		**32**

Text Books:
1. Daniel Jurafsky, James H. Martin—Speech and Language Processing, Computational Linguistics and Speech, Pearson Publication, Third Edition, 2024.

References:
1. Sebastian Raschka, "Large Language Models", MEAP Publications, 2024.

E-Resources:
1. https://web.stanford.edu/~jurafsky/slp3/
2. https://www.cs.princeton.edu/courses/archive/fall22/cos597G/

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Knowledge on Transformers and its implementation
	CO2: Understanding Large Language Models
	CO3: Demonstrating the functions of Bidirectional transformer
	CO4: Applying Transformers on Words
	CO5: Analyzing the fine tuning of Language Models

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	3
CO2	3	3	2	2	3
CO3	2	3	2	2	1
CO4	3	3	2	2	1
CO5	3	2	2	3	1

Course Code & Title	24MCAP02M2 Modular Course–I: Wireless Ad-Hoc Networks Credits:2		
Class	**MCA**	**Semester**	**II**
Course Objectives	The students should be able to • Define the basic terminologies in wireless networks • Learn the principles in wireless technologies • Explain the functionalities of the wireless net works indifferent applications		
Cognitive Levels	**K1:** Describe the basic principles of wireless Ad Hoc networks **K2:** Express the characteristics and challenges of wireless Ad Hoc networks based on different layers **K3:** Apply the routing protocols to design wireless Ad Hoc networks. **K4:** Analyze the multicast routing in Ad Hoc networks **K5:** Assess the issues and challenges in QoS		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction** Introduction-Fundamentals of Wireless Communication Technology- The Electromagnetic Spectrum - Radio Propagation Mechanisms- Characteristics of the Wireless Channel-IEEE802.11Standard	8
II	**Ad Hoc Routing Protocols** Issues and Challenges - Classifications of Routing Protocols-Table-Driven Routing Protocols - On-Demand Routing Protocols – Hybrid Routing Protocols- Power-Aware Routing (PAR).	**8**
III	**Multicast Routing in AdHoc Networks** An Architecture Reference Model for Multicast Routing Protocols -Classifications of Multicast Routing Protocols-Tree- Based Multicast Routing Protocols- Mesh-Based Multicast Routing Protocols-Energy-Efficient Multicasting -Multicasting with Quality of Service Guarantees– Application-Dependent Multicast Routing.	8
IV	**QoS and Energy Management** Classifications of QoS Solutions - MAC Layer Solutions-Network Layer Solutions-QoS Frameworks for Ad Hoc Wireless Networks Energy Management in AdHoc Wireless Networks– Introduction-Need for Energy Management in Ad Hoc Wireless Networks - Classification of Energy Management Schemes - Battery Management Schemes - Transmission Power Management Schemes-System Power Management Schemes.	8
Total Contact Hours		**32**

References:

1. C.SivaRam Murthy and B.S. Manoj "Ad Hoc Wireless Networks: Architectures and Protocols", Pearson education, 2010.
2. Charles E. Perkins, Ad Hoc Networking, Addison Wesley, 2010.
3. William Stallings, "Wireless Communications and Networks", Pearson education, 2010
4. J.Schiller, "Mobile Communications", Pearson education, 2010.
5. Vijay K.Garg, "Wireless Communications and Networking", Elsevier, 2010
6.

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Define the basic principles of wireless ad hoc networks
	CO2: Explain the functionalities and protocols of various layers.
	CO3: Describe the different issues and working concepts of wireless Ad hoc networks based on different layers, on the layer wise problem solving.
	CO4: Analyze the better problem solving approaches based on the layer wise issues.
	CO5: Apply different algorithms and techniques based on the layer wise problem solving

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	1	2	3	2	2
CO2	1	2	3	2	3
CO3	2	2	2	2	1
CO4	1	2	3	2	1
CO5	2	3	3	3	2

Course Code & Title	24MCAP02M3 Modular Course – I: Web Services Credits:2		
Class	**MCA**	**Semester**	**II**
Course Objectives	The Course aims to • Present the Web Services, Building real world Enterprise applications: • Using Web Services with Technologies SOAP, WSDL and UDDI • Develop Standards and future of Web Services		
Cognitive Levels	**K1:** Remembering the technologies and concepts of underlying web services **K2:** Understand the SOAP model **K3:** Develop and deploy basic web services for real time applications **K4:** Experiment with advanced web services and standards **K5:** Evaluate the performance and quality of web services		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to Web Services** Introduction to web services –- Evolution and importance of web services-Industry standards, Technologies and concepts underlying web services-Web services and enterprises-web Services standards organization-web services platforms.	8
II	**SOAP** SOAP: The SOAP model- SOAP messages-SOAP encoding-WSDL: WSDL structure- interface definitions-bindings-services-Using SOAP and WSDL-UDDI: About UDDI- UDDI registry Specification- CORE data structures-Accessing UDDI	8
III	**Advanced Web Services Technologies and Standards** Advanced web services technologies and standards: Conversations overview-web services conversation language-WSCL interface components. Workflow: business process management- workflows and workflow management systems Security: Basics-data hand ling and forwarding-data storage-errors-Web services security issues.	8
IV	**Quality of Service** Quality of Service: Importance of QoS for web services-QoS metrics-holes-design patterns-QoS enabled web services-QoS Enabled applications. Web services management-web services standards and future trends.	8
Total Contact Hours		**32**

Text Books:
1. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services: An Architects Guide", Prentice Hall, Nov 2003.
2. Keith Ballinger, "NET Web services: Architecture and Implementation with. Net", Pearson Education, First Edition, Feb 2003.

References:
1. Ramesh Nagappan, "Developing Java Web Services: Architecting and developing secure Web Services Using Java", John Wiley and Sons, first Edition Feb 2003.
2. Eric A Marks and Mark J Werrell, "Executive Guide to Web services", John Wiley and sons, arch2003.
3. Anne Thomas Manes, "Web Services: A managers Guide", Addison Wesley, June 2003.

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Understand web services and its related technologies **CO2:** Analyze on SOAP and UDDI model **CO3:** Demonstrate the road map for the standards and future of web services **CO4:** Learn about workflow and the features of workflow management **CO5:** Analyze QoS enabled applications in web services

Mapping of Cos with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	2
CO2	3	2	1	1	2
CO3	3	2	3	1	3
CO4	3	2	1	1	3
CO5	3	2	1	1	3

Course Code & Title	24MCAP03M1 Modular Course – II: Blockchain Technology Credits:2		
Class	MCA	Semester	III
Course Objectives	**The Course aims to** • Understand blockchain technology • Develop and deploy blockchain applications		
Cognitive Levels	**K1:** Show the basic concepts of Blockchain Technology **K2:** Demonstrate the smart contracts in Ethereum using different development frameworks. **K3:** Develop the methodology for designing the Blockchain Architecture and Applications. **K4:** Analyze the use of Blockchain with AI based management System. **K5:** Interpret the uses and functionalities of Blockchain Technology.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction** Introduction, Concept of Blockchain, History, Definition of Blockchain, Fundamentals of Blockchain, Characteristics of Blockchain, Consensus in Trust-Building Exercise, Public, Private and Hybrid Blockchains, Distributed Ledger Technologies, DLT Decentralized Applications and Databases, Architecture of Blockchain, Transactions, Chaining Blocks, Value Proposition of Blockchain Technology	8
II	**Blockchain Components and Smart Contracts** Ethereum, Ethereum Virtual machine, Working of Ethereum, Ethereum, Clients, Ethereum KeyPairs, Ethereum Addresses, Ethereum Wallets, Ethereum Transactions, Ethereum Development Tools-Smart Contracts, Absolute and Immutable, Contractual Confidentiality, Law implementation and Settlement	8
III	**Blockchain Architecture and Applications** Design methodology for Blockchain applications: Blockchain application templates, Blockchain application development Deploying a sample application : Blockchain and betting, Colored Coins, Counterparty.	8
IV	**Blockchain Use Cases** Blockchain in financial software and systems, Supply chain and logistics monitoring, Music royalties tracking, Advertising insights, Blockchain implementation for land records, digital content publishing and selling, Digital supply chain, Medical record management system. Blockchain for Government : Digital identity, Public distribution system / Social welfare system	8
Total Contact Hours		**32**

Text Books:
1. Kumar Saurabh, Ashutosh Saxena, "Blockchain Technology: Concepts and Applications", Wiley, 2020.
2. Joseph J. Bambara, paul R. Allen, Blockchain : a practical guide to developing business, law and technology solutions, 2018, 1st edition, McGraw-Hill publication, New York.
3. Bahga, Vijay Madisetti, "Blockchain Applications: A Hands-On Approach", Arshdeep Bahga, Vijay Madisetti Publishers 2017.

References:
1. MelanieSwa, "Blockchain", O' ReillyMedia2014.
2. SwanMelanie, Blockchain, "Blueprint for a new economy", 2015, 1st edition, O'Reilly Media, United States.

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Learn the fundamentals of blockchain **CO2:** Know the programming and technologies involved in blockchain **CO3:** Practice the tools and frameworks for developing blockchain applications **CO4:** Learn about the real-time significance as well as implementation areas of blockchain technology **CO5:** Demonstrate the implementation of Blockchain with real time applications.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	2	3
CO2	3	2	3	2	3
CO3	3	2	3	2	3
CO4	3	2	3	2	3
CO5	3	2	1	2	3

Course Code & Title	24MCAP03M2 Modular Course–II: Professional Ethics Credits:2		
Class	MCA	Semester	III
Course Objectives	**The Course aims to** • Understand the importance of Values and Ethics in their Personal lives and professional career. • Learn the rights and responsibilities. • Know about Responsibilities of employee, team member and a global citizen.		
Cognitive Levels	**K1:** Describe the fundamentals of Professional Ethics **K2:** Express the basic theory of Professional ethics **K3:** Apply the ethical principles to analyze case studies **K4:** Analyze the work place rights and responsibilities **K5:** Criticize the global issues in Professional Ethics		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to Professional Ethics** Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.	4
II	**Basic Theories** Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.	4
III	**Professional Practices in Engineering** Professional Practices in Engineering: Professions and Norms of Professional Contact, Norms of Professional Contact vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession, Central Responsibilities of Engineers - The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.	8
IV	**Work Place Rights & Responsibilities** Work Place Rights & Responsibilities, Ethics in changing Domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment	8

	within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation. Ethics in changing domains of research - The US government wide definition of research misContact, research misContact distinguished from mistakes and errors, recent history of attention to research misContact, the emerging emphasis on understanding and fostering responsible Contact, responsible authorship, reviewing & editing.	
	Global Issues in Professional Ethics	
V	Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights	8
	Total Contact Hours	**32**

Text Book:
1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

References:
1. Engineering Ethics, Concepts Cases: Charles E HarrisJr., Michae lS Pritchard, MichaelJ Rabins, 4e, Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Understanding basic purpose of profession, professional ethics and various moral and social issues.
	CO2: Awareness of professional rights and responsibilities of a Engineer, safety and risk benefit analysis of a Engineer.
	CO3: Acquiring knowledge of various roles of Engineer in applying ethical principles at various professional levels.
	CO4: Professional Ethical values and contemporary issues Analyze
	CO5: Excelling in competitive and challenging environment to contribute to industrial growth.

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	1
CO2	3	3	3	3	2
CO3	1	2	3	3	2
CO4	2	2	3	2	2
CO5	3	3	3	1	3

Course Code & Title	24MCAP03M3 Modular Course – II: Network Security		
			Credits:2
Class	MCA	Semester	III
Course Objectives	The Course aims to - Describe various terminologies in network security. - Learn the different types of security algorithms. - Understand the different standards in algorithms and technologies in security.		
Cognitive Levels	**K1:** Outline the fundamental security design principles **K2:** Understand the different types of security algorithms **K3:** Apply the Encryption techniques to real-world encryption scenarios for secured communication **K4:** Analyze the different standards in algorithm and technologies in Network security **K5:** Evaluate the security policies and procedures to mitigate risks		

UNIT	CONTENTS	Lecture Schedule
I	Computer Network Security Concepts: Computer Security Concepts – The OSI Security Architecture – Security Attacks – Security Services – Security Mechanisms – Fundamental Security Design Principles–Attack Surfaces and Attack Trees–A model For Network Security	8
II	Classical Encryption Techniques: Symmetric Cipher Model – Substitution Techniques – Transportation Techniques – Rotor Machines – Steganography. Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure–The Data Encryption Standard (DES) – A DES example – The strength of DES – Block Cipher Design Principles.	8
III	Advanced Encryption Standard: Finite Filed of Arithmetic – AES Structure–AES Transformation Functions–AES key Expansion–An AES Example–AES Implementation. Block Cipher Operation: Multiple Encryption and Triple DES – Electronic Code Book – Cipher Block Chaining mode – Cipher Feedback Mode – Output Feedback Mode – Counter Mode.	8
IV	Public Key Cryptography and RSA: Principles of Public Key Cryptosystems – The RSA Algorithm. Other Public key Cryptosystems: Diffiehellman Key Exchange – Elgamal Cryptographic System–Elliptic Curve Arithmetic–Elliptic Curve Cryptography–Secure Hash Algorithm (SHA).	8
Total Contact Hours		**32**

References:

1. William Stallings. Cryptography and Network Security Principles and Practice, 8/e., Pearson India Education Services Pvt. Ltd, 2023.
2. Behrouz A. Forouzan and Debdeep Mukhopadhyay. Cryptography and Network Security. New Delhi: Tata McGraw Hill Education Private Limited, 2011.
3. Atul Kahate. Cryptography and Network Security. New Delhi: Tata McGraw Hill Education Private Limited, 2010. 3. Richard E. Smith. Internet Cryptography. Delhi: Pearson Education Pvt. Ltd, 2000.

Course Outcomes	On completion of the course, students will be able to
	CO1: Remember the terminologies used in security. **CO2:** Learn the network security techniques **CO3:** Understand the various security algorithms. **CO4:** Analyze and apply the cryptographic algorithms based on requirements. **CO5:** Discuss the Standards and technologies in security

Mapping of COs with PSOs:

CO Vs PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	3	2	1
CO2	3	2	3	2	1
CO3	1	2	2	2	3
CO4	1	2	3	2	1
CO5	2	3	3	3	2