MASTER OF COMPUTER APPLICATIONS

CURRICULUM FRAMEWORK AND SYLLABUS FOR OUTCOME BASED EDUCATION

(For the students joining in the Academic Year 2021 - 2022 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

Vision

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.

Mission

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.

Graduate Attribute

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 cable of 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 undertaking 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, 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.

The Gandhigram Rural Institute
(Deemed to be University)
Gandhigram – 624 302
DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

OBE Elements for Master of Computer Applications Programme

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

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

PEO 2: To create an academic ambience for the students to gain fundamental understanding of computing technologies for pursuing higher studies.

PEO 3: To harness managerial skills to become successful entrepreneurs in Information Technology (IT) enabled ventures.

PEO 4: To inculcate the process of lifelong learning through professional activities that contribute to personal and social development.

PEO 5: To foster creativity among the students to expand the frontiers of knowledge and develop novel solutions for the betterment of the society.

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

PROGRAMME OUTCOME (PO)

PO 1: Accomplish proficiency in Computer Science discipline and provide value added services catering to the needs of the Employer/Institution/ Stakeholders/ Society

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

PO 3: Apply modern computing tools to develop and deploy cost-effective ICT based solutions for societal problems.

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: Foster 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 real-time complex problems with an understanding of the societal, legal, cultural impacts of the solution.

PSO 3: Cultivate research aptitude to become active researcher in the field of Computer Science.

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

PS0 5: Empower with self-sustainable computing skills for rewarding career opportunities in IT and IT enabled service sectors

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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
Mean												**2.58**	

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:

Exit Survey - 30 %

THE GANDHIGRAM RURAL INSTITUTE (DEEMED TO BEUNIVERSITY)

Ministry of Human Resource Development (MHRD), Govt. of India
Accredited by NAAC with A Grade (3rd Cycle)
Gandhigram

DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

Master of Computer Applications Programme (TWO YEAR)

(Under Choice Based Credit System)

SUBJECTS OF STUDY AND SCHEME OF EXAMINATION (Under Revision)
(For the students joining in 2021 - 2022 and afterwards)

Course Code	Subject	Credits	Lecture Hrs/ Week	Lab Hrs/ Week	Evaluation		Total
					CFA	ESE	
SEMESTER I							
21MCAP0101	Core I: Python Programming	4	4	-	40	60	100
21MCAP0102	Core II: Advanced Algorithms	4	4	-	40	60	100
21MCAP0103	Core III: Mathematical Foundation for Computer Science	4	4	-	40	60	100
21MCAP0104	Core IV: Compiler Design	4	4	-	40	60	100
21MCAP0105	Core V:Advanced Web Programming	4	4	-	40	60	100
21MCAP0106	Lab I: Python Programming and Algorithms Lab	1	-	2	60	40	100
21MCAP0107	Lab II: Advanced Web Programming	1	-	2	60	40	100
21GTPP0001	Gandhi in Everyday Life	2	2	-	50	-	50
Total Credits / Theory/ Practical		**24**	**22**	**4**			
SEMESTER II							
21MCAP0208	Core VI: Image Processing and Computer Vision	4	4	-	40	60	100
21MCAP0209	Core VII: Advanced Computer Networks	4	4	-	40	60	100
21MCAP0210	Core VIII: Accounting for Decision Making	4	4	-	40	60	100
21MCAP0211	Core IX: Advanced Java Programming	4	4	-	40	60	100
-------	Elective : Generic	3	3	-	40	60	100
21MCAP0212	Lab III: Image Processing and Computer Vision Lab	1	-	2	60	40	100
21MCAP0213	Lab IV: Advanced Java Programming Lab	1	-	2	60	40	100
21ENGP00XX	Communication Skills for Computer Technocrats	2	2	-	50	-	50
Total Credits / Theory/ Practical		**23**	**21**	**4**			

SEMESTER III							
21MCAP0314	Core X: Machine Learning	4	4	-	40	60	100
21MCAP0315	Core XI: Advanced Database Management Systems	4	4	-	40	60	100
21MCAP0316	Core XII: Internet of Things and Robotics	4	4	-	40	60	100
21MCAP0317	Core XIII: Optimization Techniques	4	4	-	40	60	100
21MCAP03DX	Discipline Centric Elective	3	3	-	40	60	100
21MCAP0318	Lab V: Advanced DBMS	1		2	60	40	100
21MCAP0319	Lab VI: Robotics & IoT Lab	1	-	2	60	40	100
21EXNP03V1	Village Placement Programme	2	-	-	50	-	50
21MCAP0320	Mini Project: Apps for Rural Development	1	-	1	50	-	50
Total Credits / Theory/ Practical		**24**	**19**	**5**			
SEMESTER IV							
21MCAP0421	Core XIV: Parallel and Distributed Computing	4	4	-	40	60	100
21MCAP0422	Core XV: Advanced Data Mining Techniques	4	4	-	40	60	100
21MCAP04MX	Modular Course I	2	2	-	50	-	50
21MCAP04MY	Modular Course II	2	2	-	50	-	50
21MCAP0423**	Project	10	-	10	75	75+50	200
Total Credits / Theory/ Practical		**22**	**10**	**10**			
Total Credits		**93**					

CFA – Continuous Formative Assessment (Internal Evaluation)
ESE – End Semester Examination (External Evaluation)

** Evaluated for 200 marks as below:
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

Discipline-Centric Elective

21MCAP03E1 Natural Language Processing

21MCAP03E2 Network Security and Cryptography

List of Modular Course

Modular Course: I (21MCAP04MX)

21MCAP04M1 Industry 4.0

21MCAP04M2 Virtual Reality

Modular Course: II (21MCAP04MY)

21MCAP04M3 Advanced Software Engineering Principles and Practices

21MCAP04M4 Block chain Architecture (Syllabus Under Preparation)

Value Added Courses (2 Credits)	
Course Code	**Title**
21MCAP0VA1	R Programming for Data Analysis
21MCAP0VA2	Mobile Programming
21MCAP0VA3	Universal Human Values and Professional Ethics
21MCAP0VA4	Project Management

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SEMESTER I

Course Code & Title	**21MCAP0101** **CORE I : PYTHON PROGRAMMING** **Credits: 4**		
Class	**MCA**	**Semester**	**I**
Cognitive Level	K-1 Recall the basic definitions and terminologies of computer. K-2 Summarize the knowledge in programming K-3 Prepare programs related to their field using Python language		
Course Objectives	**The Course aims to** • Develop logical thinking, problem solving and implementation skills usingPython. • Understand the data structures of Python namely lists, dictionaries andtuples. • Augment the knowledge on object oriented programming using Python. • Familiarize the usage of Python Libraries for data analysis.		

Unit	Content	Lecture Schedule
I	**Introduction** **Introduction to Python:** Introduction – Python overview – Getting started – Comments – Python identifiers – Reserved keywords – Variables – Standard data types – Operators – Statements and Expressions – String operations – Boolean expressions. **Control Statements:** The *for* loop – *while* statement – *if-elif-else* statement – Input from keyboard. **Functions:** Introduction – Built-in functions – User defined functions – Function Definition – Function Call - Type conversion – Type coercion – Python recursive function.	**12**
II	**Strings:** Strings –Compound data type – len function – String slices – String traversal – Escape characters – String formatting operator – String formatting functions. **Tuples:** Tuples – Creating tuples – Accessing values in tuples – Tuple assignment – Tuples as return values – Basic tuple operations – Built-in tuple functions. **Lists:** Values and accessing elements – Traversing a list – Deleting elements from list – Built-in list operators & methods. **Dictionaries:** Creating dictionary – Accessing values in dictionary – Updating dictionary – Deleting elements from dictionary – Operations in dictionary - Built-in dictionary methods.	**13**
III	**Files and Exceptions:** Introduction to File Input and Output - Writing Structures to a File - Using loops to process files Processing Records - Exception. **Classes and Objects in Python:** Overview of OOP – Data	**13**

	encapsulation – Polymorphism – Class definition – Creating objects – *Inheritance* – Multiple inheritances – Method overriding – Data encapsulation – Data hiding.	
IV	**Data Manipulation Tools & Softwares: Numpy:** Installation - Ndarray - Basic Operations -Indexing, Slicing, and Iterating - Shape Manipulation - Array Manipulation - Structured Arrays -Reading and Writing Array Data on Files. **Pandas:** The pandas Library: An Introduction - Installation - Introduction to pandas Data Structures - Operations between Data Structures - Function Application and Mapping - Sorting and Ranking - Correlation and Covariance - ―Not a Number‖ Data - Hierarchical Indexing and Leveling – Reading and Writing Data: CSV or Text File - HTML Files - Microsoft Excel Files.	**12**
V	**Data Analysis with Python:** Importing Datasets: Cleaning and Preparing the Data: Identify and Handle Missing Values - Data Formatting. **Data Visualization:** Matplotlib Architecture - pyplot - Plotting with pandas and seaborn: Line, Bar, Histogram, Density, Scatter charts - Python visualization tools. **Use Cases on** Regression and Classification	**14**
Total Contact Hours		**64**

TEXT BOOKS

1. Python: The Complete Reference, Matrin C Brown, McGrraw-Hill, 2018.
2. Python Programming a Modular Approach with Graphics, Database, Mobile, and Web Applications – SheetalTaneja, Naveen Kumar – Pearson Publication, 2018.
3. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, Wes McKinny, 2nd Edition,O‘Reilly Media, 2017.
4. Data Analytics Using Python, Bharti Motwani, Wiley, 2020

REFERENCES

1. Python for Everybody: Exploring Data Using Python3, Dr. Charles R. Severance, 2016.
2. E Balagurusamy, ―Introduction to computing and problem solving using Python‖, McGraw Hill Publication,2016.
3. Mark Summerfield, Programming in Python 3: A Complete Introduction to the Python Language, 2nd Ed.,Addison-Wesley Professional, 2010.
4. Mark Lutz, ―Learning Python‖, 5th Ed., 2013.
5. Welsey J. Chun, ―Core Python Programming‖, Prentice Hall, 2001.

E-REFERENCES

1. https://freepdf-books.com/impractical-python-projects-playful-programming-activities-to-make-yousmarter-book-of-2019/
2. https://freepdf-books.com/fundamentals-of-python-first-programs-second-edition-book-of-2019

3. https://docs.python.org
4. http://www.diveintopython.org
5. https://www.learnpython.org/
6. https://www.javatpoint.com/python-tutorial
7. http://nptel.ac.in/

Course Outcomes	**On completion of the course, students will be able to** **CO1:**Understand the core elements of the Python Programming **CO2:**Resolve on the ideal usage of complex data structures as well as exceptions. **CO3:** Describe the files, OOPs concepts in python **CO4:**. Apply the Python libraries NumPy and Pandas for problem solving **CO5:**Explain the Data Analysis and Visualization with Python

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0102 CORE II : ADVANCED ALGORITHMS Credits: 4		
Class	**MCA**	**Semester**	**I**
Cognitive Level	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.		
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.		

Unit	Content	Lecture Schedule
I	**Introduction** Definition – Algorithm Specification –Recursive Algorithms - Performance Analysis – Space Complexity – Time Complexity – Asymptotic Notations.Graphs – Introduction – Definitions – Graph Representations	**12**
II	**Greedy Methods** 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** Probabilistic Analysis and Randomized Algorithms: The hiring problems – Indicator random variables - Randomized Algorithms – Probabilistic analysis and further uses of indicator random variables – The birthday paradox – Balls and bins.	**14**
Total Contact Hours		**64**

TEXT BOOKS

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SartajSahni&SanguthevarRajasekaran, 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-References

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

Course Outcomes	**On completion of the course, 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 probabilistic problems.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0103 CORE III : MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE AND APPLICATIONS Credits: 4		
Class	MCA	Semester	I
Cognitive Level			
Course Objectives	The Course aims to • Teach the fundamental concepts of Mathematics which are essential for mathematical thinking. • Correlate the logical thinking in application development With mathematics		

Unit	Content	Lecture Schedule
I	**Mathematical Logic** Mathematical Logic – Statements and Notations–Connectives. NormalForms-The Theory of Inference for the Statement Calculus. The Predicate Calculus- Inference Theory and Predicate Calculus	12
II	**Set Theory** Set Theory: Basic Concepts of Set Theory, Notation, Inclusion and Equality of Sets- The Power Set, Some Operations of Sets, Venn Diagrams, Some Basic Set Identities, The Principles of Specification- Cartesian Products – Relations and Ordering – Relations, Properties of Binary Relations in a Set, Relation Matrix and the Graph ofa Relation- Partition and Covering of a Set, Equivalence Relations, Compatibility Relations, Composition of Binary Relations.	13
III	**Functions** Definition and Introduction, Composition of Functions- Inverse Functions, Binary Operations- Characteristic Function of a Set, Hashing Functions- Natural Numbers - Peano's Axioms and Mathematical Induction	13
IV	**Matrices** Matrices: Matrix Operations - Rules of Matrix Arithmetic- Eigen Values and Eigen Vectors- Cayley Hamilton theorem-Problems	12
V	**Graph Theory** Graph as Models – Vertex degrees Subgraph –Path - Cycle-Matrix Representation of graphs- Fusion –Trees- Bridges – Spanning Trees – Connecter Problem	14
Total Contact Hours		**64**

TEXT BOOKS:

1. Discrete Mathematical Structures with Application to Computer Science, J.B.Tremblay and R.Manohar, McGraw– Hill InternationalEdition,1987
2. Elementary Linear Algebra, Howard Anton, 4/e, John Wiley &Sons,1984.
3. Modern Algebra, Arumugam S Issac, SCI Tech Publications, 2008.(For Unit II,III)
4. A First Look at Graph Theory, by John clark, Allied Publisher‘s Ltd.(For unit V,Section 1.1 to 1.8 & 2.1to2.4)

REFERENCES:

1. Applied Discrete Structures for Computer Science, D.Alan, L.Lenneth, Galgotia Publications, 1983.
2. Formal Languages and their Relations to Automata, J.E. Hopcroft and J.D. Ullman, Addison – Weslay PublishingCompany,1969.
3. Elements of Discrete Mathematics, C.Liu and D. Mohapatra, McGrawHill.2008.

Course Outcomes	**On completion of the course, students will be able to** **CO1:** Demonstrate understanding of the mathematical basis of common algorithms, and the ability to calculate accurately and efficiently. **CO2:** Demonstrate the ability to solve problems, including applications outside of mathematics, by means of intuition, creativity, guessing, and the experience gained through the study of particular examples and mathematical models. **CO3:** Demonstrate the ability to communicate mathematical ideas clearly. They will use correct mathematical terminology and proper mathematical notation. **CO4:** Design and write computer programs that are correct, simple, clear, efficient, well organized, and well documented. **CO5:** Understand basic concepts in graphs which has lot of applications in computer science.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0104 CORE IV : COMPILER DESIGN Credits: 4		
Class	MCA	Semester	I
Cognitive Level			
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.		

Unit	Content	Lecture Schedule
I	**Introduction to Compilers** 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.	12
II	**Lexical Analyzer** 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	13
III	**Syntax Analyzer** 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.	13
IV	**Intermediate Code Generation** Intermediate code generation - Intermediate languages - Graphical Representation - Three Address Code - Assignment statements - Boolean expressions - Flow of Control Statements - Case Statements - .Syntax directed translation of case statements	14
V	**Code Optimization And Code Generation** An Organization for an Optimizing Compiler - the Principle sources of	12

	optimization - Function Preserving Transformations - Common Sub-expression - Copy propagation - 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:

1. Compiler Construction Principles and Practice – D.M.Dhamadhere, McMillan IndiaLtd., Madras, 1983.
2. Alfred V. Aho, Ravi Sethi and Jeffrey D Ullman, "Compilers, Principles, Techniquesand Tools", Addison Wesley Longman (Singapore Pvt. Ltd.), 2011.
3. Alfred V. Aho, Jeffrey D Ullman, "Principles of Compiler Design", Addison Wesley,1988.
4. 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:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0105 CORE V: ADVANCED WEB PROGRAMMING Credits: 4		
Class	**MCA**	**Semester**	**I**
Cognitive Level			
Course Objectives	**The Course aims to** • Provide insight into the basics of the Web Programming • Design and implement dynamic web applications using XML, JSON AngularJS, NodeJS and MySQL		

Unit	Content	Lecture Schedule
I	**Introduction** 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	AngularJS: Introduction-Expression-Modules-Directives-Model-Data Binding—Controllers-Scopes-Filters-Services-HTTP-Tables-Select-SQl-DOM-Events-Forms-Validation	**16**
IV	NodeJS: Introduction – Modulus – HTTP Modules – File System – URL Module – NPM – Events – Uploaded Modules - Email	**14**
V	Database connectivity with MySQL: MySQL Database Connect-Create Database-Create Table – Insert Data – queries – Integrating web form and databases – Displaying queries in Tables – Building Forms from queries -Working with NodeJS and MySQL to access databases	**12**
Total Contact Hours		**64**

TEXT BOOKS:

1. Steven A. Gabarro, Web Application Design and Implementation: Apache 2, PHP5, MySQL, JavaScript, and Linux/UNIX, Wiley Publications, 2006.
2. Kognet, Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and AJAX - Black Book: Kindle Edition, 2009.
3. Lindsay Basselt, Introduction to JavaScript 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 JavaScript Stack 2nd Edition, Oreilly Publication, 2019.
6. Jason Gilmore, Beginning PHP and MySQL from Novice to Professional, Fourth Edition, Apress Publications, 2010.

REFERENCES:

1. Deitel, Internet and World Wide Web – How to Program, Fourth Edition, Pearson Prentice Hall, 2009
2. Achyut S Godole&AtulKahate, Web Technologies, TCP/IP Architecture and Java Programming, Second Edition, Tata McGraw 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.

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 will 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 MySQL **CO4:** Design and update web pages using AngularJS, NodeJS and MySQL **CO5:** Have practical experience in working with Web servers and Web Application Framework

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0106 LAB I :PYTHON PROGRAMMING AND ALGORITHMS LAB Credits: 1		
Class	**MCA**	**Semester**	**I**
Course Objectives	**The Course aims to** • Develop higher-order programming skills in core Python. • Apply the theoretical elements of Python for problem solving • Provide hands-on training to solve data-intense real-world problems		

UNIT	CONTENTS
	PYTHON PROGRAMMING 1. Decision Making and Looping statements. 2. Arithmetic and Relational Operators on Strings. 3. Built-In String Functions. 4. Create and Access Strings and Substrings (using Indexing andSlicing). 5. Function Definition & Function call. 6. Create and Access Lists. 7. Built-In List Functions. 8. Create and Access Tuples. 9. Built-In Tuple Functions. 10. Create and Access Dictionaries. 11. Built-In Dictionary Functions. 12. Files and Exceptions. 13. Create classes, objects, inheritance, polymorphism 14. Numpy Arrays 15. Pandas Libraries 16. Working on real-time Datasets 17. Data visualization 18. Use cases on data analytics
	ADVANCED ALGORITHMS 1. Knapsack Problem. 2. Prim‘s Algorithms. 3. Multistage Graph. 4. All pairs shortest path. 5. 8 Queens problem 6. Sum of subsets 7. Hamiltonian cycle. 8. Randomized Algorithm (Quick select).

Course Outcomes	**On completion of the course, students will be able to** **CO1:** Analyse and understand the various programming constructs through simple python programs **CO2:** Write the python programs using control structures **CO3:** Trace the execution of programs and debug the programs **CO4:** Implement python programs with exception handling **CO5:** Illustrate file concept through python programs

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0107 LAB II : ADVANCED WEB PROGRAMMING Credits: 1		
Class	**MCA**	**Semester**	**I**
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 MySQL		

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	MySQL • Working with AngularJS, NodeJS and MySQL to access databases	3
5	Working with anyone Web Servers and Web Application Frameworks	3
6	Project on Development of microservices	
Total Conduct 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 NodeJS and AngularJS to develop dynamic webpages **CO3:** Develop online web applications with database connectivity using AngularJS, NodeJS and MySQL **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	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21GTPP0001 Gandhi in Everyday Life Credits: 2		
Class	MCA	Semester	I

SEMESTER II

Course Code & Title	21MCAP0208 CORE VI : IMAGE PROCESSING AND COMPUTER VISION Credits: 4		
Class	MCA	Semester	II
Cognitive Level	K-1Explain the fundamentals of digital image and video processing K-2Analyse the image and video processing algorithms K-3Understand the applications of Image and Video processing K-4Apply the theoretical knowledge to real-time applications		
Course Objectives	**The Course aims to** • Introduce the basics of digital image acquisition and formation • Describe the basics of digital image acquisition, formation and processing • Develop knowledge on the principles & procedures of image processing elements. • Provide foundation to learn about video processing		

Unit	Content	Lecture Schedule
	Fundamentals of Digital Image Processing	

I	**Introduction**: What is Digital Image Processing? – Origins – Examples – Fundamental steps – Components **Digital Image Fundamentals**: Elements of Visual perception – Light and Electromagnetic Spectrum - Image Sensing and Acquisition - Image Sampling and Quantization - Relationships Between Pixels - Basic Mathematical Tools Used in Digital Image Processing.	**12**
II	**Image Transformation and Filtering**	**13**
	Image Transformation: Background - Some Basic Intensity Transformation Functions - Histogram Processing - Fundamentals of Spatial Filtering - Smoothing - Sharpening - Highpass, Bandreject, and Bandpass Filters from Lowpass Filters - Combining Spatial Enhancement Methods. **Filtering**: Background - Preliminary Concepts - Sampling and the Fourier Transform of Sampled Functions - The Discrete Fourier Transform of One Variable - Extensions to Functions of Two Variables - Some Properties of the 2-D DFT and IDFT - The Basics of Filtering in the Frequency Domain.	
III	**Image Restoration/Reconstruction and Color image processing**	**13**
	Image Restoration/Reconstruction: A Model of the Image Degradation/Restoration process - Noise Models - Restoration in the Presence of Noise Only - Spatial Filtering - Periodic Noise Reduction Using Frequency Domain Filtering - Linear, Position-Invariant Degradations - Estimating the Degradation Function Inverse Filtering -	
	Minimum Mean Square Error (Wiener) Filtering - Constrained Least Squares Filtering - Geometric Mean Filter - Image Reconstruction from Projections. **Color Fundamentals**: Color Models - Pseudo color Image Processing - Basics of Full Color Image Processing - Color Transformations - Color Image Smoothing and Sharpening - Using Color in Image Segmentation - Noise in Color Images - Color Image Compression.	
IV	**Morphological and Segmentation**	**12**
	Morphological Image Processing: Preliminaries - Erosion and Dilation - Opening and Closing - The Hit-or-Miss Transform - Some Basic Morphological Algorithms - Morphological Reconstruction. **Image Segmentation**: Fundamentals - Point, Line, and Edge Detection – Thresholding - Segmentation by Region Growing and by Region Splitting and Merging - Region Segmentation Using Clustering and Superpixels - Region Segmentation Using Graph Cuts Segmentation Using Morphological Watersheds - The Use of Motion in Segmentation.	
V	**Feature Extraction and Image Pattern Classification**	**12**
	Feature Extraction: Background - Boundary Preprocessing - Boundary Feature Descriptors - Region Feature Descriptors - Principal Components as Feature Descriptors - Whole-Image Features - Scale-Invariant Feature Transform (SIFT). **Image Pattern Classification**: Background - Patterns and Pattern Classes - Pattern Classification by Prototype Matching - Optimum (Bayes) Statistical Classifiers - Neural Networks and Deep Learning - Deep Convolutional Neural Networks.	
Total Contact Hours		**64**

TEXT BOOKS:

1. Rafael C Gonzalez; Richard E Woods, Digital Image Processing, Pearson NY, 4/e., 2019.

REFERENCES BOOK(S):

1. Davies ER, ―Computer vision: Principles, Algorithms, Applications, Learning‖, Elsevier, 5/e., 2018.
2. Mark Nixon, Alberto Aquado, Feature Extraction and Image Processing for Computer Vision, 2019 (ISBN-13: 978-0128149768).
3. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall
4. Robot Vision, by B. K. P. Horn, McGraw-Hill, 2012.

E-RESOURCES:

1. https://www.researchgate.net/publication/328120952_Understanding_Digital_Image_Processing
2. https://lecturenotes.in/download/material/30278-digital-image-video-processing
3. https://kishorekumarbooks.blogspot.com/2019/05/digital-image-video-processing-notes.html
4. http://nptel.ac.in/

Course Outcomes	**On completion of the course, students will be able to**
	CO1: Elucidate the fundamental concepts of a digital image processingsystem.
	CO2: Analyze the types and importance of image transformations and Filters.
	CO3: Describe Image Restoration/Reconstruction and Color image processing techniques
	CO4: Analyze the Morphological and Image Segmentation techniques.
	CO5: Explain the Feature Extraction and Image Pattern Classification.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0209 CORE VII : ADVANCED COMPUTER NETWORKS Credits: 4		
Class	MCA	Semester	II
Cognitive Level			
Course Objectives	The Course aims to 1. Define the Advance concepts in Computer Networks 2. Learn the principles in Protocol Layering 3. Explain the functionalities of the Core TCP/IP protocols		

Unit	Content	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	**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.	13
III	**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.	13
IV	**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
V	**Mobility and MobileIP:** 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, Internetworking with TCP/IP Vol:1 Sixth Edition, OReilly Publications.
2. Tetcos, NetSim Accelerate Network R&D Experimental Manual, 2017
3. WilliamStallings,-WirelessCommunicationsandNetworks‖,Pearsoneducation,2010
4. J.Schiller,-MobileCommunications‖,Pearsoneducation,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 COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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

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Course Code & Title	21MCAP0210 Core VIII: ACCOUNTING FOR DECISION MAKING Credits: 4		
Class	MCA	Semester	II
Cognitive Level			
Course Objectives	**The Course aims to** • Make learners a good Java programmer for developing advanced applications • Import skills and knowledge to create and run Java programs for solving real time problems		

Unit	Content	Lecture Schedule
I	**Introduction to Accounting:** Definitions, Meaning and Objects of Accounting, System of Accounting, Branches of Accounting, Accounting Cycle, Functions of Accounting, Advantages and Disadvantages of Accounting, Accounting Principles: Concepts and Conventions, Computerisation of Accounting, Advantage and Limitations.	12
II	**Recording of Business Transactions:** Identification & Analysis of Transactions, Journal and Subsidiary Books, Journalising, Posting, Balancing and Preparation of Trial Balance, The concept of Error and their Rectification	13
III	**Financial Statements Analysis (FSA) and Interpretation:** Meaning and Nature of Financial Statements, Final Accounts and Balance Sheet - Tools and Methods of FSA: Comparative Statements, Common size Statements, Ratio Analysis, Funds Flow and Cash flow Statement Analysis.	13
IV	**Cost Accounting and Profit Planning:** Meaning and Purpose of Costing, Classification of Costs, Preparation and Analysis of Cost Sheet. **Marginal Costing and Break even analysis**: Cost–Volume- Profit Analysis; Different types of Break-even Points and Charts; Advantages and limitations, Applications.	12
V	**Decisions Making using Accounting Information:** Cost Concepts Associated with Decision making; Specific Management Decisions – Make or buy; Expand or buy; Expand or Contract; Change vs. Status Quo; Retain or Replace; Optimum Product Mix; Adding and Dropping a Product – activity based costing and decision making.	12
Total Contact Hours		**64**

REFERENCES BOOK(S):

1. Aggarwal, J.K., R.K.Aggarwal, M.L.Sharma (2010) **Accounting for Managerial Decisions** – Ramesh Book Depot, Jaipur.
2. Arora M.N, (2010) **Cost and Management and Accounting: Theory and Problem,** Himalaya Publishing House, Mumbai.
3. Bhabatosh Banerjee (2014) **Cost Accounting: Theory and Practice**, PHI, New Delhi
4. Hariharan, N. and R. Palaniappan, (2012) **Cost Accounting: Theory and Practice**, I K International Publishing House, Amazon Pvt ltd.
5. Jain & Narang,(2012) **Cost Accounting**,**Principles and Practice** S.Chand & Co, New Delhi.
6. Jain, S.P K.L, (2009). Narang and Simi Agarwal, **Accounting for Management**, Kalyani Publishers, New Delhi.
7. Kishore .R **Advance Management Accounting**, Taxman, New Delhi.
8. Madhav Rajan et al (2021) **Cost Accounting: A Managerial Emphasis**, Pearson, New Delhi
9. Maheswari S.N and S.K. Maheswari (2005) **Financial Accounting**, Vikas Publising House, New Delhi.
10. Pillai R.S.N. & V. Bagavathi (2006) **Cost Accounting,** S. Chand & Company Ltd., New

Mapping of COs with PSOs:

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

Course Code & Title	21MCAP0211 CORE IX : ADVANCED JAVA PROGRAMMING Credits: 4		
Class	**MCA**	**Semester**	**II**
Cognitive Level			
Course Objectives	**The Course aims to** • Make learners a good Java programmer for developing advanced applications • Import skills and knowledge to create and run Java programs for solving real time problems		

Unit	Content	Lecture Schedule
I	Event Handling- Model, Event, Event Listeners, Registering Listener with Source, Example programs, Adapter Classes. Swing-1 (Graphics) – JComponent, JFrame	**12**
II	Swing-2 (GUI Components) – Jbutton, JLabel, JToggleButton, JCheckBox, JRadioButton, JList, JScrollBar, JScrollPane, JTextField, JPasswordField, JTextArea, JComboBox, JMenuItem, JMenu, JMenuBar, Jdialog, JOptionpane, JFileCheck, JProgressBar, LayoutManager.	**13**
III	JDBC- Introduction, DriverManager, Connection Interface, Statement Interface, PreparedStatement Interface, CallableStatement Interface, ResultSet Interface.	**13**
IV	Servlet – Introduction, HTML, Interface Servlet, HttpServlet Class, Servlet Programs, Servelet with I/O Files, Servelet with JDBC, Session Handling, Session Tracking.	**12**
V	JSP – Introduction, JSP Working Model, Syntax of a JSP Page with Sample Programs.	**12**
Total Contact Hours		**64**

TEXT BOOKS:

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

REFERENCES BOOK(S):

1. Herbert Schildt, Java 2-The complete reference, 7th Edition McGraw ill,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-RESOURCES:

1. Advanced Programming in Java2, 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 https://www.researchgate.net/publication/352172393_JDBC_Connectivity_in_Java_JDK16
3. 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
4. JSP, Java Server Pages, In book: Server Side Programming Chapter: Chapter

Course Outcomes	**On completion of the course, 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 COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0212 LAB III : IMAGE PROCESSING AND COMPUTER VISION Credits: 1		
Class	**MCA**	**Semester**	**II**
Cognitive Level			
Course Objectives	**The Course aims to** • Provide hands-on training on the implementation of algorithms for Digital Image processing and computer vision. • Provide practicals on the development of solutions to simple problems in the domain of digital Image processing and computer vision.		

Sl.No.	Content	Lecture Schedule
	1. Image Transformation 2. Image Enhancement 3. Smoothing and sharpening 4. Morphological Operations 5. Edge/Boundary Detection 6. Region Growing 7. Region Splitting 8. Region Merging 9. Region Clustering 10. Graph cut segmentation 11. Feature Extraction 12. Pattern classification 13. Neural Networks 9 14. Convolutional Neural Networks	16
	Total Contact Hours	16
Course Outcomes	**On completion of the course, students should be able to** • Design and develop simple solutions using standard digitalimage processing algorithms. • Demonstrate the acquired practical knowledge on the application domains such as medical and satellite images. • Synthesize new algorithmic solutions for computer visionapplications.	

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	3
CO2	3	3	3	2	2
CO3	3	3	3	2	3
CO4	3	3	3	3	2
CO5	3	3	3	3	3

Course Code & Title	21MCAP0213 LAB IV :ADVANCED JAVA PROGRAMMING LAB Credits: 1		
Class	**MCA**	**Semester**	**II**
Course Objectives	**The 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		

Unit	Content	Lecture Schedule
1	**Swing-1(+Graphics)** 1. Create applet with default Panel inJapplet 2. Create applet on JFrame 3. Applet with data 4. Draw, line, rectangle, filledrectangle 5. Draw oval, arc, polygon,polyline 6. Event handling- MouseEvent,KeyEvent, ActionEvent,WindowEvent 7. Swing with JFrame 8. JButton,JText,JTextfield (on JApplet and JFrame)	2
2	**Swing-2** 9. JLabel, JCheckBox, JRadioButton and usingthem 10. JList and usingit 11. JScrollBar,JScrollPane, 12. TexField, JPassword,JTextArea 13. JComboBox, JMenuItem, JMenu,JMenuBar 14. JDialog, JOptionPane, JFileChooser,JProgressBar 15. BorderLayout, FlowLayout,GridLayout,CardLayout	4
3	**JDBC** 16. Configuring ODBC in thesystem 17. Creating connection and identifyingDrivers 18. Creating and using adatabase 19. Use of Statement interface anddatabase 20. Use of PreparedStatementanddatabase 21. Use of Callable Statement anddatabase 22. Use of ResultSet interface anddatabase	4
4	**Servlet** 23. Simple Servlet 24. Servlet - HTML form with GET and Servlet with doGet() method	3

	25. Servlet - HTML form with POST and Servlet with doPost()method 26. Servlet with doGet() and doPost()methods 27. Servlet receiving numbers and processing and sending the result(Factorial, Sumof numbers) 28. Servlet withJDBC 29. Creating cookies and reading them	
5	**JSP** 30. Creating HTML with various formats,superscript,subscript 31. HTML with Tables, images, link to otherpage 32. HTML with different forms-input, button,select, textarea 33. Creating a simple JSP with welcomenote 34. JSP with pagedirective 35. JSP with Scriptlet- finding factorial, JSP withexpression 36. JSP with declaration 37. JSP with implicitobject 38. JSP with action element- Javabeans	3
Total Conduct Hours		**16**

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 andtore the data in the database. **CO4:** Demonstrate server-side programming **CO5:** Design client-server based applications for all real-time problems.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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

SEMESTER III

Course Code & Title	21MCAP0314 CORE X :MACHINE LEARNING Credits: 4		
Class	**MCA**	**Semester**	**III**
Cognitive Level			
Course Objectives	**The Course aims to** • Introduce students to the basic concepts and techniques of Machine Learning. • Have a thorough understanding of the Supervised and Unsupervised learning techniques • Understand neural networks concepts • Learn regression and classification learning • Develop programming skills that helps to build real world applications based on machine learning		

Unit	Content	Lecture Schedule
I	**Introduction to Machine Learning, Model Preparation, Modelling and Evaluation** Introduction to Machine Learning: Introduction - human learning versus machine learning - types of machine learning - applications of machine learning - tools for machine learning. Model Preparation: Introduction - Machine Learning Activities - Data structures for machine learning - Data Pre-processing. Modelling and Evaluation: Introduction - Selecting a model - training a model - model representation and interpretability - evaluating performance of a model - improving performance of a model.	12
II	**Feature Engineering, Bayesian Concept Learning** Feature Engineering: Introduction to feature engineering - feature transformation - feature subset selection. Bayesian Concept Learning: Importance of Bayesian methods - Bayes‘ theorem - concept learning through Bayes‘ theorem - Bayesian Belief Network.	13
III	**Supervised Learning – Classification, Regression** **Classification**: Introduction - Example of supervised learning - classification model - classification learning steps - common classification algorithms. **Regression**: Introduction - example of regression - common regression algorithms.	13
IV	**Unsupervised Learning – Clustering, pattern finding using association rules**	12

	Introduction - Unsupervised learning versus supervised learning - applications of unsupervised learning - clustering and its types - Apriori algorithm for association rule learning.	
V	**Neural Network** Introduction - Understanding the biological neuron - exploring artificial neuron - types of activation functions - early implementation of artificial neural network - architectures of neural network - learning process in artificial neural network – backpropagation - Deep Learning. Use Cases on Ensemble Learning.	**12**
Total Contact Hours		**64**

Text Book:

1. –Machine Learning‖, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson Education, 2018.

Reference Books:

1. –Pattern Recognition and Machine Learning‖, C. M. Bishop, 2nd ed, Springer, 2011.
2. –Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow‖, Aurélien Géron, O'Reilly Media, 2019.
3. –Machine Learning‖, Tom Mitchell, McGraw Hill, 1997.
4. –Machine Learning: A Probabilistic Perspective‖, Kevin P. Murphy, MIT Press, 2012.

E-Resources:

1. http://nptel.ac.in/
2. https://www.pdfdrive.net/machine-learning-d31767902.html

Course Outcomes	**On completion of the course, students will be able to** **CO1:** Describe the differences among regression, classification, and clustering algorithms. **CO2:** Select the suitable machine learning task for a given application. **CO3:** Compute feature extraction for machine learning. **CO4:** Apply machine learning for potential applications. **CO5:** Develop machine learning based solutions for real-time applications.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0315 CORE XI :ADVANCED DATABASE MANAGEMENT SYSTEMS Credits: 4		
Class	**MCA**	**Semester**	**III**
Cognitive Level			
Course Objectives	**The Course aims to** • Explain the concepts of database management systems • Demonstrate the various data models and database systems • Manipulate real time data and elicit useful information using database concepts • Explain the concept and techniques in transaction and recovery system • Outline the Modern database design models and database languages.		

Unit	Content	Lecture Schedule
I	**Introduction**: Database System Applications – Purpose of Database Systems -View of Data – Database Languages - Relational Databases – Database Design - Data Storage and Querying - Transaction Management, Database Architecture - Data Mining and Information Retrieval, Specialty Databases - Database Users and Administrators, History of Database Systems **Relational Model**: Structure of Relational Database - Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations	**12**
II	**Introduction to SQL:** SQL Data Definition, Basic Structure of SQL Queries - Additional Basics Operations, Set Operations - Null Values, Aggregate Functions - Nested Subqueries, Modification of the Database **Intermediate SQL:** Join Expression, Views - Transactions, Integrity Constraints - Data Types and Schemas, Authorization **Advanced SQL:** Accessing SQL from Programming Language, Functions and Procedures, Triggers	**13**
III	**Transactions and Recovery:** **Transactions:** Transaction Concept– Simple Transaction Model – Storage Structure - Transaction Atomicity and Durability.Transaction Isolation – Serializability - Transaction Isolation and Atomicity – Transaction Isolation Levels – Implementation of Isolation Levels – Transactions as SQL Statements **Recovery Systems:** Failures Classification – Storage Recovery and Atomicity – Recovery Algorithm Buffer Management – Failure with Loss of Nonvolatile Storage - Early Lock Release and	**13**

	Logical Undo Operations - Remote Backup Systems	
IV	**NoSQL Database and Big Data Storage System:** Introduction to NoSQL Systems - The CAP Theorem - Document Based NoSQL Systems and MangoDB - NoSQL key value Stores - Column based or Wide Column NoSQL Systems - NoSQL graph Databases and Neo4j	**12**
V	**Big Data Technologies–**Based on MapReduce and Hadoop: What is Big Data? – Introduction to MapReduce and Hadoop-Hadoop Distributed File System – MapReduce Additional details – Hadoop V2 alias YARN – General Discussion on Cases.	**12**
Total Contact Hours		**64**

TEXT BOOKS:

1. DatabaseSystemConcepts,6/e,AviSilberchartz,HenryF.KorthandS.Sudarshan,McGraw–HillHigherEducation,InternationalEdition,2013.
2. RamexElmasriandShamkantB.Navathe,FundamentalsofDatabaseSystems,7thEdition,Pearson,NewDelhi,2016

REFERENCES BOOK(S):

1. Database Principles, 2/e, Peter Rob, Carlos Coronol, Steven A.Morris, KeeleyCrokett, Cengage Learning, 2013
2. Database System Concepts, PeterRob, CarlosCoronel, CengageLearning,2008.
3. DatabaseDevelopmentandManagement,LeeChao,AuerbachPublications,2010
4. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence,Sadalage, P. &Fowler, PearsonEducation, 2013
5. Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQLMovement,1stEdition,LucPerkins,EricRedmond,etal.O'ReilleyPublishers,2018

Course Outcomes	**On completion of the course, students will be able to**
	CO1: Revise the components, functions and various database designtechniquesusedformodellingthedatabasesmanagementsystem. **CO2:** Examine the clauses and functions of SQL and write optimal queries in the abovelanguages. **CO3:**Design entity-relationship diagrams to represent simple databaseapplication scenarios and can apply the database schema normalizationrulesandtechniques tocriticize and improve the data base design. **CO4:** Analyze the concept of transaction processing, concurrent transaction processing and recovery procedures **CO5:** Employ the advanced database models viz. Big Data – and tools like MapReduce and Hadoop.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0316 CORE XII :INTERNET OF THINGS AND ROBOTICS Credits: 4		
Class	MCA	Semester	III
Cognitive Level			
Course Objectives	The Course aims to • Import skills and knowledge on internet of thingsfor solving real time problems • Create robots for local and internet based environments • Make learners a good AI system developer		

Unit	Content	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, Robotics – Introduction, Major components, Types	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 withArduino - 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)** 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

REFERENCE BOOKS:

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 Holler, 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 IoT systems 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, MattewN.O.Saidiku, Tata, McGraw Hill company.

E-RESOURCES:

https://www.embedded-robotics.com/robotics-for-beginners/
https://www.arduino.cc/en/guide/introduction

https://www.tutorialspoint.com/arduino/index.htm

https://projects.raspberrypi.org/en/projects/raspberry-pi-getting-started

https://www.hindawi.com/journals/jhe/2021/9999504/

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	21MCAP0317 CORE XIII: OPTIMIZATION TECHNIQUES Credits: 4		
Class	MCA	Semester	III
Cognitive Level			
Course Objectives	The Course aims to • Get the knowledge about mathematical formulation, decision making and optimizing the output of many real-lifeproblems		

Unit	Content	Lecture Schedule
I	**Formulation and Solution of Linear Programming Problem (LPP)** Introduction, Mathematical Formulation of theLPP- Graphical Solution Method- General LPP, Canonical and Standard Forms ofLPP- Simplex Method Big MMethod- Two PhaseMethod.	14
II	**Transportation & Assignment Problems** LP formulation, Existence and Solution ofTP- Finding IBFS of TP by NWC, Matrix Minima andVAM- Optimal Solution of TP (MODIMethod)- Mathematical Formulation ofAP- Solution Methods ofAP	13
III	**Games and Strategies** Introduction, Two-Person Zero-SumGames- Some Basic Terms, MaxMin-MiniMaxPrinciple- Games without Saddle Points – MixedStrategies-- Graphic Solution of 2xn and mx2Games- Dominance Property	13
IV	**Replacement & Inventory Problems** Replacement of Equipment/Asset that DeterioratesGradually- Replacement of Equipment/Asset that FailSuddenly- Deterministic Inventory Problems with noshortages- Deterministic Inventory Problems withShortages	12
V	**Network Scheduling by CPM & PERT** Network: Basic Components, Logical Sequencing & Rules of NetworkConstruction- CPMAnalysis- PERTAnalysis- Distinction between PERT &CPM	12
Total Contact Hours		64

TEXT BOOKS:

1. Operations Research, KantiSwarup, P.K. Gupta & Man Mohan, 17/e, S. Sultan Chand & Sons, New Delhi, 2014
2.

REFERENCES BOOK(S):

1. Introduction to Operations Research, F. Hiller and G. J. Lieberman, Holden Day Inc.,1980.
2. Operations Research: An Introduction**,** M.A. Taha, McMillan Publ. Co,1982.
3. The Critical Path Method, L.R. Shaffer J.B. Filtter and W.L.Meyer, McGrawHill,1965.
4. Ravindran A, Philips D.T &Solbery. J.J, Operations Research: Principles andpractice, John Wiley& Sons, New York,1987.

Course Outcomes	**On completion of the course, students will be able to**
	CO1: Formulate and solve the LPP in their reallife
	CO2: Find the shortest path to get minimum transportationcost and optimum job assignment problems
	CO3: Identify best strategic game models and its characteristics.
	CO4: Handle inventory theory gives economic orders of quantity in stock of production or sales problems**.**
	CO5: Identify critical time and best path of a project to complete inminimum time, using PERT & CPM

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0318 LAB V : ADVANCED DBMS Credits: 1		
Class	**MCA**	**Semester**	**II**
Course Objectives	**The Course aims to** • Create and design RDBMS • Perform Database operations using SQL • Execute complex queries • Understand and analyze Advance Database tools		

Sl.No.	Contents
1	**SQL** 1. TablesCreations,Sorting,Settingrelationbetweentables 2. Queriesusingsingleandmultipletables 3. ExceptionHandling,CursorandTriggers 4. Import & Export Tables 5. Reports
2	**NOSQL,MySQL, MapReduce, HadoopandNeo4j** 1. Create Newtable 2. Modifytable 3. Concatenatingtables 4. CreatingBigTables 5. CreatingWebFrameworks 6. DevelopingWebApplication 7. Understanding Modern databases
Course Outcomes	**On completion of the course, students should be able to** **CO1**: Design and create different types of databases **CO2:** Write SQL Queries, and complex queries and apply functions **CO3:** Create frame work enabled database **CO4**: Use tools to generate reports

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	21MCAP0319 LAB VI : ROBOTICS AND IoT LAB Credits: 1		
Class	MCA	Semester	II
Course Objectives	The Course aims to • Train the students for developing their own intelligent and communication systems using sensors, internet, robots and advance computing techniques.		

Sl.No.	Contents
1	**USING CISCO PACKETRACER** 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 LED Blink using Arduino (SBC) 7. Interface different sensors and actuator with SBC 8. **Case Study:** Design a Fire Alarm System for a factory/Home
2	**USING TINKER CAD** 1. LED RGB Simulation in Tinkercad 2. Push Button Simulation in Tinkercad 3. Servo Motor Simulation in Tinkercad 4. Buzzer Simulation in Tinkercad
3	**USING REAL DEVICES** 1. LED Blinking using Raspberry PI/Arduino 2. Home Weather display using Raspberry PI 3. Design a robocar to follow the track.
	Simulation: 1) Cisco Packet Tracer 2) Tinkercad: https://www.tinkercad.com/

	3) https://www.javatpoint.com/arduino-simulator#:~:text=The%20Arduino%20simulator%20is%20a,the%20need%20for%20any%20hardware. **Hands-on:** 1) SparkFun kit 2) Raspberry With GrovePI Kit
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 CO5: interface different sensors and actuators CO3: Develop simple comment based robots CO4: Demonstrate some real time internet of robotic systems

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

SEMESTER IV

Course Code & Title	21MCAP0421 CORE XIV: PARALLEL AND DISTRIBUTED COMPUTING Credits: 4		
Class	**MCA**	**Semester**	**IV**
Cognitive Level			
Course Objectives	**The Course aims to** • Provide basic concepts of parallel and distributed computing • Describe CUDA programming model • Know about parallel and distributed programming		

Unit	Content	Lecture Schedule
I	Basic Concepts: Introduction to parallel processing, parallel processing terminology, decomposition, complexity, throughout, speedup, measures, data dependence, resource dependence, Bernstein's conditions levels of parallelism in programs. Program flow-control flow, data flow	12
II	CUDA programming model: Overview of CUDA, Isolating data to be used by parallelized code, API function to allocate memory on parallel computing device, to transfer data, Concepts of Threads, Blocks, Grids, Developing a kernel function to be executed by individual threads, Execution of kernel function by parallel threads, transferring data back to host processor with API function.	14
III	Distributed Computing-introduction, definition, its history; Distributed Computing system definition and its evolution, reasons for its popularity, Strength and weaknesses of distributed computing, Different forms of Computing: Minicomputer model, workstation model, workstation server model, Processor pool Model; Cluster:- definitions, reasons for its popularity cluster computer system architecture, Windows cluster, Solaris cluster, Linux cluster; Using cluster, distributed Computing System models: Distributed operating system, Introduction to DCE, architecture of Distributed Applications	14
IV	Clock: Types of Clock, Synchronization of clocks, types of Clock synchronization algorithms, lamport time stamps, Message passing:- introduction, desirable features of a good message passing system, Issues in IPC by Message passing, synchronization, Buffering, Multi-datagram messages, Encoding and decoding of message data, Process addressing, Failure handling, IPC, Distributed Election, types of election algorithms.	12
V	Parallel & Distributed Programming: Parallel Programming	12

	environments, models, synchronous asynchronous programming, Programming using the tools MPI and Open MP.	
	Total Conduct Hours	**64**

Text Books:

1. A Grama, AGupra, G Karypis, V Kumar. Introduction to Parallel Computing (2nd ed.). Addison Wesley, 2003.
2. C Lin, L Snyder. Principles of Parallel Programming. USA: Addison-Wesley Publishing Company, 2008.
3. J Jeffers, J Reinders. Intel Xeon Phi Coprocessor High-Performance Programming. Morgan Kaufmann Publishing and Elsevier, 2013.
4. T Mattson, B Sanders, B Massingill. Patterns for Parallel Programming. AddisonWesley Professional, 2004.
5. Shane, CUDA Programming: A Developer's Guide to Parallel Computing with GPUs (Applications of GPU Computing), 2012.
6. Chandra R, Dagum L, Koht D, Maydan D, McDonald J and Menon R, Parallel Programming in OpenMP, 2001
7. Salim Hariri Manish Parashar, tools and environments for parallel and distributed computing, Wiley Interscience Publications, 2004.

References:

1. Arun Kulkarni, Nupur Prasad Giri, Nikhilesh Joshi, BhushanJadhav, Parallel and Distributed Systems, 2ed, 2006
2. Michael J. Quinn, ―Parallel Computing – Theory and Practice, 2nd Edition, McGraw Hill, 1994
3. Kai Hwang, ―Advanced Computer Architecture – Parallelism, Scalability, Programmability‖, McGraw Hill Inc, 1993.
4. Wilkinson, ―Parallel Programming using networked computer‖ , Pearson Education India, 2006

E-Resources:

- https://books.google.co.in/books?id=EX2LNkSqViUC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
- http://srmcse.weebly.com/uploads/8/9/0/9/8909020/introduction_to_parallel_computing_second_edition-ananth_grama..pdf
- https://rabernat.github.io/research_computing/parallel-programming-with-mpi-for-python.html
- https://www.slideshare.net/DhanashreePrasad/openmp-tutorial-for-beginners

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Gain knowledge in Basics Parallel and distributed computing techniques. **CO2:** Understand the different architectures **CO3:** Learn the various functionalities and processing. **CO4:** Discuss practical operations in coordination and synchronization. **CO5:** Analyse the issues and challenges in these computing techniques

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0422 CORE XV: ADVANCED DATA MINING TECHNIQUES Credits: 4		
Class	**MCA**	**Semester**	**IV**
Cognitive Level	K-1: Define the concepts and architecture of data warehousing K-2: Understand the working of recent classification and Cluster analysis K-3: Comprehend and select data mining technique in a problem specific manner.		
Course Objectives	**The Course aims to** • Evaluate the concepts of database technology for data mining and its applications • Define the concepts of Data Warehousing and its Architecture • Describe the algorithms for Mining multimedia databases with text mining and web usage mining • Apply the basic algorithms, advanced techniques and tools for data mining		

Unit	Content	Lecture Schedule
I	**Data Mining** Data Mining-On What Kind of Data-Data Mining functionalities-KDD Vs Data Mining-Data Mining Techniques -Integration of a Data Mining System with a Database or Data Warehouse system-Major issues in data mining- Current Trends in Data Mining -Mining on Social networks link mining	12
II	**Data Warehouse and OLAP Technology for Data Mining** Data Warehouse and OLAP Technology for Data Mining-Data Warehouse Modeling-Data Warehouse Architecture. Association Rules-Concepts- Methods to discover Association rules- A priori algorithm – Partition algorithm- Pioneer search algorithm – Dynamic Item set Counting - Incremental algorithm-Border algorithm-Generalized association rule	13
III	**Classification and Advanced Pattern Mining** Classification and Advanced Pattern Mining-Pattern Mining in Multilevel, Multidimensional space-Mining on High Dimensional Data Classification:Advanced Methods -Support Vector Machine-Lazy learners	13
IV	**Clustering Techniques** Cluster Analysis: Advanced Cluster Analysis-Fuzzy clusters-correlation based clustering methods-Bi clustering –Dimensionality reduction methods –Similarity Measures- Categorical clustering algorithms-STIRR-ROCK-CACTUS Implementation of Clustering techniques using Orange tool	12
V	**Web Mining and Spatial Mining** Web Content Mining – Web Structure Mining – Web Usage Mining – Text Mining – Text Preprocessing - Text clustering Spatial mining – Spatial mining tasks – Spatial clustering – Spatial trends –GSP Algorithm- Time Series Analysis	14
	Total Contact Hours	64

TEXT BOOKS

1. Jiawei Han, MichelineKamber, Data Mining Concepts and Techniques, 2/e, Morgan Kaufman Publisher(Elsevier), 2012.

REFERENCES

1. Arun K Pujari, Data Mining Techniques, Universities Press (India) Private Limited, 2012.
2. ArjayChandry,P.S.Deshpande,‖Multi-dimensional Data Anaysis and Data Mining‖, Dreamtech Press,2009.

E-References

1. https://booksite.elsevier.com/9780123814791/chapters_from_the_second_edition/chapter_9.pdf
2. https://file.biolab.si/notes/2018-05-intro-to-datamining-notes.pdf

Course Outcomes	**On completion of the course, students will be able to** **CO1:** Analyze the different data mining Technology. **CO2:** Demonstrate about data warehouse modeling and operations **CO3:** Apply advanced classification and pattern mining techniques **CO4:** Compare and implement various approaches of clustering Techniques **CO5:** Discuss about different types of Web Mining and Spatial Mining

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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

DISCIPLINE-CENTRIC ELECTIVE

Course Code & Title	21MCAP03EA NATURAL LANGUAGE PROCESSING Credits: 3		
Class	**MCA**	**Semester**	**IV**
Course Objectives	**The Course aims to** • Impart, fundamental concepts of Natural Language Processing • The study of computing systems that can process, understand, or communicate in human language • Creation an understanding of various NLPtasks as listed on the course syllabus, algorithms for effectively solving these problems, and methods for evaluating their performance		

Unit	Content	Lecture Schedule
I	**Introduction and Language Processing:** Origin – Stages – Approaches of NLP - Regular Expressions-Basic Regular Expression Patterns-Disjunction, Grouping and Precedence - More Operators-Substitutions, Capture, Groups and ELIZ - Lookahead 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. 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 and Parts of Speech Tagging:** 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 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**
III	**Classification and Extraction** 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 Information Extraction-Information Extraction Architecture, Chunking-	**10**

	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	
IV	**Semantics and Sentiment Analysis** 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 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**
V	**Coreference Resoultion and Chatbot and Dialog Systems** Linguistic Background, Coreference Tasks and Datasets, Mention Detection, Architectures for Coreference Algorithms, Classifiers using hand-built features, A neural mention-ranking algorithm, Evaluation of Coreference Resolution Properties of Human Conversation, Chatbots-Rule Based Chatbots-Corpus based Chatbots-Hybrid Architectures, Simple Frame Based Dialog Systems, The Diaglog State Architecture, Evaluating Dialog Systems, Dialog System Design	**8**
	Total Contact Hours	**64**

TEXT BOOKS

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

References:

1. James Allen, –Natural Language Processing with Python‖, First Edition, O'Reilly Media, 2009.
2. Christopher D. Manning and 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 completion of the course, 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

Mappingof COswith 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	21MCAP03EB NETWORK SECURITY AND CRYPTOGRAPHY Credits: 3		
Class	**MCA**	**Semester**	**III**
Cognitive Level			
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		

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.	10
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.	10
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.	10
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).	10
V	Wireless Network Security: Wireless Security – Mobile Device Security – IEEE 802.11 Wireless LAN Overview – IEEE 802.11i Wireless LAN Security. Electronic Mail Security.	8
	Total Conduct Hours	**48**

TEXT BOOKS:

William Stallings. Cryptography and Network Security. Uttar Pradesh: Pearson IndiaEducation Services Pvt. Ltd, 2018.

REFERENCES:

1. Behrouz A. Forouzan and DebdeepMukhopadhyay. Cryptography and Network Security. New Delhi: Tata McGraw Hill Education Private Limited, 2011.
2. AtulKahate. 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 should 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 COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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

MODULAR COURSES (2CREDITS)

Course Code & Title	21MCAP03M1 INDUSTRY 4.0 Credits: 2		
Class	**MCA**	**Semester**	**III**
Course Objectives	. **Course ObjectivesThe Course aims** • To introduce the concept Industry 4.0 and its Applications • To make the students familiar with Augmented Reality. • To gain knowledge on Artificial Intelligence, and Machine Learning.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to Industry 4.0** Genesis of Industry 4.0 - Building Blocks of Industry 4.0 - Maturity and Feasibility of Industrial Net - Changing Roles - Sustainability 4.0 – Development of Industry 4.0 – Evolution of Industry - Smart Factories - Technology Development in Industry 4.0 - Talent Development in Industry 4.0 - Business Development in Industry 4.0.	8
II	**Sustainable Development and Big Data** Introduction to Sustainable Development - Challenges of Sustainable Development - The Triple Bottom Line of Sustainable Development - Solution to Sustainable Development Challenges - Future of Sustainable Development. Introduction to Big Data and Industry 4.0 - Assessment Framework for Big Data Analytics in Industry 4.0 - Data Analytics in Industry 4.0 - Big Data as a Practical Solution.	8
III	**Ubiquitous and Cloud computing** Introduction to Ubiquitous technology - Ubiquitous Computing and Ubiquitous Manufacturing - Components of Ubiquitous Manufacturing Implementation - Enabling and Allied Technologies for Industry 4.0. Introduction to Cloud computing - Cloud Based Infrastructure for Industry - Cloud Based Framework for Production - Independent and Integrated Cloud Model.	8
IV	**Modelling, Simulation, and Augmented Reality in Industry 4.0** Introduction - Modern Design and Virtual Prototyping - Simulation Based Optimization – Introduction to Augmented reality - The Role of Augmented Reality in Industry 4.0 - Technological Requirements - Applications of Augmented Reality Industry 4.0 - Virtual Reality and Speech Recognition.	8
Total Contact Hours		**32**

TEXT BOOKS:

1. –A Roadmap to Industry 4.0: Smart Production, Sharp Business and Sustainable Development‖, Anand Nayyar and Akshi Kumar, Springer, 2020.

REFERENCE BOOKS:

1. Industry 4.0: Managing the Digital Transformation‖, Alp Ustundag and Emre Cevikcan, Springer, 2018.
2. Industry 4.0: The Industrial Internet of Things‖, Alasdair Gilchrist, Apress Publications, 2016.
3. The Concept Industry 4.0: An Empirical Analysis of Technologies and Applications in Production Logistics‖, Christoph Jan Bartodziej, Springer Gabler, 2017.

E- REFERENCES

1. https://nptel.ac.in/courses/106/105/106105195/
2. https://www.udemy.com/course/intro-to-industry-4/

Course Out Comes	**On completion of the course, students will be able to**
	CO1: Understand Industry 4.0 and its scope in future. **CO2:** Appreciate the smartness in production, business and sustainabledevelopment. **CO2:** Understand the opportunities, challenges brought about by Industry 4.0. Appreciate the power of cloud, simulation, and augmented reality inIndustry. **CO4:** Explore the scope of Industrial robotics.

Mappingof COswith 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	21MCAP03M2 VIRTUAL REALITY Credits: 2		
Class	**MCA**	**Semester**	**III**
Course Objectives	**The Course aims** • To provide the history and evolution of Virtual Reality and providethe understanding of the modern virtual reality techniques. • To provide different models and concepts of design in the development of applications and guidelines • This course offers the detailed overview of the interactions and patterns in human interventions.		

UNIT	CONTENTS	Lecture Schedule
I	What is Virtual Reality? – A History of VR – An Overview of Various Realities – Immerse, Presence and Reality Trade off‘s – The Basics: Design Guidelines	**8**
II	Objective and Subjective Reality – Perceptual Models and Processes – Perceptual Modalities – Perception of Space and Time – Perceptual Stability, Attention and Action – Design Guidelines	**8**
III	High Level Concepts of Content Creation – Environmental Design – Affecting Behavior - Transitioning to VR Content Creation – Content Creation: Design Guidelines	**8**
IV	Human Centered Interaction – VR Interaction Concepts – Input Devices – Interaction Patterns and Techniques – Interaction: Design Guidelines	**8**
	Total Contact Hours	**32**

REFERENCE BOOKS:

1. M.TamerOzsu, ―The VR Book Human-Centered Design for Virtual Reality‖, ACM BOOK, ACM Book, 2016

E- REFERENCES

1. Erin Pangilinan, Steve Lukas and Vasanth Mohan ―Creating Augumented and Virtual Realities‖, O-Reilly, 2019
2. Celine Tricart, ―Virtual Reality Filmmaking Techniques and Best Practices for VR

COURSE OUTCOMES	On complection of te course, students should be able to
	CO1: To remember the basic terminologies and concepts in Virtual Reality.
	CO2: To understand the various types of modalities in application development.
	CO3: Recognize the different functionalities guidelines and overview of techniques
	CO4: Identify and analyze the interactions and patterns in human intervention

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	21MCAP04M3 MODULAR COURSE II: ADVANCED SOFTWARE ENGINEERING PRINCIPLES AND PRACTICES Credits: 2		
Class	MCA	Semester	IV
Cognitive Level			
Course Objectives	The Course aims to •Understand Project Management Concepts •Classify the various Process and project metrics •Learn the estimation for software projects and Software Process Improvement •classify the emerging Trends in Software Engineering		

Unit	Content	Lecture Schedule
I	**Project Management Concepts:**The Management Spectrum- People - The Product - Software Scope- Problem Decomposition- The Process - Melding the Product and the Process- Process Decomposition- The Project	8
II	**Process and project metrics** Metrics in the Process and Project Domains- Software Measurement - Metrics for Software Quality- Integrating Metrics within the Software Process - Metrics for Small Organizations - Establishing a Software Metrics Program	8
III	**Estimation for software projects** Observations on Estimation- The Project Planning Process- Software Scope and Feasibility- Resources- Software Project Estimation- Decomposition Techniques- Empirical Estimation Models- Estimation for Object-Oriented Projects- Specialized Estimation Techniques	8
IV	**Software Process Improvement** Introduction SPI – the SPI process – the CMMI – the people CMM – other SPI frameworks – SPI return on Investment – SPI Trends.	8
	Total Conduct Hours	**32**

TEXT BOOKS:

1. Roger S. Pressman, Software Engineering – A Practitioner‘s Approach, 7/e, McGraw Hill Inc., 2014.

REFERENCES:

1. Alistair Cockburn, Agile Software Development, 2/e ,Pearson Education, 2007
2. Richard E.Fairley, Software Engineering concepts, Mc-Graw Hill, 1984.
3. Ian Sommervillie, Software Engineering, 9/e, Addison Wesley, 2011.

Course Outcomes	On completion of the course, students should be able to **CO1:** Gain knowledge in Basics of Project Management Concepts **CO2:** Understand the different Client Process and project metrics **CO3:** Learn the various estimation for software projects **CO4:** Discuss practical applications of Software Process Improvement **CO5:** Appreciate the emerging Trends in Software Engineering

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP03M3 VIRTUAL REALITY Credits: 2		
Class	**MCA**	**Semester**	**III**
Course Objectives	**The Course aims** • To provide the history and evolution of Virtual Reality and providethe understanding of the modern virtual reality techniques. • To provide different models and concepts of design in the development of applications and guidelines • This course offers the detailed overview of the interactions and patterns in human interventions.		

UNIT	CONTENTS	Lecture Schedule
I	What is Virtual Reality? – A History of VR – An Overview of Various Realities – Immerse, Presence and Reality Trade off‘s – The Basics: Design Guidelines	8
II	Objective and Subjective Reality – Perceptual Models and Processes – Perceptual Modalities – Perception of Space and Time – Perceptual Stability, Attention and Action – Design Guidelines	8
III	High Level Concepts of Content Creation – Environmental Design – Affecting Behavior - Transitioning to VR Content Creation – Content Creation: Design Guidelines	8
IV	Human Centered Interaction – VR Interaction Concepts – Input Devices – Interaction Patterns and Techniques – Interaction: Design Guidelines	8
Total Contact Hours		**32**

REFERENCE BOOKS:

1. M.TamerOzsu, ―The VR Book Human-Centered Design for Virtual Reality‖, ACM BOOK, ACM Book, 2016

E- REFERENCES

1. Erin Pangilinan, Steve Lukas and Vasanth Mohan ―Creating Augumented and Virtual Realities‖, O-Reilly, 2019
2. Celine Tricart, ―Virtual Reality Filmmaking Techniques and Best Practices for VR

COURSE OUTCOMES	On completion of the course, students should be able to
	CO1: To remember the basic terminologies and concepts in Virtual Reality. **CO2:** To understand the various types of modalities in application development. **CO3:** Recognize the different functionalities guidelines and overview of techniques **CO4:** Identify and analyze the interactions and patterns in human intervention

Mappingof COswith 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	21MCAP04M4 Blockchain Architecture Credits: 2		
Class	**MCA**	**Semester**	**IV**
Course Objectives	**The Course aims to** • Understand Blockchain Technology • Develop and deploy Blockchain applications		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction**	
	Introduction to Blockchain-History of Blockchain– Blockchain Properties -Types of blockchain – Advantages of Blockchain –Consensus mechanism - Types of consensus mechanisms -Consensus in blockchain	8
II	**Smart Contract and Cryptography**	
	Blockchain and full ecosystem decentralization-Smart Contract - Decentralized Organizations- Platforms for decentralization- Public key cryptography – Hash function	8
III	**Bitcoin and Ethereum**	
	Introduction to Bitcoin –Mining – Transaction – Structure of Blocks – Bit coin network and payments – Introduction to Ethereum	8
IV	**Tools and Frameworks**	
	Development Tools and Frameworks- Web 3.0 - Create a smart contract application for Ethereum using REMIX IDE - Uses cases of Blockchain	8
Total Contact Hours		**32**

Text Book:

1. Imran Bashir, Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained, Packt Publishing, Second Edition, 2018.

E-References:

1. https://www.simplilearn.com/tutorials/blockchain-tutorial
2. https://www.guru99.com/blockchain-tutorial.html

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: Understand the underlying networking concepts used with blockchain
CO4: Practice the tools and frameworks for developing blockchain applications

Mappingof COswith 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

VALUE ADDED COURSES (2CREDITS)

Course Code & Title	21MCAP0VA1 R PROGRAMMING FOR DATA ANALYTICS Credits: 2		
Class	**MCA**	**Semester**	**II**
Cognitive Level	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 analyzed and visualized using statistic functions		
Course Objectives	**The Course aims to** • Teach the basics of R. • Impart knowledge on use of data fames for data representation • Prepare the students to perform effective data analysis using R functions.		

Unit	Contents	Lecture schedule
I	**Introduction** Introduction to R: What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, Few commands to get started: installed.packages(), package Description(), help(), find.package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf.	12
II	**Data Types** R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables - R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators - R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.	13
III	**R-Function** R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower() - R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting - R List - Creating a	13

	List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector - R Matrices – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division- R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements - R Factors –creating factors, generating factor levels gl().	
IV	**Data Frames** Data Frames –Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, Expand Data Frame: Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast(). Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.	**12**
V	**Descriptive Statistics** Descriptive Statistics: Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median - Mode - Standard Deviation – Correlation - Spotting Problems in Data with Visualization: visually Checking Distributions for a single Variable - R –Pie Charts: Pie Chart title and Colors – Slice Percentages and Chart Legend, 3D Pie Chart – R Histograms – Density Plot - R – Bar Charts: Bar Chart Labels, Title and Colors.	**14**
Total Contact Hours		**64**

TEXT BOOK:

1. SandipRakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN : 978-93-5260-455-5.
2. Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.

REFERENCES:

1. Tutorials Point (I) simply easy learning, Online Tutorial Library (2018), R Programming, Retrieved from https://www.tutorialspoint.com/r/r_tutorial.pdf.
2. Andrie de Vries, JorisMeys, R for Dummies A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8

Course Outcomes	On completion of the course, students will be able to **CO1**: Explain the fundamental concepts in writing R programs **CO2**: Choose the appropriate data type and data structure based on the application. **CO3**: Understand and formulate R functions for executing tasks. **CO4**: Implement data frames for handling data access. **CO5:**Apply and illustrate R statistical function s for data analysis.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0VA2 MOBILE PROGRAMMING Credits: 2		
Class	MCA	Semester	II
Cognitive Level			
Course Objectives	**The Course aims to** • Teach mobile applications development frameworks • Train the students to design the mobile applications for different domains		

Unit	Contents	Lecture schedule
I	**Basics – Part I** Introduction to Android platform- Cross platform mobile application development framework, Environment Setup, Application Components, Hello World Example	12
II	**Basics – Part II** Resources, Activities, Services, Intents / Filters, Examples	13
III	**User Interface** UI Layouts, UI Controls, Event Handling, Examples	13
IV	**Services and E-mails** Location based services, Notifications services, Sending Emails and SMS, Examples	12
V	**Data Handling and Multimedia** Access the local/ remote databases, Enhance the user experience using animations and gesture-based interaction, Test and deploy your application in multiple mobile platforms, Examples	14
	Total Contact Hours	64

References:

1. DiMarzio, J.F. (2017). Beginning Android Programming with Android Studio.
2. https://www.tutorialspoint.com/android/android_tutorial.pdf
3. Android Studio https://developer.android.com/training/basics/firstapp
4. React Native https://reactnative.dev/docs/tutorial
5. Flutter https://flutter.dev/docs/reference/tutorials
6. Ionic https://ionicthemes.com/tutorials/build-a-complete-mobile-app-with-ionic-framework
7. Xamarinhttps://dotnet.microsoft.com/learn/xamarin/hello-world-tutorial/intro

Course Outcomes	**On completion of the course, students will be able to** **CO1:** Understand the types of mobile devices and mobile platforms **CO2:** Setup programming tools for a mobile application developer **CO3:** Recognize runtime environment for mobile application **CO4:**Designing mobile applications using various layouts and GUI components **CO5:**Develop Android based mobile applications with database connection.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0VA3 UNIVERSAL HUMAN VALUE AND PROFESSIONAL ETHICS Credits: 2		
Class	MCA	Semester	IV
Cognitive Level			
Course Objectives	The Course aims to • To know about mobile applications development frameworks • To design the mobile applications for different domains		

Unit	Contents	Lecture schedule
I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education . Purpose and motivation for the course, recapitulation from Universal Human Values. Self-Exploration–what is it? - Its content and process; _Natural Acceptance‘ and Experiential Validation- as the process for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct Priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking	12
II	Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as a co-existence of the sentient _I‘ and the material _Body‘ Understanding the needs of Self (_I‘) and _Body‘ - happiness and physical facility Understanding the Body as an instrument of _I‘ (I being the doer, seer and enjoyer) . Understanding the characteristics and activities of _I‘ and harmony in _I‘ . Understanding the harmony of I with the Body: Sanyam and Health; correctappraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyamand Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one‘s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease	13
III	Understanding Harmony in the Family and Society- Harmony in HumanHuman Relationship Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships)	13

	and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship Understanding the meaning of Trust; Difference between intention and Competence Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives	
IV	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence 18. Understanding the harmony in the Nature Interconnectedness and mutual fulfilment among the four orders of naturerecyclability and selfregulation in nature Understanding Existence as Co-existence of mutually interacting units in allpervasive space Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance innature (film ‒Home‖ can be used), pollution, depletion of resources and role of technology etc.	**12**
V	Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations	**14**
	Total Contact Hours	**64**

Text Book

Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

References:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak,1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Course Outcomes	**On completion of the course, students will be able to** **CO1:**Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence. **CO2:** Understanding (or developing clarity) of the harmony in the human being,family, society and nature/existence **CO3:**Strengthening of self-reflection. **CO4:**Development of commitment and courage to act.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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	21MCAP0VA4 PROJECT MANAGEMENT Credits: 2		
Class	**MCA**	**Semester**	**IV**
Cognitive Level			
Course Objectives	**The Course aims to** • Learn the software lifecycle • Understand the activities involved in Project Management • Analyze and apply a suitable model for the specific application • Evaluate the process models using different metrics		

Unit	Contents	Lecture schedule
I	Project Management - An Overview; Software Product Lifecycle; Software Processes-Process Models-software development-Modern practices and methods;	**12**
II	Software ProjectLifecycle Models; Umbrella Activities insoftwareprojects-Softwaremetrics-Softwareconfigurationmanagement-Softwarequalityassurance-Riskanalysisandmanagement	**13**
III	Project In-Stream Activities-ProjectInitiation -ProjectPlanning-ProjectTracking-ProjectClosure;	**13**
IV	Engineering Activities- Requirements Gathering, Analysis and Management-Software size and cost estimation techniques- Design and development-Testing and Maintenance.	**12**
V	Case studies on software process models, cost estimation and software design and deployment.	**14**
	Total Contact Hours	**64**

References:

1. Gopalaswamy Ramesh, Managing Global Software Projects, Tata McGraw-Hill PublishingCompany Ltd.,New Delhi,2012.
2. WalkerRoyce,-SoftwareProjectManagement‖,TataMcGraw-HillPublishingCompanyLtd.,NewDelhi,2011.
3. BobHughes,Mikecotterell,-SoftwareProjectManagement‖,ThirdEdition,TataMcGrawHill,2012.
4. RobertT.Futrell,DonaldF.SheferandLindaI.Shefer,-QualitySoftwareProjectManagement‖,PearsonEducation,2010.

Course Outcomes	**On completion of the course, students will be able to** **CO1:**Identify suitable software process model for software projects. **CO2:** Differentiate different software product development techniques. **CO3:** Apply appropriate software cost estimation technique for a givenproject. **CO4:**Apply software project management principles for asoftwareproject.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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

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