

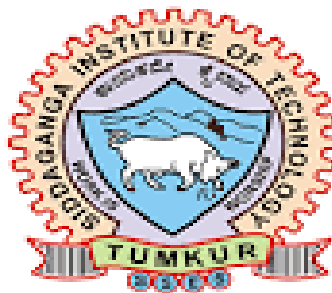
Department of Master of Computer Applications

SCHEME & SYLLABUS

I - IV SEMESTER

**(Two years MCA program)
(2021 Batch)**

2021-2023



Department of Master of Computer Applications

Siddaganga Institute of Technology

B.H. Road, Tumakuru

VISION STATEMENT

“To effectively mould quality and responsible Computer Professionals, with a mind of service and spirituality for nurturing the technological competence”

MISSION STATEMENT

“Imparting quality education to students to make them professionals in their domain replete with IT and computational skills par excellence”

Program Educational Objectives

- PEO 1** *Pursue career in computer applications domain by developing abilities that are in synchrony with changing needs of Industry or academia*
- PEO 2** *Demonstrate professionalism when working with teams and align with ethical principles.*
- PEO 3** *Engage in lifelong learning to upgrade the professional skills*

Program Outcomes (POs)

- PO1:** *Computational knowledge:* Apply fundamental knowledge of mathematics, computing and domain knowledge appropriate to computing specialization to abstract and conceptualize computational models from defined problems and requirements.
- PO2:** *Problem analysis:* Use the fundamental principles of mathematics, computing sciences, and relevant domain principles, to identify, formulate and to solve complex computing problems to reach substantiate conclusions.
- PO3:** *Design/Development of solutions:* Design and evaluate solutions for complex computing problems, systems, components or processes that meet specified needs with respect to public health , safety, cultural, societal and environmental considerations.
- PO4:** *Conduct investigations of complex computing problems:* Use research based knowledge and research methods to analyze and interpret data and synthesize Information to provide valid conclusions.
- PO5:** *Modern Tool Usage:* Create, select, adapt and apply appropriate techniques , resources, and modern IT tools to complex computing activities with an understanding on limitations.
- PO6:** *Professional ethics:* Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.
- PO7:** *Lifelong learning:* Engage in lifelong learning independently for continual development to improve the competence as a computing professional.
- PO8:** *Project management and finance:* Apply the management principles for managing projects as an individual, as a member and as a leader in a team under multidisciplinary environments.
- PO9:** *Communication efficacy:* Communicate effectively with computing community and with society at large about complex computing system activities confidently by writing effective reports, design documents and to make effective presentations and to deliver, receive and understand clear instructions.
- PO10:** *Societal and Environmental Concern:* Understand responsibilities and consequences based on societal, environmental, health, safely, legal and cultural issues within local and global contexts relevant to professional computing practices.
- PO11:** *Individual and Team work:* Function effectively as an individual as a member or leader in diverse teams and in multidisciplinary environments.
- PO12:** *Innovation and Entrepreneurship:* Identify a timely opportunity for entrepreneurship and innovate pursue and create value addition for the betterment of the individual and society at large.

SCHEME OF TEACHING OF I-II SEMESTER MCA PROGRAMME

SEMESTER – I										
SL NO	Course Code	Title of the Course	Teaching Hours/Week			Examination				Credits
			L	T	P	Duration in hours	SEE marks	CIE marks	Total mark	
1	N1MCA01	Foundations of Mathematics	3	-	-	3	50	50	100	3
2	N1MCA02	Software Engineering	3	-	-	3	50	50	100	3
3	N1MCA03	Operating Systems and Unix	3	2	-	3	50	50	100	4
4	N1MCA04	Web Application Programming	3	2	-	3	50	50	100	4
5	N1MCA05	Programming with Python	3	2	-	3	50	50	100	4
6	N1MCA06	Programming with Java	3	2	-	3	50	50	100	4
7	N1MCAL1	Unix Programming lab	-	-	2	3	50	50	100	1
8	N1MCAL2	Web Application Lab	-	-	2	3	50	50	100	1
9	N1MCAL3	Python Lab			2	3	50	50	100	1
10	N1MCAL4	Java lab	-	-	2	3	50	50	100	1
11	N1MCANC	Basic Programming *	3	-	-	3	50	50	100	0
12	HSS08	Soft Skills						100	100	0
13	N1MCACC	MOOC Certification Course	-	-	-	-	-	-	-	PP/NP
Total			21	08	08	33	550	650	1200	26

* Basic Programming (N1MCANC) is a mandatory audit course offered to non computer science Students only

SEMESTER-II										
SL NO	Course Code	Title of the Course	Teaching Hours/Week			Examination				Credits
			L	T	P	Duration in hours	SEE marks	CIE marks	Total mark	
1	N2MCA01	Data Structures using C	3	2	-	3	50	50	100	4
2	N2MCA02	Professional Web Development	3	2	-	3	50	50	100	4
3	N2MCA03	Database Management systems	3	2	-	3	50	50	100	4
4	N2MCA04	Advanced Java	3	2	-	3	50	50	100	4
5	N2MCAE1	Elective – I	3	-	-	3	50	50	100	3
6	N2MCA05	Cloud Computing		-	4	3	50	50	100	2
7	N2MCAL1	Data Structures Using C Lab	-	-	2	3	50	50	100	1
8	N2MCAL2	Professional Web Development Lab	-	-	2	3	50	50	100	1
9	N2MCAL3	Database Management systems Lab	-	-	2	3	50	50	100	1
10	N2MCAL4	Advanced Java Lab			2	3	50	50	100	1
11	ARAS	Aptitude Related & Analytical Skill	-	-	-	3	50	50	100	1
Total			15	08	12	33	550	550	1100	26

Elective-1	
N2MCAE11	MIS & E – Commerce
N2MCAE12	Data Science
N2MCAE13	Digital Marketing
N2MCAE14	Research Methodology and IPR

SEMESTER-III										
SL NO	Course Code	Title of the Course	Teaching Hours/Week			Examination				Credits
			L	T	P	Duration in hours	SEE marks	CIE marks	Total mark	
1	N3MCA01	Machine Learning	3	2	-	3	50	50	100	4
2	N3MCA02	Mobile Application Development	3	-	-	3	50	50	100	3
3	N3MCA03	Computer Network	3	-	-	3	50	50	100	3
4	N3MCA04	Software Project Management	3	-	-	3	50	50	100	3
5	N3MCA05	Professional practices & Ethics	3	-	-	3	50	50	100	3
6	N3MCAE2	Elective – II	3	-	-	3	50	50	100	3
7	N3MCAE3	Elective – III	3	-	-	3	50	50	100	3
8	N3MCAL1	Machine Learning Lab	-	-	2	3	50	50	100	1
9	N3MCAL2	Mobile Application Lab	-	-	3	3	50	50	100	1.5
10	N3MCAL3	Mini Project			3	3	50	50	100	1.5
Total			20	04	08	30	500	500	1000	26

Elective-II		Elective -III	
N3MCAE21	Artificial Intelligence & Deep learning	N3MCAE31	Entrepreneurship
N3MCAE22	Virtual Reality and Augmented Reality	N3MCAE32	Cyber security and cyber law
N3MCAE23	IOT	N3MCAE33	Software Testing
N3MCAE24	Big Data Analytics	N3MCAE34	User Interface and User Experience

SEMESTER-IV										
SL NO	Course Code	Title of the Course	Teaching Hours/Week			Examination				Credits
			L	T	P	Duration in hours	SEE marks	CIE marks	Total mark	
1	N4MCA41	Major Project	-	-	-	-	50	50	100	20
2	N4MCAS1	Technical Seminar	-	-	-	-	-	50	50	02
Total credits										22

MOOC Certification Course (N1MCACC)**"Certification Courses"****Guidelines:**

This is not a team work. Student has to register and complete the course individually. Student shall take up any online courses which is chosen in the area of computer science or similar courses.

The course duration must be a span of 4-6 weeks and should obtain the certificate within the completion of the MCA program. Students must produce the hardcopy of the registration details and confirmation details to the concerned proctor without fail. This course does not have any CIE or SEE however, students must produce the MOOC completion certificate to the respective proctors on or before the 4th Semester Major Project Viva-Voce. The result is declared either pass or fail, based on the completion of the course in the stipulated time.

Credits for the Two year MCA Program Scheme 2021							
Total Credits							
Semester	Core	Elective	Lab	Mandatory	Project/ Industry/ Internship	Seminar	Total Credits
I	22	00	04	-	-	-	26
II	16	03	06	1	-	-	26
III	16	06	04	-	-	-	26
IV	-	-	-	-	20	02	22
Total	54	9	14	1	20	02	100

Foundations of Mathematics

Contact Hours/Week	:	3+0(L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	---	SEE Marks	:	50
Course Code	:	N1MCA01			

Course Objectives:

This Course will enable students to:	
1.	Familiarize the logical notation to define and reason about fundamental mathematical concepts such as sets, relations, and functions.
2.	Understand the concepts of vectors, matrices, and their operations.
3.	Understand the basics of data, Frequency Distributions, Correlation and Regression.
4.	Learn types of probability, Bayes Theorem and the Discrete Probability Distribution of a Random Variable.

UNIT – I	07 Hours
Set Theory: Sets and Elements, Universal Set and Empty Set, Subsets, Venn diagrams, Set Operations, Algebra of Sets and Duality, Finite, Infinite sets & Counting Principle, The Inclusion-Exclusion Principle, Classes of Sets, Power Sets, Partitions.	

UNIT – II	08 Hours
Relations: Product Sets, Relations, Pictorial Representations of Relations, Composition of Relations, Types of Relations, Equivalence Relations. Functions: Functions, One-to-One, Onto, and Invertible Functions, Mathematical, Exponential and Logarithmic Functions, Recursively Defined Functions, Cardinality.	

UNIT – III	08 Hours
Vectors & Matrices: Vectors, Matrices, Matrix Addition and Scalar Multiplication, Matrix Multiplication, Transpose, Square Matrices, Invertible (Nonsingular) Matrices, Inverses, Determinants, Elementary Row Operations & Echelon Matrices.	

UNIT – IV	08 Hours
Statistical Methods: Collection of Data, Graphical Representation, Comparison of Frequency Distributions - Measures of Central Tendency and Measures of Dispersion, Correlation, Coefficient of Correlation, Lines of Regression.	

UNIT – V	08 Hours
Probability and Distributions: Introduction, Basic Terminology, Probability & Set Notations, Independent Events, Bayes Theorem, Random Variable, Discrete Probability Distribution.	

TEXT BOOKS:

1.	Seymour Lipschutz, Marc Lipson: Discrete Mathematics, Revised 3 rd Edition, McGraw-Hill. (Chapters: 1, 2, 3, 5)
2.	B S Grewal: Higher Engineering Mathematics, 43 rd Edition, Khanna Publishers. (Chapters: 25, 26)

REFERENCE BOOKS:

1.	Ralph P Grimaldi, B V Ramana: Discrete and Combinatorial Mathematics, 5 th Edition, PEARSON.
2.	Kenneth H Rosen: Discrete mathematics and Its Applications, 5th Edition, TATA McGRAW-HILL.

WEB LINKS:

1.	https://learn.careers360.com/maths/sets-relations-and-functions-chapter/
2.	https://byjus.com/jee/sets-relations-and-functions/
3.	https://www.javatpoint.com/discrete-mathematics-tutorial
4.	https://www.tutorialspoint.com/discrete_mathematics/index.htm

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Apply the fundamentals of set theory to perform various set operations to the real-world problems.
CO2	Apply the concept of relations and functions on sets to determine their types and compositions.
CO3	Acquire ability to work with vectors and matrices.
CO4	Acquire ability to represent the data and calculate the measures of central tendency, dispersion, Correlation and lines of regression.
CO5	Apply the concept of probability for uncertainty and real-world problems.

Software Engineering

Contact Hours/Week	:	3+0(L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N1MCA02			

Course Objectives:

This Course will enable students to:					
1.	Define software engineering and explain its importance				
2.	Discuss the concepts of software products and software processes				
3.	Explain the importance of process visibility				
4.	Introduce the notion of professional responsibility				

UNIT – I			10 Hours
Introduction: Professional Software Development; Software Engineering Ethics, IEEE/ ACM code of Software Engineering Ethics			
Software Processes: Waterfall, Incremental Development, Integration And Configuration, The Rational Unified Process, Plan-Driven, Extreme Programming, Scrum, DevOps, DevOps Vs Agile			
Case study: Identify the suitable development method for any real world problem			

UNIT – II			10 Hours
Requirements Engineering: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; the software requirements document, Requirements Specification, Characteristics and components of SRS, Structure of SRS (IEEEformat)			
Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management			
Case study- Develop Software Requirement Specification for any real world application (IEEE format)			

UNIT – III			07 Hours
System Modeling: Context models; Structural models; Behavioral models; Model driven engineering, Architectural Design: Architectural design decisions, Architectural patterns; Interaction Modeling : Use case models , Sequence diagrams; Structural modeling : Class diagrams;			
Agile Software Development: Agile Methods; Plan- Driven and Agile Development; Agile Project Management; Scaling Agile Methods.			

UNIT – IV			06 Hours
Software testing: Development testing; Test driven development; Release testing; User testing.			
Project Management: Risk management; Managing people; Teamwork; Project scheduling;			

UNIT – V			06 Hours
Project planning: Software Pricing; Plan Driven Development; Project Scheduling; Agile Planning; Estimation Techniques; Algorithmic Cost Modeling; COCOMO II Model; Project Duration And Staffing.			
Software Quality Management Software Quality, Software Standards, Software Measurement, Quality Management And Agile Development, Configuration Management, ISO 9001:2015 Standards			

TEXT BOOKS:

1.	Ian Sommerville: Software Engineering, 9th Edition, Pearson Education Ltd., 2017. (Chapters:- 1, 2, 3, 4, 5, 8, 20, 21)
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REFERENCE BOOKS:

1.	Guide to the Software Engineering Body Of Knowledge (SWEBOK Version 3) Library of Congress Online Catalog
2.	Roger.S.Pressman: Software Engineering-A Practitioners approach
3.	Waman S Jawadekar: Software Engineering Principles and Practice
4.	DevOps for Developers, Michael Huttermann, 2012, Apress, ISBN:978-1-4302-4569-8,

WEB LINKS:

1.	https://www.computer.org/education/bodies-of-knowledge/software-engineering
2.	The NATO Software Engineering Conferences (interesting historic material)
3.	<i>Software Engineering Code of Ethics and Professional Practice</i> established in a joint effort by IEEE-CS and ACM [copy at ACM]
4.	https://nptel.ac.in/courses/106/105/106105087/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Adopt fundamental knowledge of software engineering in project development.
CO2	Analyze the functional and non functional requirements.
CO3	Identify the design models for application development.
CO4	Adopt project management strategies and testing activities
CO5	Acquire the knowledge of project cost estimation and software quality management.

Operating System and UNIX

Contact Hours/Week	:	3+2(L +T)	Credits	:	04
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	26	SEE Marks	:	50
Course Code	:	N1MCA03			

Course Objectives:

This Course will enable students to:					
1.	Understand the basic operating system structure and concept of process scheduling.				
2.	Visualize the intricate relationship between an operating system and its underlying Hardware				
3.	Learn scheduling algorithms, deadlock detection algorithms and memory management				
4.	Demonstrate and analyses the UNIX commands usage				
5.	Illustrate the power of UNIX shell by writing shell scripts				
6.	Understand the power of Report generation using sed and awk				

UNIT – I			07 Hours
Introduction: Introduction to operating Systems, Computer System Architecture; Operating System Operations, Operating System Structure, Operating System Services, System Calls: Types of System Calls, System Programs, Virtual Machines, System boot.			
Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling.			

UNIT – II			08 Hours
Deadlocks: System model, Deadlock Characterization, Methods for handling deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from deadlock.			
Memory Management: Memory Management Strategies: Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory Management, Demand Paging; Page Replacement.			

UNIT – III			08 Hours
The File System: The File, What's in a File name? The Parent-Child Relationship, The HOME Variable, The Home Directory, pwd, cd, mkdir, rmdir, Absolute Pathnames, Relative Pathnames, The Unix File System. The vi Editor: vi Basics, Input Mode, ex Mode and Command Mode.			
Basic File Attributes: ls options, File Ownership, File Permissions, chmod, Directory Permissions, Changing the File Ownership More File Attributes, File Systems and Inodes, Hard Links, Symbolic Links, The Directory, umask, Modification and Access Times, find.			
The Shell: The Shell's Interpretive Cycle, Shell Offerings, Pattern Matching-The Wild-cards, Escaping and Quoting, Redirection. The Three Standard Files, Two Special Files: /dev/null and /dev/tty, pipes, tee: Creating a Tee, Command Substitution.			

UNIT – IV			08 Hours
The Process: Process Basics, ps: Process Status, System Processes, Mechanism of Process Creation, Internal and External Commands, Running Jobs in Background, Killing Processes with Signals, Job Control, at and batch, cron.			
Simple filters: The sample Database, pr, head, tail, cut, paste, sort, unique, tr.			
Essential Shell Programming: Shell Variables, Environment Variables, Shell Scripts, read, Using Command Line Arguments, exit and exit status of command, The Logical Operators, The if Conditional, using test and [] to Evaluate Expression, The case Conditional, expr, while: looping, for: looping with a list, set and shift, trap, Debugging Shell Scripts with set – x			

UNIT – V	08 Hours
SED and AWK : Introduction to Regular expression, Filters using Regular expressions grep: global regular expression , related programs Introduction to Sed : The stream editor : Line addressing and context addressing Simple AWK Filtering, Splitting a Line into Fields, printf, the Logical and Relational Operators, Number Processing, Variables, The -f option, BEGIN and END sections, Built-invariables, Built in functions.	

TEXT BOOKS:

1.	Sumitabha Das: UNIX Concepts and Applications, 4th Edition, Tata McGraw Hill, 2006
2.	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating Systems Principles, 8th Edition, Wiley – India.

REFERENCE BOOKS:

1.	UNIX: The Complete Reference: Kenneth Roson et al, Osborne/McGraw Hill, 2000.
2.	UNIX and Shell Programming: M G Venkateshmurthy, Pearson Education Asia, 2005
3.	D M Dhamdhare: Operating Systems – A Concept Based Approach, 2nd Edition, Tata McGraw – Hill, 2002.

WEB LINKS:

1.	To Understand Operating System Basics: https://nptel.ac.in/courses/106/105/106105214/ https://nptel.ac.in/courses/106/106/106106144/
2.	To Understand Basics in Unix: https://www.youtube.com/watch?v=1hf_0EeOYBY (NPTEL IIT Madras)
3.	UNIX process control related: http://www.youtube.com/watch?v=TIa2mhKCeYo
4.	Shell Script: https://www.youtube.com/watch?v=48zApVSX97s (NPTEL IIT Madras)

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Explicate the basic operating system structure and concept of process scheduling
CO2	Interpret the different memory management strategies and Analyze the given deadlock problems to solve and arrive at valid conclusions.
CO3	Interpret and manipulate the file attributes and illustrate the importance of editor and Shell in UNIX.
CO4	Identify the importance of process and classify the use of various UNIX commands and simple filters in Shell Scripting.
CO5	Demonstrate the usage of advanced filters in Shell scripting.

Web Application Programming

Contact Hours/Week	:	3+2(L+T)	Credits	:	04
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	26	SEE Marks	:	50
Course Code	:	N1MCA04			

Course Objectives:

This Course will enable students to:					
1.	Interpret the basic concepts of Web environment, HTML, CSS and Http				
2.	Implement simple web applications with the elements of JQuery and Java Scripts.				
3.	Interpret and use the platform of Java Enterprise Edition, Web Development and the usage of Builder Tool.				
4.	Interpret and use the XML based Web technologies and applications.				
5.	Interpret to build project's infrastructure with the usage of management and comprehension tools				

UNIT – I			08 Hours
How the Web Works : Web Applications in Comparison to Desktop Applications, Static Websites versus Dynamic Websites, Internet Protocols. Http: Hypertext Transfer Protocol, Headers, Request Methods, Response Codes. HTML: Structure of HTML Documents, DOCTYPE, HTML Tables and Forms Advanced CSS: Layout, Normal flow, Positioning elements: Relative , absolute, fixed ,Floating elements: Within a container, multiple items side by side			

UNIT – II			08 Hours
JavaScript: Client-Side Scripting, The Client-Server Model, The Request-Response Loop, Asynchronous data requests. Document Object Model (DOM) : Inner elements and modifying a DOM element. Advanced Java Scripts and JQuery: JavaScript Pseudo-Classes, Object literals, Emulate Classes through Functions, Using Prototypes, JQuery foundations: Including jQuery in the Javascript Page, JQuery selectors			

UNIT – III			08 Hours
Java EE and Web Development : The Java EE Platform, Setting Up the Java Development Environment, Running Java Application, Developing Java Applications with an IDE, Creating First Project in the IDE, Book Store Application. Data Access Layer for the Bookstore Application with JDBC, Client for the Data Access Layer Web Server and Application Server: Apache Tomcat Webserver			

UNIT – IV			07 Hours
XML and XSLT: An introduction to XML and XSLT: What is XML?, What is XSLT and how does it work?, The Document Type Definition (DTD) used in XML, The XML Schema Definition (XSD) ,Transforming XML to XHTML, using XSLT, Basic elements in XSLT, Generating loops with XSLT, Sorting XML data with XSLT, Using XSLT filtering and query features. JSON: Introducing JSON, JSON Grammar, JSON values, JSON tokens, JSON object. AJAX: Understanding AJAX , XML and JSON for Ajax: The Character Decode			

UNIT – V	08 Hours
MAVEN: Getting started with Maven, Setting up Maven, Maven Dependency Management, Using Repositories, Dependency identification, Maven Project basics, Understanding POM.XML, Building a Project. Properties in POM.XML. Node.JS: Setting Up for Node.js Development, Understanding Node.js, Node.js functions: anonymous function, Using REPL	

TEXT BOOKS:

1.	Fundamentals of Web Development by Randy Connolly (Unit-I, Unit-II), Pearson Edition 2015, ISBN 10: 1292057092, ISBN 13: 978-1-29-205709-5
2.	Learn Java for Web Development, Authors: Vishal layka, Apress edition-2014, ISBN-13 (pbk): 978-1-4302-5983-1, ISBN-13 (electronic): 978-1-4302-5984-8 (Unit-III)
3.	Practical web technologies, Authors: P.K.Yuen and V. Lau (Unit-IV), Pearson Edition-2003, ISBN 0 201 75076 7
4.	Ajax on Java, Steven Douglas Olson, O'Reilly-2007, ISBN-10: 0-596-10187-2 (Unit-IV)
5.	Introducing Maven Apress: By Balaji Waranasi ,Apress release-2014, ISBN-13 (pbk): 978-1-4842-0842-7 (Unit-V)
6.	Begin Node.js by Basarat Ali syed, Apress release-2014, ISBN-13 (pbk): 978-1-4842-0188-6 (Unit-V)

REFERENCE BOOKS:

1.	Principles of web Design, JOEL SKLAR.
2.	XML, Solomon.H, Simon Ph.D, McGraw Hill

WEB LINKS:

1.	https://www.w3schools.com
2.	https://www.tutorialspoint.com/nodejs/index.htm
3.	https://www.freecodecamp.org/
4.	https://www.javatpoint.com/
5.	https://www.json.org/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Design and develop simple web applications with the elements of HTML and CSS.
CO2	Design and develop web applications with the usage of Java Scripts.
CO3	Develop Java enterprise applications using Web Server and Data Access Layer.
CO4	Implement the usage of XML and its supportive components
CO5	Implement the usage of package management tools such as Maven, Node.Js

Programming with Python

Contact Hours/Week	:	3+2(L+T)	Credits	:	04
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	26	SEE Marks	:	50
Course Code	:	N1MCA05			

Course Objectives:

This Course will enable students to:					
1.	Implement Python programs using Python language construct				
2.	Understand various data structures provided by Python library				
3.	Use different libraries for scientific and data intensive applications				
4.	Build real-world applications using OOP, files and exception handling provided by Python				
5.	Develop GUI applications with database concepts and SQL using Python construct.				
6.	Apply Bar graph, Histogram, Pie chart and Line Graph for Data Visualization				

UNIT – I	09 Hours
Fundamentals of Python Programming: Data types in Python, Operators in Python, Input and Output Statements, Control Statements. Functions: built-in Functions: Lambda, MAP, Filters and User defined Functions Data Types: Strings Characters: Creating, Indexing, Slicing, Repeating and Concatenation, Comparing, removing spaces, Finding sub strings in String, Lists and tuples, dictionaries, sets. Lists: Creating List using range () function, Updating the elements of a list, Concatenation of two list, Repetition of lists, Membership in lists, Aliasing, Sorting list elements, Nested lists. Tuples: Creating and Accessing Tuple Elements, Basic Operation on Tuples, Nested Tuples. Dictionaries: Operation on Dictionaries, Dictionary Methods, Sorting Elements of a Dictionary, Converting Lists in to Dictionary.	

UNIT – II	08 Hours
Classes and Objects: Creating Class, The Self Variable, Constructor, Types of data members, Namespaces, Types of Methods, Passing members between classes, Inner Classes. Inheritance and Polymorphism: Constructor in Inheritance, Overriding Super Class Constructors and Methods, The super () Method, Types of Inheritance, Method Resolution Order (MRO), Polymorphism, Operator and Method Overloading and Method Overriding. Magic Methods - Magic method syntax, Available Methods	

UNIT – III	07 Hours
Reading and Writing Files- Introduction to File operation, opening a File, Techniques for Reading Files, Writing Files. Error and Exceptions: Introduction to exceptions in python, detecting and handling exceptions, exceptions as strings, raising exceptions, assertions, standard exceptions.	

UNIT – IV	07 Hours
Graphical User Interface development and Database in Python: GUI in Python, the Root Window, Font and colors, working with Containers, Canvas, Frames, Widgets. Fundamental concepts of database: Retrieving All Rows from a table, Inserting Rows in a Table, Updating Rows in a Table, Deleting Rows in a Table, Creating Database Tables through python.	

UNIT – V	08 Hours
Introduction to Data Science using Python: What is Data Science?, Why Python for data science?, Python Libraries for Data Analysis, Creation of Data Frame from Excel spread sheet, CSV files, Dictionary and Tuples, Operation of data frames. Modules: What are modules, modules and files, Importing modules, Introduction to Numpy module, Packages. Data Visualization: Creation of Bar graph, Histogram, Pie chart, Line Graph.	

TEXT BOOKS:

1.	Martin C. Brown, Python: The Complete Reference, 4 th Edition, McGraw Hill Education, USA
2.	R Nageswara Rao, “Core Python Programming”, Dreamtech Press, 2018 Edition

REFERENCE BOOKS:

1.	E Balaguruswamy, "Introduction to Computing and Problem Solving Using Python", McGraw Hill Education.
2.	Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language", 2nd Edition, Addison-Wesley Professional
3.	Timothy A. Budd, "Exploring Python", McGraw Hill Education, 2nd Reprint 2015

WEB LINKS:

1.	https://nptel.ac.in/courses/106/106/106106145/ (IIT Madras)
2.	https://www.guru99.com/python-tutorials.html
3.	https://www.geeksforgeeks.org/python-programming-language/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Implement Python data types: strings, lists, tuples and dictionaries to solve basic programs.
CO2	Apply Object-Oriented Programming concepts.
CO3	Implement file handling techniques and exception handling.
CO4	Develop Graphical User Interface applications.
CO5	Exemplify the importance of data science and visualization techniques

Programming with Java

Contact Hours/Week	:	3+2(L+T)	Credits	:	04
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	26	SEE Marks	:	50
Course Code	:	N1MCA06			

Course Objectives:

This Course will enable students to:	
1.	Comprehend the fundamental concepts of Java environment and Object oriented programming, interpretation of Classes, Objects and the various methods usage.
2.	Interpretation and implementation of Java basic programming with the concepts such as packages, inheritance, interfaces and usage of exceptions and I/O streams.
3.	Interpretation and implementation of Thread life cycle methods, multi-threading, synchronization and running Applets.
4.	Interpretation of various Java class types and fundamentals of Networking with Java

UNIT – I	08 Hours
Java Programming Fundamentals : The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, Handling Syntax Errors, The Java Keywords, Identifiers in Java, The Java Class Libraries. Introducing Classes, Objects and Methods Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword.	

UNIT – II	08 Hours
A Closer Look at Methods and Classes: Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Var args: Variable-Length Arguments. Inheritance Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, Using Abstract Classes, Using final, The Object Class.	

UNIT – III	08 Hours
Interfaces: Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Final Thoughts on Interfaces. Packages : Package Fundamentals, Packages and Member Access, Importing Packages, Static Import. The Exception Hierarchy: Exception Handling Fundamentals, The Consequences of an Uncaught Exception, Exceptions Enable you to handle errors gracefully, using Multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, Throwing an Exception, A Closer look at Throwable, using finally, using throws, Java's Built-in Exceptions, New Exception features added by JDK 7, Creating Exception Subclasses.	

UNIT – IV	07 Hours
Multithreading fundamentals The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Treads. Applets : Understanding Applets, Applets Life cycle, Usage of Applet.	

UNIT – V	08 Hours
Auto boxing and Annotations Enumerations, Java Enumeration are class types, The Values () and Valueof() Methods, Constructors, methods, instance variables and enumerations, Auto boxing, Annotations(metadata) Networking with Java.net Networking fundamentals The Networking classes and Interfaces, The InetAddress class, The Socket Class, The URL class, The URLConnection Class, The HttpURL Connection Class.	

TEXT BOOKS:

1.	Jim Keogh, The complete Reference J2SE, Tata Mc_Graw Hill , 2002
2.	Herbert Schildt The Complete reference, 7 th Edition, TaTa McGraw Hill.

REFERENCE BOOKS:

1.	J2SE Architecture Book, B.V.Kumar, ISBN: 9780070621633
2.	Programming with Java, E.Bala guru swamy, 6 th Edition

WEB LINKS:

1.	https://www.roseindia.net/
2.	https://javatpoint.com/
3.	https://tutorialspoint.com/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Interpret Java environment and Object oriented programming concepts using Classes, Objects.
CO2	Interpret and implement Java basic programs with the concepts such as packages, inheritance, interfaces and usage of exceptions and I/O streams.
CO3	Interpret and implement Thread life cycle methods, multi-threading, synchronization and execute Applets..
CO4	Interpret and implement various Java class types and interface Networking with Java

Unix Programming Lab

Contact Hours/Week	:	2	Credits	:	1.0
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N1MCAL1			

Course Objectives:

This Course will enable students to:	
1.	Interpret the basic UNIX commands and its environment
2.	Obtain complete knowledge on Shell programming
3.	Develop the programs using awk and sed

Sl.No	Programs
1.	<p>Following exercises may require referring to man pages of commands for syntax and options and their usage</p> <ol style="list-style-type: none"> Display current date in mm-dd-yy and dd-mm-yy formats. Use ls command to list only directories along with other attributes including inode number Write commands for the following queries: <ol style="list-style-type: none"> list of user names who have currently logged in list of logins for a given user name Perform the following operations. <ol style="list-style-type: none"> Create myproj directory in the login directory (home directory). Create src/include directory within myproj using a single Command. List the directory entries (long format) in ascending order of the file size
2.	<ol style="list-style-type: none"> Write a shell script that accepts two file names as arguments, checks if the permissions for these files are identical and if the permissions are identical, output common permissions and otherwise output each file name followed by its permissions Write a non-recursive shell script which accepts any number of arguments and prints them in the reverse order (For example, if the script is named rags, then executing rags A B C should produce C B A on the standard output).
3	<ol style="list-style-type: none"> Write a shell script that accepts a path name and creates all the components in that path name as directories. For example, if the script is named mpc, then the command mpc a/b/c/d should create directories a, a/b, a/b/c, a/b/c/d. Write a shell script that takes a valid directory name as an argument and recursively descend all the subdirectories, finds the maximum length of any file in that hierarchy and writes this maximum value to the standard output.
4	<ol style="list-style-type: none"> Write a shell script which accepts valid log-in names as arguments and prints their corresponding home directories, if no arguments are specified, print a suitable error message Write a shell script that accept one or more filenames as argument and convert all of them to uppercase, provided they exist in current directory.
5.	<ol style="list-style-type: none"> Write a shell script that displays all the links to a file specified as the first argument to the script. The second argument, which is optional, can be used to specify in which the search is to begin. If this second argument is not present, the search is to begin in current working directory. In either case, the starting directory as well as all its subdirectories at all levels must be searched. The script need not include any error checking. Write a shell script that accepts as filename as argument and display its creation time if file exist and if it does not send output error message

6.	a) Write a shell script to display the calendar for current month with current date replaced by * or ** depending on whether the date has one digit or two digits. b) Write a shell script to find smallest of three numbers that are read from keyboard
7.	a) Write a shell script that compute gross salary of an employee, accordingly to rule given below If basic salary is < Rs15000 then HRA=10% of basic & DA=90% of basic. If basic salary is >=Rs15000 then HRA=Rs500 & DA=98% of basic. b) Write a shell script that delete all lines containing a specific word in one or more file supplied as argument to it.
8.	a) Write a shell script that accept a list of filenames as its argument, counts and report occurrence of each word that is present in the first argument file on other argument files b) Write a shell script that accept the file name, starting and ending line number as arguments and display all the lines between the given line number
9.	a) Write a shell script to find the factorial of a given number b) Create an awk program which displays only user name and the corresponding user id as in the following Report Format : <div style="display: flex; justify-content: space-between;"> <div>User Name</div> <div>User ID</div> </div> <div style="display: flex; justify-content: space-between;"> <div>root</div> <div>0</div> </div> <div style="display: flex; justify-content: space-between;"> <div>daemon</div> <div>1</div> </div> <div style="display: flex; justify-content: space-between;"> <div>-----</div> <div></div> </div> <div style="display: flex; justify-content: space-between;"> <div>-----</div> <div></div> </div> <div style="display: flex; justify-content: space-between;"> <div>Total Number of users :</div> <div></div> </div>
10.	a) Create a program called words that will continue to prompt the user to input a single word until the user enters quit. Save each word that is entered. After the user types quit echo back all the words that have been entered. (Optional: display all the words entered in alphabetical order.) b) Create an awk program which prints the alternate lines like 2 nd , 4 th , 6 th etc... from the file /etc/group.

WEB LINKS:

1.	https://www.youtube.com/watch?v=1hf_0EeOYBY (NPTEL IIT Madras)
2.	https://www.youtube.com/watch?v=48zApVSX97s (NPTEL IIT Madras)

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Design command structure and execute basic commands
CO2	Demonstrate shell script using simple filters and grep
CO3	Develop and execute shell scripts using advance filter sed and report generation language AWK

Web Application Lab

Contact Hours/Week	:	2	Credits	:	1.0
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N1MCAL2			

Course Objectives:

This Course will enable students to:					
1.	Implement the usage of Web environment and demonstrate the functionality of static and dynamic web elements such as HTML5,CSS,Http.				
2.	Design and validate XML based web applications with the elements of DTD, XSD, XSLT, JQueryes and Java Scripts.				
3.	Use the platform of Java Enterprise Edition, Web Development and the develop web applications using JSON and web builder tools such as MAVEN.				

Sl.no	Programs
1.	Develop HTML5 static web pages of an online Book store. The pages should resemble: www.amazon.com. The website should consist the following pages. 1.Home page 2.Registration and user Login 3.User profile page 4.Books catalog
2.	Design an XML document to store information about a student in a college. The information must include USN, Name, Name of the College, Branch, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
3	Create an XSLT style sheet for one student element of the 2 nd experiment document and use it to create and display of that element.
4	Develop and demonstrate, using Javascript script, a HTML5 document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
5.	Write a Javascript program to do the following 1.Get the current date and time 2.Reverse the given string 3.Execute mouse events
6.	Validate an XML document by using the following : i) DTD ii) XSD iii)XSLT.
7.	Convert JSON text into a Java Script and perform operations.
8.	Setting up and implementing web application operations using Maven.

WEB LINKS:

1.	https://www.w3schools.com/nodejs/
2.	https://www.w3schools.com/xml/
3	https://javascript.info/
4	https://www.javatpoint.com/
5	https://www.w3schools.com/nodejs/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Design and develop web applications with the usage of the web elements HTML5, CSS and Bootstrap
CO2	Design and develop XML based applications with the usage of supportive elements DTD, XSD, XSLT, JSON and implementing Java Scripts.
CO3	Setting up and implement the usage of package management tools such as Maven, NodeJS on for Web applications

Python Lab

Contact Hours/Week	:	2	Credits	:	1.0
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N1MCAL3			

Course Objectives:

This Course will enable students to:	
1.	Implement Python programs using Python language construct
2.	Understand various data structures provided by Python library
3.	Use different libraries for scientific and data intensive applications
4.	Build real-world applications using OOP, files and exception handling provided by Python
5.	Develop GUI applications with database concepts and SQL using Python construct.
6.	Apply Bar graph, Histogram, Pie chart and Line Graph for Data Visualization

Sl.no	Programs
1.	Implement 10 operations on string and Tuple
2.	Implement 10 operations on sets and lists
3.	Demonstrate dictionary concepts for a given scenario
4.	Demonstrate Class and Objects for a given data
5.	Implement any two types of Inheritance
6.	Implement overloading concept
7.	Implement overriding concept
8.	Demonstrate any five-exception handling mechanism using files
9.	Design and Develop a GUI for a student information system.
10.	Design and Develop a GUI for a Super Market Store.
11.	Write a python program to Insert, Search, and Retrieve data into Employee DATABASE
12.	Data Visualization
To be considered for Alternative Assessment Build an application using Python, which includes the following features: 1. User and navigation friendly interfaces. 2. Database connectivity and handling data store.	

WEB LINKS:

1.	https://nptel.ac.in/courses/106/106/106106145/ (IIT Madras)
2.	https://www.guru99.com/python-tutorials.html
3.	https://www.geeksforgeeks.org/python-programming-language/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Implement python data types like strings, lists, tuples and dictionaries to solve basic programs and solving real world problems.
CO2	Develop Python programs on Object-Oriented Programming concepts, file handling and exception handling.
CO3	Implement programs on Graphical User Interface, SQL and visualization plots.

Java lab

Contact Hours/Week	:	2	Credits	:	1.0
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N1MCAL4			

Course Objectives:

This Course will enable students to:					
1.	Design and build Java applications with the implementation of basic Java object oriented methods dynamically.				
2.	Implement the mutable and immutable elements and console based implementation of Java String and Thread API.				
3.	Design and build Java web applications and implement the usage of packages and enumerations.				

Sl.no	Programs
1.	a) Develop Java Program to demonstrate Constructor Overloading and Method Overloading. b) Develop Java Program to implement Inner class and demonstrate its Access protection.
2.	Develop Java program in Java for String handling which performs the following: i) Checks the capacity of StringBuffer objects. ii) Reverses the contents of a string given on console and converts the resultant string in upper case. Reads a string from console and appends it to the resultant string of (ii).
3	a) Develop Java Program to demonstrate Inheritance. b) Develop Java program for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.
4	Develop Java program which has i) A Class called Account that creates account with 500 Rs minimum balance, a deposit() method to deposit amount, a withdraw() method to withdraw amount and also throws LessBalanceException if an account holder tries to withdraw money which makes the balance become less than 500 Rs. ii) A Class called LessBalanceException which returns the statement that says withdraw amount (Rs) is not valid. iii) A Class which creates 2 accounts, both account deposit money and one account tries to withdraw more money which generates a LessBalanceException take appropriate action for the same.
5.	Develop Java program using Synchronized Threads, which demonstrates Producer Consumer concept.
6.	Develop Java program to implement a Queue using user defined Exception Handling (also make use of throw, throws).
7.	Complete the following: 1. Create a package named shape. 2. Create some classes in the package representing some common shapes like Square, Triangle and Circle. 3. Import and compile these classes in other program.
8.	Develop Java Program to create an enumeration Day of Week with seven values SUNDAY through SATURDAY. Add a method isWorkday() to the DayofWeek class that returns true if the value on which it is called is MONDAY through FRIDAY. For example, the call DayOfWeek.SUNDAY.isWorkDay () returns false.

WEB LINKS:

1.	https://www.roseindia.net/
2.	https://javatpoint.com/
3.	https://tutorialspoint.com/
4.	https://w3schools.com/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Implementation of Java programming language features and runtime environment.
CO2	Design and develop implementation of Java String and Thread API .
CO3	Design and implement the usage of packages and enumerations.

Basic Programming

Contact Hours/Week	:	3	Credits	:	0
Total Lecture Hours	:	3	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N1MCANC			

Course Objectives:

This Course will enable students to:					
1.	Learn the fundamental programming concepts and methodologies.				
2.	Code, document, test, and implement a well-structured, robust computer program using C++.				
3.	Write reusable modules using Inheritance and polymorphism.				

UNIT – I	08 Hours
Principles of Object-Oriented Programming and Functions: Object oriented Programming Paradigm, basic concepts of object oriented programming, Benefits of OOPS, Object oriented languages, Applications of OOP, Variables, Operators in C++, Scope resolution Operator, Manipulators, Function prototyping, call by reference, return by reference, inline functions, default arguments, const arguments, function overloading.	

UNIT – II	07 Hours
Classes and Objects: C structure revisited, specifying a class, Defining member functions, A C++ program with class, Making an outside function inline, Nesting of member functions, Private member functions, Arrays within a class, memory allocation for objects, static data members, static member functions, array of objects, objects as function arguments, friendly functions, returning objects.	

UNIT – III	08 Hours
Constructors And Destructors: constructors, parameterized constructors, multiple constructors in a class, constructors with default arguments, dynamic initialization of objects, copy constructors, constructing two dimensional arrays, destructors. Operator Overloading: Defining operator overloading, overloading unary and binary operators, overloading using friend, rules for overloading operators.	

UNIT – IV	08 Hours
Inheritance: Introduction, Defining derived classes, Single inheritance, making a private member inheritable, Multi-level inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Constructors in derived classes, Nesting of classes.	

UNIT – V	08 Hours
Pointers, Virtual functions and polymorphism: Introduction, Pointers, pointers to objects, this pointer, pointers to derived classes, Virtual functions, pure virtual functions. Templates: class templates, class templates with multiple parameters, function templates, function templates with multiple parameters, overloading of template functions, member function templates, Non-type template arguments.	

TEXT BOOKS:

1.	Balagurusamy, Object Oriented Programming with C++, 6th edition, TMH, ISBN: 9781259029936, 125902993X
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REFERENCE BOOKS:

1.	The Complete Reference C++, Herbert Schildt, 4th Edition, TMH
2.	C++ Primer, Stanley B. Lippman, Josee Lajoie, Barbara E. Moo, 4th Edition, Addison Wesley, 2005
3.	Object-Oriented Programming with C++, Sourav Sahay, Oxford University Press, 2006

WEB LINKS:

1.	https://www.geeksforgeeks.org/c-plus-plus/
2.	https://nptel.ac.in/courses/106/105/106105151/
3.	https://www.tutorialspoint.com/cplusplus/index.htm
4.	https://www.onlinegdb.com/online_c++_compiler

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Interpret object oriented concepts using C++.
CO2	Develop programs using Class, Objects and Friend functions.
CO3	Design programs using constructors, destructors and Operator overloading.
CO4	Design programs using concepts of Inheritance and Virtual Base Classes.
CO5	Design programs using polymorphism techniques and Templates.

Soft Skills

Contact Hours/Week	:	3	Credits	:	
Total Lecture Hours	:	36	CIE Marks	:	100
Total Tutorial Hours	:	-	SEE Marks	:	
Course Code	:	HSS08			

Course Objectives:

This Course will enable students to:	
1.	make the students aware of the importance of soft skills in the present-day business world and work environment
2.	learn the science behind picking up any skill quickly
3.	help students realize as well as develop key soft skills interviewers look for – such as change management, professionalism, inter- and intra-personal skills, adaptability etc.
4.	develop effective resumes (paper-based as well as video)
5.	understand the importance of and create an effective digital footprint
6.	provide simulated Group Discussion and Personal Interview experience based on the models adopted by reputed companies.
7.	understand professional etiquette to be displayed in workplaces.

METHODOLOGY

Interactive instructor led session with audio-visual aids / case studies.

Day	#	Topic	Sub-topics covered	Duration (Hrs)
1.	1	How to pick up skills faster?	1. Knowledge vs skill 2. Skill introspection 3. Skill acquisition 4. "The 10,000 hours rule" and the converse	2
	2	Interpersonal and Intrapersonal skill building	Social Interaction 1. Interpersonal Communication 2. Peer Communication 3. Bonding 4. Types of social interaction Emotional Management Responsibility 1. Types of responsibilities 2. Moral and personal responsibilities	2
	3.	Professional etiquette	Workplace etiquette - meeting room, pantry, cubicle Dining etiquette Telephone etiquette Email and business correspondence etiquette	2
2.	4	Change Management	Who moved my cheese? Tolerance of change and uncertainty Joining the Bandwagon Adapting change for growth – overcoming inhibition Adapt to changes (tolerance of change and uncertainty) Adaptability Curve Survivor syndrome	2

	5	Creating a digital footprint	1.How what you post online / information online can affect people's and recruiter's perception about you 2. Usage of LinkedIn to further one's career prospects 3. Managing content that one posts on platforms like Twitter, Facebook, Instagram etc. to create positive footprint about oneself Why is it important to leave a digital footprint?	2
	6	Time Management	Prioritization - Time Busters Procrastination Scheduling Multitasking Monitoring Working under pressure and adhering to deadlines	2
3	7	Group Discussion –Basics	1.Importance of GDroundSkills assessed in a GD How to ace a GD Dos and donts in a GD Idea generation techniques One mock GD involving participation from 12 volunteers, facilitated by the trainer	2
	8	Personal Interview - Basics	Self-introduction practice. Body language – especially grooming for personal interview.Personal interview – FAQs discussion.	2
	9	Building a resume from scratch	1.How to write a good and impressive Resume. 2. Important aspects of an impressive resume.3.Sample template and formatting ideas.	2
4	10	Group Discussion – Advanced	GD sample Video with analysis and discussion.GD Dos and Don'ts – Worksheet practice. Roleplays for Dos and Don'ts. Idea generation – worksheet practice.	3
	11	Personal Interview - Advanced	1.Extensive discussion on PI FAQs. 2.Interview questions from based on resume - discussion. 3.PI Videos – discussion and analysis. 4. Highlighting successful answers for PI:3 questions.5.Body language during a personal interview. 6.Unconventional types of interviews (Stress, panel, MR, guesstimation)	3
5	12	Resume Writing - Workshop (Drafting a paper-based as well as a video resume)	1. Resume writing – Worksheet practice. 2. 3 stage Resume drafting. 3. Rough draft-1. 4. Rough draft -2. 5. Fair draft. 6. Discussion on specific aspects of an impressive Resume. 8. Creating a video resume	3
	13	Setting and achieving Targets	Ambition, goal, passion and career objective - difference SMART goals and Action plans Obstacles -Failure management (case studies)	1.5
	14	Introspection	Identify your USP - Unique Selling Proposition Recognize your strengths and weakness (SWOT) Nurture strengths Fixing weakness Overcoming your complex Confidence building	1.5
6	15	Group Discussion - Mock	1. Mock Group Discussions featuring groups of 10 people, with each GD lasting for 15 minutes. 2. Detailed feedback for each participant	3

			3.Introspection by the audience to add value to the GD	
	16	Personal Interview - Mock	1. Mock personal interview for a sample set of candidates 2. Simulate the real personal interview experience. 3. Individual feedback and areas of improvements are shared.	3
ASSESSMENTS PROVIDED The following assessments are integrated into the training programme to best judge a student's proficiency on soft skills. <ol style="list-style-type: none"> 1. Team building tasks (Inside training hours) 2. Participation in group activities (Inside training hours) 3. Psychometric test 4. Creating a resume 				

1.	Who moved my Cheese?' by Spencer Johnson
2.	'Outliers' by Malcolm Gladwell
3.	'Emotional Intelligence' by Daniel Goleman 'Road Less Travelled' by Scott Peck M.
4.	'How to win friends and influence people' by Dale Carnegie
5.	Who moved my Cheese?' by Spencer Johnson

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Exhibit key soft skills expected by recruiters
CO2	Apply scientific methods to learn any skill quickly
CO3	Participate in Group Discussions and Personal Interviews effectively
CO4	Create effective resumes that impress interviewers (paper-based as well as video)
CO5	Apply professional etiquette to be displayed in various workplace scenarios

II Semester

Data Structures using C

Contact Hours/Week	:	3+2(L+T)	Credits	:	04
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	26	SEE Marks	:	50
Course Code	:	N2MCA01			

Course Objectives:

This Course will enable students to:					
1.	Comprehend the concepts of structures, union, files and dynamic memory allocation techniques.				
2.	Differentiate the properties of various data structures such as stacks, queues, lists, trees and graphs.				
3.	Implement the data structures such as Stacks, Queues, Lists and Trees using C Language.				
4.	Recognize the applications of various Data Structures				

UNIT – I	08 Hours
Structures and Unions: Defining a Structure, accessing Structure members, Structure initialization, copying and comparing Structure variables, operations on individual members, array of Structures, array within Structure, Structure within Structure, Structures and Functions, pointers and structures, Unions. File management in C: Defining and Opening a file, Closing a file, Input/Output operations on files - getc(), putc(), getw(), putw(), fscanf(), fprintf(), Error handling during I/O operations - feof(), ferror(), Random access to files - ftell(), rewind(), fseek(), Command line arguments.	

UNIT – II	08 Hours
The Stack: Definition and Examples, representing Stacks in C using static memory allocation, Applications of stack: conversion of infix to postfix, evaluation of postfix expression, Recursion: Towers of Hanoi Problem, Binary search and Fibonacci series. Queues: Types of Queues: Linear, Circular, Priority and Double Ended Queues. Linear and circular queue implementation using static memory allocation.	

UNIT – III	08 Hours
Dynamic memory allocation: malloc(), calloc(), realloc(), free(). Singly Linked lists, Primitive operations on singly linked list: insertion, deletion, and search. Singly linked implementation of stacks, linear queue, and priority queues with integer data. Singly Linked list with non-integer and non-homogeneous lists.	

UNIT – IV	07 Hours
Doubly and Circular linked list: Doubly linked lists, Primitive operations on doubly linked list : insertion, deletion, search. Stack and queues implementation using doubly linked list. Circular lists, Primitive operations on singly circular linked list: Insertions, deletion and search. Stack as a singly Circular list, queue as a singly Circular list.	

UNIT – V	08 Hours
Nonlinear data structures : Binary trees, Operations on Binary Trees, Applications of Binary Trees, types of Binary Tree: complete binary tree, strictly binary trees, expression trees, threaded binary trees, binary search trees. Memory Representations of binary trees, Binary Tree Traversals. C representations of binary search trees, basic operation on BST: insertion, deletion,	

find minimum, find maximum node, tree traversals. Construction and Evaluating an Expression tree. Introduction to Graph, graph memory representation, graph traversal: DFS and BFS.

TEXT BOOKS:

1.	E. Balagurusamy Programming in ANSI C, 7th Edition, Tata McGraw-Hill Publications, 2017. (Unit I)
2.	Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum Data structures using C and C++, PHI/Pearson, 2nd Edition, 2015.

REFERENCE BOOKS:

1.	Horowitz, Sahni and Anderson-Freed Fundamentals of Data Structures in C, 2nd Edition, Universities Press Pvt. Ltd., 2011
2.	Jean- Paul Tremblay Paul G. Sorenson An Introduction to Data Structures with Applications, 2nd edition, McGraw-Hill International, 2007

WEB LINKS:

1.	https://nptel.ac.in/courses/106/103/106103069/
2.	https://nptel.ac.in/courses/106/106/106106131/
3.	https://www.tutorialspoint.com/data_structures_algorithms

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Apply advanced C programming techniques structures, union and files to illustrate and develop solution for a given problem.
CO2	Implement different linear data structures stacks and queues using static memory allocation
CO3	Differentiate different types of linked lists and its implementation.
CO4	Differentiate non-linear data structures trees and graphs, implement binary trees using dynamic memory allocation .

Professional Web Development

Contact Hours/Week	:	3+2(L+T)	Credits	:	04
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	26	SEE Marks	:	50
Course Code	:	N2MCA02			

Course Objectives:

This Course will enable students to:					
1.	Interpret and use Java Collection Framework elements on real time systems.				
2.	Interpret and implement the services of Web services technologies: WSDL, SOAP				
3.	Design and develop Angular web application which creates rich interactive Features with reducing code to build user interface applications.				
4.	Interpret about what a Restful API for web development and how it is structured and the usage of Spring Boot and Deployment process.				
5.	Discover the Spring philosophies and principles and how they impact Application Development and understand the usage of dependency injection.				

UNIT – I			08 Hours
Java Collection Framework:			
The Collections Framework: Collections overview, Recent changes to Collections, The Collection Interfaces, Java Collection API and framework, Collection Interface, List interface, Set interface, Queue interface, The Collection classes: ArrayList class, List, ArrayList, Queue, LinkedList class, HashSet class, TreeSet class, Accessing a Collection via an Iterator, Using an iterator, The For-Each alternative to iterators, User defined classes			

UNIT – II			07 Hours
WSDL :Web Services Description Languages Inside WSDL, The WSDL document Type Element, Message Element, Port Type Element, Binding Element, Port Element, Service element.			
Simple Object Access Protocol(SOAP): SOAP one-way transmission primitive, SOAP request-response transmission primitive, SOAP binding element, SOAP operation element, SOAP body element, SOAP fault element, SOAP header element, SOAP address element, WSDL and HTTP binding			

UNIT – III			08 Hours
REST API: Introduction to RESTful web services, , RESTful key elements, RESTful methods, RESTful Architecture, RESTful principles and constraints, creating a first RESTful web service, Running and testing first RESTful web service, Exposing a REST API: RESTful, Spring Data within Spring Application			

UNIT – IV			08 Hours
AngularJS Framework : Evolution, Building blocks, Dependency injection, Setting up The AngularJS development environment, Writing first application, Angular Basics: Components, code listing for to-do list application, interpolation, Templating and styling, Property binding, Event binding, Wire frames			

UNIT – V			08 Hours
Spring Framework: Basics of Spring architecture, environment setup, Inversion Of Control containers, First Spring Application, Spring Dependency Injection, Applying different configurations: Using XML configuration			

Spring Boot: Pre requirements, Spring Boot, Running Spring Boot application, working with classes and dependencies, Spring Boot-Tomcat Deployment. Spring Boot servlet initializer, Update packaging JAR into WAR.

TEXT BOOKS:

1.	Jim Keogh, The Complete Reference JAVA, 7th Edition, Tata McGraw Hill. ISBN: 978-0-07-163177-8 (Unit-1 : PageNos: 440-446, 448-456, 458-463)
2.	Herbert Schildt The Complete Reference J2EE, Tata McGrawHill, ISBN: 978-0-07-052912-0 for Unit-5: Page Nos: 684-700)
3.	Web Development with go, Building scalable web Apps and RESTful Services Shiju Varghese, Apress. ISBN-13 (pbk): 978-1-4842-1053-6
4.	Felipe Gutierrez: Spring Framework , Apress Edition, ISBN: 9781430265337, 2014
5.	Sridhar Rao : Web Development with Angular and Bootstrap, 3 rd Edition, Packt, ISBN: 978-1-78883-810-8

REFERENCE BOOKS:

1.	RESTful API Design, Matthias Biehl, API University Press,
2.	Spring in Action, ISBN-13: 978-1617294945
3.	ANGULAR , Lakshmi Kamala Thota, ISBN: 9789389932072, 9789389932072

WEB LINKS:

1.	https://www.soapui.org/docs/soap-and-wsdl/working-with-wsdl/
2.	https://angular.io and https://angularjs.org
3.	https://www.w3schools.com/CSS/
4.	https://restfulapi.net/
5.	https://spring.io/
6.	https://getbootstrap.com

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Interpret the Java Collection Framework elements and its usages.
CO2.	Create, Configure and deploy WSDL and SOAP for web services.
CO3.	Implement RESTful API in accessing and using the data.
CO4.	Develop dynamic and interactive applications using AngularJS .
CO5.	Build, configure and develop flexible web based Java enterprise applications using Spring Framework and Sprint Boot Framework services.

Database Management systems

Contact Hours/Week	:	3+2(L+T)	Credits	:	04
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	26	SEE Marks	:	50
Course Code	:	N2MCA03			

Course Objectives:

This Course will enable students to:	
1.	Understand the different issues involved in the design and implementation of a database system.
2.	Study the physical and logical database designs, database modelling, relational, hierarchical, and network models
3.	Understand and use data manipulation language to query, update, and manage a database
4.	Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.
5.	Analyze relational and non-relational data model to check the performance of the data models with respect to design and manipulations

UNIT – I	08 Hours
Introduction: An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS. Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.	

UNIT – II	08 Hours
Entity Relationship Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two. Relational Model and Relational Algebra: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.	

UNIT – III	08 Hours
SQL: Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL, More Complex SQL Retrieval Queries, Views (Virtual Tables) in SQL, Schema Change Statements in SQL ,Discretionary Access Control Based on Granting and Revoking Privileges, Transaction Support in SQL (Commit, Rollback, Save point)	

UNIT – IV	08 Hours
Database Design and Transaction Concepts : Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Cod Normal Form, De-normalization, Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Two-Phase Locking Techniques for Concurrency Control	

UNIT – V	07 Hours
Introduction to NoSQL : NoSQL, SQL versus NoSQL, Types of NoSQL Databases, CAP theorem, Getting Started with MongoDB – Documents, Collections, Databases, Getting and Starting MongoDB, MongoDB Shell, Data Types, Inserting and Saving Documents, Removing Documents, Updating Documents, Introduction to find, Query Criteria, Type Specific Queries and where Queries.	

TEXT BOOKS:

1.	Elmasri and Navathe: Fundamentals of Database Systems, 7th Edition, Pearson Publishers, 2016 (Chapters 1, 2, 3 except 3.8, 5, 6.1 to 6.5, 7.1, 8, 10, 11)
2.	Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003. (Chapters 16, 17.1, 17.2, 18)
3.	Professional NOSQL, Shashank Tiwari, 2011, Inc. WROXPress, John Wiley & Sons, ISBN: 978-0-470-94224-6,
4.	MongoDB: The Definitive, Guide Kristina Chodorow and Michael Dirolf, 1 st Edition, 2010 O'Reilly Media, ISBN: 978-1-449-38156-1.

REFERENCE BOOKS:

1.	Silberschatz, Korth and Sudharshan: Data base System Concepts, 5th Edition, Mc-GrawHill, 2006.
2.	C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems, 8th Edition, Pearson education, 2006.

WEB LINKS:

1.	https://nptel.ac.in/courses/106/105/106105175/
2.	https://www.youtube.com/watch?v=T7AxM7Vqvaw&t=10s
3.	https://www.youtube.com/watch?v=BPHAr4QGGVE
4.	https://www.youtube.com/watch?v=uD3p_rZPBUQ
5.	https://www.youtube.com/watch?v=t4wPUQ5REIY

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Identify the fundamentals of database technologies and its different architectures.
CO2.	Analyse the Entity Relational model concepts and Design relational algebraic expressions for SQL queries
CO3.	Illustrate the various concepts of SQL and Develop Queries to perform CRUD (Create, Retrieve, Update and Delete) operations on database
CO4.	Apply the database design with Normalization concepts and Analyze the criteria's of transaction management, concurrency control algorithms.
CO5.	Implement non-relational data model for any given problem to analyze performance of the data models with respect to design and manipulation.

Advanced Java

Contact Hours/Week	:	3+2(L+T)	Credits	:	04
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	26	SEE Marks	:	50
Course Code	:	N2MCA04			

Course Objectives:

This Course will enable students to:					
1.	Interpret, design and build Java Swing GUI applications with the implementation of event handling mechanism.				
2.	Interpret and implement JDBC concepts and build applications integrating relational databases with updation, quick retrieval of data.				
3.	Design and build Java web applications using Servlets, JSPs and integrating JDBC.				
4.	Design and build Java web applications implementing custom and standard tag libraries of JSP and web component based Java bean and EJB applications.				

UNIT – I	08 Hours
Event Handling on Swing Components: Introduction to Swings : Advantages of Swings over AWT, JLabel and ImageIcon , JTextField, JButton, JCheck Boxes, JRadio Buttons, Layout Managers:FlowLayout, BorderLayout, Designing GUI applications using Swings on JApplet, Introduction to Event Handling: Delegation Event Model mechanism, Event Classes: The(ActionEvent) Class, The MouseEvent Class, The WindowEvent Class, Event Listener Interfaces: The ActionListener Interface, The MouseListener Interface, The MouseMotionListener Interface, The Window Listener Interface	

UNIT – II	08 Hours
JDBC Object The Concept of JDBC, JDBC Driver Types, JDBC Packages, A Brief Overview of JDBC Process, Database Connection, Associating the JDBC/ODBC Bridge with the Database, Statement Objects, ResultSet, Transaction Processing, Metadata, Data Types, Exceptions. JDBC and Embedded SQL Model Programs, Tables, Indexing, Inserting Data into Tables, Selecting Data from a Table, Metadata, Updating Tables, Deleting Data from a Table, Joining Tables, Calculating Data, Grouping and Ordering, Data, Subqueries, Views.	

UNIT – III	08 Hours
Servlets Introduction, Advantages of Servlets over CGI, Installing Servlets, Servlets Life Cycle, Servlet API, Handling HTTP GET Request, Handling HTTP POST Request, Servlet Context, ServletConfig, GenericServlet, HttpServlet. Servlets – Cookies, Sessions - Cookies: Creating and Reading a Cookie, Servlets Session Tracking, Servlets Filter API, Designing dynamic GUI applications using Servlets.	

UNIT – IV	08 Hours
Java Server Pages (JSP) Introduction to JSP, Advantages of JSP, JSP Architecture, Processing a JSP page, JSP access Models (Model 1 & Model 2), Developing First JSP, JSP Scripting Elements- (Directives, Declaratives, Scriptlets, Expressions, Comments, Implicit Variables), Page Directives, JSP Actions, JSP accessing Database system	

UNIT – V	08 Hours
JSP JSTL and Java Beans JSTL (JSP Standard Tag Libraries: Core Tags, XML Tags, Formatting Tags, SQL Tags, Function tags) and Expression Language. What is a Java Bean? Advantages of Java Beans, The Java Beans API – Introspector, property Descriptor, Event Descriptor, Method Descriptor, A Bean Example, JSP with Java Beans Enterprise Java Beans Deployment Descriptors; Session Java Bean, Entity Java Bean; Message-Driven Bean;	

TEXT BOOKS:

1.	Jim Keogh, The complete Reference J2EE, Tata Mc_Graw Hill , 2002
2.	Herbert Schildt The Complete reference, 7 th Edition, TaTa McGraw Hill.

REFERENCE BOOKS:

1.	J2SE Architecture Book, B.V.Kumar, ISBN: 9780070621633
2.	Programming with Java, E.Bala guru swamy, 6 th Edition
3.	J2EE Architecture Book, B.V.Kumar, ISBN: 9780070621633

WEB LINKS:

1.	https://www.roseindia.net/
2.	https://javatpoint.com/
3.	https://tutorialspoint.com/
4.	https://w3schools.com/
5.	https://www.roseindia.net/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Interpret, design and build Java Swing GUI applications with the implementation of event handling mechanism.
CO2.	Interpret and implement JDBC concepts and build applications integrating relational databases with updation, quick retrieval of data.
CO3.	Design and build Java web applications using Servlets, JSPs and integrating JDBC.
CO4.	Design and build Java web applications implementing custom and standard tag libraries of JSP and web component based Java bean and EJB applications.

MIS & E – Commerce

Contact Hours/Week	:	3 + 0 (L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N2MCAE11			

Course Objectives:

This Course will enable students to:	
1.	Distinction between Data, Information and its classification
2.	Understand and use decision making concepts, behavioral concepts and models, and identify problem alternatives for approaches to resolve them.
3.	Analyze and use how the problems of managing data resources in a traditional file environment are solved by a ERP system
4.	Become familiar with all phases of E-business in the realm of modern business
5.	Mastering the different aspects of E-Commerce and the security features involved in Ecommerce

UNIT – I	07 Hours
Information concepts: Information concepts, Information: A quality product, Classification of Information Methods of Data and Information collection, Value of the Information, General model of a Human as Information processor. Management Information System: Introduction of MIS:MIS Concept, Definition, Role of the MIS, Impact of MIS, MIS and the user, Management as a control system, MIS support to the management, Management effectiveness and MIS.	

UNIT – II	08 Hours
Decision Making: Decision Making and DSS: Decision making concepts, Decision making process, Decision making by analytical modeling, Behavioral concepts in Decision making, Organizational Decision-making, MIS and Decision Making. Decision Support System Decision Support System (DSS): Concept and philosophy, DSS Models: Behavioral, Management Science and Operations Research Models, Group Decision Support System (GDSS)	

UNIT – III	08 Hours
Management of Global Enterprise Enterprise Management System (EMS), Enterprise Resource Planning (ERP), ERP Model and modules, Benefits of ERP, ERP Product evaluation, ERP implementation, Supply Chain Management(SCM), Information system in SCM, Customer Relationship Management (CRM), Management of Global Enterprise, EMS and MIS.	

UNIT – IV	08 Hours
E-business Technology Introduction to E-business, Models of E-business, Internet and World Wide Web(WWW), Intranet/Extranet, Security in E-business, Electronic Payment Systems, Impact of web on Strategic Management, Web enabled Business Management, WEB 2.0, MIS in Web Environment.	

UNIT – V	07 Hours
Electronic commerce(E-commerce) Introduction: Electronic commerce and physical commerce, The DIGITAL phenomenon, Looking at e-commerce from different perspectives, Different types of e-commerce, Examples of the types of e-commerce, Amazon: B2C e-commerce, eBay: C2C e-commerce Trading process network: B2B e-commerce, Priceline : C2B e-commerce, Some e-commerce scenarios: Retailing, Servicing, Publishing, Changes brought by e-commerce, Advantages of ecommerce.	
Basic cryptography for enabling e-commerce Security concerns, Security requirements, Encryption, Two basic principles for private key encryption, Data encryption standard, symmetric key encryption algorithm, The key distribution problem, Public key encryption	

TEXT BOOKS:

1.	Waman S Jhawadekar: Management Information Systems, 5th Edition, McGraw Hill.
2.	Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang: E-Commerce Fundamentals and Applications, Wile India Edition

REFERENCE BOOKS:

1.	James A O'Brein, George M Marakas, Management Information Systems, 7th Edition, TMH publication, 2007
2.	Ravi Kalakota Andrew Winston, Frontiers of Electronic Commerce
3.	H. M. Deitel, P. J. Deitel, E-Business and E-Commerce: How to Programe.

WEB LINKS:

1.	https://nptel.ac.in/courses/122/105/122105022/
2.	https://nptel.ac.in/courses/110/105/110105148/
3.	https://www.youtube.com/watch?v=xuAltdNpvC0
4.	https://www.tutorialspoint.com/listtutorial/introduction-to-e-business/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Interpret the various types of information and its usage in the business systems.
CO2.	Explicate the process of decision making with the support of decision support technology in the business organizations.
CO3.	Explicate Enterprise Management System and various Enterprise management systems.
CO4.	Interpret E-business Technologies.
CO5.	Recognize the contemporary e-commerce concepts and basics of cryptography for enabling e-commerce.

Data Science

Contact Hours/Week	:	3+0(L + T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N2MCAE2			

Course Objectives:

This Course will enable students to:	
1.	Understanding aspects and benefits of Data Science.
2.	Learning Data Processing.
3.	Understanding Data Visualization, Probability and Bayse's theorem.
4.	Demonstration of Random variable, Binomial theorem and Normal Distribution.
5.	Case study for Sampling and Hypothesis testing.

UNIT – I	08 Hours
Data Sources, Getting information from Data, Different aspects of Data science, Job of Data Scientist, Benefits and uses of Data Science. Descriptive statistics, Description of Data, Measure of central tendency, Mean and Variance, standard deviation.	

UNIT – II	07 Hours
Python programming for Data Science. Data handling, Data collection process, rules.	

UNIT – III	08 Hours
Data visualization, Python programming for Data visualization. Probability, Basic rules , conditional probability , independence, joint probability, Bayes' theorem.	

UNIT – IV	08 Hours
Random variable, Expected value, Bernoulli Random variable, Binomial theorem. Normal Distribution.	

UNIT – V	08 Hours
Sampling and sampling distribution confidence Interval, Hypothesis testing.	

TEXT BOOKS:

1.	Python Data Science Handbook, Jake VanderPlas, O'reilly Publication
2.	Practical Statistics for data Scientists, Peter Bruce, Andrew Bruce and Peter Gedeck, 2 nd Edition
3.	Think Stats Exploratory Data Analysis in Python Version 2.1.0 Allen B. Downey Green Tea Press

WEB LINKS:

1.	www.python.org
2.	www.learnpython.org
3.	http://www.saedsayad.com/data_mining.htm

4.	https://jakevdp.github.io/PythonDataScienceHandbook/
5.	https://towardsdatascience.com/introduction-to-data-visualization-in-python-89a54c97fbed

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Interpret and describe the data using the descriptive statistics.
CO2.	Apply data preprocessing techniques using Python.
CO3.	Apply data visualization techniques using Python.
CO4.	Analyze the data distribution.

Digital Marketing

Contact Hours/Week	:	3+0(L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N2MCAE3			

Course Objectives:

This Course will enable students to:	
1.	Explain the role and importance of digital marketing in a rapidly changing business landscape
2.	Discuss the concepts of Display Advertising
3.	Discuss the concepts of Social Media Marketing
4.	Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM
5.	Familiarize students to methodologies, tools and technologies involved in digital marketing

UNIT – I	08 Hours
Digital Marketing, Introduction To Digital Marketing , Origin And Development Of Digital Marketing, Internet Users, Digital Marketing Strategy, The Consumer Decision Journey, Principles Of DMI's 3i Methodology, The P.O.E.M. Framework, IMC In Digital Marketing, Digital Landscape, Digital Advertising Market , Digital Marketing Plan, Ethical And Legal Framework Of Digital Marketing, Skills Required In Digital Marketing, Careers In Digital Marketing.	

UNIT – II	08 Hours
Concept Of Display Advertising, Digital Metrics, Types Of Display Ads, What Makes A Good Ad, How To Make A Good Ad, Display Plan, Targeting In Digital Marketing, Content Targeting, Placement Targeting, Remarketing, Interest Categories, Custom Intent Targeting, Geographic And Language Tagging, Demographics, CRM, Lookalike Targeting, Other Targeting Methods, Ad Scheduling, Frequency Capping, Ad Server, Ad Exchange, Challenges Faced By Display Advertising.	

UNIT – III	10 Hours
Social Media Marketing, The Social Media Model By Mckinsey, Marketing With Networks, Social Media Analytics, Social Media Tools, Google Analytics, Social Crawlytic, Social Web, Listen, Benefits Of Listening, Tools To Listen, Goal Setting, Strategy, Implementation, Measure, Improve, Facebook Marketing, Introduction, Organic Marketing, Edgerank Algorithm, 3E Strategy For Organic Content, Content With Human Touch, Emotions And Content Virality, Paid Marketing, Antomay Of An Ad Campaign, Types Of Adverts, Advert Optimization, Facebook Insights, Linkedin Marketing, Introduction, Why It Is Important To Have Linkedin Presence, Linkedin Strategy, Content Strategy, Linkedin Analytics, Ad Campaign, TwitterMarketing, Twitter Building Blocks, Building A Content Strategy, Twitter Usage, Twitter Ads, Twitter Analytics, Pinterest, Pinterest Strategy, Snapchat	

UNIT – IV	07 Hours
Introduction To SEO, Search Engine Marketing(SEM), Web Analytics, Mobile Marketing, Online Campaign Management, Optimization, How To Organize Your Site: Hub And SpokeModel, SEO Phases, Website Audit, SEO Techniques, How Do You Measure SEO, SEO For	

Visibility, SEO Vs SEM, SEO Best Practices, Search Engine Result Page(SERP), On-Page Optimization, Off-Page Optimization, Types Of SEO, Techniques Of SEO, Importance Of SEO

UNIT – V	06 Hours
Digital Analytics, Data Collection, Weblogs, Challenges With Weblogs, Key Metrics, Behavior Analysis, Methods To Calculate Unique Visitors, Outcome Analysis, Experience Analysis, Usability Testing, A/B Testing, Multivariate Testing, Types Of Tracking Codes	

TEXT BOOKS:

1.	Seema Gupta “Digital Marketing”, Mc-Graw Hill, Second Edition, 2020
2.	Ian Dodson “The Art of Digital Marketing”, Wiley publications, 2017
3.	Vandana Ahuja “Digital Marketing”, Oxford university press, 2015

REFERENCE BOOKS:

1.	Ryan Deiss, Russ Henneberry, “Digital Marketing For Dummies”, 2017
2.	Dave Chaffey, Fiona Ellis-Chadwick, “Digital Marketing Strategy Implementation And Practice”, Sixth Edition, Pearson, 2016
3.	Puneet Singh Bhatia, “Fundamentals Of Digital Marketing” Pearson, First Edition, 2017
4.	Tracy L Tuten, Michael R Solomon, Social Media Marketing, Sage Publications, Third Edition, 2020

WEB LINKS:

1.	https://swayam.gov.in/explorer
2.	https://www.linkedin.com/learning/
3.	https://learndigital.withgoogle.com/digitalunlocked/
4.	https://digitalskills.fb.com/en-in/
5.	https://www.hubspot.com/digital-marketing
6.	https://www.tutorialspoint.com/digital_marketing/index.htm
7.	https://klientboost.com/seo/technical-seo/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Analyze the role and importance of digital marketing.
CO2.	Identify the importance of Good Ad.
CO3.	Interpret the importance of Social Media Marketing.
CO4.	Demonstrate the importance of Search Engine Optimization.
CO5.	Identify the importance of Digital Analytics.

Research Methodology and IPR

Contact Hours/Week	:	3+0(L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N2MCAE4			

Course Objectives:

This Course will enable students to:					
1.	Identify the suitable research methods and articulate the research steps in a proper sequence for the given problem.				
2.	Carry out literature survey, define the problem statement and suggest suitable solution for the given problem and present in the format of the research paper (IEEE).				
3.	Analyse the problem and conduct experimental design with the samplings.				
4.	Perform the data collection from various sources segregate the primary and secondary data				
5.	Understand some concepts/section of Copy Right Act /Patent Act /Cyber Law/ Trademark to the given case and develop –conclusions				

UNIT – I			08 Hours
Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.			

UNIT – II			08 Hours
Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.			

UNIT – III			08 Hours
Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs			

UNIT – IV			08 Hours
Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout. Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.			

UNIT – V	07 Hours
Intellectual Property (IP) Acts: Introduction to IP: Introduction to Intellectual Property (IP), different types of IPs and its importance in the present scenario, Patent Acts: Indian patent acts 1970. Design Act: Industrial Design act 2000. Copy right acts: Copyright Act 1957. Trade Mark Act, 1999	

TEXT BOOKS:

1.	Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.
2.	Research Methodology a step-by- step guide for beginners. (For the topic Reviewing the literature under module 2) Ranjit Kumar SAGE Publications Ltd 3rd Edition, 2011 Study Material.
3.	Intellectual property, Debirag E. Bouchoux, Cengage learning, 2013.

REFERENCE BOOKS:

1.	Research Methods: the concise knowledge base Trochim, Atomic Dog Publishing, 2005.
2.	Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications, 2009.

WEB LINKS:

1.	https://onlinecourses.nptel.ac.in/noc22_ge08/preview
2.	https://www.youtube.com/watch?v=XEMyDu_VoeQ
3.	https://www.youtube.com/watch?v=GSeeyJVD0JU

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Identify the suitable research methods to articulate the research steps.
CO2.	Conduct literature survey to define research problem.
CO3.	Analyze and conduct experimental design with the samplings.
CO4.	Perform data collection, interpret and report writing.
CO5.	Identify the Intellectual Property (IP) Acts.

Cloud Computing

Contact Hours/Week	:	4+0 (L+T)	Credits	:	02
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N2MCA05			

Course Objectives:

This Course will enable students to:	
1.	Examine the use of Cloud Computing to solve given engineering problem.
2.	Use of the public cloud computing platforms.
3.	Use of cloud native technologies to develop cloud agnostic solutions.

Cloud Computing (List of Programs)

Creating EC2 instance and manually hosting website
Creating EC2 instance and using user-data to automate the web server installation and static website hosting
Creating Security Groups in AWS
Creating AMI of the EC2 Instance
Assigning Elastic IP address to EC2 Instance
1. Creating VPC
2. Creating Security Group in your VPC
3. Fork the GitHub php-mysql project
4. Creating a EC2 instance in a new VPC with user-data
5. Setting up RDS MySQL DB instance
6. Deleting DB Instance
Creating S3 bucket and uploading objects
Providing Public Read Access to S3 Bucket
Enabling Website Hosting on the S3 bucket
Creating DynamoDB table and exploring the dynamodb operations
1 - Creating IAM Policy and Role to Lambda
2- Creating DynamoDB Table
3 - Creating S3 bucket
4 - Creating Lambda function
1. Creating Target Groups and Application Load Balancer
2. Creating Launch Templates and Auto Scaling Groups
AWS CloudFormation Hands on - S3 and EC2 instance

Project 1:

(Two tier application deployment) Deploy a 2-tier application with following requirements

- Create custom vpc with public and private subnet
- Deploy the frontend UI application in publicsubnet.
- Deploy the backend database (AWS RDS) in a private subnet.
- Establish a connection between frontend and backend.

Demonstrate the database CRUD operation through frontend.

Project 2:

(AWS Serverless Project) Automatically populate employees details in DynamoDB using Lambda function when employees details are uploaded to S3 bucket in json format

Project 3:

(Autoscaling Project) Demonstrate the Scale-out and Scale-in capabilities of AWS Autoscaling

WEB LINKS:

1.	Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishing Inc. 2011 https://arpitapatel.files.wordpress.com/2014/10/cloud-computing-bible1.pdf
2.	https://docs.microsoft.com/en-gb/learn/modules/intro-to-azure-fundamentals/what-is-cloud-computing
3.	Getting start with GCP, Azure, AWS https://cloud.google.com/compute/docs , https://docs.microsoft.com/en-gb/learn/azure , https://aws.amazon.com/getting-started/hands-on/
4.	Getting start with Docker & Kubernetes https://docs.docker.com/get-started/ https://kubernetes.io/docs/tutorials/
5.	IBM Cloud Computing http://www.ibm.com/cloud-computing/us/en/
6.	Wikipedia page on Cloud Computing http://en.wikipedia.org/wiki/Cloud_computing .

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Analyze the trade-offs in cloud modules, services and cloud characteristics.
CO2.	Adopt AWS cloud with a core AWS services like EC2, VPC, RDS and IAM.
CO3.	Perceive the serverless technologies and core AWS serverless services.
CO4.	Use Infrastructure as a Code (IaC) concepts and AWS Cloud Formation.
CO5.	Perceive the Cloud native technologies, containerization and Docker containerization tool.

Data Structures Using C Lab

Contact Hours/Week	:	2	Credits	:	1.0
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N2MCAL1			

Course Objectives:

This Course will enable students to:	
1.	Design and implement different data structures.
2.	Develop C programs for various applications of data structures.

Sl.no	Programs
1.	Develop a C program to create a sequential file for storing employee records with each record having following information: EmpId, EmpName, Salary, Department and Gender. Perform the following operations: <ol style="list-style-type: none"> Display the details of a given EmpId. In case if the required record is not found, suitable message should be displayed. Display all the records in the file. Search for a specific records based on Department. In case if the required record is not found, suitable message should be displayed.
2.	Develop a C program to implement Stack of City names to perform the push, pop and display operations.
3.	Develop a C program to convert a valid infix expression to postfix.
4.	Develop a C program to evaluate the given postfix expression.
5.	Develop a C program to implement Linear Queue of characters to perform the insertion, deletion and display operations.
6.	Develop a C program to implement Circular Queue of integers to perform the insertion, deletion and display operations.
7.	Define a structure to represent a node in a Singly Linked List. Each node must contain the following information: <i>Student name, USN, and TotMarks</i> . Develop a C program using functions to perform the following operations: <ol style="list-style-type: none"> Add student at the end of the list. Search for a specific student based on <i>USN</i> and increment <i>TotMarks</i> by 5 if the <i>USN</i> exists.
8.	Develop a C program to implement basic operations of linear queue with Student USN, Name and Age using doubly linked list.
9.	Develop a C program to perform the following operations: <ol style="list-style-type: none"> Construct a binary search tree of integers Traverse the tree in Inorder/preorder/postorder. Delete a given node from the BST.
10.	Develop a C program to construct an expression tree for a given postfix expression and evaluate the expression tree.

Open Ended Problems These problems are introduced to make the students to apply the knowledge of Data Structures in solving real world problems.

Following are the guidelines:

- Each team (3 to 4 students) from each batch should come up with the problem statement for an application of any of the data structures like files, stacks, queues, linked lists, trees and graphs.
- The students should submit the report on the same.

TEXT BOOKS:

1.	E. Balagurusamy Programming in ANSI C, 7th Edition, Tata McGraw-Hill Publications, 2017. (Unit I)
2.	Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum Data structures using C and C++, PHI/Pearson, 2nd Edition, 2015.

REFERENCE BOOKS:

1.	Horowitz, Sahni and Anderson-Freed Fundamentals of Data Structures in C, 2nd Edition, Universities Press Pvt. Ltd., 2011
2.	Jean- Paul Tremblay Paul G. Sorenson An Introduction to Data Structures with Applications, 2nd edition, McGraw-Hill International, 2007

WEB LINKS:

1.	https://nptel.ac.in/courses/106/103/106103069/
2.	https://nptel.ac.in/courses/106/106/106106131/
3.	https://www.tutorialspoint.com/data_structures_algorithms

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Design and develop C programs by applying advanced C programming techniques like pointers, structures and files to solve a given problem
CO2	Design and develop C programs to implement linear data structures like stack, queue and explore its applications by applying the knowledge of static memory allocation technique and dynamic memory allocation technique.
CO3	Apply the knowledge of dynamic memory allocation technique to implement nonlinear data structures and its applications.

Professional Web Development Lab

Contact Hours/Week	:	2	Credits	:	1.0
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N2MCAL2			

Course Objectives:

This Course will enable students to:	
1.	Implement the usage of Java Collection Framework, demonstrate the functionality of linear, static and dynamic structured elements.
2.	Create web services, Design and validate XML based web applications with the elements of WSDL, SOAP and also develop front end client side applications with the usage of Angular and RESTful.
3.	Use the platform of Spring ,Spring Boot framework, Design and build web application using Spring Framework and its services.

Sl.no	Programs
1.	Write a Java Collection program to demonstrate TreeSet by adding books to a Set and display all the books and ensure that TreeSet must be Comparable type and TreeSet objects must be user defined objects and implement comparable interface.
2.	Write a Java Collection program to find the union, intersection and the difference between two sets in both ways using HashSet
3.	Implement the service of Web Services Description Language (WSDL) Create and use your own function and execute it using WSDL.
4.	Implement the service of Simple Object Access Protocol (SOAP) Create and use your own function and execute it using SOAP.
5.	Create a new project using AngularJs and implement the User Interface operations.
6.	Design and build a web application and demonstrate the implementation of building RESTful web Service.
7.	Design and build a web application using Spring Framework and its services.
8.	Design and build a MVC Application using Spring Boot Framework and add some useful services.

WEB LINKS:

1.	https://www.soapui.org/docs/soap-and-wsdl/working-with-wsdl/ https://angular.io and https://angularjs.org
2.	https://www.w3schools.com/CSS/ https://restfulapi.net/
3.	https://spring.io/
4.	https://getbootstrap.com
5.	https://www.soapui.org/docs/soap-and-wsdl/working-with-wsdl/ https://angular.io and https://angularjs.org

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Implement the usage of Java Collection Framework API.
CO2	Design and develop the usage of Web WSDL and SOAP services.
CO3	Develop dynamic and interactive AngularJS user interface applications using dependency injection, services, RESTful API and Spring Boot Framework.

Database Management Systems Lab

Contact Hours/Week	:	2	Credits	:	1.0
Total Lecture Hours	:	24	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N2MCAL3			

Course Objectives:

This Course will enable students to:	
1.	Design and implement SQL queries in DBMS
2.	Design and implement NoSQL queries in DBMS
3.	Compare the performance of SQL and NoSQL queries

Sl.no	Programs
Part A: SQL Programming	
1.	<p>Practical – 1 :</p> <p>Consider the Insurance database given below. The primary keys are underlined and the datatypes are specified.</p> <p>DRIVER (<u>driver-id#</u>:String, driver_name : string, address:string) CAR (<u>Regno</u>:String, car_model:string, yearofpurchase:int) ACCIDENT (<u>Report-Number</u>:int, <u>dateofaccident</u>:date, location:string) CAR_OWNER (<u>driver-id#</u>:string, <u>Regno</u>:String) PARTICIPATED (<u>driver-id#</u>:string, <u>report-number</u>:int, damage_amount:int)</p> <ol style="list-style-type: none"> Create the above tables by properly specifying the primary keys and the foreign keys. Enter atleast five tuples (i.e. records) for each relation (i.e. table). <p>Execute SQL queries for the following requirements:</p> <ol style="list-style-type: none"> List out driver name, address, model of the car, year of purchase for a particular owner List out driver name, model of the car, year of purchase, place of accident and date of accident occurred at a particular place. List the number of accidents done by a particular driver : List out the accident details (i.e. driver name, model of the car, date of accident, place of accident, damage amount) where the damage amount exceeds Rs. 25,000 Find out the place of accident where the number of accidents occurred are more than one. Find the total number of people who owned car that were involved in an accident in the year 2009 Find the number of accidents in which car belongs to specific model were involved.
2.	<p>Practical – 2 :</p> <p>Consider the following relations for an order processing database application in a company.</p>

	<p>CUSTOMER (cust#: int, cname: String, City: String) ORDER (order#: int, odate: date, cust#: int, ord-Amt:int)ORDER-ITEM (order#: int, Item#: Int, Qty: int) ITEM (item#: int, item_name string, unitprice: int) SHIPMENT (order# int, warehouse#: int, ship-date: date) WAREHOUSE (warehouse#: int, warehouse_name: string, city: String)</p> <p>Create the above tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation. Execute SQL queries for the following requirements:</p> <ol style="list-style-type: none"> 1) List out the details of orders, i.e. order no, warehouse name, ship date for a particular city : 2) List out customer name, number of orders they made, their total ordered amount and their average ordered amount for all the customers: 3) Find out the warehouse and number of orders they obtained from different customers. 4) Find out the warehouse, which has got number of orders more than 2. 5) Find out the customer who has ordered the number of items more than 3.
3	<p>Practical – 3 :</p> <p>Consider the following database of student enrollment in courses and books adopted for each course.</p> <p>STUDENT (regno: string, name: string, major: string, bdate: date) COURSE (course#: int, cname#: string, dept: String) TEXT (book_ISBN: int, book_title: string, publisher: string, author: string) ENROLL (regno: string, course#: int, sem: int, marks: int) BOOK_ADOPTION (course#: int, sem: int, book_ISBN: int)</p> <p>Create the above tables by properly specifying the primary keys and the foreign keys Enter at least 7 to 10 records to each table. Execute SQL queries for the following requirements:</p> <ol style="list-style-type: none"> 1) List out the student details, and their course details. The records should be ordered in a semesterwise manner. 2) List out the student details under a particular department whose name is ordered in a semester wise 3) List out all the book details under a particular course 4) Find out the Courses in which number of students studying will be more than 2. 5) Find out the Publisher who has published more than 2 books. 6) Find out the authors who have written book for I semester, computer science course. 7) List out the student details whose total number of months starting from their date of birth is more than 225 8) Find out the course to which maximum number of students have joined
4	<p>Practical – 4.</p> <p>Consider the following Employee database of working in a department and getting salary grade.</p>

	<p>Employee (empno: number, empname: string, job: string, manager: number (self reference key),hiredate: date, salary: number, commision: number, deptno number(foreign key))</p> <p>Department (deptno: number, deptname: string, location: string) SalaryGrade (grade: number, LowSalary: number, highSalary: number)</p> <p>Create the above tables by properly specifying the primary keys and the foreign keys</p> <p>Enter at least ten tuples for each relation.</p> <p>Execute SQL queries for the following requirements:</p> <ol style="list-style-type: none"> 1) List details of employees who have joined before 30 Sep 81. 2) List employee names those who have joined between the months June to December of the year 1981. 3) List the name and designation of the employee who does not report to anybody. (i.e. doesn't have any managers) 4) List the names of employees whose names should have 'A' as the third character. 5) List the employees whose name should not start with letter 'A' and should not end with the letter 'A' but it should be there in the name other than First and Last character. 6) List the names of employees who have finished their 25 years of experience in the company. 7) List the employee name, salary, PF, HRA, DA and gross; order the results in the ascending order of gross. (PF is 10%, HRA is 50%, DA is 30% of the salary and gross is sum of salary, PF, HRA & DA) 8) List the department name, number of employees, total_salary, average salary, maximum salaryand minimum salary in each of the department. 9) List the total salary, maximum salary, minimum salary and average salary of the employeesaccording to job wise.
5.	<p>Practical – 5 :</p> <p>For the same previous database tables (i.e. Practical – 5)</p> <p>Employee (empno: number, empname: string, job: string, manager: number (self reference key),hiredate: date, salary: number, commision: number, deptno number(foreign key))</p> <p>Department (deptno: number, deptname: string, location: string) SalaryGrade (grade: number, LowSalary: number, highSalary: number)</p> <p>Execute SQL queries for the following requirements:</p> <ol style="list-style-type: none"> 1) List details of the employees who have joined in the month of February. 2) List the employees having experience greater than 300 months. 3) List empno, empname, job, salary, deptname, and grade of the salary of all the employees exceptclerks. 4) List empno, empname, job, salary, deptname and grade of the salary with annual

	<p>remuneration greater than 36000</p> <p>5) Find the job that was filled in first half of 1981 and the same job that was filled during second half of 1981</p> <p>6) Find all the employees who have joined the company before their managers</p> <p>7) List departments for which no employees exists.</p> <p>8) In which year did most people join the company. Display the year and no of employees</p> <p>9) List the department in which highest number of employees are working.</p>
Part B: NoSQL Programming	
1	<p>Create the below tables, insert suitable tuples and perform the following operations using MongoDB</p> <p>EMPLOYEE (SSN, Name, DeptNo), ASSIGNED_TO (SSN , ProjectNo)</p> <p>a. List all the employees of department “XYZ”.</p> <p>b. Name the employees working on Project Number 6.</p>
2	<p>Create the below tables, insert suitable tuples and perform the following operations using MongoDB</p> <p>PART (PNO, PNAME, COLOUR), SUPPLY (SNO, SNAME, PNO, ADDRESS)</p> <p>a. Update the parts identifier</p> <p>b. Display all suppliers who supply the part with part identifier: #PNO</p>
3	<p>Create the below tables, insert suitable tuples and perform the following operations using MongoDB</p> <p>BOAT (BID, BNAME, COLOUR) , RESERVES (BID, SNAME, SID, DAY)</p> <p>a. Obtain the number of boats obtained by sailor :#sname</p> <p>b. Retrieve boats of color :”White”</p>
4	<p>Create the below tables, insert suitable tuples and perform the following operations using MongoDB</p> <p>PART (PNO, PNAME, COLOUR), SHIPMENT (PNO, WNO, WNAME, QUANTITY, DATE)</p> <p>a. Find the parts shipped from warehouse :Wname”</p> <p>b. List the total quantity supplied from each warehouse</p>
5	<p>Create the below tables, insert suitable tuples and perform the following operations using MongoDB</p> <p>BOOK (ISBN, TITLE, AUTHOR, PUBLISHER), BORROW (ISBN,USN,DATE)</p> <p>a. Obtain the name of the student who has borrowed the book bearing ISBN “123”.</p> <p>b. Obtain the Names of students who have borrowed database books.</p>
<p>Open Ended Project</p> <p>Develop a database application using Oracle/MySQL/NoSQL</p> <p>a) Login Page Validation System.</p> <p>b) Material Requirement Processing.</p> <p>c) Reservation System for Bus/Train/Flight.</p> <p>d) Personal Information System.</p> <p>e) Student Admission Processing System.</p> <p>f) Attendance Monitoring System.</p>	

- g) Rooms Booking System.
- h) Web Based User Identification System.
- i) Examination Schedule System.
- j) Timetable Management System.
- k) Hotel Management System.
- l) Inventory Control System.
- m) Health Care Monitoring System and so on.

Please note the following conditions.

1. Mini project should give proper idea about the application for which it is developed.
2. Maximum 2 students per team. No team is allowed to do the same project.
3. The front end has to be created with any programming language with proper design.
4. Students must:
 - a. Create schema and insert the records for each table. Add appropriate database constraints.
 - b. Implement, analyze and evaluate the project developed for an application
 - c. Create, update, delete and query on the database
 - d. Demonstrate the working of different concepts of DBMS
5. Must be able to generate reports

WEB LINKS:

1.	https://www.youtube.com/watch?v=XiDnK9Lq-Ng&list=PLGR2HrDYtzHDNzemUUiSxXsYXMJgaXvVY
2.	https://www.youtube.com/watch?v=zbMHLJ0dY4w
3.	https://www.youtube.com/watch?v=vUj-kUEC_oA

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Analyze and write SQL queries for the given relational database schema.
CO2	Demonstrate NoSQL queries for the given relational database schema.
CO3	Apply design techniques and concepts of DBMS to solve real world problems.

Advanced Java Lab

Contact Hours/Week	:	2	Credits	:	1.0
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N2MCAL4			

Course Objectives:

This Course will enable students to:	
1.	Design and build Java Swing GUI applications with the implementation of event handling mechanism.
2.	Interpret and implement JDBC concepts and build applications integrating relational databases with updation, quick retrieval of data.
3.	Design and build Java web applications using Servlets, JSPs and integrating JDBC and develop custom tags with JSTL, component based web applications with Java bean and EJB

Sl.no	Programs
1.	Design a GUI application using Java SWING components as front end which accepts <i>sid</i> and <i>sname</i> as the data fields for a database table student and retrieve the same based on particular queries using Embedded SQL and by implementing ActionListener interface event handling mechanism.
2.	Design a GUI application using HTML code which accepts inputs for a Student Registration form and sends them to a Servlet which inserts them in to a Database table and display the form details on the web browser.
3	a)Write a Java Servlet Program to Auto Web Page refresh in regular intervals of time. (Consider a webpage which is displaying Date and Time). b)Write a Java Servlet Program to create cookies for first and last names, set expiry date after 24 Hrs for both the cookies and display the cookies data on the web browser.
4	Write a JAVA Servlet Program to implement HttpSession methods (Using HttpSession Interface).
5.	Design a GUI application using HTML code which accepts inputs username and password and send them to JSP Page which further connects and stores them in to aDatabase Table using JDBC. Display the inserted data on the web browser
6.	Write all the related programs using JSP code to demonstrate the action tags include and forward.
7.	Write a JSP program to implement and handle custom tag using the Java TLD (Tag library descriptive) and Tag handler class
8.	Write a JSP program to implement few standard functions using JSTL and EL
9.	Write a JAVA JSP Program to get student information through a HTML and create a JAVA Bean Class, populate Bean and display the same information through another JSP

WEB LINKS:

1.	https://www.javatpoint.com/java-swing
2.	https://www.tutorialspoint.com/jdbc/index.htm
3.	https://www.edureka.co/blog/servlet-and-jsp-tutorial/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Design and develop Java applications to demonstrate the usage of event handling mechanism and JDBC transactions over Embedded SQL queries using Java AWT, SWING and JDBC API.
CO2	Design and develop dynamic web based Java applications to demonstrate database transactions, Java cookies and sessions using embedded SQL, HTML, Servlet and JSP technologies on Netbeans/Eclipse IDE.
CO3	Design, develop, configure and deploy the usage of JSP over JSTL and Java bean on Netbeans/Eclipse IDE.

Aptitude Related & Analytical Skill

Contact Hours/Week	:		Credits	:	1.0
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	ARAS			

Modules Covered:

Sl. No.	Module covered	Duration (in hrs.)
1	Quantitative Aptitude	16
2	Verbal Reasoning	08
3	Logical Reasoning	08
4	Test taking strategies to crack recruiter tests	02
5	Post-Training Assessment along with debrief	02
	Total Course	36

Methodology: Instructor led – Concepts with guided question-solving, assignments and homework assessments

Sl.no	Programs
1.	Quantitative Aptitude (with focus on questions from top recruiters) (16 Hours) <ol style="list-style-type: none"> Number System <ul style="list-style-type: none"> Classification of numbers Divisibility tests Power cycles and remainders Factors and multiples Applications of HCF and LCM Profit and Loss, Partnerships and Averages <ul style="list-style-type: none"> Basic terminology in Profit and Loss Partnerships Averages and weighted averages Mixtures and alligations Time and Work <ul style="list-style-type: none"> Working with different efficiencies Pipes and cisterns Work equivalence Division of wages Time, Speed and Distance <ul style="list-style-type: none"> Basics of Time Speed and Distance Relative Speed Problems based on trains Problems based on boats and streams Problems based on Races Percentages, Simple and Compound Interest <ul style="list-style-type: none"> Percentages as fractions and decimals Percentage increase / decrease

	<ul style="list-style-type: none"> • Simple interest and compound interest • Relationship between simple and compound interest <p>f) Permutation, Combination and Probability</p> <ul style="list-style-type: none"> • Fundamental counting principle • Basics of permutation and combination • Computation of permutation • Circular permutation • Computation of combination • Probability <p>g) Logarithms, Progressions, Geometry and Quadratic Equations</p> <ul style="list-style-type: none"> • Logarithms • Progressions – Arithmetic, Geometric and Harmonic • Geometry • Mensuration • Quadratic equations
2.	<p>Verbal Reasoning (with focus on questions from top recruiters)– (8 Hours)</p> <p>a) Reading Comprehension –</p> <ul style="list-style-type: none"> • Eyespan • Speed reading techniques • Types of questions • Comprehension strategies <p>b) Sentence Correction –</p> <ul style="list-style-type: none"> • Subject-Verb Agreement • Parallelism • Modifiers • Pronoun Antecedent Agreement • Verb Time Sequence • Comparison • Determiners • Prepositions <p>c) Vocabulary –</p> <ul style="list-style-type: none"> • Etymology of words • Prefix and suffix • Memory techniques to remember words • Synonyms and antonyms • Analogy <p>d) Sentence Completion and Para Jumbles –</p> <ul style="list-style-type: none"> • Sentence completion – single blank and double blank questions • Parajumbles – Moving and anchored jumbles
3	<p>Logical Reasoning (with focus on questions from top recruiters) - (8 Hours)</p> <p>a) Coding and Decoding, Series, Analogy, Odd Man Out and Visual Reasoning</p> <ul style="list-style-type: none"> • Coding and decoding • Number and alphabet series • Analogy

	<ul style="list-style-type: none"> • Odd man out • Visual Reasoning <p>b) Data Arrangements and Blood Relations</p> <ul style="list-style-type: none"> • Linear, circular and distribution arrangements • Blood Relations <p>c) Data interpretation and Data Sufficiency</p> <ul style="list-style-type: none"> • Tables • Pie Charts • Bar Graphs • Data Sufficiency <p>c) Clocks, Calendars, Direction sense and Cubes</p> <ul style="list-style-type: none"> • Clocks • Calendars (Conventional and shortcut methods to find day of a date) • Cubes • Direction Sense
4	<p>Test taking strategies – (2 Hours)</p> <p>This module will focus on:</p> <ul style="list-style-type: none"> • Understanding patterns of tests (Adaptive, non adaptive, navigation – intra sectional, inter sectional) • Best strategies to maximize scores and clear cut-offs • Shortcut strategies on Quantitative Aptitude, Logical Reasoning as well as Verbal Ability to ace sections
5.	<p>Post Training Assessment with debrief – (2 Hours)</p> <p>An assessment that tests a student on all three sections of Aptitude, followed a detailed student-wise analysis based on:</p> <ul style="list-style-type: none"> • Cut-off • Percentile w.r.t the batch • Percentile w.r.t. the college • Corrective measures to be taken to improve the score <p>In class, there will be a debrief on how the test should have been taken by an ideal test taker to navigate through the difficulties and ace the cut-off.</p>
6.	<p>Tests outside training schedule</p> <p>An ideal aptitude training course is a mix of classroom learning / guided question solving, followed by self-practice. The ‘training duration’ focuses mainly on laying strong foundations on concepts and ability to solve questions on major aptitude topics. Significant amount of practice is also provided to students through online tests in the form of:</p> <ol style="list-style-type: none"> 1. Pre-Assessment test 2. Full-length practice tests 3. Company specific tests (patterns and question types of major recruiters should be given exposure to)

Reference material –

1. ‘Aptipedia’, Wiley India
2. ‘Quantitative Aptitude for Competitive Examinations’ by R S Agarwal
3. ‘The Pearson Guide to Verbal Ability’ by Nisht K Sinha

III Semester

Machine Learning

Contact Hours/Week	: 3+2(L+T)	Credits	: 04
Total Lecture Hours	: 39	CIE Marks	: 50
Total Tutorial Hours	: 26	SEE Marks	: 50
Course Code	: N3MCA01		

Course Objectives:

This Course will enable students to:	
1.	Learn the basic concepts of machine learning and Concept Learning.
2.	Learn the elements of decision trees & Model Evaluation.
3.	Understand the concepts of artificial neural networks & Evaluating Hypothesis.
4.	Understand the Bayesian classifiers and instance based learning.
5.	Familiarize unsupervised learning.

UNIT – I	07 Hours
Introduction: Well posed learning problems, Designing a Learning system, Perspectives and Issues in Machine Learning.	
Concept Learning: A Concept learning task, Concept learning as search, Find-S: Finding a maximally specific hypothesis, Version spaces and the Candidate Elimination algorithm.	

UNIT – II	08 Hours
Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, The Basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Issues in decision tree learning.	
Model Evaluation: Metrics for evaluating Classifier Performance, Holdout method & Random Subsampling, Cross-Validation, Bootstrap.	

UNIT – III	08 Hours
Artificial Neural Networks: Introduction, Biological Motivation, Neural Network representations, Appropriate problems for Neural network Learning, Perceptrons, Multilayer Networks and the backpropagation algorithm, A Differentiable Threshold Unit, The Backpropagation Algorithm.	
Evaluating Hypothesis: Motivation, Estimating hypothesis accuracy, Sample Error & True Error, Confidence Intervals for Discrete-Valued Hypotheses.	

UNIT – IV	08 Hours
Bayesian Learning: Introduction, Bayes theorem, An example, Naïve Bayes classifier, An Illustrative Example, Bayesian belief networks, Conditional Independence, Representation, Inference.	
Instance based Learning: Introduction, k-nearest neighbor learning, Distance-Weighted Nearest Neighbor Algorithm, and Remarks on k- Nearest Neighbor Algorithm.	

UNIT – V	08 Hours
Unsupervised Learning: Cluster analysis: What is Cluster analysis?, Requirements for Cluster analysis, Partitioning Methods: k-Means, Hierarchical Methods: Agglomerative vs Divisive Hierarchical Clustering, Distance Measures in Algorithmic Methods, Expectation-Maximization Algorithm.	

TEXT BOOKS:

1.	Tom M Mitchell , Machine Learning, McGraw Hill Education (India) Edition 2013. (Sections: 1.1, 1.2, 1.3, 2.2, 2.3, 2.4, 2.5, 3.2, 3.3, 3.4, 3.5, 3.7, 4.1, 4.2, 4.3, 4.4, 4.5 (4.5.1, 4.5.2), 5.1, 5.2, 6.1, 6.2, 6.9, 6.11(6.11.1, 6.11.2, 6.11.3), 8.1, 8.2, (8.2.1, 8.2.2))
2.	Jiawei Han, MK, JP, Data mining, Concepts & Techniques, 3 rd Edition, MK. (Sections: 8.5, 8.5.1, 8.5.2, 8.5.3, 8.5.4, 10.1(10.1.1, 10.1.2), 10.2(10.2.1), 10.3(10.3.1, 10.3.2), 11.1.3

REFERENCE BOOKS:

1.	Ethem Alpaydin, Introduction to Machine Learning, 3 rd Edition, EEE, MIT Press, 2018.
2.	SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Machine Learning, Pearson Publications, 4 th impression, 2019, ISBN 978-93-530-6669-7

WEB LINKS:

1.	https://www.kaggle.com/
2.	https://machinelearningmastery.com/
3.	https://www.tensorflow.org/
4.	https://www.youtube.com/?gl=IN&tab=w1
5.	https://ai.google/
6.	http://ndl.iitkgp.ac.in/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Summarize the basics of machine learning and apply the concept learning algorithm to real world problems.
CO2	Apply decision trees for classification tasks and evaluate classifier's performance.
CO3	Apply neural networks for classification tasks and evaluate the hypothesis accuracy.
CO4	Apply Bayesian learning and instance-based learning techniques for classification tasks.
CO5	Apply unsupervised learning techniques for clustering the data.

Mobile Application Development

Contact Hours/Week	:	3+0 (L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N3MCA02			

Course Objectives:

This Course will enable students to:	
1.	Understanding the concepts of mobile and its platforms
2.	Explore the android tools and its applications
3.	Analyze the usage the UI design LBS
4.	Understand the messaging and network related

UNIT – I	08 Hours
Introduction Preliminary Considerations – Cost of Development – Importance of Mobile Strategies in the Business World – Effective use of Screen Real Estate. Understanding Mobile Applications: Users – Understanding Mobile Information Design – Understanding Mobile Platforms – Using the Tools of Mobile Interface Design.	

UNIT – II	08 Hours
Getting Started with Android Programming What is Android – Obtaining the required tools– Anatomy of an Android Application – Components of Android Applications – Activities – Fragments – Utilizing the Action Bar, introduction to Android SDK, build.gradle and Android Manifest file.	

UNIT – III	08 Hours
Android UI Design and Location Based Services Views and View Groups – Basic Views – Fragments – Displaying Maps – Getting Location Data – Publishing for Publishing – Deploying APK Files, Importance of debug build and release build.	

UNIT – IV	08 Hours
Android Messaging and Networking SMS Messaging – Sending Email – Networking – Downloading Binary Data, Text files – Accessing Web Services – Performing Asynchronous Call – Creating your own services – Communicating between a service and an activity – Binding activities to services, Simple SQL lite/cloud database connectivity.	

UNIT – V	07 Hours
Feedback and Oscillator Circuits iOS – Obtaining the tools and SDK – Components of XCODE – Architecture of iOS – Building Derby App in iOS – Other useful iOS things – Windows Phone: Getting the tools you need – Windows Phone 7 Project – Building Derby App in Windows Phone 7 –Distribution – Other useful Windows Phone Thing.	

TEXT BOOKS:

1.	Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", 1 st Edition, 2012, ISBN: 978-1-118-20390-3
2.	Wei-Meng Lee, "Beginning Android Application Development", Wiley 2011.

REFERENCE BOOKS:

1.	Reto Meier, "Professional Android 4 Application Development", Wrox Publications 2012
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WEB LINKS:

1.	https://www.youtube.com/watch?v=giVfVQIKBVM
2.	https://www.youtube.com/watch?v=aS_9RbCyHg
3.	https://www.tutorialspoint.com/android/index.htm
4.	https://developer.android.com/
5.	https://www.geeksforgeeks.org/android-tutorial/
6.	https://www.tutlane.com/tutorial/android
7.	https://www.w3schools.in/category/android-tutorial/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Exemplify the existing UI design components to build mobile applications.
CO2.	Develop applications using software development kits (SDKs), frameworks and toolkits.
CO3.	Apply Android UI Design and Location Based Services
CO4.	Design and develop an application using Android Messaging and Networking
CO5.	Deploy competent mobile application development solutions on various cross platforms.

Computer Networks

Contact Hours/Week	:	3+0 (L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N3MCA03			

Course Objectives:

This Course will enable students to:	
1.	Impart knowledge of computer networks by going through basic terminologies and concepts.
2.	Study the conceptual and implementation aspects of network applications, including application layer protocols, clients, servers, processes and interfaces.
3.	Understand the principles as to how two entities can communicate reliably over a medium through series of complicated scenarios.
4.	Understand how forwarding and routing functions of the network layer.
5.	Understand two fundamentally different types of link layer channels, broadcast channels and HFCs, To get clear idea about wireless Internet devices, mobility related services.
6.	Understand network security related algorithms and protocols.

UNIT – I	07 Hours
Introduction , nuts-and-bolts description, service oriented description, The network edge, client and server programs, network access. The network core, circuit switching, multiplexing, packet switching. ISPs, delays in packet switch networks, end-to-end delay. Throughput in computer networks. Layered architecture, 5 layer model, message, segments, and networks under attack.	

UNIT – II	08 Hours
Application layer: Network application architectures, client server architectures, peer-to-peer architecture. Client server processes. Network application architectures, client server architectures, peer-to-peer architecture. Client server processes. Application layer protocols, services needed by an application, reliable data transfer, bandwidth, timing, services provided by the Internet. Transport protocols, TCP and UDP services. HTTP, web caching. File transfer, out of band and in band, FTP commands and replies, electronic mail in the Internet, simple mail transfer protocol, mail message formats. Transport Layer: transport layer services, best effort delivery service, transport layer multiplexing, multiplexing and de-multiplexing. Connectionless transport, UDP, UDP segments structure, UDP checksum. Principles of reliable data transfer, reliable data transfer protocol, positive and negative acknowledgements, ARQ protocols, Go-Back-N protocol, SR protocol.	

UNIT – III	08 Hours
The network layer: Introduction, forwarding and routing, forwarding table. VC networks, VC setup and VC tear down. Datagram networks, longest matching prefix rule. The router fundamentals, input ports, switching fabric, routing processor. Output ports, queue management, HOL blocking. The Internet protocol, IPv4 datagram format, fields, functions. IPv6 protocol, format, fields, differences between IPv4 and IPv6.	

UNIT – IV	08 Hours
<p>The link Layer: services offered by the link-layer protocols, framing, link access, reliable delivery, flow control, error detection and correction. Parity checks-one and two dimensional, check summing methods. CRC-example problem, multiple access protocols-channels partitioning protocols.</p> <p>Random access protocols- ALOHA and slotted ALOHA. Carrier sense multiple access, space-time- diagram of two CSMA nodes with colliding transmissions. Link layer addressing, MAC address, address resolution protocol. Dynamic host configuration protocol, address resolution protocol, DHCP client server scenario. The Ethernet, Ethernet frame structure, connectionless service, Manchester encoding. CSMA/CD-Ethernets multiple access protocol.</p>	

UNIT – V	08 Hours
<p>Physical layer: Guided transmission media, magnetic media and twisted pairs, coaxial cables, fiber optic cables, satellite communication. Wireless networks, components of wireless networks, network characteristics, hidden terminal problem.</p> <p>Security in computer networks - Elements of secure communication. Confidentiality, authentication, message integrity and non-repudiation. Availability and access control. Eavesdropping, principles of cryptography, plain text, Types of attacks. Symmetric key cryptography, mono-alphabetic cipher, Block ciphers.</p>	

TEXT BOOKS:

1.	James F. Kurose, Keith W. Ross: Computer Networking- A Top down Approach, 5th Edition, Pearson Publishing. [1-1- 1.5, 2.1-2.4, 3.1-3.5, 4.1-4.5, 5.1-5.5, 8.1, 8.2]
2.	Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 5th Edition, Pearson Publishing. [Unit 5: 2.2- 2.4, 2.7]

REFERENCE BOOKS:

1.	Behrouz A. Forouzan: Data Communications and Networking, 4th Edition, Tata Mc_GrawHill, 2006.
2.	Larry L. Peterson and Bruce S. David: Computer Networks- A Systems Approach, 4th Edition, Elsevier 2007, Tata MC_Graw Hill, 2004.
3.	Nader F. Mir: Computer and Communication, Pearson Education, 2007.

WEB LINKS:

1.	https://nptel.ac.in/courses/106/105/106105183/
2.	https://www.youtube.com/watch?v=XMhCC2Q4xJA
3.	https://www.youtube.com/watch?v=0PbTi_Prpgs
4.	https://www.youtube.com/watch?v=k9ZigsW9il0

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Interpret the different network components and layers.
CO2.	Illustrate the functionalities of the predominant protocols of application layer and transportation layer.
CO3.	Interpret the functionalities of network layer.
CO4.	Illustrate various functionalities of link layer and its protocols.
CO5.	Explicate the concepts of physical layer and secure communication.

Software Project Management

Contact Hours/Week	:	3+0 (L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N3MCA04			

Course Objectives:

This Course will enable students to:	
1.	Deliver successful software projects that support organization's strategic goals
2.	Match organizational needs to the most effective software development model
3.	Plan and manage projects at each stage of the software development life cycle (SDLC)
4.	Create project plans that address real-world management challenges
5.	Develop the skills for tracking and controlling software deliverables

UNIT – I	08 Hours
Introduction to Project Management Importance of software project management: What is a project? Problems with Software Projects What are Project Management? Stages of Project. The Feasibility Study. The Cost-benefit Analysis. Planning. Project Execution. Project and Product Life Cycles. The Stakeholder of Project. All parties of project. The Role of Project Manager. Project Management Framework.	
Project Planning Integration Management. What is Integration Management? Project Plan Development. Plan Execution. Scope Management. What is Scope Management?. Methods for Selecting Projects. Project Charter. Scope Statement. Work Breakdown Structure. Stepwise Project Planning Overview. Main Steps in Project Planning.	

UNIT – II	08 Hours
Project Scheduling Time Management, Importance of Project Schedules, Schedules and Activities, Sequencing and Scheduling Activity, Project Network Diagrams. Network Planning Models, Duration Estimating and Schedule Development, Critical Path Analysis, Program Evaluation and Review Technique (PERT).	
Project Cost Management Importance and Principles of Project Cost Management, Resource Planning, Cost Estimating, Types of Cost Estimates, Expert Judgment, Estimating by Analogy, COCOMO Model, Cost Budgeting, Cost Control.	

UNIT – III	08 Hours
Project Quality Management Quality of Information Technology Projects, Stages of Software Quality Management Quality Planning, Quality Assurance. Quality Control, Quality Standards, Tools and Techniques For Quality Control.	
Project Human Resources Management What is Project Human Resources Management? Keys to Managing People, Organizational Planning, Issues in Project Staff Acquisition and Team Development.	

UNIT – IV	08 Hours
Project Communication Management Communications Planning, Information Distribution, Performance Reporting, Administrative Closure, Suggestions for Improving Project Communications.	

UNIT – V	08 Hours
Project Risk Management The Importance of Project Risk Management, Common Sources of Risk in IT projects, Risk Identification, Risk Quantification, Risk Response Development and Control, Project Procurement Management Importance of Project Procurement Management, Procurement Planning, Solicitation. Source Selection, Contract Administration and Contract Close- out.	

TEXT BOOKS:

1.	Kathy Schwalbe, —Information Technology Project Management, International Student Edition, THOMSON Course Technology, 2003
2.	Bob Hughes and Mike Cotterell, —Software Project Management, Third Edition, Tata McGraw-Hill.

REFERENCE BOOKS:

1.	Basics of Software Project Management, NIIT, Prentice-Hall India, 2004.
2.	Pankaj Jalote, Software Project Management in Practice, Pearson Ed., 2002.
3.	S.A. Kelkar, Software Project Management, a Concise Study, Revised Edition, Prentice-Hall India, 2003

WEB LINKS:

1.	https://www.tutorialspoint.com/software_engineering/software_project_management.htm
2.	https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/
3.	https://london.ac.uk/sites/default/files/study-guides/software-engineering-project-management.pdf
4.	http://www.cs.ox.ac.uk/people/michael.wooldridge/teaching/soft-eng/lect05.pdf
5.	https://www.tutorialspoint.com/ms_project/ms_project_tutorial.pdf

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Recognize the practices and methods for successful software project management
CO2.	Apply the evaluation techniques for estimating cost, benefits, schedule and risk
CO3.	Identify techniques for requirements, policies and decision making for effective resource management and project quality
CO4.	Devise a framework to manage project communication and project reporting
CO5.	Develop strategies for software project management plan for activities, risk, monitoring, control and procurement management

Professional Practices and Ethics

Contact Hours/Week	:	3+0(L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N3MCA05			

Course Objectives:

This Course will enable students to:	
1.	Interpret the different types of barriers in communication
2.	Inculcate the problems covering Quantitative, verbal Ability and Logical Reasoning
3.	Interpret the job search process and networking
4.	Inculcate the Effective Presentation Strategies
5.	Develop Ethics in business world.

UNIT – I	09 Hours
Basics of Technical Communication Introduction, Process Of Communication, Language As A Tool, Levels Of Communication, The Flow Of Communication, Communication Networks, Importance Of Technical Communication Barriers To Communication: Definition Of Noise, Classification Of Barriers. Active Listening: Introduction, Types Of Listening, Traits Of A Good Listener, Active Versus Passive Listening	

UNIT – II	08 Hours
Group Communication and writing skills: Various Forms of group communication, body language, discussion and group discussion. Paragraphs & Essays: Expressing idea, Paragraph construction, Paragraph length, paragraph pattern, Kinds of paragraph, writing first draft, revising & finalising, Essay, Letters & Email: Letter writing, business letter, cover letter, resume, Email.	

UNIT – III	09 Hours
Strategies in the job search process. Job search, Building a network of contacts, identifying appropriate jobs, Finding your employer, Preparing the application documents, Constructing the resume. Interviews: Introduction, Objectives, Types of Interviews, Job Interviews Group Discussion: Introduction, Group Discussion, Organizational Group discussion, Group discussion as part of selection process	

UNIT – IV	07 Hours
Effective Presentation Strategies Introduction, Defining purpose, Analyzing Audience and Locale, Organizing Contents, preparing outline, Visual Aids, Understanding Nuances of Delivery, Kinesics, Proxemics, Paralinguistic, Chronemics.	

UNIT – V	06 Hours
An Overview of Ethics What are Ethics? Ethics in the Business World, Fostering good business ethics, improving corporate ethics, improving corporate ethics, Ethics in Information Technology (IT)	

TEXT BOOKS:

1.	Meenakshi Raman and Sangeeta Sharma: Technical Communication - Principles and Practices, Oxford University Press, 2011, Chapters: 1, 2, 4, 5, 6, 7
2.	Raymond V Lesikar, Flatley, Rentz, Pande : Business Communication Making connections in a digital world, 11th Edition, Tata McGraw-Hill Edition. Chapter: 9.
3.	George Reynolds: Ethics in Information Technology, Thomson Course Technology, 2nd Edition, 2007 Chapter: 1

REFERENCE BOOKS:

1.	M.Ashraf Rizivi: Effective Technical Communication, 1st Edition, Tata McGraw Hill, 2005.
2.	Mike W Martin and Ronald Schinzinger: Ethics in Engineering, 3rd Edition, Tata McGraw Hill, 2003

WEB LINKS:

1.	https://onlinecourses.nptel.ac.in/noc21_hs76/preview
2.	https://onlinecourses.nptel.ac.in/noc21_hs02/preview
3.	https://www.coursera.org/courses?query=soft%20skills
4.	https://www.edx.org/learn/soft-skills
5.	https://learning.linkedin.com/content-library/online-business-courses/soft-skills

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Acquire the communication skills.
CO2.	Perceive the knowledge of group communication and writing skills.
CO3.	Acquire the knowledge of job search strategies, interviews and GDs.
CO4.	Demonstrate the effective presentation strategies.
CO5.	Adopt ethical and privacy practices.

Artificial Intelligence & Deep learning

Contact Hours/Week	:	3+0(L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N3MCAE21			

Course Objectives:

This Course will enable students to:	
1.	Know the representations and algorithms used to build artificial intelligence systems
2.	Understand the role of the knowledge representation and reasoning.
3.	Achieve the knowledge in building the simple knowledge-based systems.
4.	Foundation to deep learning and its major architectures

UNIT – I	07 Hours
What is AI? The state of the art. Intelligent Agents: Agents and environment; Good behavior: the concept of Rationality ; The nature of environment ; the structure of agents . Problem solving: Problem-solving agents; Example problems; Searching for solution; Uninformed search strategies.	

UNIT – II	08 Hours
Informed Search: Informed search strategies ; Heuristic functions ; Adversarial search: Games ; Optimal decisions in games; Alpha-Beta pruning Constraint satisfaction problems: Defining Constraint satisfaction problems.	

UNIT – III	08 Hours
Logical Agents: Knowledge-based agents; The wumpus world ;Logic, Propositional logic: A very simple logic; First-Order Logic: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic	

UNIT – IV	08 Hours
Fundamentals of Deep Networks: Neural networks, Training neural networks, Defining Deep Learning, Common architectural principles of Deep Networks-Parameters, Layers, Activation functions, Loss functions, Hyper parameters, Building blocks of Deep Networks-RBMs, and Auto encoders.	

UNIT – V	08 Hours
Major architectures of Deep Networks: Convolutional Neural Network-Biological inspiration, Intuition, CNN architecture over view, Input Layers, Convolutional layers, pooling layers, Fully Connected layers, Recurrent Neural Networks- Modeling the time dimension, 3D Volumetric input, General RNN architecture, LSTM networks, Domain specific Applications, when do I need deep learning	

TEXT BOOKS:

1.	Stuart J Russel and Peter Norvig : Artificial Intelligence A Modern Approach, 3rd Edition, Pearson India Education limited, 2015, (1.1,2.1to2.4,3.1 to 3.6,5.1 to 5.3, 6.1, 7.1 to 7.4, 8.1 to 8.3, 9.1 to 9.4)
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2.	Josh Patterson and Adam Gibson, Deep Learning, A practitioner's approach, First edition, Shroff Publishers and Distributors Pvt.Ltd.,2017.
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REFERENCE BOOKS:

1.	Elaine Rich, Kevin Knight: Artificial Intelligence, 2nd Edition, Tata McGraw Hill, 1991.
2.	Nils J. Nilsson: Principles of Artificial Intelligence, Elsevier, 1980.
3.	Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, Jan2017
4.	S Lovelyn Rose, L Ashok Kumar, and D Karthika Renuka, Deep learning using Python, Wiley India Pvt.Ltd.,2019

WEB LINKS:

1.	Artificial Intelligence, Dash gupta(IITK), https://nptel.ac.in/courses/106/105/106105079/
2.	Andrew Ng, AI for everyone, coursera.org
3.	Deeplearning Tutorial(Stanford university), http://deeplearning.stanford.edu/tutorial/
4.	Mitesh M Khapra(iitm),and Sudarshan Iyengar(IITR), Deep learning, https://nptel.ac.in/courses/106/106/106106184/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Apply basic principles of AI with problem solving agents.
CO2.	Analyze and apply searching techniques to solve real world problems
CO3.	Represent the real world problems by using first order and propositional logic.
CO4.	Comprehend the deep neural network and its major architectures

Assignment Component with open ended Project:

1. Mini project should give proper idea about the application of AI or Deep learning.
2. Maximum of two students per team. No team is allowed to do the same project.
3. Must be able to give demo and generate reports.

Virtual Reality and Augmented Reality

Contact Hours/Week	:	3+0(L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N3MCAE22			

Course Objectives:

This Course will enable students to:	
1.	Gain the knowledge of Virtual Reality concepts and its implication.
2.	Understand the Input-Output interactions in Virtual Reality
3.	Understand role of Computer Graphics in Virtual reality
4.	Gain the knowledge of Architecture of Augmented Reality

UNIT – I	07 Hours
Introduction to Virtual Reality: History of Virtual Reality, Types of Virtual Reality, Three I's of Virtual Reality, Architecture / Components of Virtual Reality, Applications of Virtual Reality Common Issues of Human Communication Media	

UNIT – II	06 Hours
Input Devices: Trackers: Three Dimensional Position Trackers: Tracker Performance Parameters, Mechanical Trackers, Magnetic Trackers, Optical Trackers, Gesture Interfaces – The Pinch Glove, The 5DT Data Glove, The Cyber glove.	

UNIT – III	10 Hours
Output Devices: Graphic Displays The human visual system, Personal Graphics Displays, Sound Displays The human auditory system, Haptic Feedback – The Human Haptic System, Tactile Feedback Interfaces, Force Feedback Interfaces. Programming with Unity: Unity Basics, Manipulating the Scene, Code blocks and Methods, Debugging Conditional and looping statements. Working with objects, Working with Scripts, Player movement, Camera Movement Further Learning for Unity: The Asset Store	

UNIT – IV	08 Hours
Computing Architectures for VR: The Rendering Pipeline – The Graphics Rendering Pipeline, The Haptics Rendering Pipeline Modeling: Geometric Modeling – Visual Object Shape, Object Visual Appearance; Kinematics Modeling – Homogeneous Transformation Matrices, Object Position; Physical Modeling – Collision Detection, Surface Deformation, Force Smoothing and Mapping, Haptic Texturing; Behavior Modeling; Principles of touch feedback and force feedback;	

UNIT – V	07 Hours
Introduction to Augmented Reality: Definition and scope, technology and features of augmented reality, difference between AR and VR, Challenges with AR, Augmented reality methods, Mixed Reality, Applications of AR & MR Computer Vision for Augmented Reality : Marker-based tracking, Marker-less tracking	

TEXT BOOKS:

1.	Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
2.	Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

REFERENCE BOOKS:

1.	Sherman, William R. and Alan B. Craig. Understanding Virtual Reality – Interface, Application, and Design, Morgan Kaufmann, 2002.
2.	Fei GAO. Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.
3.	“Understanding Virtual Reality”, William R. Sherman, Alan B. Craig, 2003, Morgan Kaufmann Publishers.
4.	“Augmented Reality Principles and Practice”, Dieter Schmalstieg Tobias Höllerer, 2016 Pearson Education, Inc.
5.	“Game Programming with Unity and C#”, Casey Hardman, 2020. https://doi.org/10.1007/978-1-4842-5656-5

WEB LINKS:

1.	https://www.youtube.com/watch?v=HRzobEK03mY
2.	https://www.youtube.com/watch?v=h3rKvsFTfPA
3.	https://www.youtube.com/watch?v=zLMgdYI82IE
4.	https://www.youtube.com/watch?v=Nq3mPFgpREE
5.	https://freevideolectures.com/course/3693/virtual-reality
6.	https://docs.unity3d.com/Manual/index.html
7.	https://youtu.be/XLP4YTpUpBI

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Apply Virtual Reality concepts and its implication.
CO2.	Illustrate the Input-Output interactions in Virtual Reality
CO3.	Build applications using UNITY tool.
CO4.	Illustrate the role of modeling in Virtual Reality
CO5.	Exemplify the Architecture of Augmented Reality

IoT

Contact Hours/Week	:	3+0(L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N3MCAE23			

Course Objectives:

This Course will enable students to:					
1.	Understand the definition and significance of the Internet of Things				
2.	Understand the components of IoT .				
3.	Discuss the architecture, operation, and business benefits of an IoT solution				

UNIT – I				08 Hours
Introduction, Design And Technologies :Introduction- Definition & Characteristics of IoT – Physical design of IoT -Things in IoT and IoT protocols logical Design of IoT - IoT Functional Blocks-IoT Communication Model and IoTCommunication APIs				

UNIT – II				07 Hours
IoT Enabling Technologies - Wireless Sensor Networks -Cloud Computing- Big Data Analytics - Communication Protocols- Embedded Systems. IoT Levels & Deployment Templates. Domain Introduction Introduction- Home Automation – Cities - Industry- Health & Lifestyle.-Environment-Energy-				

UNIT – III				08 Hours
M2M And System Management: Introduction-M2M-Difference between IoT andM2M SDN and NFV for IoT - Software Defined Networking - Network Function Virtualization- IoT System Management- Need for IoT Systems Management – Simple Network Management Protocol -Limitations of SNMP - Network Operator-Requirements				

UNIT – IV				08 Hours
Protocols Infrastructure - 6LowPAN- IPv6, Identification - EPC-uCode-URIs,Comms / Transport - Wifi, Bluetooth- LPWAN,Discovery- Physical Web- mDNS-DNS-SD,Data Protocols – MQTT-CoAP- AMQP- Websocket- Node,Device Management ,Semantic -JSON-LD.				

UNIT – V				08 Hours
IoT Platforms Design Methodology - IoT System for Weather Monitoring – IoT System for Agriculture. Introduction to Cloud Storage Models & Communication APIs -WAMP - AutoBahn for IoT-Xively Cloud for IoT . Python Web Application Framework - Django Architecture -Starting Development withDjango Toolkit-arduino-raspberry pi.				

TEXT BOOKS:

1.	Arshdeep Bahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach”, Universities Press, 2015
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REFERENCE BOOKS:

1.	Dieter Uckelmann et.al, “Architecting the Internet of Things”, Springer, 2011.
2.	CunoPfister, “Getting Started with the Internet of Things”, O’Reilly, 2011.
3.	Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, Wiley, 2014
4.	Honbo Zhou , “The Internet of Things in the Cloud: A Middleware Perspective “, CRC Press , 2012
5.	Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things – Key applications and Protocols”, Wiley, 2012.

WEB LINKS:

1.	Introduction To Internet Of Things By Prof. Sudip Misra IIT Kharagpur https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2.	https://www.edx.org/learn/iot-internet-of-things

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Comprehend the fundamental concepts of IoT
CO2.	Perceive the IoT Enabling Technologies and Domains
CO3.	Explore the system management and domain for various applications of IoT.
CO4.	Categorize the various protocols that are used for developing IoT applications.
CO5.	Design methodologies of IoT using cloud and python

Big Data Analytics

Contact Hours/Week	:	3+0(L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N3MCAE24			

Course Objectives:

This Course will enable students to:	
1.	Gain knowledge of various technologies supporting Big DATA
2.	Get acquainted with Hadoop Ecosystem : YARN, MapReduce, Spark
3.	Get acquainted with HIVE, PIG and NoSQL

UNIT – I	08 Hours
Getting an Overview of Big Data: What is Big Data? Types of Data, Elements of Big Data, Careers in Big data. Introducing Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data, Cloud Computing and Big Data, and In-Memory Computing Technology for Big Data. The Hadoop Distributed Filesystem: Design of HDFS, HDFS Concepts, Blocks, Namenodes and Datanodes, Block Caching, HDFS Federation, HDFS High Availability, Hadoop file system, Data Flow: Anatomy of a File Read, Anatomy of a File Write, Coherency Model, Parallel Copying with distcp, Keeping an HDFS Cluster Balanced	

UNIT – II	08 Hours
YARN: Anatomy of a YARN Application Run, Resource Requests, Application Lifespan, Building YARN Applications, YARN Compared to MapReduce 1, Scheduling in YARN, Scheduler Options, Capacity Scheduler Configuration, Fair Scheduler Configuration, Delay Scheduling, Dominant Resource Fairness. Spark: Introduction to Spark, Difference between Hadoop and Spark.	

UNIT – III	08 Hours
How MapReduce Works: Anatomy of a MapReduce Job Run :Job Submission, Job initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion. Failures : Task Failure, Application Master Failure, Node Manager Failure, Resource Manager Failure. Shuffle and Sort :The Map Side, The Reduce Side, Configuration Tuning. Task Execution :The Task Execution Environment, Speculative Execution, Output Committers MapReduce Types and Formats: the Default MapReduce Job, Input Formats:Input Splits and Records, Text Input, Binary Input, Multiple Inputs, Database Input (and Output). Output Formats:Text Output, Binary Output	

UNIT – IV	07 Hours
Exploring Hive: Introducing Hive, Hive Variables, Hive Properties, Hive Queries, Data Types in Hive, Built-In Functions in Hive, Hive DDL, Creating Databases, Viewing a Database, Dropping a Database, Altering Databases, Creating Tables, Creating a Table Using the Existing Schema, Dropping Tables, Altering Tables, Using Hive DDL Statements, Data Manipulation in Hive, Loading Files into Tables, Inserting Data into Tables, Update in Hive, Delete in Hive, Using Hive DML Statements, Data Retrieval Queries, Using the SELECT Command, Using the WHERE Clause, Using the GROUP BY Clause, Using the HAVING Clause, Using the LIMIT Clause, Executing HiveQL Queries, Using JOINS in Hive, Inner Joins, Outer Joins, Cartesian Product Joins, Map-Side Joins, Joining Tables.	

UNIT – V	08 Hours
Pig: Execution Types, Comparison with Databases, Pig Latin : Structure, Statements, Expressions , Types, Schemas , Functions, Macros. User-Defined Functions: A Filter UDF, An Eval UDF, A Load UDF. Data Processing Operators Loading and Storing Data, Filtering Data, Grouping and Joining Data , Sorting Data, Combining and Splitting Data. Pig in Practice: Parallelism, Anonymous Relations, Parameter Substitution NoSQL: Introduction to NoSQL, why NoSQL, Characteristics of NoSQL. Types of NoSQL models: key value Data model, Column-oriented data model, document data model, graph databases. Schema less database, materialized views, Distributed models: CAP theorem. Sharding	

TEXT BOOKS:

1.	Hadoop – The Definitive Guide; Storage and Analysis at Internet scale, Tom White, 4th Edition, 2015, O'Reilly, Shroff Publishers & Distributors Pvt. Ltd., ISBN – 978-93-5213-067-2
2.	Big Data – Black Book, DT Editorial Services, Edition – 2015, Dreamtech Press, ISBN - 978-93-511-9-757-7

REFERENCE BOOKS:

1.	Big Data and Hadoop, V.K Jain, Khanna Book Publishing, Edition 2017, ISBN: 9789382609131.
2.	Big Data Analytics with Hadoop 3, Sridhar Alla, Packt Publisher, Pages 482, ISBN 978178862884

WEB LINKS:

1.	https://nptel.ac.in/courses/106/104/106104189/
2.	https://www.youtube.com/watch?v=1vbXmCrkT3Y
3.	https://www.guru99.com/nosql-tutorial.html
4.	https://www.youtube.com/watch?v=2yQ9TGFpDuM
5.	https://www.w3schools.in/mongodb/introduction-to-nosql/
6.	https://www.tutorialspoint.com/hive/hive_installation.htm

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Comprehend various technologies supporting Big Data
CO2.	Analyze the working of YARN and SPARK
CO3.	Analyze and apply MapReduce for real time problems
CO4.	Apply Hive Query for real time problems
CO5.	Apply PIG Latin for real time problems; differentiate types of No SQL

Big Data Analytics Assignment component:

1. Students should form a team of not more than 3, and deliver a presentation covering Hive, Pig, Map reduce and Tableau.
2. Each team must submit the report of the presentation
3. No two teams are allowed to use the same database for presentation.

Entrepreneurship

Contact Hours/Week	:	3+0 (L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N3MCAE31			

Course Objectives:

This Course will enable students to:	
1.	Gain knowledge about Entrepreneur, Intrapreneur, Entrepreneurship
2.	Get acquainted with different types of Entrepreneurship
3.	Get acquainted with Micro & Small and Medium Enterprise, Intellectual Property Rights, Project Management and Financing

UNIT – I	07 Hours
<p>Entrepreneur: Introduction, Evolution, Characteristics of successful Entrepreneur, Charms of becoming an entrepreneur, entrepreneurial decision process, functions, need and types of entrepreneurs, Distinction between an Entrepreneur & a manager, Intrapreneur.</p> <p>Entrepreneurship: Concept, growth of Entrepreneurship in India, Role of Entrepreneurship in Economic Development.</p>	

UNIT – II	08 Hours
<p>Women Entrepreneurship: Concept, Functions, Growth, Problems, Developing and Limitation of Women Entrepreneurship.</p> <p>Rural Entrepreneurship: Meaning, need, problems of rural entrepreneurship, developing rural entrepreneurship, NGO & Rural Entrepreneurship. Challenges faced by women entrepreneurs, strategies for the development of women entrepreneurs</p> <p>Tourism Entrepreneurship: meaning, perspective, Tourism enterprise, entrepreneur, entrepreneurship, policy measures.</p> <p>Agri-prenuership: Introduction, need for developing agri-prenuership in India, Opportunities for developing agri-prenuership, Challenges involved in developing agri-prenuership, suggestions for developing agri-prenuership.</p> <p>Social Entrepreneurship: Introduction, meaning, perspective, Social Entrepreneurship in practice, boundaries of Social Entrepreneurship</p>	

UNIT – III	08 Hours
<p>Micro & Small Enterprise: Small Enterprise: Meaning, Micro & Macro Units, Essentials, Features & Characteristics, Relationship between Micro & Macro Enterprises, Rationale behind Micro & small enterprises, Scope of Micro & small enterprises & objectives of Micro enterprises.</p> <p>Financing of Enterprise: Meaning & need of financial planning, sources of finance, capitalisation, term loans, sources of short term finance, Venture capital.</p> <p>Forms of business ownership: Sole proprietorship, partnership, company, cooperative, selection of appropriate form of ownership</p>	

UNIT – IV	08 Hours
<p>Identification of Business opportunities: Introduction, Mobility of Entrepreneurs, Business opportunities in India, Models for opportunity evaluation.</p> <p>Project Management and Financing: Introduction, Project Manager, Project Life Cycle, Project Scheduling: GANTT Charts, Network techniques, Project Management software: Microsoft</p>	

Project, InstaPlan, Yojana, PRISM Project Manager, PRIMAVERA, Generating an investment project proposal: Project Analysis, Market Analysis, Technical Analysis, Financial Analysis, Economic Analysis, Ecological Analysis. Project Financing: Equity Financing, Angel Financing, Debt Financing, Miscellaneous sources. Project Implementation Phase, capital structure and cost of capital, Detailed Project Report. Business Plan: Introduction, purpose, contents, presenting why do some plans fail? Procedure for setting up an enterprise. Institution supporting business enterprises: Introduction, central level institutions, state level institutions, other institutions, Institutions supporting women entrepreneurs

UNIT – V	08 Hours
Intellectual Property Rights and Micro & Small and Medium Enterprise: IPR and MSMEs, Patents: meaning, what can be patented? Types of patent, who can file a patent, patent process. Copyrights: Meaning, objectives. Trademarks: Meaning, functions, categories of trademarks, benefits, registration of trademarks. Geographical indications, Industrial designs, Trade Secrets, Integrated Circuits, protection of new variety of plants, why IPR for MSMEs? Efforts to help MSMEs to exploit benefits of IPR, Need for further actions. Role and importance of micro, small and medium enterprises, concepts and definition of MSME, The MSMED ACT 2006, Problems facing the MSME sector.	

TEXT BOOKS:

1.	Entrepreneurial Development, Dr S S Khanaka, Revised edition, S Chand Publishing
2.	Entrepreneurship and Small Business Enterprises, Poornima M Charantimath, 2nd Edition, Pearson

REFERENCE BOOKS:

1.	Desai, Vasant, Project Management and Entrepreneurship', Himalayan Publishing House, Mumbai.
2.	Gupta and Srinivasan, 'Entrepreneurial Development', S Chand & Sons, New Delhi.

WEB LINKS:

1.	https://nptel.ac.in/courses/110/106/110106141/
2.	https://onlinecourses.nptel.ac.in/noc19_mg55/preview
3.	https://teamtreehouse.com/library/how-to-start-a-business

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Comprehend entrepreneur, entrepreneurship and role of entrepreneurship in economic development.
CO2.	Explicate the need of women, rural, tourism and social entrepreneurs.
CO3.	Recognize features of micro and small enterprise, financing of enterprise and Forms of business ownership
CO4.	Identify various business opportunities, significance of project management, project scheduling and financing.
CO5.	Explicate the concept of IPR for micro, small and medium enterprises

Cyber Security and Cyber Laws

Contact Hours/Week	:	3+0(L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N3MCAE32			

Course Objectives:

This Course will enable students to:	
1.	Gain knowledge of basics of Cybercrime, tools and methods used in cybercrime
2.	Realize cybercrime in Mobile and Wireless devices
3.	Gain knowledge of computer forensics, security policies and cyber laws

UNIT – I	08 Hours
Introduction to Cybercrime: Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens. Cyber offenses: How Criminals Plan Them: How Criminals Plan the Attacks, Social Engineering, Cybers talking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.	

UNIT – II	08 Hours
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops	

UNIT – III	07 Hours
Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).	

UNIT – IV	08 Hours
Understanding Computer Forensics: Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Anti- forensics.	

UNIT – V	08 Hours
Cybercrime and Cyberterrorism: Social, Political Ethical and Psychological Dimensions Introduction to Security Policies and Cyber Laws: Need for An Information Security Policy, Information Security Standards – ISO, Introducing Various Security Policies and Their Review Process, Introduction to Indian Cyber Law, Objective and Scope of the it Act, 2000, Intellectual Property Issues, Overview of 2008/2020 / 23 Intellectual - Property - Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License	

TEXT BOOKS:

1.	Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives, Sunit Belapure and Nina Godbole, Wiley India Pvt Ltd, 2013
2.	Introduction to information security and cyber laws, Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla, Dreamtech Press 2015

REFERENCE BOOKS:

1.	Cyber security: Managing Systems, Conducting Testing, and Investigating Intrusions ,Thomas J. Mowbray, John Wiley & Sons, 2013
2.	Cyber Security Essentials James Graham, Ryan Olson, Rick Howard CRC Press 2010

WEB LINKS:

1.	https://nptel.ac.in/courses/106/106/106106129/
2.	https://www.youtube.com/watch?v=F7mH5vz1qEI&list=PLf8YqCm9HoI6fb4LdoY2tFgJfM0PrgInS

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Comprehend fundamental of Cyber crime
CO2.	Realize cybercrime in Mobile and Wireless Devices
CO3.	Apply Tools and Methods Used in Cybercrime
CO4.	Realize significance and applications of Computer Forensics
CO5.	Comprehend Security Policies and Cyber Laws

Software Testing

Contact Hours/Week	:	3+0(L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N3MCAE33			

Course Objectives:

This Course will enable students to:	
1.	Understand the principles of testing.
2.	Identify the need for testing.
3.	Identify testing process.
4.	Describe various types of test and their objectives.
5.	Identify the types of tests to be conducted on applications.

UNIT – I	08 Hours
Introduction to testing as an engineering activity, the evolving profession of software engineering, the role of process in software quality, testing as a process. Testing fundamentals: initiating a study of testing, basic definitions, why testing is necessary? What is testing? The psychology of testing? Software quality assurance group, software-testing principles, the tester's role in a software development organization.	

UNIT – II	09 Hours
The test development life cycle (tdlc), when should testing stop?; verification strategies; review, walkthrough, inspection testing types and techniques; white box testing: basis path testing, flow graph notation, cyclomatic complexity, graph matrices, loop testing black box testing: boundary value analysis, equivalence partitioning, graph based testing methods, error guessing.	

UNIT – III	09 Hours
Levels of testing; The Need for Levels of Testing, Unit Test, Unit Test Planning, Designing the Unit Tests. The Class as a Testable Unit, Running the Unit tests and Recording results, Integration tests, Designing Integration Tests, Integration Test Planning, System Test – The Different Types, Regression Testing, Alpha, Beta and Acceptance Tests, Web testing: Introduction to web testing, web testing process and techniques, cross browser testing, web browser error messages, Performance testing	

UNIT – IV	07 Hours
Test planning: what is test plan; why to plan test? Template for test plan; guidelines for creating the test plan; risk analysis Test design: importance; test design essentials; good test case; test case mistakes; test case template; test design stages; Software Testing Metrics: Why Test Metrics are Important?: Types of Test Metrics Manual Test Metrics; Test Metrics Life Cycle;How to calculate Test Metric;Test Strategy;Test Plan Vs Test Strategy	

UNIT – V	06 Hours
Test execution: Objectives; execution considerations; execution activities Defect management: what is defect; defect life cycle; defect management process	

TEXT BOOKS:

1.	Ilene Burnstein, "Practical Software Testing", Springer international edition. Publisher : Springer; 2003 1 st edition (Unit-I)
2.	Foundations of Software Testing ISTQB certification (Level I) by Dorothy graham, Erik van veenendaal, Rex black, Publisher : Cengage Publications, 3rd edition
3.	Watts Humphrey, "Managing the Software Process", Publisher : Addison Wesley , 1 st edition.

REFERENCE BOOKS:

1.	Boris Beizer, "Software System Testing And Quality Assurance", Publisher : Van Nostrand Reinhold, 1st edition
2.	Gordon schulmeyer , "Zero Defect Software", Publisher : McGraw-Hill, 1st edition

WEB LINKS:

1.	https://www.coursera.org/specializations/software-testing-automation
2.	https://www.udemy.com/course/everything-for-software-tester/
3.	https://www.udacity.com/course/software-testing--cs258
4.	https://www.greatlearning.in/academy/learn-for-free/courses/software-testing-fundamentals1
5.	https://www.guru99.com/software-testing.html
6.	https://onlinecourses.nptel.ac.in/noc19_cs71/preview
7.	https://testinginstitute.com/Free-Software-Testing-Training.php

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Identify the need and the importance of software testing as an engineering activity
CO2.	Interpret the concept of testing using different types of testing and testing techniques.
CO3.	Identify the different levels of testing.
CO4.	Demonstrate the test plans and test cases.
CO5.	Interpret the defect management process

User Interface and User Experience

Contact Hours/Week	:	3+0(L+T)	Credits	:	03
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:		SEE Marks	:	50
Course Code	:	N3MCAE34			

Course Objectives:

This Course will enable students to:	
1.	Explain the concepts of how to use Interactive systems like electronic mails, object action interface model, human-computer interaction
2.	Designing the user-interface is intended primarily for designers, managers and evaluators of interactive systems
3.	Understand the concepts of task related menu organization like single menus, combinations of multiple menus, form filling, dialogue boxes, audio menus and window designing.
4.	Understand the given features, parameters and patterns of User Interface or User Experience for a real world scenario
5.	Perform in a team to makes oral presentation on the effects of Wearable devices on health and environment/Banking/Insurance etc.,

UNIT – I	07 Hours
What Users Do: A Means to an End, the Basics of User Research, Users' Motivation to Learn, The Patterns – Safe Exploration, Instant Gratification, Satisficing, Changes in Midstream, Deferred Choices, Incremental Construction, Habituation, Micro breaks, Spatial Memory, Prospective Memory, Streamlined Repetition, Keyboard Only, Other People's Advice, Personal Recommendations	

UNIT – II	08 Hours
Information Architecture and Application Structure: The Big Picture, The Patterns – Feature, Search and browse, News Stream, Picture Manager, Dashboard, Canvas Plus Palette, Wizard, Setting Editor, Alternative Views, Many Workspaces, MultiLevel Help Making it Look Good: Visual Style and Aesthetics: Same content, Different styles, The Basics of Visual Design, What This Means for Desktop Applications, The Patterns: Deep Background, Few Hues, Many Values, Corner Treatments, Borders That Echo Fonts, Hairlines, Contrasting Font Weights, Skins and Themes.	

UNIT – III	08 Hours
Design and UX: Users Vs Life Cycles, Visual Design, Web standards, Potential Barriers to sustainable UX, designing for Emerging Technologies: Design for Disruption, Eight Design Tenets for Emerging Technology, Changing Design and Designing Change, Fashion with Function: Designing for wearable devices, the next big wave in Technology, the wearable market segments, Wearable are not able, UX (and Human) Factors to consider.	

UNIT – IV	08 Hours
An Ecosystem of connected device: The concept of an Ecosystem, The 3Cs Frame work: Consistent, Continuous and Complementary, Single Device Design is History, It's an Eco system, The Consistent Design Approach: What is consistent Design, Consistency in Minimal Interface, Page 56 of 139 Progressive Disclosure in Consistent Design, Beyond Device Accessibility, Devices are means not an end.	

UNIT – V	08 Hours
The Continuous and Complementary Design Approach: The continuous Design Approach: What is Continuous Design? Single Activity flow and the Sequenced Activity Flow. What is Complementary Design? Collaboration: Must-Have, Collaboration: Nice to have, Control: Nice to Have, Fascinating Use Cases: What do they mean for my work? Integrated Design Approaches: 3 Cs as building blocks: Beyond the Core Devices: The Internet of Things, The Internet of Things already there?	

TEXT BOOKS:

1.	Jenifer Tidwell, “Designing Interfaces”, 2 nd Edition, Oreilly, 2015.
2.	Jonathan Follet, “Designing for Emerging Technologies- UX for Genomics, Robotics and The Internet of Things”, 1st Edition, Oreilly, 2014.
3.	Michal Levin, “Designing Multi-Device Experiences”, 1st Edition, Oreilly, 2014.
4.	Tim Frick, “Designing for Sustainability”, 1st Edition, Oreilly 2016

REFERENCE BOOKS:

1.	Ben Shneiderman, Plaisant, Cohen, “Jacobs: Designing the User Interface”, 5th Edition, Pearson Education, 2010.
2.	Unger and Chandler, “A Project Guide to UX Design”, 2 nd Edition, New Riders, 2012

WEB LINKS:

1.	https://www.youtube.com/watch?v=c9Wg6Cb_YIU
2.	https://www.youtube.com/watch?v=qDUYIQZVQDE
3.	https://www.youtube.com/watch?v=tRpoI6vkqLs

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Explicate the concepts related to User interface or User Experience.
CO2.	Apply the knowledge of features, approach, patterns for designing User interface or User Experience for a given scenario.
CO3.	Analyse the given features, parameters and patterns of User interface or User Experience for a real world scenario.
CO4.	Perform in a team to make oral presentation on the effects of wearable devices on health and environment/Banking/Insurance etc.,

Machine Learning Lab

Contact Hours/Week	:	2	Credits	:	1.0
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N3MCAL1			

Course Objectives:

This Course will enable students to:	
1.	Understand writing programs in Python for various machine learning algorithms.
2.	Apply appropriate dataset for a given machine learning program.

Implementation of the following techniques of machine learning in Python:

Sl.no	Programs
1.	FIND-S algorithm for finding the maximally specific hypothesis consistent with the training examples.
2.	Candidate-Elimination algorithm to output a description of the General and Specific boundary sets consistent with the training examples.
3.	ID3 algorithm to construct the decision tree, finding the accuracy and apply this knowledge to classify a new sample.
4.	K-Nearest Neighbour algorithm to classify the given data set.
5.	Backpropagation algorithm to build an Artificial Neural Network.
6.	Naïve Bayesian Classifier to classify a set of documents and to calculate the accuracy, precision, and recall for the given data set.
7.	Bayesian network construction for medical data to diagnose heart patients.
8.	K-Means algorithm to cluster the given data set and comments on the quality of clustering.
9.	EM algorithm to cluster the given data and compare the result with that of using k-Means algorithm.

WEB LINKS:

1.	https://www.w3schools.com/
2.	https://www.tutorialspoint.com/
3.	https://www.freecodecamp.org/
4.	https://www.youtube.com/
5.	http://ndl.iitkgp.ac.in/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Analyze & implement Find-S algorithm using Python.
CO2.	Analyze & implement Supervised learning algorithms using Python.
CO3.	Analyze & implement Clustering algorithms using Python.

Mobile Application Development Lab

Contact Hours/Week	:	3	Credits	:	1.5
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N3MCAL2			

Course Objectives:

This Course will enable students to:	
1.	Understand the installation of android studio tools
2.	Define problems of the societal interest for implementation on mobile
3.	Understand basic graphical primitives
4.	Understand multi-threading concepts, SMS

Sl.no	Programs
1.	Design an application that contains Phone Contacts in vertical linear manner. Selected contact appears at the top of the list with a large italicized font and a blue background.
2.	Create an application that uses Layout Managers and Event Listeners.
3.	Develop a standard calculator application to perform basic calculations like addition, subtraction, multiplication and division.
4.	Devise an application that draws basic graphical primitives (rectangle, circle) on the screen.
5.	Build a mobile application that create, save, update and delete data in a SQL lite/cloud database connectivity.
6.	Devise an application that implements Multi-threading.
7.	Develop a mobile application that displays the Google maps and different view in maps.
8.	Create an application that writes data to the SD card.
9.	Implement an application that creates a service and play the music in back ground/display the accepted text and demonstrate start and stop the services.
10.	Devise a mobile application that creates alarm clock.

WEB LINKS:

1.	https://www.youtube.com/watch?v=giVfVQIKBVM
2.	https://www.youtube.com/watch?v=aS_9RbCyHg
3.	https://www.tutorialspoint.com/android/index.htm
4.	https://developer.android.com/
5.	https://www.geeksforgeeks.org/android-tutorial/
6.	https://www.tutlane.com/tutorial/android
7.	https://www.w3schools.in/category/android-tutorial/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Develop applications using software development kits (SDKs), frameworks and toolkits.
CO2.	Apply Android UI Design and Location Based Services
CO3.	Design and develop an application using Android Messaging and Networking

Mini Project

Contact Hours/Week	:	03	Credits	:	1.5
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N3MCAL3			

Course Objectives:

This Course will enable students to:	
1.	Develop problem statement
2.	Understand requirement analysis and identify design methodologies
3.	Use computing tools and appropriate programming language

Prerequisites: None

Course Details:

1	Students are expected to take up mini project with a team size not exceeding 2*. The objective of this course is to develop real time mini projects using latest technologies.
2	The title, relevance, novelty, synopsis and technologies used for developing an application or to carry out research work will be scrutinized by respective guides and Mini project coordinator.
3	The Mini project work can be carried out as an application project / research oriented project.
4	The team must submit project report (20 - 30 pages) hard copy and soft copy approved by both DPEC and project guide.
5.	The sample contents for both application project and the research oriented project are shown below:

<p><i>Sample contents for application development include the following chapters:</i></p> <ul style="list-style-type: none"> • Introduction • Project Plan • Analysis and Design • Implementation (screenshots with description to be included) • Testing • Conclusion • Future enhancements • References 	<p><i>Sample contents of the Report include the following for Research oriented work:</i></p> <ul style="list-style-type: none"> • Title, Abstract, Keywords • Introduction • Literature Survey • Objectives of Investigation • Research findings (e.g. Proposed method or Process, or System) • Validation (Experimental Results or Theoretical Analysis) • Conclusion & References
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Note: * May vary with prior approval from Head of the Department.

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Identify the relevant topic that is in synchrony with recent trends in information technology by performing the literature survey referring journals and conference articles.
CO2	Identify the problem statement befitting the domain of interest.
CO3	Conduct investigations, Analyze the requirements, and Interpret the problem.
CO4	Identify algorithms, and propose innovative ideas to solve the problem.
CO5	Apply modern computing tools and techniques to develop an application.
CO6	Commit to professional ethics & apply the management principles for managing the projects.
CO7	Work effectively as an individual and as a team member
CO8	Indulge in lifelong learning to improve competence as a computing professional.
CO9	Apply appropriate testing techniques and develop test cases.
CO10	Prepare a technical report and demonstrate the project

IV Semester

Major Project

Hours/Week	:	40	Credits	:	20
Total Lecture Hours	:	-	CIE Marks	:	50
Total Tutorial Hours	:	-	SEE Marks	:	50
Course Code	:	N4MCA41			

Major project Regulations	
1	The project is to be carried out by individual student.
2	The major project is to be carried out for 14-16 week duration and evaluated at the end of the semester for the assigned credits.
3	The project may be carried out covering either of following <ul style="list-style-type: none"> • Design of a system. • Theoretical/Analytical modeling. • Computer simulation. • Developing working software • Interdisciplinary computer application/modeling.
4	The project may be part of the research activity carried out in the department or outside the institute in a recognized industry/research lab.
5	The literature survey should be one of the components of the project.
6	All the project work should be approved by DPEC
7	The DPEC allocate guides for the major project.

Table 1. Break up of CIE marks for major project

Seminar-1	20 marks
Seminar-2	40 marks
Seminar-3	40 marks
Total	100 marks

*CIE is evaluated for 100 marks, **which is reduced to 50.**

Rubrics:

Seminar-1

1. Relevance of the project topic & related literature survey (CO1). –5M
2. Identification of requirements, problem analysis and framing objectives and preparing Abstract (CO2)-5M
3. Degree of understanding the domain to adopt methodology to design the model (CO3)- 10M

Seminar-2

1. Project Design (CO4)-10M
 - Low level design
 - High level design
2. Project Implementation, Testing (CO5)-15M
 - Implementation of project using appropriate tools/ technologies
 - Preparing test plan (as per project requirement)
3. Commitment to professional ethics and practices (CO6)-5M
4. Lifelong learning to adopt new tools/technologies (CO7)-5M
5. Adopt Project management principles while developing project (CO8)-5M

Seminar-3

1. Project demonstration and project report submission (with similarity index $\leq 25\%$) (CO9)-25M
2. Degree of innovative content / degree to which the project addresses societal/ environmental needs. (CO10)- 08M
3. Work effectively on the project individually or as a member in a team. (CO11)-5M
4. Identify business model to convert project work into a product. (CO12)-2M

SEE for the major project

SEE is conducted by an external examiner and the Project guide. The breakup of marks is given in Table 2.

SEE is done for a total of 100 marks, **which shall be reduced to 50.**

Table 2. Break up of SEE marks for major project

Evaluation of the Dissertation report by external examiner and the guide(average of independent evaluations)	50 marks
Presentation, Demonstration and viva-voce	50 marks
Total	100 marks

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Identify the relevant topic that is in synchrony with recent trends in information technology by performing the literature survey through standard journal referrals or industry professionals.
CO2.	Analyse the defined problem and identify the corresponding requirements / objectives
CO3.	Design and develop a model / procedure / algorithm
CO4.	Conduct investigations of computing problems for the proposed problem.
CO5.	Implement the developed model using appropriate software tools / technologies
CO6.	Commit to professional ethics, and to the norms of computing practice.
CO7.	Effectively engage in lifelong learning
CO8.	Apply the management principles for managing projects
CO9.	Prepare a report and demonstrate the project
CO10.	Identify Legal / Ethical / Societal / Health or Environmental issues related to project work.
CO11.	Work effectively as an individual and as a member while carrying out a project work.
CO12.	Generate ideas & identify the business model to convert the project work into a product.

Technical Seminar

Course Code	:	N4MCAS1	Credits	:	02
SEE Marks	:	-	CIE Marks	:	50

Course Objectives:

This Course will enable students to:	
1.	Identify the topic of the seminar appropriate to the domain
2.	Perform literature survey
3.	Understand the ppt and report preparation techniques

Instructions to Students:

1.	Select the seminar topics from recent publications (last 5 years) and your area of interest.
2.	The seminar topics must be referred through Scopus Journals/Conferences, Web of Science, IEEE explore or ACM digital library, etc.
3.	After reading the refereed journals/conference papers, students must prepare and submit a report to their respective guides by comparing the contribution of all the authors, methods used, Parameters used for comparison, Experiments carried out, Tools used, results they have published, Improvements claimed, Limitations, etc.
4.	The research article should be prepared based on the limitations observed and ideas for improving the proposed work.
5.	Finally if the students prepare and publish a research article in the Scopus/Web of science Journals/Conferences will be awarded with 10 marks and for non-Scopus will be awarded with 5 marks.

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Perform the literature survey through standard referrals and select the relevant topic that is in synchrony with recent trends.
CO2.	Prepare a concise article using ICT efficiently
CO3.	Communicate professionally and develop the spirit of lifelong learning

Scheme for Continuous Internal Evaluation (CIE):

The evaluation will be done by ONE Senior faculty / Internal Guide from the department and ONE External member from Academia / Industry / Research Organization. Evaluation will be done in batches.

Rubrics for SEE evaluation

- Topic - 05 Marks
- Literature Review – 10 Marks
- Technical relevance, Sustainability and Societal Concerns - 10 Marks
- Presentation Skills - 10 Marks
- Viva- Voce – 05 Marks
- Paper Published (Scopus Indexed / Non- Scopus Indexed) – 10 / 5 Marks

Course Articulation Matrix (Mapping between COs and POs):

		Programme Outcomes											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Course Outcomes	CO1	1	1										
	CO2											1	
	CO3							1		2			

1: Low, 2: Medium, 3: High