

**V.R.SIDDHATHA ENGINEERING COLLEGE**  
**DEPARTMENT OF COMPUTER APPLICATIONS**

**Scheme of Instruction( MCA19 Regulations)**

<b>Semester</b>	<b>Total Number of Credits (Regular Students)</b>	<b>Total Number of Credits (Lateral Entry Students)</b>
<b>I</b>	<b>19.5</b>	<b>-</b>
<b>II</b>	<b>23.5</b>	<b>-</b>
<b>III</b>	<b>23.5</b>	<b>23.5</b>
<b>IV</b>	<b>23.5</b>	<b>23.5</b>
<b>V</b>	<b>18</b>	<b>18</b>
<b>VI</b>	<b>12</b>	<b>12</b>
<b>Total Credits</b>	<b>120</b>	<b>77</b>

**SEMESTER - I**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CE</b>	<b>SE</b>	<b>Tot</b>
1	19MCA2101	IT Fundamentals	3	-	-	3	40	60	100
2	19MCA2102	Programming in C	3	1	-	4	40	60	100
3	19MCA2103	Computer Organization	3	-	-	3	40	60	100
3	19MCA1104	English Language Communication Skills	2	-	-	2	40	60	100
4	19MCA1105	Discrete Mathematics	3	-	-	3	40	60	100
6	19MCA2151	IT Fundamentals Lab	-	-	3	1.5	40	60	100
7	19MCA2152	C Programming Lab	-	-	3	1.5	40	60	100
8	19MCA1153	English Language Communication Skills Lab	-	-	3	1.5	40	60	100
			<b>14</b>	<b>1</b>	<b>9</b>	<b>19.5</b>	<b>320</b>	<b>480</b>	<b>800</b>

**L:** Lecture**T:** Tutorial**P:** Practical**C:** Credits**CE:** Continuous Evaluation**SE:** Semester End Evaluation**Tot:** Total Marks

**SEMESTER – II**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CE</b>	<b>SE</b>	<b>Tot</b>
1	19MCA1201	Statistics with R	3	-	-	3	40	60	100
2	19MCA2202	Data Structures	3	1	-	4	40	60	100
3	19MCA2203	Software Engineering	3	1	-	4	40	60	100
4	19MCA2204	Object Oriented Programming through Java	3	1	-	4	40	60	100
5	19MCA2205	Operating Systems	3	-	-	3	40	60	100
6	19MCA2251	Data Structures using C Lab	-	-	3	1.5	40	60	100
7	19MCA2252	Object Oriented Programming through Java Lab	-	-	3	1.5	40	60	100
8	19MCA2253	Operating Systems Lab	-	-	3	1.5	40	60	100
9	19MCA1254	Professional Communication Practice Lab	-	-	2	1	40	60	100
			<b>15</b>	<b>3</b>	<b>11</b>	<b>23.5</b>	<b>360</b>	<b>540</b>	<b>900</b>

**L:** Lecture**T:** Tutorial**P:** Practical**C:** Credits**CE:** Continuous Evaluation**SE:** Semester End Evaluation**Tot:** Total Marks

**SEMESTER – III**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>CE</b>	<b>SE</b>	<b>Tot</b>
1	19MCA2301	Industrial Management	3	-	-	3	40	60	100
2	19MCA2302	Database Management Systems	3	1	-	4	40	60	100
3	19MCA2303	Advanced Java Programming	3	1	-	4	40	60	100
4	19MCA2304	Computer Networks	3	1	-	4	40	60	100
5	19MCA2305	Web Design and Development	3	1	-	4	40	60	100
6	19MCA2351	Database Management Systems Lab	-	-	3	1.5	40	60	100
7	19MCA2352	Advanced Java Programming Lab	-	-	3	1.5	40	60	100
8	19MCA2353	Web Design and Development Lab	-	-	3	1.5	40	60	100
9	19MCA5354	Personality Development Course (Logical Reasoning and English for Professionals)	-	-	2	0	100	-	100
			<b>15</b>	<b>4</b>	<b>11</b>	<b>23.5</b>	<b>420</b>	<b>480</b>	<b>900</b>

**L:** Lecture**T:** Tutorial**P:** Practical**C:** Credits**CE:** Continuous Evaluation**SE:** Semester End Evaluation**Tot:** Total Marks

**SEMESTER - IV**

S. No.	Subject Code	Subject Title	L	T	P	C	CE	SE	Tot
1	19MCA2401	Data Mining	3	-	-	3	40	60	100
2	19MCA2402	Cryptography and Network Security	3	1	-	4	40	60	100
3	19MCA2403	Mobile Application Development	3	1	-	4	40	60	100
4	19MCA2404	Design and Analysis of Algorithms	3	1	-	4	40	60	100
5	19MCA2405	ELECTIVE - I	3	-	-	3	40	60	100
6	19MCA2451	.NET Lab	-	-	3	1.5	40	60	100
7	19MCA2452	Data Mining Lab	-	-	3	1.5	40	60	100
8	19MCA2453	Mobile Application Development Lab	-	-	3	1.5	40	60	100
9	19MCA4454	Term Paper	-	-	2	1	40	60	100
10	19MCA5455	Personality Development Course (Aptitude and Campus Recruitment Training)	-	-	2	0	100	-	100
			<b>15</b>	<b>3</b>	<b>13</b>	<b>23.5</b>	<b>460</b>	<b>540</b>	<b>1000</b>

**ELECTIVE - I**

19MCA2405A : Artificial Intelligence

19MCA2405B : Computer Graphics

19MCA2405C : Distributed Systems

19MCA2405D : Optimization Techniques

**L:** Lecture**T:** Tutorial**P:** Practical**C:** Credits**CE:** Continuous Evaluation**SE:** Semester End Evaluation**Tot:** Total Marks

**SEMESTER - V**

S. No.	Subject Code	Subject Title	L	T	P	C	CE	SE	Tot
1	19MCA2501	Python Programming	3	-	-	3	40	60	100
2	19MCA2502	Big Data Analytics	3	-	-	3	40	60	100
3	19MCA2503	<b>ELECTIVE –II</b>	3	-	-	3	40	60	100
4	19MCA2504	<b>ELECTIVE –III</b>	3	-	-	3	40	60	100
5	19MCA3505	Self-Learning Course	-	-	-	2	40	60	100
6	19MCA2551	Python Programming Lab	-	-	3	1.5	40	60	100
7	19MCA2552	Big Data Analytics Lab	-	-	2	1	40	60	100
8	19MCA4553	Mini Project	-	-	3	1.5	40	60	100
			<b>12</b>	<b>-</b>	<b>8</b>	<b>18</b>	<b>320</b>	<b>480</b>	<b>800</b>

**ELECTIVE –II**

19MCA2503A : Machine Learning

19MCA2503B : Cloud Computing

19MCA2503C : Web Mining

19MCA2503D : Software Project Management

**ELECTIVE –III**

19MCA2504A : Data Visualization

19MCA2504B : Software Testing Methodologies

19MCA2504C : Information Retrieval Systems

19MCA2504D : Wireless and Mobile Networks

**Self-Learning Course**

A: Database Administration

B: Network Administration

C: E-Commerce

D: IOT

E: R Programming for Data Science

F: Introduction to AngularJS

**SEMESTER –VI**

S. No.	Subject Code	Subject Title	L	T	P	C	CE	SE	Tot
1	19MCA4651	Major Project	-	-	24	12	40	60	100
			<b>-</b>	<b>-</b>	<b>24</b>	<b>12</b>	<b>40</b>	<b>60</b>	<b>100</b>

**L:** Lecture**T:** Tutorial**P:** Practical**C:** Credits**CE:** Continuous Evaluation**SE:** Semester End Evaluation**Tot:** Total Marks

**19MCA2101: IT FUNDAMENTALS**

<b>Lecture :</b>	3 hrs/ week				<b>Internal Assessment:</b>				40					
<b>Tutorial :</b>	-				<b>Final Examination:</b>				60					
<b>Practical:</b>	-				<b>Credits:</b>				3					
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Carry out the process of identifying Hardware and Software components.												
	<b>CO2</b>	Demonstrate different Storage devices, Operating System concepts and Database Management Systems.												
	<b>CO3</b>	Review the basics of Networks and Data communication.												
	<b>CO4</b>	Illustrate the way Hardware /Software interaction and different programming languages.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>	L			M									
	<b>CO2</b>			L	M									
	<b>CO3</b>	H		M										
	<b>CO4</b>	H			M									
<b>UNIT – I</b>														
<b>Exploring Computers and their uses:</b> The computer defined, History of Computers, Computers for Individual users, Computers for Organizations and Computers in society. <b>Looking inside the computer system:</b> The parts of a computer system, The information processing cycle, Essential computer hardware, Software brings the machine to life, Computer data and Computer users. <b>Transforming data into information:</b> How computers represent data, How computers process data, Factors effecting processing speed.														
<b>UNIT – II</b>														
<b>Types of Storage devices:</b> Categorizing storage devices, Magnetic storage devices, Optical storage devices, Solid-state storage devices. <b>Operating systems basics:</b> The purpose of operating systems, Types of operating systems, Providing a user interface, Running Programs, Enhancing an OS with Utility Software. computer applications, Databases and Database Management Systems, Working with a database.														

**UNIT – III****Networking Basics:**

The uses of a network, Common types of networks, Hybrid networks, How networks are structured, Network topologies and protocols.

**Data Communications:**

Data communications with standard telephone lines and modems, Using digital data connections, Wireless networks.

**UNIT – IV****Creating Computer programs:**

What is a computer program, Hardware/Software interaction, Planning a computer program, How programs solve problems, Structured and Object-Oriented Programming.

**Programming languages and the programming process:**

The evolution of programming languages, Categories of programming languages, World wide web development languages, The Systems development life cycle for programming

**Learning Resources****Text Book:**

- [1] Peter Norton, Introduction to Computers, Seventh Edition, Tata McGraw Hill

**Reference Books:**

- [1] Computer Fundamentals and C Programming by Reema Thareja.  
 [2] Information Technology in theory, 1ed, Aksoy, Laura DeNardis, Cengage Learning  
 [3] Information Technology: Principles and Applications, Ajoy Kumar Ray, PHI.

**Web Resources:**

- [1] Lecture Series on Computer Organization by Prof. S. Raman, Department of Computer Science and Engineering, IIT Madras  
<https://www.youtube.com/watch?v=leWKvuZVUE8>  
 [2] Lecture Series on Data Communication by Prof. A. Pal, Department of Computer Science Engineering, IIT Kharagpur. <https://www.youtube.com/watch?v=sG6WGvzmVaw>

## 19MCA2102: PROGRAMMING IN C

<b>Lecture :</b>	3 hrs/ week				<b>Internal Assessment:</b>				40				
<b>Tutorial :</b>	1 hr/ week				<b>Final Examination:</b>				60				
<b>Practical:</b>	-				<b>Credits:</b>				4				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Describe the fundamentals and structure of a C programming language											
	<b>CO2</b>	Apply arrays and modular programming to solve computing problem.											
	<b>CO3</b>	Apply pointers to find the solution for the given application.											
	<b>CO4</b>	Implement structures, unions and file operations in developing applications											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	H											
	<b>CO2</b>		L	H									
	<b>CO3</b>		L	M									
	<b>CO4</b>	H	L								L		
<b>UNIT – I</b>													
<b>Overview of C:</b> History of C, Importance of C, Basic Structure of C Programs <b>Constants, Variables and Data Types:</b> Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants <b>Operators and Expressions:</b> Introduction, Types of operators and their expressions, Precedence of Arithmetic Operators, Type Conversions in Expressions, Operator Precedence and Associativity, Mathematical Functions <b>Managing Input and Output Operations:</b> Introduction, Reading a character, Writing a Character, Formatted Input, Formatted Output <b>Decision Making and Branching:</b> Introduction, Simple if Statement, The if....else Statement, Nesting of if...else Statement, The else if Ladder, The Switch Statement. <b>Decision Making and Looping:</b> Introduction, The while Statement, The do Statement, The for Statement, Jumps in Loops.													
<b>UNIT – II</b>													
<b>Arrays:</b> Introduction, One-Dimensional Arrays, Two-Dimensional Arrays, Multi-Dimensional Arrays. <b>Character arrays and Strings:</b> Introduction, Declaring and Initializing String Variables, Reading Strings From terminal, Writing Strings to screen, Arithmetic Operations on Characters, String-Handling Functions, Table of Strings.													



**User-Defined Functions:** Introduction, Need for User-Defined Functions, Elements of User-Defined Functions, Category of Functions, Recursion, Passing Arrays to Functions, Passing Strings to Functions, The Scope, Visibility and Lifetime of Variables.

### UNIT – III

**Pointers:** Introduction, Understanding Pointers, Accessing the Address of a variable, Declaring Pointer variables, Initialization of pointer variables, Accessing a variable through its pointer, Pointer Expressions, Pointer Increments and Scale Factor, Pointers and Arrays, Pointers and Character Strings, Array of Pointers, Dynamic Memory Allocation.

### UNIT – IV

**Structure and Unions:** Introduction, Defining a Structure, Declaring Structure Variables, Accessing Structure Members, Structure Initialization, Copying and Comparing Structure Variables, Operations on Individual Members, Array of Structures, Arrays within Structures, Structures within Structures, Unions.

**File Management:** Introduction, Defining and Opening a File, Closing a File, Input/Output Operations on Files, Command Line Arguments.

### Learning Resources

#### **Text Book:**

- [1] Programming in ANSI C by E.Balaguruswamy, Sixth Edition – McGraw-Hill Education.

#### **Reference Books:**

- [1] Programming with C (Schaum's Outlines ) by Byron.C.Gottfried, Tata McGraw-Hill.
- [2] C Programming , A Problem-Solving Approach by Behrouz A.Forouzan, E.V.Prasad Richard F.Gilberg , Cengage Learning
- [3] Let us C (Third Edition) by Yashavant Kanetkar.
- [4] The C programming Language by Kernighan and Ritchie, Prentice Hall.
- [5] C Programming by Balaguruswamy, Second Edition – TMH.

#### **Web Resources:**

- [1] <https://www.youtube.com/watch?v=yKGVMRIei9k>
- [2] <http://www.programiz.com/c-programming/c-if-else-statement>
- [3] <http://www.programiz.com/c-programming/c-for-loop>
- [4] [http://www.tutorialspoint.com/cprogramming/c\\_arrays.htm](http://www.tutorialspoint.com/cprogramming/c_arrays.htm)
- [5] <http://www.programiz.com/c-programming/c-strings>
- [6] <http://www.c4learn.com/c-programming/c-pointer-applications>
- [7] [http://www.tutorialspoint.com/cprogramming/c\\_file\\_io.htm](http://www.tutorialspoint.com/cprogramming/c_file_io.htm)

**19MCA2103: COMPUTER ORGANIZATION**

<b>Lecture :</b>	3 hrs/ week					<b>Internal Assessment:</b>					40			
<b>Tutorial :</b>	-					<b>Final Examination:</b>					60			
<b>Practical:</b>	-					<b>Credits:</b>					3			
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Understand, analyze and design various digital circuits.												
	<b>CO2</b>	Understand the theory and architecture of central processing unit.												
	<b>CO3</b>	Analyze some of the design issues in terms of speed, technology, cost, performance.												
	<b>CO4</b>	Exemplify in a better way the I/O and memory organization												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>	M												
	<b>CO2</b>	M												
	<b>CO3</b>	L	M	H								M	M	
	<b>CO4</b>	L	M	H								M	M	
<b>UNIT – I</b>														
<b>Digital Logic Circuits:</b> Digital Computers, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Flip-Flops, Sequential Circuits. <b>Digital Components:</b> Integrated Circuits, Decoders, Multiplexers, Registers, Shift Registers, Binary Counters, Memory Unit. <b>Data Representation:</b> Data Types, Complements, Fixed-Point Representation, Floating-Point Representation, Other Binary Codes, Error Detection Codes.														
<b>UNIT – II</b>														
<b>Basic Computer Organization and Design:</b> Instruction Codes, Computer Registers, Computer Instructions. <b>Microprogrammed Control:</b> Control Memory, Address Sequencing, Microprogram Example.														
<b>UNIT – III</b>														
<b>Central Processing Unit:</b> Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes. <b>Computer Arithmetic:</b> Introduction, Addition and Subtraction, Multiplication Algorithms, Floating-point Arithmetic Operations.														
<b>UNIT – IV</b>														
<b>Input-Output Organization:</b> Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Priority Interrupt, Direct Memory Access. <b>Memory Organization:</b> Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory.														

<b><u>Learning Resources</u></b>
<b>Text Book:</b> [1] <b>Computer System Architecture</b> --- M. Morris Mano, 3rd edition, Pearson Education/PH
<b>Reference Books:</b> [1] Computer Organization, 5 <sup>th</sup> ed., Hamacher, Vranesic and Zaky, TMH, 2002 [2] Computer Organization & Architecture: Designing for Performance, 7 <sup>th</sup> Ed., William Stallings, PHI, 2006 [3] Digital Logic and Computer Systems Organization--- V.Rajaraman, T.Radhakrishnan PHI, 2006

**19MCA1104: ENGLISH LANGUAGE COMMUNICATION SKILLS**

<b>Lecture :</b>	2 hrs/ week					<b>Internal Assessment:</b>					40			
<b>Tutorial :</b>	-					<b>Final Examination:</b>					60			
<b>Practical:</b>	-					<b>Credits:</b>					2			
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Acquire proficiency in administrative and professional compilation skills.												
	<b>CO2</b>	Attain practice in Interpersonal Communication.												
	<b>CO3</b>	Acquire authentic understanding in the elements of functional English for authentic use of language in any given academic and/or professional environment.												
	<b>CO4</b>	Enhance Reading skills, along with a wide range of Vocabulary.												
	<b>CO5</b>	Acquire competence in Technical communication skills.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>						M			M				
	<b>CO2</b>						M		M	H				
	<b>CO3</b>						M		M		M			
	<b>CO4</b>								L		M			
	<b>CO5</b>						M				H			
<b>UNIT – I</b>														
Basic Features of English Parameters of Communication Elements of Non-verbal communication Barriers to Effective communication														
<b>UNIT – II</b>														
Speech acts- Extending Invitation, Reciprocation, Acceptance, Concurrence, Disagreeing without being disagreeable. Professional Letter-Business, Complaint, Explanation and Transmittal														
<b>UNIT – III</b>														
A basic List of 500 words – Over view. Exposure through Reading Comprehension- Skimming, Scanning. Functional English with special reference to Concord, Prepositions and Pronoun-referent analysis.														
<b>UNIT – IV</b> Guided writing. Essay Writing- Descriptive, Reflective and Analytical. Technical Proposal writing. Synopsis & Thesis writing- overview.														

**Learning Resources****Text Books:**

- [1] TM Farhathullah, Communication skills for Technical Students, I Edition, Orient Longman, 2002.
- [2] 'Krishna', English Language Communication Skills, I Edition, Duvvuri Publications, 2008.
- [3] B.S .Sarma, Structural Patterns & Usage in English, IV Edition, Poosha Series, 2008.
- [4] Eclectic Learning materials offered by the Department.

**Reference Books:**

- [1] Randolph Quirk, Use of English, Longman, I Edition (1968) Reprinted 2004.
- [2] Thomson A.J & A.V, Martinet, Practical English Grammar, III Edition Oxford University Press, 2001.
- [3] Thomas Eliot Berry, The most Common Mistakes in English, TMH, First Paper Back 1971, (reprinted) 2010.
- [4] John Langan, College Writing Skills, McGraw Hill, IX Edition, 2014.
- [5] Selinkar, Larry et al, English for Academic and Technical Purposes, I edition, Newbury House Publishers, 1981.
- [6] Martin Cutts, Oxford guide to Plain English, 7th Impression Oxford University Press, 2011.

**Web Resources:**

- [1] [www.britishcouncil.org/learning-english-gateway.htm](http://www.britishcouncil.org/learning-english-gateway.htm) up dated 2014
- [2] [pdfstuff.blogspot.com/2013/.../the-oxford-guide-to-english-usage-pdf.ht](http://pdfstuff.blogspot.com/2013/.../the-oxford-guide-to-english-usage-pdf.ht)
- [3] [www.cambridgeapps.org/](http://www.cambridgeapps.org/) up dated 2014

**19MCA1105: DISCRETE MATHEMATICS**

<b>Lecture :</b>	3 hrs/ week					<b>Internal Assessment:</b>					40			
<b>Tutorial :</b>	-					<b>Final Examination:</b>					60			
<b>Practical:</b>	-					<b>Credits:</b>					3			
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Understand the concepts of Statements, Validate the arguments, verify the proofs and construct proofs												
	<b>CO2</b>	Understand different types of relations and apply basic rules of counting												
	<b>CO3</b>	Understand and solve different types of recurrence relations and apply wherever necessary												
	<b>CO4</b>	Understand various types of graphs, their properties and graph coloring												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>	H	H			H				H				
	<b>CO2</b>	H	H			L				H				
	<b>CO3</b>	H	H			L		L		L				
	<b>CO4</b>	H	H					L		L				
<b>UNIT – I</b>														
<b>Propositional logic:</b> Fundamentals of logic, Truth tables, Tautologies, Logical inferences, Methods of an implication, Pigeon hole principle, Normal forms: DNF, CNF, PDNF, and PCNF. First order logic and other methods of proof, Rules of inference for quantified propositions.														
<b>UNIT – II</b>														
<b>Set Theory and Relations:</b> Introduction, relations and ordering, Properties of binary relations, Equivalence relations, compatibility relations, partial ordering, Hasse diagrams, Lattices. <b>Elementary Combinatorics:</b> Basic of counting, Combinations and permutations, enumeration of combinations and permutations, Enumerating combinations and permutations with repetitions, Binominal Coefficients, The binomial and multinomial theorems.														
<b>UNIT – III</b>														
<b>Recurrence Relations:</b> Generating functions of sequences, calculating coefficients of generating functions, recurrence relations, solving recurrence relations by substitution and generating, the method of characteristic roots, Solutions of inhomogeneous equations.														
<b>UNIT – IV</b>														
<b>Graph Theory:</b> Basic of concepts, isomorphism and sub graphs, planar graphs, Euler formula, multi graphs and Euler circuits, Hamiltonian graphs, chromatics numbers.														

**Learning Resources**

**Text Books:**

- [1] **“Discrete Mathematics for Computer Scientists and Mathematicians”** – Joe L.Mott, AbrahamKandel, Theodore P. Baker; PHI
- [2] **“Discrete Mathematical Structures with Applications to Computer Science”**- J.P.Tembly, R.Manohar; TMH

**Reference Books:**

- [1] **“Discrete Mathematical and its Applications”** , Kenneth H. Rosen, TMH
- [2] **“Elements of discrete Mathematics”** , C L Liu, D. P. Mohapatra, TMH

## 19MCA2151: IT FUNDAMENTALS LAB

<b>Lecture :</b>	-	<b>Internal Assessment:</b>								40				
<b>Tutorial :</b>	-	<b>Final Examination:</b>								60				
<b>Practical:</b>	3 hrs/ week	<b>Credits:</b>								1.5				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	CO1	Generate different word documents using MS Office Package												
	CO2	Integrate various features of MS Power point to create presentation.												
	CO3	Create Spreadsheets for different types of applications.												
	CO4	Develop database applications in MS Access.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>	M				H								
	<b>CO2</b>			M		H								
	<b>CO3</b>		M			M								
	<b>CO4</b>		M			M								
<b>LAB CYCLE – I: Word Processing</b>														
<div>1. Creating project synopsis: Features to be covered:- Table of Content, List of Tables, Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.</div> <div>2. Creating a Newsletter: Features to be covered:- Table of Content, List of figures, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images</div> <div>3. Create personal letter using MS Word.</div> <div>4. Create a resume using MS Word.</div>														
<b>LAB CYCLE – II: Presentations</b>														
<div>5. Create the presentation using the following tools:<div><div>• Formatting: Color, font type, font size, font style etc.</div><div>• Header and Footer</div><div>• Bullets and Numbering</div><div>• Drawing Toolbar: Auto shapes, Textboxes, etc</div><div>• Design Template</div><div>• Introduction to custom animation.</div></div></div> <div>6. Create a presentation to conduct a creativity session using the following tools:<div><div>• Slide transition</div><div>• Master slide view</div><div>• Insert picture – clipart, image</div><div>• Action button</div><div>• Drawing tool bar – lines, arrows</div><div>• Hyperlink</div></div></div>														



- Custom animation
- Hide slide
- Wash out

7. Create a presentation to build relationships, think creatively and market your product using the following tools: Slide Layout, fill color, Inserting object, Picture (effects), Graph, Word art, Comments, Security – password, Tables and Borders, Rehearse timings, Recording Narrations, Audio and video files, Inserting files, Merging files, Creating custom shows.

### **LAB CYCLE – III: Spread Sheets**

8. Create a worksheet containing pay details of the employees.
9. Creating a Scheduler using the features:
  - Gridlines
  - Format Cells
  - Summation
  - Auto fill
  - Formatting Text
10. Create a worksheet which contains student results using the features:
  - Cell Referencing,
  - Formulae in excel – average
  - Charts
  - Renaming and Inserting worksheets
  - Hyper linking
  - Count function
  - LOOKUP/VLOOKUP
  - Sorting
  - Conditional formatting
11. Create a worksheet importing data from database and calculate sum of all the columns.

### **LAB CYCLE – IV: Database**

12. Create simple table in MS Access for results processing.
13. Create a query table for the results processing table.
14. Create a form to update/modify the results processing table.
15. Create a report to print the result sheet and marks card for the result.
16. Establish relationship between tables and generate queries.

### **Learning Resources**

#### **Reference Books:**

- [1] Microsoft Office 2003 For Dummies--Wallace Wang
- [2] Web Technology: A Developer's Perspective- By N. P. Gopalan, J. Akilandeswari

#### **Web Resources**

- [1]<http://www.w3schools.com/html/>
- [2]<http://www.tutorialspoint.com/html5/index.htm>

**19MCA2152: C PROGRAMMING LAB**

<b>Lecture :</b>	-	<b>Internal Assessment:</b>				40								
<b>Tutorial :</b>	-	<b>Final Examination:</b>				60								
<b>Practical:</b>	3 hrs/week	<b>Credits:</b>				1.5								
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Apply programming constructs in a structured programming language.												
	<b>CO2</b>	Apply the arrays and modular programming concepts to solve the given problem.												
	<b>CO3</b>	Implement the usage of pointers												
	<b>CO4</b>	Implement user-defined types via structures, unions and file operations on data												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>	L		H										
	<b>CO2</b>		L	H										
	<b>CO3</b>		L	H										
	<b>CO4</b>			H							L			
<b>LAB CYCLE – I</b>														
1. Write a C program to find the Biggest of three numbers using else-if structure and conditional operators. 2. Write a C program to calculate electricity bill. Read starting and ending meter reading. The charges are as follows. No. of Units Consumed                      Rate in(Rs) 1-100    1.50 per unit 101-300    2.00 per unit for excess of 100 units 301-500    2.50 per unit for excess of 300 units 501-above                                        3.25 per unit for excess of 500 units. 3. Write a C program to demonstrate arithmetic operators using switch statement. 4. Write a C program to print various patterns (Ex: Pascal Triangle, Floyd’s Triangle etc.) 5. Write a C program to print sinx value using series expansion for given number of terms and angle in degrees. 6. Write a C program to check the given number is Fibonacci number using or not. 7. Write a C program to print the Prime numbers in a given range.														
<b>LAB CYCLE - II</b>														
8. Write a C program to insert an element at a specified location in an array. 9. Write a C program to print the minimum and maximum elements in the 1-D array. 10. Write a C program to perform Matrix addition and multiplication (menu-driven). 11. Write a C program to perform the following operations without using string handling functions: a)Length of a string      b) Concatenate two strings      c) Compare two strings														

**LAB CYCLE – III**

12. Write a C program to implement call by value and call by reference methods.
13. Write a C program to find NCR using functions.
14. Write a C program to implement arithmetic operations using pointers.
15. Write a C-program to sort names in ascending order using functions and pointers

**LAB CYCLE – IV**

16. Define a structure with real part and imaginary part of a complex number as its member data.
17. Write a C program to perform the following operations over two complex numbers.
  - a) Addition      b) Subtraction      iii) Multiplication
18. Write a C-Program to count number of characters, spaces, words and lines in given file.
19. Write a C-Program to copy the contents of one file into another file using command line argument.

**Learning Resources****Reference Books:**

- [1] Programming in ANSI C by E.Balaguruswamy, Sixth Edition – McGraw-Hill Education.
- [2] Programming with C (Schaum's Outlines ) by Byron.C.Gottfried, Tata McGraw-Hill.
- [3] C Programming , A Problem-Solving Approach by Behrouz A.Forouzan, E.V.Prasad Richard F.Gilberg , Cengage Learning
- [4] Let us C (Third Edition) by Yashavant Kanetkar.
- [5] C Programming by Balaguruswamy, Second Edition – TMH.

**Web Resources**

- [1] <https://www.youtube.com/watch?v=yKGVMRIei9k>
- [2] <http://www.programiz.com/c-programming/c-if-else-statement>
- [3] <http://www.programiz.com/c-programming/c-for-loop>
- [4] [http://www.tutorialspoint.com/cprogramming/c\\_arrays.htm](http://www.tutorialspoint.com/cprogramming/c_arrays.htm)
- [5] <http://www.programiz.com/c-programming/c-strings>
- [6] <http://www.c4learn.com/c-programming/c-pointer-applications>
- [7] [http://www.tutorialspoint.com/cprogramming/c\\_file\\_io.htm](http://www.tutorialspoint.com/cprogramming/c_file_io.htm)

**19MCA1153: ENGLISH LANGUAGE COMMUNICATION SKILLS LAB**

<b>Lecture :</b>	-	<b>Internal Assessment:</b>										40		
<b>Tutorial :</b>	-	<b>Final Examination:</b>										60		
<b>Practical:</b>	3 hrs/ week	<b>Credits:</b>										1.5		
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Acquire competence in the scientific processes of articulation.												
	<b>CO2</b>	Develop insights into the elements of listening comprehension.												
	<b>CO3</b>	Develop understanding about the patterns of communication with special reference to standardization of pronunciation.												
	<b>CO4</b>	Develop the skills of public speaking in both across the table communication and public address.												
	<b>CO5</b>	Be aware of the elements of employment- oriented communication.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>						M			M				
	<b>CO2</b>						M		M	H				
	<b>CO3</b>						M		M		M			
	<b>CO4</b>								L		M			
	<b>CO5</b>						M				H			
<b>LAB CYCLE – I</b>														
1. An overview of English Phonetics- Speech Mechanism including organs of speech, Air stream Mechanisms, Insights into the process of articulation. 2. Types and Processes of Listening comprehension														
<b>LAB CYCLE – II</b>														
3. Vowels & Consonants - Phonetic Transcription using IPA symbols including stress (Accentuation). 4. Patterns of Connected speech.														
<b>LAB CYCLE – III</b>														
5. Elements of Public Speaking including Group Discussion. 6. Seminar talks vis-à-vis Power point presentation.														
<b>LAB CYCLE – IV</b>														
8. Resume Preparation. 9. Types and processes of Interviews														
<b><u>Learning Resources</u></b>														
<b>Text Book:</b> [1] Martin Cutts, “Oxford Guide to Plain English”, 7th Impression, OUP, 2011.														

- [2] **“Exercises in Spoken English”**, Prepared by Department of Phonetics and Spoken English, CIEFL, OUP, 21st Impression, 2003.

**Reference Books:**

- [1] Stephen R Covey, The 7 Habits of Highly Effective people, II edition, (Pocket Books) Simon & Schuster UK Ltd, 2004.
- [2] Martin Cutts, Oxford Guide to Plain English, 7th Impression, OUP, 2011. Eclectic Learning Materials offered by the Department

**E-resources and other digital material:**

- [1] ODII Language Learner's Software, 27-6-2012 Orell Techno Systems.
- [2] Visionet Spears Digital Language Lab software Advance Pro, 28-01-2015.
- [3] [www.natcorp.ox.ac.uk](http://www.natcorp.ox.ac.uk), British National Corpus, XML edition 2007.

**19MCA1201: STATISTICS WITH R**

<b>Lecture :</b>	3 hrs/ week				<b>Internal Assessment:</b>				40				
<b>Tutorial :</b>	-				<b>Final Examination:</b>				60				
<b>Practical:</b>	-				<b>Credits:</b>				3				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Able to write R commands for Basic math and Data representation.											
	<b>CO2</b>	Understand data reading, statistical graphs and control statements using R commands.											
	<b>CO3</b>	Classify Probability distributions, Data inference by T-test and find correlation using R commands											
	<b>CO4</b>	Construct generalized linear models and understand survival analysis using R commands											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	L								M			
	<b>CO2</b>		M	H									
	<b>CO3</b>	M	M									M	
	<b>CO4</b>	M	M	H								M	
<b>UNIT – I</b>													
Introduction, Basics of R - Basic math, Variables, Data types, Vectors, Calling Functions, Missing Data. Advanced data structures- Data Frames, Lists, Matrices, Arrays													
<b>UNIT – II</b>													
Reading data into R - Reading CSV's, Excel data. Statistical Graphics - Basic graphics, ggplot2. Control Statements - if and if else, switch, if else, Compound tests. Loops- For loop, While Loops													
<b>UNIT – III</b>													
Probability Distributions - Normal Distribution, Binomial Distribution, Poisson Distribution, other distribution. Basic Statistics - Correlation and Covariance, T- Tests- ANOVA (one way).													
<b>UNIT – IV</b>													
Linear Models - Simple Linear Regression, Multiple Regression. Generalized linear models - Logistic Regression, Poisson Regression, other Generalized linear Models - Survival Analysis.													
<b><u>Learning Resources</u></b>													
<b>Text Books:</b>													
[1] “The Art of R Programming, Norman Matloff”, Cengage Learning.													
[2] “R for Everyone”. Lander, Pearson.													

**Reference Books:**

- [1] **“Probability and Statistics for Engineers”**, Eighth edition, Richard A.Johnson.
- [2] **“R Cookbook”**, Paul Teetor, Oreilly.
- [3] **“R in Action”**, Rob Kabacoff, Manning.

**Web Resource:**

- [1] [digimat.in/nptel/courses/video/111104100/L01.html](http://digimat.in/nptel/courses/video/111104100/L01.html)

## 19MCA2202: DATA STRUCTURES

<b>Lecture :</b>	3 hrs/ week				<b>Internal Assessment:</b>				40				
<b>Tutorial :</b>	1 hr/ week				<b>Final Examination:</b>				60				
<b>Practical:</b>	-				<b>Credits:</b>				4				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Explain the concepts of data structures											
	<b>CO2</b>	Analyze various data structures to develop an application.											
	<b>CO3</b>	Apply the concepts of data structures for various problems											
	<b>CO4</b>	Implement sorting and searching techniques											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	L	M					M					
	<b>CO2</b>			H							L		
	<b>CO3</b>			M									
	<b>CO4</b>	M			H								
<b>UNIT – I</b>													
<b>Basic Concepts:</b> Algorithm Specification, Data Abstraction, Performance Analysis.-Space Complexity, Time Complexity. <b>Linked Lists:</b> Single Linked Lists, Double Linked List and Circular Linked List Operations- Insertion, Deletion, Traversal. <b>Stacks:</b> Definition and examples, Representing Stacks in C, Application of Stacks, Examples: Infix, Postfix and Prefix.													
<b>UNIT – II</b>													
<b>Queues:</b> Introduction, Definition, Queue and its representation, Implementation of Queues, Queue Structures, Circular Queue - Implementation and Operations, Applications of Queues. <b>Trees:</b> Introduction, Terminology, Representation of Trees. <b>Binary Trees:</b> Abstract Data type, Properties of Binary Trees, Binary Tree Representation, Binary Tree Traversals: Inorder, Preorder and Postorder- recursive and non recursive, Complete Binary Tree, Expression trees construction and evaluation													
<b>UNIT – III</b>													
<b>Binary Search Trees:</b> Definition, Searching a Binary Search Trees (BST), Insertion into a binary search tree, Deletion from a binary search tree. <b>Efficient Binary and Multi Search Trees:</b> AVL trees-rotations, insertion, deletion, m-way Search Trees-definition and properties, B-Trees – definition and properties, insertion and deletion operations.													



**UNIT – IV**

**Graphs:** Introduction, Definitions, Graph Representations -Adjacency Matrix, Adjacency Lists, Adjacency Multilists. Elementary Graph Operations: Depth First Search and Breadth First Search.

**Sorting:** Bubble Sort, Selection Sort, Insertion Sort and Merge Sort.

**Searching:** Sequential Search and Binary Search and its time complexities.

**Learning Resources****Text Books:**

- [1] Horowitz, Sahni and Anderson-Freed, “**Fundamentals of Data Structures in C**”, Second Edition, Universities Press.
- [2] Yedidyah Langsam, Moshe J. Augenstein and Aaron M. Tenenbaum, “**Data Structures using C and C++**”, Second Edition, Pearson Education.

**Reference Books:**

- [1] Debasis Samanta, “**Classic Data Structures**”, Second Edition, PHI.
- [2] Mark Allen Weiss, “**Data structure and Algorithm Analysis in C**”, Addison Wesley Publication.
- [3] Horowitz and Sahani, “**Fundamentals of Data Structures**”, Galgotia Publication.
- [4] Jean Paul Trembley and Paul G. Sorenson, “**An Introduction to Data Structures with Applications**”, McGraw Hill.

**Web Resource:**

- [1] <https://nptel.ac.in/courses/106/106/106106130/>

## 19MCA2203: SOFTWARE ENGINEERING

<b>Lecture :</b>	3 hrs/ week				<b>Internal Assessment:</b>				40				
<b>Tutorial :</b>	1 hr/ week				<b>Final Examination:</b>				60				
<b>Practical:</b>	-				<b>Credits:</b>				4				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Demonstrate the basic concepts of software engineering and compare various software development life cycle models											
	<b>CO2</b>	Classify different software engineering practice and Testing Tactics											
	<b>CO3</b>	Organize the software project management estimation process											
	<b>CO4</b>	Develop different software design models using unified modeling language											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	H										M	
	<b>CO2</b>		M										
	<b>CO3</b>		H		M				M				
	<b>CO4</b>			M		H							
<b>UNIT – I</b>													
<b>Introduction to Software Engineering:</b> The Evolving Role of Software, Software, The Changing Nature of Software, Software Myths. <b>A Generic View of Process:</b> Software Engineering-A Layered Technology, A Process Frame Work, The Capability Maturity Model Integration (CMMI). <b>Process Models:</b> Prescriptive Models, The Waterfall Model, Incremental Process Models: The Incremental Model, The RAD Model, Evolutionary Process Model: Prototyping, The Spiral Model, The Concurrent Development Model. <b>An Agile View of Process:</b> What is Agility? What is Agile Process? Agile Process Models: Extreme Programming, Scrum.													
<b>UNIT – II</b>													
<b>Software Engineering Practice:</b> Software Engineering Practice, communication practices, Planning Practices, Modeling Practices, Construction Practices, Deployment. <b>Testing Tactics:</b> Software Testing Fundamentals, Black Box and White Box Testing, White Box Testing, Basis Path Testing, Control Structure Testing, Black Box Testing.													
<b>UNIT – III</b>													
<b>Project Management:</b> The Management Spectrum, The People, The Product, The Process, The Project, The W5HH Principles. <b>Metrics for Process and Projects:</b> Metrics in the Process and Project Domains, Software Measurement, Metrics for Software Quality, Integrating Metrics within Software Process, Metrics for Small Organizations.													

**Estimation:** Observations on Estimations, The project planning process, Software Scope and Feasibility, Resources, Software Project Estimation.

**Quality Management:** Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Reviews, Software Reliability, The ISO 9000 Quality Standards, the SQA Plan.

## UNIT – IV

**Class Modeling:** Object and Class Concepts, Link and Association concepts, Generalization and Inheritance, A Sample Class Model.

**State Modeling:** Events, States, Transitions and Conditions, state diagrams.

**Interaction Modeling:** Use Case Models, Sequence Models, Activity Models.

### Learning Resources

#### Text Books:

- [1] Roger S Pressman, “Software Engineering–A Practitioner’s Approach”, Sixth Edition, TMH International. (UNIT - I, II, III)
- [2] Michael Blaha, James Rumbaugh, “Object Oriented Modeling and Design with UML”, Second Edition, PHI. (UNIT - IV)

#### Reference Books:

- [1] Sommerville, “Software Engineering”, Seventh Edition Pearson Education (2007).
- [2] “Software Engineering”, Kassem A. Saleh, Cengage Learning.
- [3] S.A.Kelkar, “Software Engineering – A Concise Study”, PHI.
- [4] Waman S.Jawadekar, “Software Engineering”, TMH.
- [5] Ali Behforooz and Frederick J.Hudson, “Software Engineering Fundamentals”, Oxford (2008).
- [6] “Object Oriented Analysis & Design with Applications”, Grady Booch, 2<sup>nd</sup> Edition Pearson Education 1999.
- [7] “Unified Modeling Language Reference Manual”, James Rumbaugh, Jacobson, Booch, PHI.
- [8] “The Unified Software Development Process”, Jacobson et al., AW, 1999.
- [9] “UML Bible” by Tom Pender John Wiley & Sons.

#### Web Resources:

- [1] <http://www-01.ibm.com/software/rational/announce/rose/>
- [2] <http://www-01.ibm.com/software/rational/>

**19MCA2204: OBJECT ORIENTED PROGRAMMING THROUGH JAVA**

<b>Lecture :</b>	3 hrs/ week					<b>Internal Assessment:</b>					40			
<b>Tutorial :</b>	1 hr/ week					<b>Final Examination:</b>					60			
<b>Practical:</b>	-					<b>Credits:</b>					4			
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Paraphrase the fundamental concepts of object oriented approach												
	<b>CO2</b>	Analyses exception handling techniques and I/O streams to handle user input and output												
	<b>CO3</b>	Demonstrate the usage of multi threads and collection framework for Structures												
	<b>CO4</b>	Able to develop Networking enabled applications and Applets												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>	L												
	<b>CO2</b>		M	H										
	<b>CO3</b>			M						H			M	
	<b>CO4</b>			M							M		H	
<b>UNIT – I</b>														
<p><b>History &amp; Evolution of Java:</b> Java’s Lineage, The Birth of Modern Programming: C, C++: The Next Step, The Creation of Java, How Java Changed the Internet, Java Applets, Security, Portability, Java’s Magic: The Byte code, The Java Buzzwords.</p> <p><b>An Overview of Java:</b> Object-Oriented Programming, Two Paradigms, Abstraction, The Three OOP Principles, A First Simple Program, Lexical Issues.</p> <p><b>Data Types, Variables and Arrays:</b> The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Arrays.</p> <p><b>Operators:</b> Arithmetic Operators, Bitwise Operators, Relational Operators, Boolean Logical Operators.</p> <p><b>Control Statements:</b> Java’s Selection Statements, Iteration Statements, Nested Loops, Jump Statements.</p> <p><b>Introducing Classes:</b> Class Fundamentals, Declaring Objects, A Closer Look at new operator, Assigning Object Reference Variables, Introducing Methods, Constructors, this Keyword, Instance Variable Hiding, and Garbage Collection.</p> <p><b>A Closer Look at Methods and Classes:</b> Overloading Methods, Overloading Constructors, Using Objects as Parameters, Returning Objects, Recursion, Introducing Access Control, Understanding static, final, String Class, Command-Line Arguments.</p>														

**UNIT – II**

**Inheritance:** Inheritance Basics, Super class Variable-Reference a Subclass Object, Using super, using super to call Superclass Constructors, A Second use for Super, Creating a Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Using final with Inheritance.

**Packages and Interfaces:** Defining a Package, Access Protection, Importing Packages, Interfaces: Defining an Interface, Implementing Interfaces, Variables in Interfaces, Interfaces can be Extended.

**Exception Handling:** Exception-Handling Fundamentals, Java's Built-in Exceptions, Creating Your Own Exception Subclasses.

**UNIT – III**

**Multithreaded Programming:** Creating a Thread: Implementing Runnable, Extending Thread, Creating Multiple threads, Using isAlive() and join(), Thread Priorities, Synchronization, Interthread Communication, Deadlock, Suspending, Resuming, and Stopping threads.

**Input/Output: Exploring java.io** - The I/O Classes and Interfaces, File- Directories, The Stream Classes, The Byte Streams- InputStream, OutputStream, FileInputStream, FileOutputStream Buffered Byte Streams, DataInputStream and DataOutputStream, RandomAccessFile, The Character Streams-Reader Writer FileReader, FileWriter, BufferedReader, PrintWriter, Serialization.

**UNIT – IV**

**Networking:** Networking Basics, The Networking Classes and Interfaces, InetAddress Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URLConnection, TCP/IP Server Sockets, Datagrams.

**The Applet Class:** Applet Basics, The Applet Class, Applet Architecture, An Applet Skeleton, Applet Initialization and Termination, A Simple Banner Applet, Using the Status Window, The HTML APPLET Tag, Passing Parameters to Applets, getDocumentBase() and getCodeBase().

**Learning Resources****Text Book:**

- [1] **“The Complete Reference Java”**, Eighth Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi.

**Reference Books:**

- [1] **JAVA How to program**, Eighth Edition, Paul Deitel,Harvey Deitel,PHI Learning Pvt.Ltd.,New Delhi
- [2] **Core Java 2**, Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
- [3] **Core Java 2**, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
- [4] **Thinking in Java**, 3rd Edition, Bruce Eckel
- [5] **Object Oriented Programming through JAVA**, P. Radha Krishna

**Web Resources:**

- [1] [https://www.youtube.com/watch?v=OjdT2l-EZJA&list=PLfn3cNtmZdPOe3R\\_wO\\_h540QNfMkCQ0ho](https://www.youtube.com/watch?v=OjdT2l-EZJA&list=PLfn3cNtmZdPOe3R_wO_h540QNfMkCQ0ho)

**19MCA2205: OPERATING SYSTEMS**

<b>Lecture :</b>	3 hrs/ week					<b>Internal Assessment:</b>					40			
<b>Tutorial :</b>	-					<b>Final Examination:</b>					60			
<b>Practical:</b>	-					<b>Credits:</b>					3			
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Demonstrate the structure and concepts of an Operating System.												
	<b>CO2</b>	Analyze algorithmic techniques to solve problems related to Process Management.												
	<b>CO3</b>	Evaluate the concepts related to Memory Management.												
	<b>CO4</b>	Perform in a team to simulate different Operating System concepts.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>	H												
	<b>CO2</b>	M	H										M	
	<b>CO3</b>	M											M	
	<b>CO4</b>		M	H										
<b>UNIT – I</b>														
<b>Introduction:</b> What Operating Systems Do, Computer-System Organization, Computer-System Architecture, Operating System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Kernel Data Structures. <b>System Structures:</b> Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating System Structure, Operating-System Debugging, Operating-System Generation, System Boot.														
<b>UNIT – II</b>														
<b>Process Concept:</b> Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication. <b>Multithreaded Programming:</b> Overview, Multithreading Models, Thread Libraries, Threading Issues. <b>Process Scheduling:</b> Basic Concepts, Scheduling Criteria, Scheduling Algorithms.														
<b>UNIT – III</b>														
<b>Synchronization:</b> Background, The Critical-Section Problem, Peterson’s Solution, Semaphores, Classical Problems of Synchronization, Monitors. <b>Deadlocks:</b> System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. <b>Memory-Management Strategies:</b> Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging.														

**UNIT – IV**

**Virtual-Memory Management:** Background, Demand Paging, Page Replacement, Thrashing.

**File System:** File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection

**CONTENT BEYOND THE SYLLABUS:** Multicore Programming, Thread Scheduling, Mutex Locks, File-System Implementation, Disk Scheduling

**Learning Resources****Text Book:**

- [1] Abraham Silberschatz, Peter B Galvin, Gerg Gagne, “**Operating System Concepts**”, Ninth Edition, Wiley, 2016 India Edition.

**Reference Books:**

- [1] William Stallings, “**Operating Systems – Internals and Design Principles**”, Fifth Edition, Pearson Education (2007).
- [2] Deitel & Deitel, “**Operating Systems**”, Third Edition, Pearson Education (2008).

**Web Resource:**

- [1] <https://www.bing.com/videos/search?q=Deadlocks+nptel>

**19MC2251: DATA STRUCTURES USING C LAB**

<b>Lecture :</b>	-	<b>Internal Assessment:</b>					40							
<b>Tutorial :</b>	-	<b>Final Examination:</b>					60							
<b>Practical:</b>	3 hrs/ week	<b>Credits:</b>					1.5							
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Implement various operations on linear data structures												
	<b>CO2</b>	Solve problems using appropriate data structure.												
	<b>CO3</b>	Perform various operations on non-linear data structures												
	<b>CO4</b>	Develop various searching and sorting methods												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>	L	M					M						
	<b>CO2</b>			H		H					L			
	<b>CO3</b>			M	M									
	<b>CO4</b>	M			H									
<b><u>LIST OF PROGRAMS</u></b>														
<b>LAB CYCLE – I</b>														
1. Develop a program to implement operations on singly linked list. 2. Develop a program to implement the operations on doubly linked list. 3. Develop a program to implement the operations on circular linked list. 4. Develop a program to implement the operations on stacks using arrays. 5. Develop a program to implement the operations on stacks using linked list. 6. Develop a program for converting a given infix expression to postfix form. 7. Develop a program for evaluating a given postfix expression.														
<b>LAB CYCLE – II</b>														
8. Develop a program to implement the operations on queues using arrays. 9. Develop a program to implement the operations on queues using linked list. 10. Develop a program to implement the operations on circular queues using arrays 11. Write a program to create a binary tree and also implementing the tree traversal techniques using recursion														
<b>LAB CYCLE - III</b>														
12. Develop a program to create a binary search tree and perform insertion operation. 13. Develop a program to perform the insertion and display operations on B-tree.														



**LAB CYCLE - IV**

14. Develop a program to implement graph traversal techniques.
15. Develop a program to implement following searching techniques.
  - Linear search
  - Binary search
  - Fibonacci search
16. Develop a program to implement the following sorting techniques:
  - Bubble sort
  - Selection sort
  - Insertion sort
  - Merge sort

**Learning Resources****Reference Books:**

- [1] Horowitz and Sahani, “**Fundamentals of Data Structures**”, Galgotia Publication Pvt. Ltd., New Delhi.
- [2] R. Kruse et al, “**Data Structures and Program Design in C**”, Pearson Education Asia, Delhi, 2002.
- [3] AM Tanenbaum, Y Langsam & MJ Augustein, “**Data Structure using C**”, Prentice Hall India, New Delhi.
- [4] Jean Paul Tremblay, and, Paul Gordon Sorenson, “**Introduction to Data Structures: With A Applications**”, second edition, McGraw Hill Higher Education.
- [5] Lipschutz S, “**Theory and Problems of Data Structures**”, Schaums Outline Series, McGraw-Hill.
- [6] Behrouz A. Forouzan, Richard F. Gilberg, “**C Programming and Data Structures**”, Cengage Publications.

**19MCA2252: OBJECT ORIENTED PROGRAMMING THROUGH JAVALAB**

<b>Lecture :</b>	-	<b>Internal Assessment:</b>				40								
<b>Tutorial :</b>	-	<b>Final Examination:</b>				60								
<b>Practical:</b>	3 hrs/ week	<b>Credits:</b>				1.5								
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Design Java Applications on object-oriented concepts.												
	<b>CO2</b>	Implement techniques to handle run time errors and different types of Inheritance												
	<b>CO3</b>	Develop java applications on multithreading and collection classes.												
	<b>CO4</b>	Develop programs using Files, Networking enabled applications and Applets.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>	L												
	<b>CO2</b>		M	H										
	<b>CO3</b>			M						H			M	
	<b>CO4</b>			M							M			H

**LIST OF PROGRAMS****LAB CYCLE – I**

- Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
  - Write a Java program to find both the largest and smallest number in a list of integers.
- Write a Java program to multiply two given matrices by checking the compatibility of multiplication.
- Find Volume of a box using classes.
  - Write a Java program to illustrate method overloading and constructor overloading.
  - Write a Java program to demonstrate on static variables and methods.
- Write a Java program to demonstrate objects as arguments.
- Write a Java program using String class methods to perform the following operations
  - Sort a list of names in ascending order by command line arguments.
  - Develop a program that will take a string from a command line argument in order to check whether it is a palindrome.

**LAB CYCLE – II**

- Design three classes: Student, Exam and Result. The student class has data members such as roll no, name etc. Create a class Exam by inheriting the Student class. The Exam class adds data members representing the marks scored in six subjects. Derive the Result from class Exam and it has its own members such as total marks and average. Calculate the total marks and average.

7.
  - a) Write a java program to implement Method Overriding.
  - b) Write a java program to demonstrate constructor chaining in Inheritance.
  - c) Write a java program to demonstrate the use of final.
8.
  - a) Write a java program by implementing super class reference and subclass object (Implement Dynamic Binding).
  - b) Write a Java program to create an abstract class named Shape that contains an empty method named numberOfSides( ). Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method numberOfSides( ) that shows the number of sides in the given geometrical figures.
9. Write a Java program that illustrates the following.
  - a) Creation of simple package.
  - b) Accessing a package.
10. Develop a program to demonstrate multiple inheritance through interface

### LAB CYCLE - III

11. Write Java programs that illustrates the following
  - a) Handling predefined exceptions
  - b) Handling user defined exceptions
12. Write a Java program to create thread using Thread class and Runnable Interface.
13. Write a Java program to demonstrate Synchronization.

### LAB CYCLE - IV

14.
  - a) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
  - b) Write a Java program that displays the number of characters, lines and words in a text file.
15. Write a Java program to demonstrate URL and URLConnection.
16. Write a Java program for establishing a socket connection.
17. Write a Java program to pass parameters to Applets.

### Learning Resources

#### Text Books:

- [1] “The Complete Reference Java”, Seventh Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi.
- [2] **JAVA How to program**, Eighth Edition, Paul Deitel, Harvey Deitel, PHI Learning Pvt.Ltd., New Delhi.
- [3] **Core Java 2**, Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
- [4] **Core Java 2**, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
- [5] **Object Oriented Programming through JAVA**, P. Radha Krishna.

#### Web Resources

- [1] <http://download.oracle.com/javase/tutorial/index.html>
- [2] <http://www.javaj2ee.net/core-java-video-tutorial>
- [3] <http://www.coderanch.com/forums/f-33/java>
- [4] <http://www.javacertificate.net/>
- [5] <http://www.deitel.com/Tutorials/Freetutorialsandarticles/tabid/1575/default.aspx>
- [6] <http://www.herongyang.com/Java/>

**19MCA2253: OPERATING SYSTEMS LAB**

<b>Lecture :</b>	-	<b>Internal Assessment:</b>					40							
<b>Tutorial :</b>	-	<b>Final Examination:</b>					60							
<b>Practical:</b>	3 hrs/ week	<b>Credits:</b>					1.5							
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	CO1	Analyze a problem and apply requisite facets of shell programming in order to devise a shell script to solve the problem												
	CO2	Demonstrate UNIX commands for file handling and process control.												
	CO3	Familiarize with the complexity of CPU scheduling algorithms.												
	CO4	Recognize the importance of System calls.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>	<b>H</b>	<b>H</b>											
	<b>CO2</b>	<b>H</b>	<b>M</b>											
	<b>CO3</b>	<b>H</b>	<b>H</b>	<b>H</b>								<b>M</b>		
	<b>CO4</b>	<b>H</b>	<b>M</b>	<b>H</b>								<b>M</b>		

**LIST OF PROGRAMS****LAB CYCLE – I**

1. Write a shell script to accept two numbers and perform all arithmetic operations on it.
2. Write a shell script to check whether a particular user has logged in or not.
3. Write a shell script to find whether a number is Prime or not.
4. Write a shell script to find Factorial of a given number.
5. Write a shell script to find number of vowels, consonants, numbers and special characters in a given string.

**LAB CYCLE – II**

6. Write a shell script to implement searching and sorting operations on a list.
7. Write a shell script to accept the name of the file from standard input and perform the following tests on it
  - File executable
  - File readable
  - File writable
  - Both readable & writable
8. Write a shell script to accept student number, name, and marks in 5 subjects. Find total, average and grade. Display the result of student and store in a file called stu.dat  
 Rules: avg>=80 then grade A  
       avg<80 && avg>=70 then grade B  
       avg<70 && avg>=60 then grade C  
       avg<60 && avg>=50 then grade D  
       avg<50 && avg>=40 then grade E  
       Else grade F

**LAB CYCLE - III**

9. Write a C Program to implement FCFS scheduling algorithm.
10. Write a C Program to implement SJF scheduling algorithm.

**LAB CYCLE - IV**

11. Write a C Program to implement FORK system call and EXECL system call.
12. Write a C program that makes a copy of a file using standard I/O and system calls.

**Learning Resources**

**Text Books:**

- [1] “UNIX and Shell Programming”, [Behrouz A. Forouzan](#), [Richard F. Gilberg](#), Cole-Thomson Learning.
- [2] “UNIX in a nut shell”, Arnold Robbins, O'Reilly Media.

**Web Resources**

- [1] <https://www.digimat.in/nptel/courses/video/117106113/L39.html>

**19MCA1254: PROFESSIONAL COMMUNICATION PRACTICE LAB**

Lecture :	-	Internal Assessment:								40				
Tutorial :	-	Final Examination:								60				
Practical:	2 hrs/week	Credits:								1				
Learning Outcomes:	Upon successful completion of the course, the student will be able to:													
	CO1	Be aware of the processes of administrative communication												
	CO2	Develop insights into the professional argumentation												
	CO3	Be proficient in technology enabled communication skills												
	CO4	Develop technical and professional drafting skills												
	CO5	Be aware of the elements of Professional leadership												
Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
	CO1							M	H		M			
	CO2							M	H		M			
	CO3							M	H		M			
	CO4							M	H		M			
	CO5							M	H		M			
LIST OF PROGRAMS														
LAB CYCLE – I														
Administrative drafting and correspondence – Format, style and techniques Memos Minutes E-mail Etiquette and Web notes														
LAB CYCLE – II														
Self Affirmation Advanced Group Discussion Pyramid Discussion PNI & Point-Counter Point														
LAB CYCLE - III														
Technology enabled conferencing skills Developing Abstract Introduction to Executive summary- written and spoken Technical Vocabulary- relevant sentential patterns														

**LAB CYCLE – IV**

Select Life Skills (50)  
 Select Logies, Isms, Phobias and Manias (25 each)  
 Sentence Completion (50 items)  
 Fundamentals of Syllogisms

**Learning Resources****Text Books:**

- [1] Deborah. J. Bennett, Logic made easy: How to know when Language Deceives you, WW Norton company , I edition(Reprint), 2005.
- [2] Ashraf Rizvi, Effective Technical Communication, TMI, I edition 2005.
- [3] ‘Krishna’, English Language Communication Skills, I Edition, Duvvuri Publications, 2008.
- [4] Eclectic Learning Materials offered by the Department

**Reference Books:**

- [1] Khera Shiv, Living with Honour, Macmillan, I edition (Reprinted) 2003
- [2] Daniel Goleman, Working with Emotional Intelligence, Bantam Books, I edition ( Export Edition) 1999.
- [3] Christopher. M.Avary et al, Teamwork is an individual Skill, Magna, I edition 2003
- [4] William W Hewitt, Art of Developing Personal Power, Jaico, Third Impression, 2003

**E-Resources and other digital materials:**

- [1] Visionet Spears Digital Language Lab software Advance Pro, 28-01-2015
- [2] [www.bbc.co.uk/learning/subjects/english.shtml](http://www.bbc.co.uk/learning/subjects/english.shtml)

**19MCA2301: INDUSTRIAL MANAGEMENT**

<b>Lecture :</b>	3 hrs/ week					<b>Internal Assessment:</b>					40			
<b>Tutorial :</b>	-					<b>Final Examination:</b>					60			
<b>Practical:</b>	-					<b>Credits:</b>					3			
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Get knowledge how to apply the managerial functions and principles in an organization. He/She also get knowledge about corporate ethics and Social Responsibilities of Business.												
	<b>CO2</b>	Get knowledge how to associate with peers, superiors and other employees in an organization.												
	<b>CO3</b>	Understand how to make investment decisions based on the requirement of business through knowledge on financial management.												
	<b>CO4</b>	Get thorough knowledge in motivation, leadership principles and HR policies in an organization.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>						<b>H</b>	<b>M</b>		<b>M</b>	<b>M</b>		<b>H</b>	
	<b>CO2</b>						<b>M</b>	<b>M</b>				<b>M</b>		
	<b>CO3</b>							<b>H</b>	<b>H</b>				<b>M</b>	
	<b>CO4</b>							<b>M</b>		<b>H</b>		<b>H</b>		
<b>UNIT – I</b>														
<b>Management:</b> Meaning, Management: A Science or an Art?, Management vs. Administration, Management Functions: Planning, Organizing, Staffing, Directing and Controlling, Management Levels, Scientific Management, Administrative Management, Fayol’s Principles of Management, Objectives of Business, Social Responsibilities of Business, Decision Making: Types and Process.														
<b>UNIT – II</b>														
<b>Organizational Behavior:</b> Meaning, Nature and Significance of Organizational Behavior, Values, Attitudes, Emotions and Moods, Personality: Traits, Determinants, Personality Development and Personality Theories, Perception: Perceptual Process and Barriers to Perceptual Accuracy, Learning: Characteristics of Learning, Process and Theories of Learning, Stress Management: Causes of Stress, How to manage stress?														
<b>UNIT – III</b>														
<b>Financial Management:</b> Meaning, Scope, Finance Function, Financial Goal, Profit Maximization vs. Wealth Maximization, Value and Return, Future Value: Future Value of Single Cash Flow and Annuity, Annuity of a Future Value, Present Value: Present Value of Single Cash Flow and Annuity, Cost of Capital: Significance, Weighted Average Cost of Capital (WACC), Capital Budgeting Decisions: Nature and Features, Techniques of Capital Budgeting, Discounted Cash Flow Techniques: Net Present Value (NPV), Internal Rate of Return (IRR) and Profitability Index (PI), Non-Discounted Cash Flow Techniques: Payback, Discounted Payback and Accounting Rate of Return (ARR).														



**UNIT – IV**

**Human Resource Management:** Nature and Scope, Functions, Objectives, Human Resource Planning: Importance and The Planning Process, Recruitment: Nature, Purpose, Importance, Factors and Process, Selection: Nature and Process, Training, Development and Career Management: Nature of Training and Development, The Training Process, How to Make Training Effective? and Career Development, Performance Appraisal: Appraisal Process and Methods of Appraisal, Job Evaluation: Process and Methods, Motivation: Meaning, Importance, Theories of Motivation: Maslow's Need Hierarchy Theory and Herzberg's Two Factor Theory.

**Learning Resources****Text Books:**

- [1] P. Subba Rao, "**Management and Organisational Behaviour, Text and Cases**", Himalaya Publishing House, Mumbai, 2012.
- [2] I. M. Pandey: "**Financial Management**", Vikas Publishing House Pvt. Ltd., 11<sup>th</sup> Edition, 2015.
- [3] K. Aswathappa: "**Human Resource Management, Text and Cases**", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

**Reference Books:**

- [1] Gupta R S, Sharma B D Bhalla N S: "**Principles and Practice of Management**", Kalyani Publications, Hyderabad, 2008.
- [2] Prasanna Chandra, "**Fundamentals of Financial Management**", McGraw Hill Education (India) Pvt. Ltd., New Delhi, 6<sup>th</sup> Edition.
- [3] M.Y Khan, P K Jain: "**Financial Management-Text and Problems**", Tata McGraw Hill, New Delhi. 2003
- [4] Gary Dessler: "**Human Resources Management**", PHI Private Limited, New Delhi, 2007.
- [5] Ramaswamy V.S and Nama kumari S, "**Marketing Management- Indian Context Global Perspective**", McGrawHill, NewDelhi, 2010.

**Web Resources**

- [1] [https://www.managementstudyguide.com/management\\_principles.htm](https://www.managementstudyguide.com/management_principles.htm)
- [2] [https://www.tutorialspoint.com/organizational\\_behavior/index.htm](https://www.tutorialspoint.com/organizational_behavior/index.htm)
- [3] [https://www.tutorialspoint.com/human\\_resource\\_management/index.htm](https://www.tutorialspoint.com/human_resource_management/index.htm)
- [4] [https://www.tutorialspoint.com/managerial\\_economics/index.htm](https://www.tutorialspoint.com/managerial_economics/index.htm)
- [5] <https://nptel.ac.in/courses/112/107/112107292/>

**19MCA2302: DATABASE MANAGEMENT SYSTEMS**

<b>Lecture :</b>	3 hrs/ week				<b>Internal Assessment:</b>				40					
<b>Tutorial :</b>	1 hr/week				<b>Final Examination:</b>				60					
<b>Practical:</b>	-				<b>Credits:</b>				4					
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	CO1	Identify the features of the DBMS that will meet the organizational needs.												
	CO2	Familiarize on different ER models, Relational database constraints and able to write the SQL queries using Relational model concepts.												
	CO3	Recognize the importance of design guidelines for relation schemas and Normal Forms.												
	CO4	Judge the value of transaction transparency and Concurrency Control Techniques in the maintenance of data integrity.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>			<b>M</b>				<b>M</b>						
	<b>CO2</b>		<b>H</b>			<b>M</b>								
	<b>CO3</b>		<b>M</b>	<b>M</b>										
	<b>CO4</b>		<b>M</b>			<b>M</b>								
<b>UNIT – I</b>														
<b>Databases and Database Users:</b> Introduction, An Example, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach. <b>Database System Concepts and Architecture:</b> Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, Centralized and Client/Server Architectures for DBMSs, Classification of Database Management Systems.														
<b>UNIT – II</b>														
<b>Data Modeling Using the Entity-Relationship (ER) Model:</b> Using High-Level Conceptual Data models for Database Design, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types. <b>The Relational Data Model and Relational Database Constraints:</b> Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions, and Dealing with Constraint Violations. <b>SQL-99: Schema Definition, Constraints, Queries, and Views:</b> SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, More Complex SQL Queries, INSERT, DELETE and UPDATE Statements in SQL.														
<b>UNIT – III</b>														

**Functional Dependencies and Normalization for Relational Databases:** Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

**Relational Database Design Algorithms and Further Dependencies:** Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

#### UNIT – IV

**Introduction To Transaction Processing Concepts and Theory:** Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability.

**Concurrency Control Techniques:** Two-Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency Control Techniques.

#### Learning Resources

##### **Text Book:**

- [1] Ramez Elmasri, Shamkant B. Navathe, “**Fundamentals of Database Systems**”, Fifth Edition, Pearson Education (2007).

##### **Reference Books:**

- [1] “**Database Management Systems**”, Peter Rob, A. Anand Rao, Carlos Coronel, Cengage Learning.
- [2] “**Database System Concepts**”, Abraham Silberschatz, Henry F. Korth, S. Sudarshan
- [3] “**Database Management Systems**”, Raghu ramakrishnan, Fourth Edition
- [4] “**Database Management System Oracle SQL and PL/SQL**”, P.K.Das Gupta, PHI.
- [5] “**Database System Concepts**”, Peter Rob & Carlos Coronel, Cengage Learning, 2008.

##### **Web Resources:**

- [1] <https://nptel.ac.in/courses/106/105/106105175/>

**19MCA2303: ADVANCED JAVA PROGRAMMING**

<b>Lecture :</b>	3 hrs/week				<b>Internal Assessment:</b>				40				
<b>Tutorial :</b>	1 hr/week				<b>Final Examination:</b>				60				
<b>Practical:</b>	-				<b>Credits:</b>				4				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Create swing based GUI applications.											
	<b>CO2</b>	Create Java applications that interact with database using JDBC.											
	<b>CO3</b>	Develop web applications with Servlets.											
	<b>CO4</b>	Develop web applications using JSP.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	H	L	L		H							
	<b>CO2</b>	M	M	M		H							
	<b>CO3</b>	M	M	M		H							
	<b>CO4</b>	M	M	M		H							
<b>UNIT – I</b>													
<b>Introducing Swing:</b> The Origins of Swing ,Swing Is Built on the AWT ,Two Key Swing Features, Swing Components Are Lightweight ,Swing Supports a Pluggable Look and Feel, The MVC Connection, Components and Containers, Components, Containers, The Top-Level Container Panes, The Swing Packages, A Simple Swing Application, Event Handling, Create a Swing Applet. <b>Exploring Swing:</b> JLabel and ImageIcon, JTextField, The Swing Buttons, JButton, JToggleButton Check Boxes, Radio Buttons, JTabbedPane, JScrollPane, JList, JComboBox, Trees, JTable													
<b>UNIT – II</b>													
<b>Database Programming with JDBC:</b> Database Drivers, The java.sql Package- Connection management, Database access, Data Types, Database Metadata, Loading a Database Driver and Opening Connections, Establishing a Connection, Creating and Executing SQL Statements, Querying the Database, Prepared Statements													
<b>UNIT – III</b>													
<b>Servlet Programming:</b> Overview of the Java Servlet API, Servlet Implementation, Servlet Configuration, Servlet Lifecycle, Requests and Responses. <b>Servlet Sessions:</b> Approach to session tracking, Session tracking with java servlet API.													

**UNIT – IV**

**Java Server Pages (JSP):** Introducing JSP, JSP Directives, Scripting Elements, Standard Actions, Implicit Objects, Scope.

**Learning Resources****Text Books:**

- [1] “**Java: The Complete Reference**”, Seventh Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi (Unit-I).
- [2] “**Professional Java Server Programming**”, J2EE 1.3 Edition, Subrahmanyam Allamaraju, Cedric Buest, APress Publications (Unit – II, Unit-III, and Unit-IV).

**Reference Books:**

- [1] Robert W. Sebesta, “**Programming the World Wide Web**”, Third Edition, Pearson Education.
- [2] Chris Bates, “**Web Programming–Building Internet Applications**”, Second Edition, Wiley.
- [3] Jeffrey C. Jackson, “**Web Technologies – A Computer Science Perspective**”, Pearson Education.

**Web Resources:**

- [1] <https://nptel.ac.in/courses/106/105/106105191/>

## 19MCA2304: COMPUTER NETWORKS

<b>Lecture :</b>	3 hrs/week	<b>Internal Assessment:</b>				40								
<b>Tutorial :</b>	1 hr/week	<b>Final Examination:</b>				60								
<b>Practical:</b>	-	<b>Credits:</b>				4								
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Familiarize the concepts of computer networks and structuring of computer networks using OSI and TCP/IP reference model.												
	<b>CO2</b>	Compare and contrast different Transmission Media along with their characteristics and understand the methods for detecting and correcting errors in Data Link Layer Protocols.												
	<b>CO3</b>	Understand the functionality of various routing algorithms.												
	<b>CO4</b>	Understand the transport services, elements of transport protocols, TCP, UDP and DNS.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>		L											
	<b>CO2</b>					M								
	<b>CO3</b>											H		
	<b>CO4</b>												H	

## UNIT – I

**INTRODUCTION: Uses of Computer Networks:** Business Applications, Home Applications, Mobile Users, Social Issues. **Network Hardware:** Personal Area Networks, Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks. **Network Software:** Protocol Hierarchies, Design Issues for the Layers, Connection Oriented and Connectionless Services, Service Primitives, The relationship of Services to Protocols. **Reference Models:** The OSI Reference Model, The TCP/IP Reference Model, A Comparison of OSI and TCP/IP reference Model, A Critique of the OSI Model and Protocols, A Critique of the TCP/IP reference model.

## UNIT – II

**PHYSICAL LAYER**

**Guided Transmission Media:** Magnetic Media, Twisted Pair, Coaxial Cable, **Power Lines** and Fiber Optics.

**DATA LINK LAYER**

**Data Link Layer Design Issues:** Services Provided to the Network Layer, Framing, Error Control and Flow Control. **Error Detection and Correction:** Error-Correcting Codes, Error-Detecting Codes. **Elementary Data Link Protocols:** A Utopian Simplex Protocol, A simplex Stop-and-Wait Protocol for an Error Free Channel, A simplex Protocol for a Noisy channel. **Sliding Window Protocols:** A One-Bit sliding Window Protocol, A Protocol using Go Back N and Selective Repeat.

**UNIT – III****THE NETWORK LAYER**

**Network Layer Design Issues:** Store and Forward Packet Switching, Services provided to the Transport Layer, Implementation of Connectionless Services, Implementation of Connection Oriented Services, Comparison of Virtual Circuit and Datagram Networks.

**Routing Algorithms:** The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing.

**Congestion Control Algorithms:** Approaches to Congestion Control, Traffic-Aware Routing, Congestion Control, Traffic Throttling, Load Shedding.

**The Network Layer in the Internet:** The IP Version 4 Protocol, IP address.

**UNIT – IV****THE TRANSPORT LAYER**

**The Transport Service:** Services provided to the Upper Layers, Transport Services Primitives, and Berkeley Sockets. **Elements of Transport Protocols:** Addressing, Connection Establishment, Connection Release, Flow Control. **The Internet Transport Protocols: UDP:** Introduction to UDP, Remote Procedure Call.

**The Internet Transport Protocols: TCP:** Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP segment header, TCP connection establishment, TCP connection release, Modeling TCP connection management, TCP Transmission Policy, TCP congestion Control, TCP Timer Management, Wireless TCP and UDP, Transactional TCP.

**THE APPLICATION LAYER**

**DNS - The Domain Name System:** The DNS Name Space, Resource Records, Name Servers.

**Learning Resources****Text Book:**

- [1] Andrew S. Tanenbaum, “**Computer Networks**”, 5<sup>th</sup> Edition, PHI.

**Reference Books:**

- [1] Behrouz A Forouzan, “**Data Communications and Networking**”, Fourth Edition, TMH (2007).  
 [2] James F. Kurose, Keith W. Ross, “**Computer Networking**”, Third Edition, Pearson Education.  
 [3] Michael A. Gallo, William M. Hancock, “**Computer Communications and Networking Technologies**”, Cengage Learning (2008).

**Web Resources:**

- [1] <https://nptel.ac.in/courses/106/105/106105081/>

**19MCA2305: WEB DESIGN AND DEVELOPMENT**

<b>Lecture :</b>	3 hrs/week					<b>Internal Assessment:</b>					40				
<b>Tutorial :</b>	1 hr/week					<b>Final Examination:</b>					60				
<b>Practical:</b>	-					<b>Credits:</b>					4				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:														
	CO1		Design and implement web pages using XHTML, CSS, JavaScript.												
	CO2		Configuring the web server and how to use open source database.												
	CO3		Design and implement web pages using PHP and MYSQL.												
	CO4		Design of web pages that can handle session tracking.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>		
	<b>CO1</b>			<b>H</b>											
	<b>CO2</b>					<b>H</b>									
	<b>CO3</b>					<b>M</b>									
	<b>CO4</b>							<b>M</b>		<b>H</b>					
	<b>CO5</b>				<b>M</b>						<b>M</b>				
<b>UNIT – I</b>															
<p><b>XHTML:</b> Introduction, Headers, Linking, Images, Special characters, Tables, Tables and formatting, Forms, Interlinking, Image maps, Meta Elements, Frames, Nested Frames.</p> <p><b>CASCADING STYLE SHEETS (CSS):</b> Introduction, Inline styles, Embedded style sheets, External Style Sheets, Positioning Elements, Backgrounds, Element Dimensions, Text flow and Box Model, User Style Sheets.</p> <p><b>Java Script:</b> Introduction to Scripting, Control Statements, Functions, Arrays, Objects.</p>															
<b>UNIT – II</b>															
<p><b>Introduction to Apache:</b> Apache Explained; Starting, Stopping and Restarting Apache.</p> <p><b>Configuration:</b> Modifying the Default Configuration.</p> <p><b>Securing Apache:</b> Set User and Group, Consider Allowing Access to Local Documentation, Don't Allow Public_html Web Site (Unless You want to), .htaccess, Remove server-status and server-info.</p> <p><b>Apache Log files:</b> Access control with .htaccess.</p> <p><b>Introduction to MySQL:</b> The SHOW DATABASE and CREATE DATABASE Commands, The USE Command, The CREATE TABLE and SHOW TABLES Commands, The DESCRIBE Command, The INSERT Command, The SELECT Command, The UPDATE Command, The DELETE Command, Some Administrative Details, Database Independent Interface, Table Joins, Loading and Dumping a Database.</p>															
<b>UNIT – III</b>															



**Language syntax:** Variables, Data types, Arrays, Web Variables, Operators, Flow control Constructs, Writing PHP functions.

**Built in PHP functions:** Important Functions, Array functions, String functions, Other functions.

**PHP and MYSQL:** MySQL Functions Part 1 & Part 2, More PHP MySQL Functions.

#### UNIT – IV

**Sessions and Authentication:** Introduction to Sessions, Definition of session, Perpetuation of a Session, Session Security, How PHP implements Sessions, Basic PHP Sessions, Limitations of Basic PHP Sessions.

#### Learning Resources

##### Text Books:

- [1] **“Internet and World Wide Web How To Program”**, Third Edition, H.M.Deitel, P.J.Deitel, A.B.Goldberg, PHI Pvt. Ltd., New Delhi (Unit-I).
- [2] **“Open Source Web Development with LAMP”**, James Lee and Brent Ware (Unit-II and Unit-III).
- “Professional PHP6”**, Ed Lecky-Thompson, Steven D.Nowicki, Thomas Myer(Unit-IV).

##### Reference Books:

- [1] C. Bates, **“Web Programming Building Internet Applications”**, Willey Dream Tech, 3rd edition, 2006.
- [2] Kevin Tatroe, Peter MacIntyre, **“Programming PHP”**, O'REILLY, 3rd Edition, 2013.
- [3] Adam Trachtenberg, David Sklar, **“PHP Cookbook: Solutions and Examples for PHP Programmers”**, O'REILLY, 2nd Edition, 2006.
- [4] Lucas Carlson, Leonard Richardson, **“Ruby Cookbook”**, O'REILLY, 2<sup>nd</sup> Edition, 2015.
- [5] Jay McGavren, **“Head First Ruby”**, O'REILLY, 2nd Edition, 2015.
- [6] Robert W. Sebesta, **“Programming the World Wide Web”**, Third Edition, Pearson Education (2007).
- [7] Chris Bates, **“Web Programming–Building Internet Applications”**, Second Edition, Wiley (2007).
- [8] Jeffrey C. Jackson, **“Web Technologies – A Computer Science Perspective”**, Pearson Education (2008).

##### Web Resources:

- [1] <https://nptel.ac.in/courses/106/106/106106222/>

**19MCA2351: DATABASE MANAGEMENT SYSTEMS LAB**

<b>Lecture :</b>	-	<b>Internal Assessment:</b>								40				
<b>Tutorial :</b>	-	<b>Final Examination:</b>								60				
<b>Practical:</b>	3 hrs/ week	<b>Credits:</b>								1.5				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Familiarize on different DDL Commands.												
	<b>CO2</b>	Identify the features of the DML commands.												
	<b>CO3</b>	Recognize the importance of DCL Commands.												
	<b>CO4</b>	Gain the knowledge of PL/SQL.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>		H	M										
	<b>CO2</b>		H	M										
	<b>CO3</b>		H	M										
	<b>CO4</b>		M			M								
<b>LAB CYCLE - I</b>														
1. List the products which have highest sales. 2. Find out the details of top 5 earners of company. 3. Determine the names of employee, who earn more than their managers. 4. Find the names of clients who have placed orders worth of Rs. 10,000/- or more. 5. Determine the names of employees, who take highest salary in their departments. 6. Find the names of clients who have placed orders before the month of may 2006. 7. Find the customer names and address for the clients, who placed the order ‘019001’. 8. Display names of the managers who is having maximum number of employees working under him. 9. Create a view, which contain employee names and their manager names working in sales department. 10. Find out if the product is ‘1.44 drive’ is ordered by any client and print the client number, name to whom it is sold.														
<b>LAB CYCLE – III</b>														
11. Queries using Aggregate functions. 12. Nested Queries using ANY, ALL, EXISTS, NOTEXISTS. 13. Nested Queries using UNION, INTERSECT. 14. Create a user. 15. Grant/Revoke Privileges on/from Tables.														

**LAB CYCLE - III**

- 16.Create predefined exceptions.
- 17.Create user-defined exceptions.
18. Create an index for fast access. 19.Lock table in Share/Exclusive mode.

**LAB CYCLE - IV**

- 20.Write a PL/SQL program to display top 10 rows in emp table based on their job and salary.
- 21.Write a PL/SQL procedure to read the data into table as per following description:  
EMP (Empno, Ename, Address(Object), Qualification, PhoneNum (varchar))
- 22.Write a PL/SQL program to update the salary of a given employee using cursors.

Salary	Increment
-----	-----
<=1000	5%
> 1000 & < = 2500	10%
> 2500 & < = 4000	20%
> 4000	30%

23. Write a recursive function to calculate the  $nC_R$  value.

**Learning Resources****Text Book:**

- [1] “Introduction to SQL”, Rick F.Vander Lans, Pearson education.

**Reference Books:**

- [1] “Oracle PL/SQL”, B.Rosenzweig and E.Silvestrova, Pearson education.
- [2] “Oracle PL/SQL Programming”, Steven Feuerstein, SPD.
- [3] “SQL & PL/SQL for Oracle 10g”, Black Book, Dr.P.S.Deshpande, Dream Tech.
- [4] “Oracle Database 11g PL/SQL Programming”, M. Mc Laughlin, TMH.

**Web Resources:**

- [1] <https://nptel.ac.in/courses/106/105/106105175/>

**19MCA2352: ADVANCED JAVA PROGRAMMING LAB**

Lecture :	-	Internal Assessment:					40							
Tutorial :	-	Final Examination:					60							
Practical:	3 hrs/ week	Credits:					1.5							
Learning Outcomes:	Upon successful completion of the course, the student will be able to:													
	CO1	Create swing based GUI applications.												
	CO2	Create Java applications that interact with database using JDBC.												
	CO3	Develop web applications with Servlets.												
	CO4	Develop web applications using JSP.												
Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
	CO1	H	L	L		H								
	CO2	M	M	M		H								
	CO3	M	M	M		H								
	CO4	M	M	M		H								
LAB CYCLE – I														
1. Write a swing program to create a login form that validates the user using the following components: JLabel, JTextField and JButton. 2. Write a sample swing application using ActionListener with the following components: JScrollPane, JList, JComboBox.														
LAB CYCLE – II														
3. Write a program by using JDBC to execute a SQL query for a database and display the results. 4. Write a program by using JDBC to execute an update query and display the results. 5. Write a program by using JDBC to execute an update query and display the results.														
LAB CYCLE - III														
6. Write a HttpServlet that will reads user name and prints “Hello <Your name > Welcome to Servlets concept ” in two ways. 1)Get 2)Post 7. Write a servlet program to display the data in a table using JDBC. 8. Write a servlet program to check username and password entered by the user in database and redirect the user based on authentication. 9. Demonstrate session tracking in servlets using sessions.														
LAB CYCLE – IV														
10. Write a JSP page to greet the user by writing a simple function by using scripting elements. 11. Write a JSP page that performs arithmetic operations accepting data from user. 12. Write a factorial program in JSP using include directive.														

**Learning Resources**

**Text Books:**

- [1] **“Java: The Complete Reference”**, Seventh Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi.
- [2] **“Professional Java Server Programming”**, J2EE 1.3 Edition, Subrahmanyam Allamaraju, Cedric Buest, APress Publications.

**Reference Books:**

- [1] Robert W. Sebesta, **“Programming the World Wide Web”**, Third Edition, Pearson Education.
- [2] Chris Bates, **“Web Programming–Building Internet Applications”**, Second Edition, Wiley.
- [3] Jeffrey C. Jackson, **“Web Technologies – A Computer Science Perspective”**, Pearson Education.

**Web Resources:**

- [1] <https://nptel.ac.in/courses/106/105/106105191/>

**19MCA2353: WEB DESIGN AND DEVELOPMENT LAB**

<b>Lecture :</b>	-	<b>Internal Assessment:</b>				40								
<b>Tutorial :</b>	-	<b>Final Examination:</b>				60								
<b>Practical:</b>	3 hrs/ week	<b>Credits:</b>				1.5								
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Design and implement web pages using XHTML, CSS, JavaScript.												
	<b>CO2</b>	Configuring the web server and develop web pages using PHP.												
	<b>CO3</b>	Design and implement web pages using PHP and MYSQL.												
	<b>CO4</b>	Design of web pages that can handle session tracking.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>			<b>H</b>										
	<b>CO2</b>					<b>H</b>								
	<b>CO3</b>					<b>M</b>								
	<b>CO4</b>							<b>M</b>		<b>H</b>				
	<b>CO5</b>				<b>M</b>									
<b>LAB CYCLE – I</b>														
1. Create an XHTML Document using frames dividing the page into three frames: Top frame, Left frame and Right frame. Top frame should contain a banner. Left frame containing menu with hyperlinks and pages to the links in the left frame must be loaded in Right frame initially this page contains description of frames.														
2. Create an XHTML Document that marks up your Resume using the XHTML tags.														
3. Write a XHTML Document using Inline, Internal and External Cascading Style Sheets.														
4. Design a Registration form using Form elements and validate it using JavaScript.														
5. Write a java script program using String, Date and Math Objects.														
<b>LAB CYCLE – II</b>														
6. Installation and configuration of scripting language.														
7. Develop web pages on making use of data types.														
8. Develop web pages that make use of operators.														
9. Develop web pages that make use of control structures.														
<b>LAB CYCLE – III</b>														
10. Develop web pages using arrays and functions.														
11. Develop web pages using string functions.														
12. Develop web pages to demonstrate form handling.														
13. Develop web page to fetch the data from MYSQL database.														

**LAB CYCLE – IV**

14. Develop web pages to demonstrate validation of forms/active record validation.  
Case study: Application Development that uses form validation.
15. Develop web pages Cookies and Sessions handling.  
Case study: Application Development using the language.

**Learning Resources****Text Books:**

- [1] **“Internet and World Wide Web How To Program”**, Third Edition, H.M.Deitel, P.J.Deitel, A.B.Goldberg, PHI Pvt. Ltd., New Delhi.
- [2] **“Open Source Web Development with LAMP”**, James Lee and Brent Ware..
- [3] **“Professional PHP6”**, Ed Lecky-Thompson, Steven D.Nowicki, Thomas Myer.

**Reference Books:**

- [1] C. Bates, **“Web Programming Building Internet Applications”**, Willey Dream Tech, 3rd edition, 2006.
- [2] Kevin Tatroe, Peter MacIntyre, **“Programming PHP”**, O'REILLY, 3rd Edition, 2013.
- [3] Adam Trachtenberg, David Sklar, **“PHP Cookbook: Solutions and Examples for PHP Programmers”**, O'REILLY, 2nd Edition, 2006.
- [4] Lucas Carlson, Leonard Richardson, **“Ruby Cookbook”**, O'REILLY, 2<sup>nd</sup> Edition, 2015.
- [5] Jay McGavren, **“Head First Ruby”**, O'REILLY, 2nd Edition, 2015.
- [6] Robert W. Sebesta, **“Programming the World Wide Web”**, Third Edition, Pearson Education (2007).
- [7] Chris Bates, **“Web Programming–Building Internet Applications”**, Second Edition, Wiley (2007).
- [8] Jeffrey C. Jackson, **“Web Technologies – A Computer Science Perspective”**, Pearson Education (2008).

**Web Resources:**

- [1] <https://nptel.ac.in/courses/106/106/106106222/>

**19MCA5354: PERSONALITY DEVELOPMENT COURSE  
(Logical Reasoning and English for Professionals)**

<b>Lecture :</b>	-	<b>Internal Assessment:</b>				100								
<b>Tutorial :</b>	-	<b>Final Examination:</b>				-								
<b>Practical:</b>	2 hrs/ week	<b>Credits:</b>				0								
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Assess their strengths and weaknesses, both in their personality development and productivity.												
	<b>CO2</b>	Solve problems in quantitative aptitude and reasoning.												
	<b>CO3</b>	Face interviews and group discussions with confidence and attain their realistic goals and objectives.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>							L	M					
	<b>CO2</b>							M	M				M	
	<b>CO3</b>							L	H	M				
<b>UNIT – I</b>														
<b>Introduction</b> – Introducing one self. “Shaping Young Minds” – A talk by Azim Premji – Listening activity and Discussion. R.C. Tips Self-Analysis, Developing Positive Attitude. Perception- Importance of analytical thinking. PPT – activity. <b>General Mental Ability:</b> Series completion; Coding and decoding ; Blood relations ; Puzzle test; Sequential output tracing ; Direction sense test; Logical Venn diagrams; Alphabet test														
<b>UNIT – II</b>														
<b>Communication skills</b> – Need and Methods. PPT – activity. Body Language – I, How to interpret and understand – PPT. Body Language – II, How to improve one’s body language. PPT – activity. Anger Management – PPT. Stress Management – steps to reduce – Practical tips. Time Management – Methods of using time effectively. <b>General Mental Ability:</b> Number, Ranking& time sequence test; Mathematical operations; Logical sequence of words; Arithmetical reasoning; Inserting the missing character. Data sufficiency; Assertion and reason; Verification of the truth of the statement.														
<b>UNIT – III</b>														
Social and Business etiquettes – Video clips. Telephone and etiquette. <b>Logic reasoning:</b> Statement- conclusions.														



**UNIT – IV**

Team Building – Leadership Qualities – Importance of a Team.

**Learning Resources****Text Books:**

- [1] Personality development - Wallace and Masters.
- [2] Winning at interview - Edgar Thorpe, Showick Thorpe.
- [3] Quantitative Aptitude - R. S. Aggarwal.
- [4] A Modern approach to Verbal and Non verbal reasoning - R.S.Aggarwal.

**Reference Books:**

- [1] Six thinking hats - Edward de Bono.
- [2] Communication skills in English - Shipa Sapre –Bharmal,Dinesh Kumar, Susmita Dey, Nilakshi Roy.
- [3] Technical communication - Principles and Practice - Meenakshi Raman, Sangeetha Sharma.
- [4] Personality Development and soft skills - Barun K. Mitra.

**Web Resources:**

- [1] <https://www.indiabix.com/aptitude/questions-and-answers/>
- [2] <https://www.indiabix.com/aptitude/clock/>
- [3] <https://www.indiabix.com/online-test/aptitude-test/>

**19MCA2401: DATA MINING**

<b>Lecture :</b>	3 hrs/ week					<b>Internal Assessment:</b>					40			
<b>Tutorial :</b>	-					<b>Final Examination:</b>					60			
<b>Practical:</b>	-					<b>Credits:</b>					3			
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Utilize a range of techniques for designing Data Mining and Data Warehousing Systems.												
	<b>CO2</b>	Familiarize with the functionality of the various data mining and Data Warehousing components.												
	<b>CO3</b>	Realize the strengths and limitations of various data mining and data warehousing models.												
	<b>CO4</b>	Recognize the ability of Cluster Analysis and Hierarchical Methods.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>				<b>H</b>	<b>L</b>							<b>M</b>	
	<b>CO2</b>	<b>L</b>	<b>M</b>		<b>H</b>	<b>L</b>								
	<b>CO3</b>	<b>M</b>	<b>M</b>		<b>H</b>	<b>M</b>							<b>L</b>	
	<b>CO4</b>	<b>H</b>	<b>M</b>		<b>H</b>	<b>M</b>							<b>M</b>	
<b>UNIT – I</b>														
<b>Data Mining:</b> Introduction, Why Data Mining? What is Data Mining? What kinds of Data can be Mined? What kinds of Patterns Can be mined? Which Technologies are used? Which kinds of applications are Targeted? Major issues in Data Mining. <b>Getting to Know Your Data:</b> Data Objects and Attribute Types, Measuring Data Similarity and Dissimilarity. <b>Data Preprocessing: Data Preprocessing an Overview,</b> Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.														
<b>UNIT – II</b>														
<b>Data Warehousing and Online Analytical Processing:</b> Data Warehouse: Basic Concepts. Data Warehouse Modeling: Data Cube and OLAP. Data Warehouse Design and usage. Data Warehouse Implementation.														
<b>UNIT – III</b>														
<b>Mining Frequent Patterns, Associations and Correlations-Basic concepts and Methods:</b> Basic Concepts. Frequent Itemset Mining Methods. <b>Classification: Basic Concepts:</b> Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification. <b>Classification Advanced Methods:</b> Bayesian Belief Networks, Classification by Backpropagation, Other Classification Methods.														

**UNIT – IV**

**Cluster Analysis: Basic Concepts and Methods:** Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Outlier Detection: Outliers and Outlier Analysis.

**Learning Resources****Text Book:**

- [1] Jiawei Han Micheline Kamber, “**Data Mining Concepts and Techniques**”, Morgan Kaufmann Publishers, Third Edition.

**Reference Books:**

- [1] S.N.Sivanandam, S.Sumathi, “**Data Mining – Concepts, Tasks and Techniques**”, Thomson (2006).  
[2] Ralph Kimball, “**The Data Warehousing Toolkit**”, Wiley.  
[3] Margaret H. Dunham, “**Data mining - Introductory and advanced topics**”, Pearson Education.  
[4] D.Hand, H. Mannila and P.Smyth, “**Principles of Data mining**”, PHI (2001).

**Web Resources:**

- [1] <https://nptel.ac.in/courses/106/105/106105174/>

**19MCA2402: CRYPTOGRAPHY AND NETWORK SECURITY**

<b>Lecture :</b>	3 hrs/ week				<b>Internal Assessment:</b>				40					
<b>Tutorial :</b>	1 hr/week				<b>Final Examination:</b>				60					
<b>Practical:</b>	-				<b>Credits:</b>				4					
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Familiarize the use of encryption in secure data transfer.												
	<b>CO2</b>	Recognize the use of authentication, confidentiality and Digital Signatures.												
	<b>CO3</b>	Understand the importance of internet/web security and secure electronic transactions.												
	<b>CO4</b>	Identify and investigate vulnerabilities and security threats and mechanisms to counter them												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>	M	H				M				H			
	<b>CO2</b>	M	M		M									
	<b>CO3</b>	L			M		M							
	<b>CO4</b>		H		M		H				H			
<b>UNIT – I</b>														
<b>Introduction:</b> The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security. <b>Classical Encryption Techniques:</b> Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography. <b>Block Cipher and the Data Encryption Standard:</b> Block Cipher Principles, The Data Encryption Standard. <b>Confidentiality Using Symmetric Encryption:</b> Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.														
<b>UNIT – II</b>														
<b>Public Key Cryptography and RSA:</b> Principles of Public Key Cryptosystems, The RSA Algorithm. <b>Key Management: Other Public-Key Cryptosystems:</b> Key Management, Diffie-Hellman Key Exchange. <b>Message Authentication and Hash Functions:</b> Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions. <b>Digital Signatures and Authentication Protocols:</b> Digital Signatures, Authentication Protocols, Digital Signature Standard.														

**UNIT – III**

**Authentication Applications:** Kerberos, X.509 Authentication Service, PKI.

**Email Security:** Pretty Good Privacy, S/MIME.

**IP Security:** IP Security Overview, IP security architecture, Authentication Header, Encapsulating Security Payload, Key Management.

**Web Security:** Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction.

**UNIT – IV**

**Intruders:** Intruders, Intrusion Detection, Password Management.

**Malicious Software:** Viruses and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks.

**Firewalls:** Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation.

**Learning Resources****Text Book:**

[1] William Stallings, “**Cryptography and Network Security**”, Fourth Edition, PHI.

**Chapters:** 1,2,3,7,9,10.1,10.2,11,13,14,15,16,17,18,19,20.

**Reference Books:**

[1] William Stallings, “**Network Security Essentials – Applications and Standards**”, Third Edition, Pearson Education (2007).

[2] Neal Krawetz, “**Introduction to Network Security**”, Thomson (2007).

[3] Behrouz A. Forouzan, “**Cryptography & Network Security**”, The McGraw-Hill Companies (2007)

**Web Resources:**

[1] <https://nptel.ac.in/courses/106/105/106105162/>

**19MCA2403: MOBILE APPLICATION DEVELOPMENT**

<b>Lecture :</b>	3 hrs/ week				<b>Internal Assessment:</b>				40				
<b>Tutorial :</b>	1 hr/week				<b>Final Examination:</b>				60				
<b>Practical:</b>	-				<b>Credits:</b>				4				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Understand the importance of mobiles, mobile operating systems, and Android market.											
	<b>CO2</b>	Analyse the use of activities, intents and fragments.											
	<b>CO3</b>	Implement user interface design with layouts, views & display pictures and menus with views.											
	<b>CO4</b>	Create database and store data in database to retrieve as per user criteria.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>						<b>H</b>	<b>M</b>					
	<b>CO2</b>		<b>H</b>										
	<b>CO3</b>					<b>H</b>							<b>M</b>
	<b>CO4</b>			<b>M</b>	<b>H</b>								
<b>UNIT – I</b>													
<p><b>Getting Started With Android Programming:</b> What Is Android? - Android Versions, Features of Android, Architecture of Android, Android Devices in the Market, The Android Market, The Android Developer Community.</p> <p>Setting up An Android Studio Development Environment, Creating Your First Android Application, Anatomy of an Android Application.</p> <p><b>Activities, Fragments, and Intents:</b> Understanding Activities - Applying Styles and Themes to an Activity, Hiding the Activity Title, Displaying a Dialog Window, Displaying a Progress Dialog, Displaying a More Sophisticated Progress Dialog.</p>													
<b>UNIT – II</b>													
<p><b>Activities, Fragments, and Intents:</b>Fragments-Adding Fragments Dynamically, Life Cycle of a Fragment, Interactions between Fragments. Calling Built-In Applications Using Intents - Understanding the Intent Object, Using Intent Filters, Displaying Notifications.</p> <p><b>Getting to know the Android User Interface:</b> Understanding the Components of a Screen - Views and ViewGroups, LinearLayout, AbsoluteLayout, TableLayout, RelativeLayout, FrameLayout, ScrollView.</p>													

**UNIT – III**

**Getting to know the Android User Interface:** Adapting to Display Orientation- Anchoring Views, Resizing and Repositioning. Utilizing the Action Bar - Adding Action Items to the Action Bar, Customizing the Action Items and Application Icon, Creating the User Interface Programmatically.

**Designing your User Interface with Views:** Using Basic Views - textView View, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup Views, ProgressBar View, AutoCompleteTextView View.

**UNIT – IV**

**Designing your User Interface with Views:** Using List Views to Display Long Lists- ListView View, Using the Spinner View.

**Displaying Pictures and Menus with Views:** Using Image Views to Display Pictures- Gallery and ImageView Views, Using Menus with Views- Creating the Helper Methods, Options Menu, Context Menu.

**Data Persistence:** Creating and Using Databases- Creating the DBAdapter Helper Class, Using the Database Programmatically, Pre-Creating the Database.

**Learning Resources****Text Book:**

- [1] “**Beginning Android 4 Application Development**”, Wei-Meng Lee, Wiley India (Wrox).

**Reference Books:**

- [1] “**Professional Android 4 Application Development**”, Reto Meier, Wiley India, (Wrox).  
 [2] “**Android Application Development for Java Programmers**”, James C Sheusi, Cengage Learning.  
 [3] Sam’s “**Teach Yourself Android Application Development in 24 Hrs**”, Lauren Darcy and Shane Conder, 2ed.  
 [4] “**Android apps for absolute beginners**”, Wallace Jackson, Apress.

**Web Resources:**

- [1] <https://nptel.ac.in/courses/106/106/106106147/>  
 [2] [www.ebookfrenzy.com/pdf\\_previews/AndroidStudioEssentialsPreview.pdf](http://www.ebookfrenzy.com/pdf_previews/AndroidStudioEssentialsPreview.pdf)  
 [Chapter 2 in the pdf - Setting up An Android Studio Development Environment (for Unit-I)]

**19MCA2404: DESIGN AND ANALYSIS OF ALGORITHMS**

<b>Lecture :</b>	3 hrs/ week				<b>Internal Assessment:</b>				40				
<b>Tutorial :</b>	1 hr/week				<b>Final Examination:</b>				60				
<b>Practical:</b>	-				<b>Credits:</b>				4				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Describe the divide-and-conquer paradigm and explain when a particular algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms, and analyze them.											
	<b>CO2</b>	Describe the greedy and dynamic programming paradigms and explain when a particular algorithmic design situation calls. Recite algorithms that employ the particular paradigm. Synthesize the greedy and dynamic programming algorithms, and analyze them.											
	<b>CO3</b>	Describe the backtracking and basic traversal and search paradigms and explain when a particular algorithmic design situation calls. Recite algorithms that employ the particular paradigm. Synthesize the backtracking and basic traversal and search algorithms, and analyze them.											
	<b>CO4</b>	Describe the branch-and-bound and NP-Hard and NP – Complete problems paradigms and explain when a particular algorithmic design situation calls. Recite algorithms that employ the particular paradigm. Synthesize the NP-Hard and NP – Complete problems algorithms, and analyze them.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	L	L	L		L						L	
	<b>CO2</b>	H	H	L		H							
	<b>CO3</b>	L	H	M		M						M	
	<b>CO4</b>		L			M							
<b>UNIT – I</b>													
<b>Introduction:</b> What is an algorithm, Algorithm Specification:Pseudocode Conventions, Recursive Algorithms; Performance Analysis: Space Complexity, Time Complexity, Asymptotic notations <b>Divide and Conquer:</b> General Method, Binary Search, Finding Maximum and Minimum, Merge Sort, Quick sort, Strassen’s Matrix Multiplication.													
<b>UNIT – II</b>													
<b>The Greedy Method:</b> The general method, Knapsack Problem, Job sequencing with deadlines; Minimum cost spanning trees: Prim’s Algorithm, Kruskal’s Algorithm; Optimal Storage on tapes, Optimal Merge patterns, Single Source shortest paths. <b>Dynamic Programming:</b> The general method, Multistage graphs, All-Pairs shortest paths, Single source shortest paths, , 0/1 Knapsack Problem, The Traveling Salesperson Problem.													



**UNIT – III**

**Basic Traversal and Search Techniques:** Techniques for Binary Trees, Techniques for graphs: Breadth First Search, Depth First Search traversals; Connected Components and Spanning Trees.

**Backtracking:** The general method, The 8-Queens problem, Sum of Subsets, Graph coloring, Hamiltonian cycles.

**UNIT – IV**

**Branch and Bound:** The Method: Least Cost search, Control abstractions for LC search, Bounding, FIFO Branch and Bound, LC Branch and Bound; LC Branch and Bound solution, FIFO Branch and Bound solution, Traveling Salesperson problem.

**NP-Hard and NP – Complete problems:** Basic concepts: Non deterministic algorithms, The classes NP hard and NP Complete.

**Learning Resources****Text Book:**

- [1] Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran “**Fundamentals of Computer Algorithms**”, Second Edition, Universities Press (2008).  
**Chapters:** 1,3,4,5,6,7,8 and 11.

**Reference Books:**

- [1] Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “**Introduction to Algorithms**”, Second Edition, McGraw Hill.  
 [2] Anany Levitin, “**Introduction to the Design and Analysis of Algorithms**”, Second Edition, Pearson Education (2007).

**Web Resources:**

- [1] <https://nptel.ac.in/courses/106/101/106101060/>  
 [2] <http://www.nptelvideos.in/2012/11/design-analysis-of-algorithms.html>

## 19MCA2405A: ARTIFICIAL INTELLIGENCE

<b>Lecture :</b>	3 hrs/ week					<b>Internal Assessment:</b>					40				
<b>Tutorial :</b>	-					<b>Final Examination:</b>					60				
<b>Practical:</b>	-					<b>Credits:</b>					3				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:														
	<b>CO1</b>		Use logic as a representation and reasoning strategy for AI effectively.												
	<b>CO2</b>		Understand the representation schemas such as Procedural Representations, Network Representations and Structured Representations and apply these to case studies.												
	<b>CO3</b>		Select and apply a variety of graph search algorithms underpinning AI applications.												
	<b>CO4</b>		Undertake efficient searches and interpret the results of such searches.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>		
	<b>CO1</b>					M									
	<b>CO2</b>											H			
	<b>CO3</b>	M													
	<b>CO4</b>				M										
<b>UNIT – I</b>															
<b>What is AI:</b> The AI Problems, The Underlying Assumption, What is AI Technique? The level of the Model, Criteria for Success. <b>Problems, Problem spaces &amp; Search:</b> Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the design of Search Programs, Additional Problems. <b>Heuristic Search Techniques:</b> Generate and Test, Hill Climbing, Best First Search, Problem Reduction, Constraint Satisfaction, Means Ends Analysis.															
<b>UNIT – II</b>															
<b>Knowledge Representation Issues:</b> Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation, The Frame Problem. <b>Using Predicate Logic:</b> Representing Simple Facts in Logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution, Natural Deduction. <b>Representing knowledge using Rules:</b> Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge.															
<b>UNIT – III</b>															

**Symbolic Reasoning under Uncertainty:** Introduction to Nonmonotonic Reasoning, Logics for Nonmonotonic Reasoning, Implementation Issues, Augmenting a Problem Solver, Implementation: Depth-First Search, Implementation: Breadth-First Search.

**Weak slot & filler Structures:** Semantic Nets, Frames.

**Planning :** Overview, An Example Domain : The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.

#### UNIT – IV

**Natural Language Processing:** Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing

**Commonsense:** Qualitative Physics, Commonsense Ontologies, Memory Organisation, Case-Based Reasoning.

**Expert Systems:** Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

#### Learning Resources

**Text Book:**

- [1] Elaine Rich, Knight K, “**Artificial Intelligence**”, TMH (1991)

**Chapters:** 1 through 7, 9, 13, 15, 10 and 20.

**Reference Books:**

- [1] Michael Negnevitsky, “**Artificial Intelligence – A Guide to Intelligent Systems**”, Second Edition, Pearson Education (2008).  
[2] Winston P.H, “**Artificial Intelligence**”, Addison Wesley (1993).

**Web Resources:**

- [1] <https://nptel.ac.in/courses/106/105/106105077/>

## 19MCA2405B: COMPUTER GRAPHICS

<b>Lecture :</b>	3 hrs/ week				<b>Internal Assessment:</b>				40				
<b>Tutorial :</b>	-				<b>Final Examination:</b>				60				
<b>Practical:</b>	-				<b>Credits:</b>				3				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Understand the overview of recent advances in Computer Graphics including applications of computer graphics.											
	<b>CO2</b>	Implement various algorithms for Generating Line, Circle and Ellipse and also familiarize with Aliasing & Anti aliasing techniques.											
	<b>CO3</b>	Implement 2D Geometric transformations on graphics objects and also understanding various clipping operations & 2D viewing concepts.											
	<b>CO4</b>	Design basic graphics application programs including animations. Understand the basic concept of Multimedia & its applications and also make acquainted with 3D Geometric Transformations & Projections.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	M						L					
	<b>CO2</b>			M				L					
	<b>CO3</b>			M				L					
	<b>CO4</b>			M		H		L					
<b>UNIT – I</b>													
<b>Overview of Computer Graphics:</b> Introduction to Computer graphics & its applications, Video Display Devices, Raster Scan Displays, Random Scan Displays, Color CRT Monitors, Direct View Storage Tubes, Flat Panel Displays, Raster Scan Systems, Random Scan Systems, Input Devices & output Devices.													
<b>Graphical User Interfaces and Interactive Input Methods:</b> The User Dialogue, Windows and Icons, Input of Graphical Data, Input Functions.													
<b>UNIT – II</b>													
<b>Output Primitives:</b> Points and Lines, Line-Drawing Algorithms: DDA Algorithm, Bresenham's Line Algorithm, Circle Generation Algorithms, Ellipse Generation Algorithms.													
<b>Attributes of output Primitives:</b> Line Attributes, Area Fill Attributes, Character Attributes, Bundled Attributes, Ant aliasing													
<b>UNIT – III</b>													
<b>Two Dimensional Geometric Transformations:</b> Basic Transformations, Matrix Representation and Homogenous Coordinates, Composite Transformations, Other Transformations.													
<b>Two Dimensional Viewing:</b> The Viewing pipeline, Viewing Coordinates Reference Frame, Window to Viewport Coordinate Transformations, Two Dimensional Viewing Functions, Clipping Operations, Point Clipping, Line Clipping: Cohen-Sutherland Line Clipping, Polygon Clipping: Sutherland-Hodgeman Polygon Clipping, Curve Clipping, Text Clipping, Exterior Clipping.													

**UNIT – IV**

**Three-Dimensional Object Representations:** Polygon Surfaces, Quadric Surfaces, Super quadrics.

**Three Dimensional Geometric and Modeling Transformations:** Translation, Rotation, Scaling, Composite Transformations, Three-Dimensional Transformation Functions, Projections.

**Animations:** Creating Animations: Creating Keyframes, Layers in Animation, Steps for Creating Animation, Frame-by-Frame Animation, Tweened Animations.

**Multimedia:** Introduction to Multimedia, Multimedia Applications, Building Blocks of Multimedia, Visual elements, Sound Elements, Multimedia storage.

**Learning Resources****Text Books:**

- [1] “**Computer Graphics**”, 2nd Edition, Donald Hearn and M.Pauline Baker, PHI/Pearson Education. (UNIT - I, II, III).
- [2] “**Computer Graphics, Multimedia and Animation**”, Malay K. Pakhira, PHI Publications. (UNIT - IV).

**Reference Books:**

- [1] “**Computer Graphics C Version**”, Donald Hearn and M.Pauline Baker, Pearson Education.
- [2] “**Computer Graphics 2nd Edition**”, Zhigand xiang, Roy Plastock, Schaum’s outlines, Tata Mc-Graw hill edition.
- [3] “**Procedural elements for Computer Graphics**”, David F Rogers, Tata Mc Graw hill, 2nd Edition

**Web Resources:**

- [1] <https://nptel.ac.in/courses/106/106/106106090/>
- [2] <http://www.mhhe.com/ansinha/cg>

**19MCA2405C: DISTRIBUTED SYSTEMS**

<b>Lecture :</b>	3 hrs/ week					<b>Internal Assessment:</b>					40		
<b>Tutorial :</b>	-					<b>Final Examination:</b>					60		
<b>Practical:</b>	-					<b>Credits:</b>					3		
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	List the principles of distributed systems and describe the problems and challenges associated with these principles											
	<b>CO 2</b>	Understand Distributed Computing techniques, Synchronous and Processes											
	<b>CO 3</b>	Design a distributed system that fulfills requirements with regards to key distributed systems properties.											
	<b>CO 4</b>	Apply Distributed web-based system.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	L	M	H									
	<b>CO2</b>	M	M	M									
	<b>CO3</b>			H								M	
	<b>CO4</b>	M		H									
<b>UNIT – I</b>													
<b>Introduction:</b> Definition of a Distributed System, Goals, Hardware Concepts, Software Concepts, The Client-Server. <b>Communication:</b> Layered Protocols, Remote Procedure Call- Basic RPC Operation, Parameter Passing, Extended RPC Models, Remote Object Invocation - Distributed Objects, Binding a Client to an Object, Static versus Dynamic Remote Method Invocations, Parameter Passing.													
<b>UNIT – II</b>													
<b>Processes:</b> Threads, Clients, Servers, Code Migration, Software Agents. <b>Naming:</b> Naming Entities -Names, Identifiers and Addresses, Name Resolution, The Implementation of a Name Space. Locating Mobile Entities, Removing Unreferenced Entities.													
<b>UNIT – III</b>													
<b>Synchronization:</b> Clock Synchronization. Logical Clocks, Global State, Election Algorithms, Mutual Exclusion, Distributed Transactions. <b>Consistency and Replication:</b> Introduction, Data- Centric Consistency Models, Client –Centric Consistency Models, Distribution Protocols, Consistency Protocols.													
<b>UNIT – IV</b>													
<b>Fault Tolerance:</b> Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery. <b>Distributed File Systems:</b> Sun Network File System, The Coda File System.													

**Learning Resources**

**Text Book:**

- [1] Andrew S. Tanenbaum, Maarten Van Steen, “**Distributed Systems: Principles and Paradigms**”, 2002, Pearson Education/PHI.

**Reference Books:**

- [1] “**Distributed Systems: Principles and Paradigms**, A S Tanenbaum & MartiSteen”, 2/E, PHI, 2006.  
[2] “**Distributed Systems Concepts & Design**”, Colouris, Dollimore, Kindberg, Pearson, 4/Ed. 2005.

**Web Resources:**

- [1] <https://nptel.ac.in/courses/106/106/106106107/>

**19MCA2405D: OPTIMIZATION TECHNIQUES**

<b>Lecture :</b>	3 hrs/ week				<b>Internal Assessment:</b>				40				
<b>Tutorial :</b>	-				<b>Final Examination:</b>				60				
<b>Practical:</b>	-				<b>Credits:</b>				3				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.											
	<b>CO2</b>	Solve the problem of transporting the products, assigning jobs with minimum cost and understand the dynamic programming											
	<b>CO3</b>	Identify the optimal strategies for the players to win a game and optimal sequence for sequencing and scheduling problems.											
	<b>CO4</b>	Assess the resources required for a project and produce a plan and work schedule in an optimal way.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>		<b>H</b>			<b>H</b>							
	<b>CO2</b>		<b>H</b>			<b>L</b>							
	<b>CO3</b>		<b>H</b>			<b>L</b>		<b>L</b>					
	<b>CO4</b>		<b>H</b>					<b>L</b>	<b>H</b>			<b>L</b>	
<b>UNIT – I</b>													
<b>Linear Programming:</b> Introduction, Formulation of Linear Programming Problems, Graphical method, Standard form, Simplex method, Big-M method, Two-phase method, Dual simplex method.													
<b>UNIT – II</b>													
<b>Transportation Problem:</b> Introduction, Mathematical formulation, Basic feasible solution by Matrix minima method, Vogel’s approximation method, Optimal solution by (uv-method) Modi method, Unbalanced Transportation problem. <b>Assignment problem:</b> Formulation, Hungarian method, Maximal Assignment problem, Unbalanced Assignment problem.													
<b>UNIT – III</b>													
<b>Theory of Games:</b> Introduction, Characteristics of game theory, Minimax & Maximin principles, Saddle point, Optimal strategies and value of the game, Solution of 2x2 game, Dominance property, Graphical method for 2xn and mx2 games. <b>Sequencing and Scheduling:</b> Introduction, Johnson’s algorithm, Problems with n jobs and two machines, n jobs and m machines.													



**UNIT – IV**

**Project Management:** Introduction, PERT and CPM , Rules for drawing network diagram, Time Estimates and critical path in network analysis, Forward pass computations, Backward pass computations, Determination of floats and slack times, Determination of critical path, Project Evaluation and Review Technique

**Learning Resources****Text Book:**

- [1] “Operations Research”, S.D.Sharma, Kedarnath Co, Meerut.

**Reference Books:**

- [1] “Operations Research, An introduction”, 8/e, Taha, Pearson.  
[2] “Operations Research”, 2/e, Panneerselvam.  
[3] “Operations Research theory and applications”, 3/e, JK Sharma, McMillan.

**Web Resources:**

- [1] <https://nptel.ac.in/courses/111/107/111107128/>

## 19MCA2451: .NET LAB

<b>Lecture :</b>	-	<b>Internal Assessment:</b>										40		
<b>Tutorial :</b>	-	<b>Final Examination:</b>										60		
<b>Practical:</b>	3 hrs/ week	<b>Credits:</b>										1.5		
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Describe the purpose of the .NET Framework, and explain how to use Microsoft Visual C# and Visual Studio 2010 to build .NET Framework applications.												
	<b>CO2</b>	Familiarize with syntax of basic C# programming constructs, how to create and call methods, how to catch, handle, and throw exceptions, how to perform basic file I/O operations in a Visual C# application.												
	<b>CO3</b>	Design and configure numerous aspects of an ASP.NET application effectively.												
	<b>CO4</b>	Familiarize how to display and modify data from a database by using ADO.NET with ASP.NET Web controls, manipulate and update data using ADO.NET DataSets effectively.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>			<b>H</b>										
	<b>CO2</b>			<b>H</b>						<b>M</b>		<b>M</b>		
	<b>CO3</b>			<b>H</b>						<b>M</b>		<b>M</b>		
	<b>CO4</b>			<b>H</b>						<b>M</b>		<b>M</b>		
<b>LAB CYCLE – I (VB.NET)</b>														
1. Develop an application for facilitating purchasing order. 2. Develop an application which is similar to login form including the progress bar controls. 3. Develop an application using font dialog control. 4. Develop an application using color dialog control. 5. Develop an application using the data reader to read from a database.														
<b>LAB CYCLE – II (ASP.NET)</b>														
1. Design an application by using the compare validator to test values against control values. 2. Design an application using the grid view control in an ASP.Net web page. 3. Design an application for adding an insert command to the SQL data source control. 4. Design a web site using the concept of master pages.														
<b>LAB CYCLE – III (C#.NET)</b>														
1. Develop a project for demonstrating polymorphism, abstraction. 2. Develop a project for demonstrating switch statements. 3. Develop a project for implementing inheritance using abstract classes. 4. Develop a project for implementing interfaces using multiple inheritance.														

**UNIT – IV**

1. Create a form which displays the given inputs in the form of a tree view structure.
2. Develop a project for implementing exception handling in C#.
3. Develop a project which displays the student information in the relevant fields from the database which already exists.

**Learning Resources**

**Text Books:**

- [1] Xue Bai, Michael Ekedah, “**The Web Warrior Guide to Web Programming**”, Thomson.
- [2] Kogent Solutions Inc., “**.Net Programming**”, Black Book, Dream Tech (2008).

**Reference Books:**

- [1] Joe Duffy, “**Professional.Net Programming 2.0**”, Wiley.
- [2] George Shepherd, “**ASP.NET 3.5 Microsoft**”, PHI (2008).

**Web Resources:**

- [1] <http://www.asp.net/>
- [2] <http://www.andymcm.com/dotnetfaq.htm>
- [3] <http://www.codeproject.com/kb/dotnet/>
- [4] <http://www.worldofdotnet.net/>
- [5] <http://www.csharp-station.com/Links.aspx>
- [6] <http://msdn.microsoft.com/en-gb/netframework/>

**19MCA2452: DATA MINING LAB**

Lecture :	-	Internal Assessment:				40							
Tutorial :	-	Final Examination:				60							
Practical:	3 hrs/ week	Credits:				1.5							
Learning Outcomes:	Upon successful completion of the course, the student will be able to:												
	CO1	Get acquaintance with data mining tools and implement different methods of preprocessing data.											
	CO2	Understand the association rule mining concepts of data mining.											
	CO3	Implement multiple classification algorithms.											
	CO4	Implement and analyze clustering algorithms for different datasets.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1				H	L							M
	CO2	L	M		H	L							
	CO3	M	M		H	M							L
	CO4	H	M		H	M							M
LAB CYCLE – I													
1. Introduction to weka and rapid miner tool. 2. Create a dataset and apply preprocessing techniques like Data cleaning. 3. Application of Association rule mining using apriori algorithm.													
LAB CYCLE – II													
4. Application of Association rule mining using FP Growth algorithm. 5. Implementation of classification technique using Decision trees. 6. Demonstration of classification technique using Naive Bayesian classifier													
LAB CYCLE - III													
7. Exhibiting clustering process using simple k-means and k-medians algorithm. 8. Evaluation of clustering process using DBSCAN algorithm													
LAB CYCLE – IV													
9. Demonstration of clustering process using BIRCH algorithm 10. Analysing the clustering algorithms													

**Learning Resources**

**Text Book:**

- [1] **“RapidMiner: Data Mining Use Cases and Business Analytics Applications”** (Chapman & Hall/CRC Data Mining and Knowledge Discovery Series) - Markus Hofmann and Ralf Klinkenberg.

**Reference Books:**

- [1] **“Data Mining: Practical Machine Learning Tools and Techniques”**, Second Edition (Morgan Kaufmann Series in Data Management Systems) 2nd Edition –Ian H.Witten and Eibe Frank.
- [2] J. Han and M. Kamber, **“Data Mining Concepts and Techniques”**, 2 ed, Elseiver Publishers.
- [3] A. K. PUJARI, **“Data Mining Techniques”** University Press.

**Web Resources:**

- [1] <http://www.cs.waikato.ac.nz/ml/weka/>

**19MCA2453: MOBILE APPLICATION DEVELOPMENT LAB**

<b>Lecture :</b>						<b>Internal Assessment:</b>					40			
<b>Tutorial :</b>	-					<b>Final Examination:</b>					60			
<b>Practical:</b>	3 hrs/ week					<b>Credits:</b>					1.5			
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Build custom android applications.												
	<b>CO2</b>	Design and develop apps with good user interface by using menus and views.												
	<b>CO3</b>	Design and develop apps with pictures and action bars.												
	<b>CO4</b>	Develop apps that store data in files and databases.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>					<b>H</b>								
	<b>CO2</b>		<b>H</b>											
	<b>CO3</b>					<b>H</b>							<b>M</b>	
	<b>CO4</b>					<b>H</b>						<b>M</b>		
<b>LAB CYCLE – I</b>														
1. Understand the architecture of Android, features of android, and Android versions. 2. Installation of the required software: JDK, Android SDK, and Eclipse IDE. 3. Create an Android application that shows “Welcome to Android” and run it on the emulator.														
<b>LAB CYCLE – II</b>														
4. Create an application that displays a dialog window using an activity. 5. Create an application that displays the progress of an operation. 6. Create an application that obtains result from an activity. 7. Create an application that dynamically adds a fragment.														
<b>LAB CYCLE – III</b>														
8. Create a screen that has input boxes for Name, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. 9. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout. 10. Create an application that uses the basic views of Android.														
<b>LAB CYCLE – IV</b>														
11. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.														

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| 12. Create a user registration application that stores the user details in a database table.<br>13. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user. |
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<b><u>Learning Resources</u></b>
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<b>Web Resources:</b>
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<a href="https://nptel.ac.in/courses/106/106/106106156/">[1] https://nptel.ac.in/courses/106/106/106106156/</a>
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## 19MCA4454: TERM PAPER

<b>Lecture :</b>	-	<b>Internal Assessment:</b>				40							
<b>Tutorial :</b>	-	<b>Final Examination:</b>				60							
<b>Practical:</b>	2 hrs/week	<b>Credits:</b>				1							
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Choose the topic in the domain of interest in order to study literature.											
	<b>CO2</b>	Analyze the selected topic and organize the content.											
	<b>CO3</b>	Summarize and communicate the content to audience in an effective manner.											
	<b>CO4</b>	Practice the learning by self study.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	L	M	M									
	<b>CO2</b>	M	M	H	M								
	<b>CO3</b>	M	M	H	M								
	<b>CO4</b>	M	M	H									



**19MCA5455: PERSONALITY DEVELOPMENT COURSE**  
**(Aptitude and Campus Recruitment Training)**

<b>Lecture :</b>	-	<b>Internal Assessment:</b>					100							
<b>Tutorial :</b>	-	<b>Final Examination:</b>					-							
<b>Practical:</b>	2 hrs/ week	<b>Credits:</b>					0							
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	Assess their strengths and weaknesses, both in their personality development and productivity.												
	<b>CO2</b>	Solve problems in quantitative aptitude and reasoning.												
	<b>CO3</b>	Would face interviews and group discussions with confidence and attain their realistic goals and objectives.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>						<b>L</b>	<b>H</b>	<b>M</b>		<b>M</b>			
	<b>CO2</b>						<b>L</b>	<b>M</b>	<b>M</b>		<b>H</b>			
	<b>CO3</b>						<b>M</b>	<b>M</b>	<b>M</b>		<b>M</b>		<b>H</b>	
<b>UNIT – I</b>														
Introduction to topics. Vocabulary: Analogies. Sentence Completion – Sentence-Course of Action. Sentences – Assumptions, Correction of sentences. Analogy, Sentence and Arguments, Sentence and Conclusion. Paragraph Writing. <b>Arithmetical ability:</b> Numbers; H.C.F &L.C.M of numbers; Averages; Problem on numbers; Problem on ages; Percentages.														
<b>UNIT – II</b>														
Group Discussion – How to present yourself. Group Discussion – Activity practical sessions with PPTs. <b>Arithmetical ability:</b> Profit& loss; Ratio& Proportion; Partnership; Chain rule; Time& work; Pipes & cisterns.														
<b>UNIT – III</b>														
Letter Writing – Formal and Informal. CV/Resume with Practice Session. <b>Arithmetical ability:</b> Time & Distance; Problems on trains; boats & Streams; Allegation OR mixtures; Simple interest; compound interest; Area.														

**UNIT – IV**

Interview Questions – Problem questions and Answers.

Interview- Practice session with student activity and video clips.

**Arithmetical ability:** Calendar; Clocks; Permutations & Combinations; Probability.

**Data interpretation:** Bar graph, pie chart, Line graph, table method.

**Learning Resources****Text Books:**

- [1] Personality development - Wallace and Masters.
- [2] Winning at interview - Edgar Thorpe, Showick Thorpe.
- [3] Quantitative Aptitude - R. S. Aggarwal.
- [4] A Modern approach to Verbal and Non verbal reasoning - R. S. Aggarwal.

**Reference Books:**

- [1] Six thinking hats - Edward de Bono.
- [2] Communication skills in English - Shipa Sapre – Bharmal, Dinesh Kumar, Susmita Dey, Nilakshi Roy.
- [3] Technical communication - Principles and Practice - Meenakshi Raman, Sangeetha Sharma.
- [4] Personality Development and soft skills - Barun K. Mitra.

**Web Resources:**

- [1] <https://www.indiabix.com/aptitude/questions-and-answers/>
- [2] <https://www.indiabix.com/aptitude/clock/>
- [3] <https://www.indiabix.com/online-test/aptitude-test/>

## 19MCA2501: PYTHON PROGRAMMING

Lecture	3 hrs/week	Internal Assessment		40											
Tutorial		Final Examination		60											
Practical	-	Credits		3											
Course Outcomes	Upon successful completion of the course, the student will be able to														
	CO1	Understand the basic concepts in development of applications using Python.													
	CO2	Create and use different libraries in Python.													
	CO3	Implement handling exceptions and files.													
	CO4	Implement basic data structures in Python.													
Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)		P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2
	CO1	M	L	L		L		M							
	CO2	H	M	M		H		M							
	CO3	L	M	M		H		M							
	CO4	M	M	M		H		M							
UNIT – I															
<b>Introduction:</b> Creativity and motivation, Computer hardware architecture, Understanding programming, Words and sentences, Conversing with Python, Terminology: interpreter and compiler, Writing a program, What is a program?, The building blocks of programs, What could possibly go wrong? <b>Variables, expressions and statements:</b> Values and types, Variables, Variable names and keywords, Statements, Operators and operands, Expressions, Order of operations, Modulus operator, String operations, Asking the user for input, Comments, Choosing mnemonic variable names. <b>Conditional execution:</b> Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Catching exceptions using try and except, Short-circuit evaluation of logical expressions.															
UNIT – II															
<b>Functions Calls:</b> Built-in functions, Type conversion functions, Random numbers, Math functions, Adding new functions, Definitions and uses, Flow of execution, Parameters and arguments, Fruitful functions and void functions, Why functions? <b>Iteration:</b> Updating variables, The while statement, Infinite loops, “Infinite loops” and break, Finishing iterations with continue, Definite loops using for, Loop patterns.															
UNIT – III															
<b>Strings:</b> A string is a sequence, Getting the length of a string using len, Traversal through a string with a loop, String slices, Strings are immutable, Looping and counting, The in operator,															

String comparison, String methods, Parsing strings, Format operator.

**Files:** Persistence, Opening files, Text files and lines, Reading files Searching through a file, Letting the user choose the file name, Using try, Except, and Open, Writing files.

#### UNIT – IV

**Lists:** A list is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Deleting elements, Lists and functions, Lists and Strings, Parsing lines, Objects and values, Aliasing, List arguments.

**Dictionaries:** Dictionary as a set of counters, Dictionaries and files, Looping and Dictionaries.

**Tuples:** Tuples are immutable, Comparing tuples, Tuple assignment, Dictionaries and tuples, Multiple assignment with dictionaries, The most common words example.

#### Learning Resources

##### Text Book:

- [1] Charles Severance, “**Python for Informatics**”, Exploring Information.(Unit I – Chapters: 1,2,3 Unit II – Chapters: 4,5 Unit III – Chapters: 6,7 and Unit IV – Chapters: 8,9,10)

##### Reference Books:

- [1] **Head First Python: A Brain-Friendly**, Paul Barry, 2017.  
 [2] Allen Downey "Think Python, How to Think Like a Computer Scientist", 2nd edition, Green Tea Press, 2015  
 [3] Mark Lutz, — **Learning Python**, 5th Edition , O’Rielly Media, 2017

##### Web Resources:

- [1] <https://www.coursera.org/course/pythonlearn>  
 [2] <https://www.edx.org/course/introduction-computer-science-mitx-6-00-1x-0>  
 [3] <https://www.thenewboston.com/videos.php?cat=36>  
 [4] <http://diveintopython.org/>

**19MCA2501: BIG DATA ANALYTICS**

<b>Lecture :</b>	3 hrs/ week	<b>Internal Assessment:</b>	40
<b>Tutorial :</b>	-	<b>Final Examination:</b>	60
<b>Practical:</b>	-	<b>Credits:</b>	3

<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	It is expected that the students familiarize with traditional business intelligence and Big Data.											
	<b>CO2</b>	It is expected that the students recognize the challenges facing Big Data.											
	<b>CO3</b>	It is expected that learners identify the features of Hadoop and HDFS.											
	<b>CO4</b>	It is expected that the students able to differentiate RDBMS and Hadoop.											

<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>			M									
	<b>CO2</b>		H			H			H				
	<b>CO3</b>		H								M		
	<b>CO4</b>				M			L					

**UNIT – I**

**Types of Digital Data:** Classification of Digital Data.

**Introduction to Big Data:** Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, What is Big Data? Other Characteristics of Data which are not Definitional Traits of Big Data, Why Big Data? Are we just an Information Consumer or Do We also Produce Information?, Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment, A Typical Hadoop Environment, What is New Today? What is changing in Realms of Big Data?

**Big Data Analytics:** Where do we Begin?, What is Big Data Analytics?, What Big Data Analytics isn't?, Why this Sudden Hype Around Big Data Analytics?, Classification of Analytics, Greatest Challenges that Prevent Businesses from Capitalizing on Big Data, Top Challenges Facing Big Data, Why is Big Data Analytics Important?, What Kind of Technologies are we Looking Toward to Help Meet the Challenges Posed by Big Data?, Data Science, Data Scientist, Terminologies Used in Big Data Environments, Basically Available Soft State Eventual Consistency, Few Top Analytics Tools

**UNIT – II**

**The Big Data Technology Landscape:** NoSQL, Hadoop.

**Introduction to Hadoop:** Introducing Hadoop, Why Hadoop?, Why not RDBMS?, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Use Case of Hadoop, Hadoop Distributors, HDFS, Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN, Interacting with Hadoop Ecosystem.

**UNIT – III**

**Understanding MapReduce Fundamentals and HBase:** The MapReduce Framework, Techniques to Optimize MapReduce Jobs, Uses of MapReduce, Role of HBase in Big Data Processing.

**Understanding Big Data Technology Foundations:** Exploring the Big Data Stack, Virtualization and Big Data, Virtualization Approaches.

**UNIT – IV**

**Storing Data in Databases and Data Warehouses:** RDBMS and Big Data, Non-Relational Database, Polyglot Persistence, Integrating Big Data with Traditional Data Warehouses, Big Data Analysis and Data Warehouse, Changing Deployment Models in Big Data Era.

**Storing Data in Hadoop:** Introducing HDFS, Introducing HBase, Combining HBase and HDFS, Selecting the Suitable Hadoop Data Organization for Applications.

**Learning Resources**

**Text Books:**

- [1] Seema Acharya, Subhashini Chellappan, “**BIG DATA AND ANALYTICS**”, Wiley Publications (2015)  
**UNIT I:** Chapters: 1, 2, 3  
**UNIT II:** Chapters: 4, 5
- [2] “**BIG DATA Black Book**”, DT Editorial Services, DreamTech Press (2015)  
**UNIT III:** Chapters: 5, 6  
**UNIT IV:** Chapters: 7, 8

**Reference Books:**

- [1] “**Business Intelligence – Practice, Technologies and Management**”, Rajiv Sabherwal, Irma Becerra – Fernandez, John Wiley 2011.
- [2] “**Business Intelligence Roadmap**”, Lariss T.Moss, ShakuAtre, Addison-Wesley It Service.
- [3] “**Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting**”, Yuli Vasiliev, SPD Shroff, 2012.

## 19MCA2503A : MACHINE LEARNING

Lecture	3 hrs/week					Internal Assessment					40				
Tutorial	1 hr/week					Final Examination					60				
Practical	-					Credits					4				
Learning Outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Recognize the characteristics of machine learning, binary classification.													
	CO2	Apply the algorithms to a real problem													
	CO3	Understand a wide variety of learning algorithm													
	CO4	Analyze Genetic and Neural network algorithms.													
Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)		P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2
	CO1			M					H						
	CO2		H			M									
	CO3		M												
	CO4				M			M							
UNIT – I															
<b>Introduction to Machine Learning:</b> Human learning and its types; Machine Learning and its types; Well posed learning problem; Applications of machine learning; Issues in machine learning <b>Feature Engineering:</b> Feature construction; Feature extraction –PCA, SVD, LDA; Feature selection															
UNIT – II															
<b>Bayesian concept learning:</b> Bayes theorem- prior and posterior probability likelihood; concept learning; Bayesian Belief network <b>Supervised Learning:</b> Regression-Linear , polynomial ,logistic															
UNIT – III															
<b>Supervised Learning:</b> KNN, Decision trees, SVM <b>UnSupervised Learning:</b> Clustering-K-Means, DBSCAN															
UNIT – IV															
<b>Basics of Neural Networks:</b> Understanding biological neuron and artificial neuron; types of activation functions; early implementations-McCulloch Pitt’s, Rosenblatt’s perception, ADALINE: Architectures of neural network; learning process in ANN; Backpropagation.															

**Learning Resources**

**Text Book:**

- [1] **Machine Learning** by Saikat Dutt , Subramanian Chandramouli , Amit Kumar Das,Pearson,2019

**Reference Books:**

- [1] Tom M.Mitchell, “**Machine Learning**”, India Edition 2013,McGraw Hill Education.  
[2] Ethem Alpaydin, “ **Introduction to Machine Learning**, Second Eedition, MIT press.

**Web Resource:**

- [1] <https://nptel.ac.in/courses/106/104/106104189/>



## 19MCA2503B: CLOUD COMPUTING

<b>Lecture :</b>	3 hrs/ week				<b>Internal Assessment:</b>				40				
<b>Tutorial :</b>	-				<b>Final Examination:</b>				60				
<b>Practical:</b>	-				<b>Credits:</b>				3				
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Analyze the architecture, services and models of cloud computing											
	<b>CO2</b>	Deploy applications for storing data and accessibility in different cloud ecosystems											
	<b>CO3</b>	Interpret local cloud and virtualization techniques based on application requirements											
	<b>CO4</b>	Identify real time cloud applications in different scenarios appropriate to society											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>P O 1</b>	<b>P O 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	L	L								H		
	<b>CO2</b>	L	M	H		L							
	<b>CO3</b>				H				L				
	<b>CO4</b>			L			H						
<b>UNIT – I</b>													
<b>Cloud Computing Basics:</b> Cloud Computing Overview, Applications, Intranets and the cloud. <b>Your Organization and Cloud Computing:</b> When you can use cloud computing, Benefits, Limitations, Security concerns. <b>Cloud computing with the Titans:</b> Google, Microsoft, and Amazon. <b>The Business case for going to the cloud:</b> Cloud computing services, How those applications help your business.													
<b>UNIT – II</b>													
<b>Hardware and Infrastructure:</b> Clients, Security, Network. <b>Accessing the Cloud:</b> Platforms, Web Applications, Web APIs, Web Browsers. <b>Cloud Storage:</b> Overview, Cloud Storage Providers. <b>Standards:</b> Application, Client, Infrastructure, Service.													
<b>UNIT – III</b>													
<b>Software as a service:</b> Overview, Driving Forces, Company offerings. <b>Software plus Services:</b> Overview, Mobile Device Integration, Providers. <b>Developing Applications:</b> Google, Microsoft, Intuit Quick Base, Cast Iron Cloud, Bungee Connect.													

**UNIT – IV**

**Local clouds and Thin Clients:** Virtualization, Server Solutions, Thin Clients.

**Migrating to the Cloud:** Cloud Services for Individuals, Cloud services aimed at the mid-market, Migration.

**Best practices and the future of cloud computing:** Analyze your service, Best Practices.

**Learning Resources**

**Text Book:**

- [1] Anthony T.Velte, Toby.J Velte, Robert Elsenpeter, **“Cloud Computing: A Practical Approach”**, Tata McGraw- Hill, 2010.

**Reference Books:**

- [1] **“Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online”**, Michael Miller, Que Publishing, 2008.
- [2] George Reese **“Cloud Applications Architectures: Building Applications and Infrastructure in the cloud”**, O'Reilly.
- [3] **“Cloud Computing Implementation, Management and Security”**, John W. Rittinghouse, James F.Ransome, CRC Press, Taylor & Francis group,2010.
- [4] Beard Haley, **“Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs”**, 2008, Emereo Pvt. Limited.

## 19MCA2503C: WEB MINING

<b>Lecture :</b>	3 hrs/ week					<b>Internal Assessment:</b>					40			
<b>Tutorial :</b>	-					<b>Final Examination:</b>					60			
<b>Practical:</b>	-					<b>Credits:</b>					3			
<b>Learning Outcomes:</b>	Upon successful completion of the course, the student will be able to:													
	<b>CO1</b>	It is expected that the students understand the basic concepts and techniques of information retrieval, web search for extracting knowledge from the web.												
	<b>CO2</b>	It is expected that the students understand the different knowledge discovery issues in data mining from the World Wide Web.												
	<b>CO3</b>	It is expected that the learners recognize the role played by Web mining in Information retrieval and extraction.												
	<b>CO4</b>	It is expected that the learners understand architecture and main algorithms commonly used by web mining applications.												
	<b>CO5</b>	It is expected that the students use the probabilistic model for web mining.												
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L- Low, M- Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	
	<b>CO1</b>			<b>M</b>			<b>H</b>							
	<b>CO2</b>		<b>H</b>											
	<b>CO3</b>								<b>H</b>					
	<b>CO4</b>				<b>M</b>									
	<b>CO5</b>			<b>M</b>										
<b>UNIT – I</b>														
<b>Introduction:</b> Crawling and Indexing, Topic Directories, Clustering and Classification, Hyperlink Analysis, Resource Discovery and Vertical Portals, Structured vs. Unstructured Data Mining. <b>Crawling the Web:</b> HTML and HTTP Basics, Crawling Basics, Engineering Large Scale Crawlers, Putting together a Crawler.														
<b>UNIT – II</b>														
<b>Web Search and Information Retrieval:</b> Boolean Queries and the Inverted Index, Relevance Ranking, Similarity Search.														
<b>UNIT – III</b>														
<b>Learning:</b> Similarity and Clustering, Formulations and approaches, Bottom up and Top down Partitioning Paradigms, Clustering and Visualization via Embeddings, Probabilistic Approaches to clustering, Collaborative Filtering, Supervised Learning, Semi Supervised Learning.														

**UNIT – IV**

**Applications:** Social Network Analysis- Social Sciences and Bibliometry – Page Rank and HITS – Shortcomings of coarse Grained Graph model- Enhanced Models and Techniques- Evaluation of Topic Distillation- Measuring and Modeling the Web – Resource Discovery – Collecting Important Pages Preferentially – Similarity Search Using Link Topology – Topical Locality and Focused Crawling – Discovering Communities- The Future of Web Mining.

**Learning Resources****Text Book:**

- [1] Soumen Chakrabarti, “**Mining the Web: Discovery Knowledge from Hypertext Data**”, Elsevier Science 2003.

**Reference Books:**

- [1] Sholom Weiss, “**Text Mining: Predictive Methods for Analyzing Unstructured Information**”, Springer, 2005.
- [2] Hercules Antonio do Prado, Edilson Fernada, “**Emerging Technologies of Text Mining: Techniques and Applications**”, Information Science Reference (IGI), 2008.
- [3] Min Song, Yi-fang Brrok Wu, “**Handbook of Research on Text and Web Mining Technologies**”, Vol I & II, Information Science Reference (IGI), 2009.

**19MCA2503D: SOFTWARE PROJECT MANAGEMENT**

<b>Lecture</b>	3 hrs/week	<b>Internal Assessment</b>	40
<b>Tutorial</b>	-	<b>Final Examination</b>	60
<b>Practical</b>	-	<b>Credits</b>	3

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Examine different project contexts and suggest an appropriate management strategy.											
	<b>CO2</b>	Analyze the strategies required for managing projects from their genesis to completion.											
	<b>CO3</b>	Evaluate software Project Planning, cost estimation, scheduling and automation.											
	<b>CO4</b>	Acquire the knowledge of managing, modern and future software projects.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>		M			M							
	<b>CO2</b>	H		M									
	<b>CO3</b>				M							M	
	<b>CO4</b>								H		M		

**UNIT – I**

**Evolution of Software Economics:** Software Economics, Pragmatic software cost estimation.

**Improving Software Economics:** Reducing Software product size, Improving software processes, improving team effectiveness, improving automation, Achieving required quality, Peer inspections.

**The old way and the new:** The principles of conventional software Engineering, Principles of modern software management, Transitioning to an iterative process.

**UNIT – II**

**Life cycle phases:** Engineering and production stages, Inception, Elaboration, Construction, Transition phases.

**Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

**Model based software architectures:** A Management perspective and technical perspective.

**Work Flows of the process:** Software process workflows, Iteration workflows.

**UNIT – III**

**Checkpoints of the process:** Major mile stones, Minor Milestones, Periodic status assessments.

**Iterative Process Planning:** Work breakdown structures, Planning guidelines, Cost and schedule estimating, Iteration planning process, Pragmatic planning.

**Project Organizations and Responsibilities:** Line-of-Business Organizations, Project Organizations, evolution of Organizations.

**Process Automation:** Automation Building blocks, The Project Environment.

**UNIT – IV**

**Project Control and Process instrumentation:** The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation. **Tailoring the Process:** Process discriminants.

**Future Software Project Management:** Modern Project Profiles, Next generation Software economics, modern process transitions.

**Learning Resources**

**Text Book:**

- [1] “Software Project Management”, Walker Royce: Pearson Education, Fifth Edition.

**Reference Books:**

- [1] “Software Project Management”, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.  
[2] “Software Project Management”, Joel Henry, Pearson Education.  
[3] “Software Project Management In Practice”, Pankaj Jalote, Pearson Education, 2005.

**Web Resource:**

- [1] <https://nptel.ac.in/courses/106/105/106105218/>

**19MCA2504A : DATA VISUALIZATION**

<b>Lecture</b>	3 hrs/week	<b>Internal Assessment</b>	40
<b>Tutorial</b>	-	<b>Final Examination</b>	60
<b>Practical</b>	-	<b>Credits</b>	3

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Illustrate visualizations that represent the relationships contained in complex data sets and their interpretation.											
	<b>CO2</b>	Analyze and select appropriate data that can be used in order to create a visualization that answers a particular research application											
	<b>CO3</b>	Identify the statistical analysis needed to validate the trends present in data visualizations.											
	<b>CO4</b>	Choose leading open source software packages to create and publish visualizations that enable clear interpretations of big, complex and real world data.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	M	L	M								L	
	<b>CO2</b>	L	L	M								L	
	<b>CO3</b>		M										
	<b>CO4</b>	L		L								L	

**UNIT – I**

**The Context of Data Visualization :** Visualization as a discovery tool, The bedrock of visualization knowledge, Defining data visualization, Visualization skills for the masses, The data visualization methodology.

**Setting the Purpose and Identifying Key Factors:** Establishing intent – the visualization's function, Establishing intent – the visualization's tone, Key factors surrounding a visualization project, The " eight hats" of data visualization design

**UNIT – II**

**Conceiving and Reasoning Visualization Design Options:** Data visualization design is all about choices, The visualization anatomy – data representation, The visualization anatomy – data presentation

**Taxonomy of Data Visualization Methods:** Data visualization methods, Choosing the appropriate chart type, Assessing hierarchies and part-to-whole relationships.

**UNIT – III**

**Constructing and Evaluating Your Design Solution:** For constructing visualizations, technology matters, The construction process, Approaching the finishing line, Post-launch evaluation, Case Studies on real-time applications.

**UNIT – IV**

**An Introduction to Connecting to Data:** An Introduction to Connecting to Data in Tableau, Shaping Data for Use with Tableau, Getting a Lay of the Land: Tableau Terminology, View the Underlying Data, View the Number of Records, Dimension Versus Measure, What Is a Measure? What Is a Dimension? Discrete Versus Continuous

**Five Ways to Make a Bar Chart/An Introduction to Aggregation:** Five Ways to Create a Bar Chart in Tableau An Introduction to Aggregation in Tableau, Line Graphs, Independent Axes, and Date Hierarchies, How to Make a Line Graph in Tableau, Independent Axes in Tableau, Date Hierarchies in Tableau, Marks Cards, Encoding, and Level of Detail, An Explanation of Level of Detail, An Introduction to Encoding, Label and Tooltip Marks Cards, Case studies.

**Learning Resources****Text Books:**

- [1] Andy Kirk, **"Data Visualization: A Successful Design Process"**, Packet Publishing (26 December 2012)
- [2] Ryan Sleeper, Practical Tableau, O'Reilly Media, Inc. April 2018.

**Reference Books:**

- [1]. Chakrabarti, S, **"Mining the Web: Discovering Knowledge from Hypertext Data"** Morgan Kaufman Publishers, 2003.
- [2]. Fry, **"Visualizing Data"**, Sebastopo, O'Reilly, 2007.

**Web Resources:**

- [1] Prof. Shankar Narasimhan, Ragunatha Rengasamy, IIT Madras, **"Data Visualization in R Basic Graphics"**, 2016  
<https://nptel.ac.in/courses/106106179/11>
- [2] Dr. Ed Vul, Dr. Mike Frank, Massachusetts Institute of Technology, "Statistics and Visualization for Data Analysis and Inference", 2009.  
<https://ocw.mit.edu/resources/res-9-0002-statistics-and-visualization-for-data-analysis-and-inference-january-iap-2009/>
- [3] Dr. Gaurav Dixit, Department of Management Studies, Indian Institute of Technology, Roorkee: <https://nptel.ac.in/courses/110107092/7,2017>



**19MCA2504B: SOFTWARE TESTING METHODOLOGIES**

<b>Lecture</b>	3 hrs/week	<b>Internal Assessment</b>	40
<b>Tutorial</b>	-	<b>Final Examination</b>	60
<b>Practical</b>	-	<b>Credits</b>	3

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Understand the principles, functional, non-functional and performance testing.											
	<b>CO2</b>	Understand the concept that the testing is the last step before releasing software is performed at the end of software development life cycle.											
	<b>CO3</b>	Understand the necessity of testing teams.											
	<b>CO4</b>	Apply various tools for testing and use test director.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	H											
	<b>CO2</b>		M	H								M	
	<b>CO3</b>				M				H			M	
	<b>CO4</b>					H		M					

**UNIT – I**

**Principles of Testing:** Context of testing in producing software, About this chapter, The incomplete car, Dijkstra's doctrine, A test in time!, The cat and the saint, Test the tests first!, The pesticide paradox, The convoy and the rags, The policeman on the bridge, The ends of the pendulum, Men in black, Automation syndrome.

**System and Acceptance Testing:** System testing overview, Why do system testing, Functional Vs Nonfunctional testing, Functional system testing, Nonfunctional testing, Acceptance testing, summary of testing Phases.

**Performance Testing:** Introduction, Factors governing performance testing, Tools for performance testing, Process for performance testing, Challenges.

**UNIT – II**

**Regression Testing:** What is regression testing, Types of regression testing, When do regression testing, How to do regression testing, Best practices in regression testing.

**Ad hoc Testing:** Overview of Ad hoc testing, Buddy testing, Pair testing, Exploratory testing, Iterative testing, Agile and extreme testing, Defect seeding.

**Testing of object oriented Systems:** Introduction, Primer on object-oriented software, Differences in OO testing.

**UNIT – III**

**Usability and Accessibility Testing:** What is usability testing, Approach to usability, when to do usability testing, How to achieve usability, Quality factors for usability, Aesthetics testing,

Accessibility testing, Tools for usability, Usability lab setup, Test roles for usability.

**Organization Structures for testing teams:** Dimension of organization structures, Structures in single-product companies, structures for multi-product companies, Testing services organizations, Success factors for testing organizations.

#### UNIT – IV

**Functional Testing Tool:** Overview, Testing an application using tool, Synchronization of test cases, Creating checkpoints, Testing calculator with parameterization, Testing database application, Testing web application.

**Test Director:** Test Director overview, Testing management process, Managing the testing process using Test Director.

#### Learning Resources:

##### Text Books:

- [1] “Software Testing Principles and practices”, Srinivasan Desikan, Gopalaswamy Ramesh, Pearson Education.

**UNIT I:** Chapters: 1, 6, 7

**UNIT II:** Chapters: 8, 10, 11

**UNIT III:** Chapters: 12, 14

- [2] “Software Testing Tools”, Dr. K.V.K.K.Prasad, Dream Tech Press.

**UNIT IV:** Chapters: 9, 11

##### Reference Books:

- [1] “The craft of software Testing”, Brian Marick, Pearson Education.

- [2] “Software Testing in the Real World”, Edward Kit, Pearson.

“Art of Software Testing”, Meyers, John Wiley.

## 19MCA2504C : INFORMATION AND RETRIEVAL SYSTEMS

Lecture	3 hrs/week					Internal Assessment				40				
Tutorial	-					Final Examination				60				
Practical	-					Credits				3				
Course Outcomes	Upon successful completion of the course, the student will be able to:													
	CO1	Interpret the functional processes and effectiveness of information storage and retrieval systems												
	CO2	Utilize techniques and architectures necessary to speed up the retrieval process for information retrieval systems												
	CO3	Apply metadata organization for effective information access.												
	CO4	Evaluate and use different information retrieval techniques in various application areas												
Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
	CO1		L	L										
	CO2		L		M									
	CO3	L	M	M			H							
	CO4	L	M	M	M		H							
UNIT – I														
Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses.														
Information Retrieval System Capabilities: Search, Browse, Miscellaneous.														
UNIT – II														
Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction.														
Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.														
UNIT – III														
Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages.														
Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.														
UNIT – IV														
User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, weighted searches of Boolean systems, Searching the Internet and hypertext. Information Visualization: Introduction, Cognition and perception, Information visualization technologies. Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems.														

**Learning Resources:****Text Book:**

- [1] M. T. M. Gerald J Kowalski, “**Information Storage and Retrieval Systems**”, Springer International Edition, 2005.

**Reference Books:**

- [1]. G. G. Chowdhury, “ **Introduction to Modern Information Retrieval**”, Neal-Schuman Publishers; Third edition , 2010
- [2]. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, “ **Introduction to Information Retrieval**”, Cambridge University Press. 2008.

**Web Resources:**

- [1] Information Retrieval, Prof. Pabitra Mitra, IIT Kharagpur, <http://cse.iitkgp.ac.in/~pabitra/course/ir06/ir06.html>
- [2] Information Retrieval, Prof. Pawan Goyal, IIT Kharagpur, <http://cse.iitkgp.ac.in/~pawang/courses/IR16/lec1.html>
- [3] Natural Language Processing by Prof. Pushpak Bhattacharyya, Department of Computer science & Engineering, IIT Bombay, <https://www.youtube.com/watch?v=m0oiAOgSQFw>
- [4] Introduction to Information Retrieval <https://www.youtube.com/watch?v=yIuvahNq3wk>

## 19MCA2504D : WIRELESS AND MOBILE NETWORKS

<b>Lecture</b>	3 hrs/week	<b>Internal Assessment</b>	40
<b>Tutorial</b>	-	<b>Final Examination</b>	60
<b>Practical</b>	-	<b>Credits</b>	3

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Analyze the basic concepts of wireless communication and Wireless Networks.											
	<b>CO2</b>	Compare WPAN, WMAN and WWAN technologies.											
	<b>CO3</b>	Interpret 3G and 4G technologies of communications.											
	<b>CO4</b>	Examine the concepts of Wireless Adhoc Networks and the Research Issues in Wireless Networks.											

<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>		M			M							
	<b>CO2</b>	H						M					
	<b>CO3</b>			M					M				
	<b>CO4</b>				H						L		

**UNIT – I**

**Fundamentals of Wireless Communication:** Digital Communications, Wireless Communication Systems, Wireless Media, Frequency Spectrum, Technologies in Digital Wireless Communication, Wireless Communication Channel Specifications, Types of Wireless Communication Systems.

**Basics of Wireless Networks:** Wireless Network, Wireless Switching Technology, Wireless Communication Problems, Wireless Network Reference Model, Wireless Networking Issues, Wireless Networking Standards.

**UNIT – II**

**Wireless Personal Area Networks (WPAN):** WPAN, Network Architecture, WPAN Components, WPAN Technologies and Protocols, WPAN Applications.

**Wireless Metropolitan Area Networks (WMAN):** WMAN, WMAN Network Architecture, Network Protocols, Broadband Wireless Networks, WMAN Applications.

**Wireless Wide Area Networks (WWAN):** Cellular Networks, Satellite Networks, WLAN versus WWAN, Interworking of WLAN and WWAN, WWAN Applications.

**UNIT – III**

**Third Generation (3G) Overview:** Introduction, UMTS, UMTS Services, The UMTS Air Interface, Overview of the 3GPP release 1999 Network architecture, Overview of the 3GPP Release 4 Network Architecture, Overview of the 3GPP Release 5 All-IP architecture, Overview CDMA2000, TD-CDMA, TD-SCDMA, Commonality among WCDMA, CDMA2000, TD-CDMA and TD-SCDMA.

**Long-Term Evolution:** LTE Ecosystem, Standards, Radio Spectrum, LTE Architecture, UE, eNodeB, Core Network, Radio Channel Components, TD-LTE, MIMO, LTE Scheduler, Carrier aggregation, Cell Search, Cell Reselection, Attach and Default Bearer Activation, Handover, SONs, Relay Cells, HetNET, RRH, VoLTE, LTE Advanced.

#### UNIT – IV

**Wireless Ad Hoc Networks:** Wireless Ad Hoc Networks, Mobile Ad Hoc Networks, Wireless Sensor Networks, Wireless Mesh Networks, Vehicular Ad Hoc Networks

**Research Issues in Wireless Networks:** Modulation, Radio Resource Management, Channel Allocation, Error Control and Coding, Congestion Control, Routing, Addressing, Network Access Control, Flow Control, Security and Privacy, QoS Management, Power Management, Cross Layer Control, Network Modeling, Simulation Modeling, Network Measurements.

#### Learning Resources

##### Text Books:

- [1] Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri, et al **“Wireless and Mobile Networks: Concepts and Protocols”**, Second Edition, Wiley India
- [2] Clint Smith, Daniel Collins, **“Wireless Networks: Design and Integration for LTE, EVDO, HSPA and WIMAX”**, Third Edition, McGraw Hill (UNIT – III)

##### Reference Books:

- [1] Raj Kamal, **“Mobile Computing”**, Second Edition, Oxford University Press, 2012
- [2] Asoke K. Talukder, Roopa R. Yavagal, **“Mobile Computing – Technology, Applications and Service Creation”** McGraw Hill, 2007
- [3] Iti Saha Misra, **“Wireless Communications and Networks- 3G and Beyond”**, 2nd Edition, McGraw Hill, 2013
- [4] William Stallings **“Wireless Communications and Networks”**, Second Edition, Pearson Education, 2007

##### Web Resources:

- [1] <https://nptel.ac.in/courses/117/102/117102062/>
- [2] <https://nptel.ac.in/courses/106/105/106105160/>
- [3] Sciencedirect.com, 'Mobile Networks', 2019. [Online] Available: <https://www.sciencedirect.com/topics/computer-science/mobile-networks>.
- [4] Springer.com, The Journal of SPECIAL ISSUES on Mobility of Systems, Users, Data and Computing: Mobile Networks and Applications, 2019. [Online]. Available: <https://link.springer.com/journal/11036>.

**19MCA3505A : DATABASE ADMINISTRATION**

Lecture	-	Internal Assessment											40
Tutorial	-	Final Examination											60
Practical	-	Credits											2
Course Outcomes	Upon successful completion of the course, the student will be able to												
	CO1	Familiarize with various jobs of a Database Administrator.											
	CO2	Recognize the Locking mechanisms.											
	CO3	Identify the features of memory and process architecture.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, Medium -M, H- High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	L	H									M	
	CO2	L	M	M									
	CO3	L	H	M		M							
UNIT – I													
Introduction, Schema objects (Tables and Indexes): About Relational Databases, Brief History of Oracle Database, Introduction to Schema Objects. Data Concurrency and consistency: Introduction to Data Concurrency and Consistency, Oracle Database Transaction Isolation Levels, Oracle Database Locking Mechanism, Automatic Locks, Manual Data Locks, User-Defined Locks.													
UNIT – II													
Transactions: Introduction to Transactions, Transaction Control, Transaction Guard, Application Continuity, Autonomous Transactions, Distributed Transactions. Physical Storages and Logical Storages: Physical Storage Structures, Data Files, Control Files, Online Redo Log. Logical Storage Structures: Logical Storage Structures, Data Blocks, Extents, Segments, Tablespaces.													
UNIT – III													
Oracle Database Instance: Oracle Database Instance, Database Instance Startup and Shutdown: Instance and Database Startup, Database and Instance Shutdown, Checkpoints, Instance Recovery, Parameter Files, Diagnostic Files.													

**UNIT – IV**

**Memory Architecture:** Oracle Database Memory Structures, User Global Area and Program Global Area (PGA), System Global Areas.

**Process Architecture:** Introduction to Processes, Client Processes, Server Processes, Background Processes.

**Learning Resources****Text Book:**

- [1] “**Beginning Oracle Database 12c Administration: From Novice to Professional**”, Second Edition, Ignatius Fernandez, Apress, 2015.

**Reference Books:**

- [1] “**Database Administration Fundamentals**”, [Microsoft Official Academic Course](#), 1<sup>st</sup> Edition.  
 [2] “**Oracle 10g Database Administrator II: Backup/Recovery and Network Administration**”, Claire Rajan, 2<sup>nd</sup> Edition.  
 [3] “**Oracle Essentials Oracle Database 12C**”, Rick Greenwald, 2013.

**Web Resources:****UNIT – I**

- [1] <https://docs.oracle.com/database/121/CNCPT/intro.htm#CNCPT001>  
 [2] <https://docs.oracle.com/database/121/CNCPT/tablecls.htm#CNCPT111>  
 [3] <https://docs.oracle.com/database/121/CNCPT/consist.htm#CNCPT020>

**UNIT - II**

- [4] <https://docs.oracle.com/database/121/CNCPT/transact.htm#CNCPT016>  
 [5] <https://docs.oracle.com/database/121/CNCPT/physical.htm#CNCPT003>  
 [6] <https://docs.oracle.com/database/121/CNCPT/logical.htm#CNCPT004>

**UNIT - III**

- [7] <https://docs.oracle.com/database/121/CNCPT/startup.htm#CNCPT005>

**UNIT - IV**

- [8] <https://docs.oracle.com/database/121/CNCPT/memory.htm#CNCPT007>  
 [9] <https://docs.oracle.com/database/121/CNCPT/process.htm#CNCPT008>



**19MCA3505B : NETWORK ADMINISTRATION**

<b>Lecture</b>	-	<b>Internal Assessment</b>	40
<b>Tutorial</b>	-	<b>Final Examination</b>	60
<b>Practical</b>	-	<b>Credits</b>	2

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to												
	<b>CO1</b>	Understand the role of administrator, meta principles of system administration, system components and network communities.											
	<b>CO2</b>	Design and configuring workstations with various models, controlling resources and also integrating multiple OS's.											
	<b>CO3</b>	Summarize diagnostics, fault and change management, and also provide various services.											
	<b>CO4</b>	Apply network level services and security.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, Medium -M, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	H						M					L
	<b>CO2</b>			H		M							
	<b>CO3</b>	L	H										
	<b>CO4</b>				H								M

**UNIT – I**

**Introduction:** What is network and system administration? , Applying technology in an environment, The human role in Systems, Ethical issues, Is system administration a discipline? The challenges of system administration, Common practice and good practice, Bugs and emergent phenomena, The meta principles of system administration.

**System components:** What is the system? , Handling hardware, Operating systems, File systems, Processes and job control, Networks, IPv4 networks, Address space in IPv4, IPv6 networks.

**Networked communities:** Communities and enterprises, Policy blueprints, System uniformity User behavior: socio-anthropology, Clients, servers and delegation, Host identities and name services, Common network sharing models, Local network orientation and analysis.

**UNIT – II**

**Host management:** Global view, local action, Physical considerations of server room, Computer startup and shutdown, Configuring and personalizing workstations, Installing a Unix disk, Installation of the operating system, Software installation.

**User management:** Issues, User registration, Account policy, Login environment, User support services, Controlling user resources, Online user services, User well-being, Ethical conduct of

administrators and users.

**Models of network and system administration:** Information models and directory services, System infrastructure organization, Network administration models, Network management technologies, Creating infrastructure, System maintenance models, Competition, immunity and convergence, Policy and configuration automation, Integrating multiple Oss.

### UNIT – III

**Configuration and maintenance:** System configuration policy, Methods: controlling causes and symptoms, Change management, Declarative languages, Policy configuration and its ethical usage

Common assumptions: clock synchronization, Human-computer job scheduling, Automation of host configuration, Preventative host maintenance, SNMP tools, Cfengine, Database configuration management.

**Diagnostics, fault and change management:** Fault tolerance and propagation, Networks and small worlds, Causality and dependency, Defining the system, Faults, Cause trees, Probabilistic fault trees, Change management revisited, Game-theoretical strategy selection, Monitoring, System performance tuning.

**Application-level services:** Application-level services, Proxies and agents, Installing a new service, Summoning daemons, Setting up the DNS name service, Setting up a WWW server, E-mail configuration, OpenLDAP directory service, Mounting NFS disks.

### UNIT – IV

**Network-level services:** The Internet, A recap of networking concepts, Getting traffic to its destination, Alternative network transport technologies, Alternative network connection technologies IP routing and forwarding, Multi-Protocol Label Switching (MPLS), Quality of Service, Competition or cooperation for service?, Service Level Agreements.

**Principles of security:** Four Independent issues, Physical security, Trust relationships, Security policy and definition of security, RFC 2196 and BS/ISO 17799, System failure modes, Preventing and minimizing failure modes.

**Security implementation:** System design and normalization, The recovery plan, Data integrity and protection, Authentication methods, Analyzing network security, VPNs: secure shell and FreeS/WAN, Role-based security and capabilities, WWW security, IPSec secure IP, Ordered access control and policy conflicts, IP filtering for firewalls, Firewalls.

### Learning Resources

#### **Text Book:**

[1] Principles of Network and System Administration, Second Edition, Wiley India Pvt Ltd.

#### **Web Resources:**

[1] [www.tutorialspoint.com](http://www.tutorialspoint.com)

**19MCA3505C: E-COMMERCE**

Lecture	-	Internal Assessment	40
Tutorial	-	Final Examination	60
Practical	-	Credits	2

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Understand the various components of electronic commerce.											
	<b>CO2</b>	Analyze Inter-organizational business scenarios involving Electronic Data Interchange.											
	<b>CO3</b>	Recognize the dimensions of internal electronic commerce systems.											
	<b>CO4</b>	Examine the Information search and retrieval through Multimedia.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, Medium -M, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	H				M							
	<b>CO2</b>		H										
	<b>CO3</b>			H									H
	<b>CO4</b>				H								

**UNIT – I**

Electronic Commerce: Frame work, Anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.  
 Consumer Oriented Electronic commerce: Mercantile Process models.  
 Electronic payment systems: Types of Electronic payment systems, Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

**UNIT – II**

Inter Organizational Commerce: EDI, EDI Implementation, Value added networks.  
 Intra Organizational Commerce: Work Flow, Automation Customization and internal Commerce, Supply Chain Management.

**UNIT – III**

Corporate Digital Library: Document Library, digital Document types, corporate Data Warehouses.  
 Advertising and Marketing: Information based marketing, Advertising on Internet, on-line marketing Process, market research.

**UNIT – IV**

Consumer Search and Resource Discovery: Information search and Retrieval, Commerce Catalogues, Information Filtering.

Multimedia: key multimedia concepts, Digital Video and electronic Commerce, Desktop video Processing, Desktop video conferencing.

Learning Resources:

**Text Book:**

- [1] Frontiers of electronic commerce – Kalakata, Whinston, Pearson.

**Reference Books:**

- [1] “E-Commerce fundamentals and applications”, Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.
- [2] “E-Commerce”, S.Jaiswal, Galgotia.
- [3] “E-Commerce”, Efrain Turbon, Jae Lee, David King, H.Michael Chang.
- [4] “Electronic Commerce”, Gary P.Schneider – Thomson.
- [5] “E-Commerce:Business,Technology, Society”, Kenneth C.Taudon, Carol Guyerico Traver.

**Web Resources:**

- [1] [http://onlinevideolecture.com/?course\\_id=190&lecture\\_no=35](http://onlinevideolecture.com/?course_id=190&lecture_no=35)

## 19MCA3505D : IOT

<b>Lecture</b>	-	<b>Internal Assessment</b>	40
<b>Tutorial</b>	-	<b>Final Examination</b>	60
<b>Practical</b>	-	<b>Credits</b>	2

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Understand the concepts and protocols related to Internet of Things.											
	<b>CO2</b>	Analyse trade-offs in interconnected wireless embedded device networks.											
	<b>CO3</b>	Illustrate key technologies, protocols and standards in Internet of Things.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, Medium-M, H- High)</b>		<b>PO 01</b>	<b>PO 02</b>	<b>PO 03</b>	<b>PO 04</b>	<b>PO 05</b>	<b>PO 06</b>	<b>PO 07</b>	<b>PO 08</b>	<b>PO 09</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	L				H		M					M
	<b>CO2</b>	H	M	H		M		M					
	<b>CO3</b>	M	H	M		M		M					M

**UNIT – I**

**Introduction:** Overview and Motivations, IPv6 Role, IoT Definitions, IoT Frameworks.

**UNIT – II**

**Prototyping Embedded Devices:** Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Beagle Bone Black, Electric Imp, Other Notable Platforms

**UNIT – III**

**IPv6 Technologies for the IoT:** Overview and Motivations, Address Capabilities, IPv6 Protocol Overview , IPv6 Tunneling , IPsec in IPv6, Header Compression Schemes , Quality of Service in IPv6 , Migration Strategies to IPv6

**UNIT – IV**

**Evolving IoT Standards:** Overview and Approaches, IETF IPv6 Routing Protocol for RPL Roll , Constrained Application Protocol (CoAP) , Representational State Transfer (REST) , ETSI M2M , Third-Generation Partnership Project Service Requirements for Machine-Type Communications , CENELEC, IETF IPv6 Over Lowpower WPAN (6LoWPAN) , ZigBee IP (ZIP), IP in Smart Objects (IPSO)

**Learning Resources****Text Books:**

- [1] “**Building the Internet of Things with IPv6 AND MIPv6**” by DANIEL MINOLI  
Published by John Wiley & Sons, Inc., Hoboken, New Jersey. (UNIT-I, III).

- [2] **“Designing the Internet of Things”** by Adrian McEwen and Hakim Cassimally Published by John Wiley & Sons (UNIT-II, IV)

**Reference Books:**

- [1] **“Getting Started with the Internet of Things”** by CunoPfister Published by O’Reilly Media, Inc.
- [2] Olivier Hersent, David Boswarthick, Omar Elloumi, **“The Internet of Things”** Key Applications and Protocols, ISBN 978-1-119-99435-0, Wiley Publications.

## 19MCA3505E : R PROGRAMMING FOR DATA SCIENCE

<b>Lecture</b>	-	<b>Internal Assessment</b>	40
<b>Tutorial</b>	-	<b>Final Examination</b>	60
<b>Practical</b>	-	<b>Credits</b>	2

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Learn R language fundamentals and basic syntax.											
	<b>CO2</b>	Perform data analysis using R.											
	<b>CO3</b>	Apply looping functions using R.											
	<b>CO4</b>	Perform debugging and simulation using R.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, Medium-M, H- High)</b>		<b>PO 01</b>	<b>PO 02</b>	<b>PO 03</b>	<b>PO 04</b>	<b>PO 05</b>	<b>PO 06</b>	<b>PO 07</b>	<b>PO 08</b>	<b>PO 09</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	L						M					M
	<b>CO2</b>	H	M	H		M							
	<b>CO3</b>	M	H			M		M					M

**UNIT – I**

**History and Overview of R:** Introduction to R & S language, The S Philosophy, Back to R, Basic Features of R, FreeSoftware, Design of the R System, Limitations of R.

**Getting Started with R:** Installation, Getting started with the R interface.

**R Nuts and Bolts:** Entering Input, Evaluation, R Objects, Numbers, Attributes, Creating Vectors, Mixing Objects, Matrices, Lists, Factors, Missing Values, Data Frames, Names

**UNIT – II**

**Getting Data In and Out of R:** Reading and Writing Data, Reading Data Files with read.table(), Reading in Larger Datasets with read.table, Calculating Memory Requirements for R Objects.

**Control Structures in R:** if-else, for Loops, Nested for loops, while Loops, repeat Loops, next, break.

**UNIT – III**

**Functions in R:** Your First Function, Argument Matching, Lazy Evaluation, The Argument, Arguments Coming After the Argument.

**Loop Functions:** Looping on the Command Line, lapply(), sapply(), split(), Splitting a Data Frame, Tapply, apply(), Col/Row Sums and Means, Other Ways to Apply, mapply(), Vectorizing a Function.

**UNIT – IV**

**Debugging:** Something's Wrong!, Figuring Out What's Wrong, Debugging Tools in R, Using traceback(), Using debug(), Using recover().

**Simulation:** Generating Random Numbers, Setting the random number seed, Simulating a Linear Model, Random Sampling.

**Learning Resources****Text Books:**

- [1] Roger D Peng, “ R Programming for Data Science” Lean Publishing, 2014-15
- [2] Michael J Crawley “ The R Book” John Wiley & Sons, 2007

**Reference Books:**

- [1] Paul Teetor, “R Cookbook”, Oreily publications, 2011
- [2] Mark Gardener, “Beginning R: The statistical programming language”, 2012

**Web Resources:**

- [1] <https://www.coursera.org/learn/r-programming>
- [2] <https://www.edx.org/course/introduction-r-data-science-microsoftdat204x-2>
- [3] <https://www.udemy.com/r-basics/>
- [4] <https://www.udemy.com/r-programming/>



**19MCA3505F : INTRODUCTION TO ANGULARJS**

<b>Lecture</b>	-	<b>Internal Assessment</b>	40
<b>Tutorial</b>	-	<b>Final Examination</b>	60
<b>Practical</b>	-	<b>Credits</b>	2

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:												
	<b>CO1</b>	Understand the basic concepts of AngularJS, Ajax & jQuery.											
	<b>CO2</b>	Understand of framework of AngularJS.											
	<b>CO3</b>	Develop different AngularJS components of web application.											
	<b>CO4</b>	Implement Single page web Application											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, Medium-M, H- High)</b>		<b>PO 01</b>	<b>PO 02</b>	<b>PO 03</b>	<b>PO 04</b>	<b>PO 05</b>	<b>PO 06</b>	<b>PO 07</b>	<b>PO 08</b>	<b>PO 09</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	L		L				H					
	<b>CO2</b>	L	M	M									
	<b>CO3</b>	M		H		M		M					
	<b>CO 4</b>		M			H		M					

**UNIT – I**

AngularJS prerequisites (HTML, CSS, JavaScript), AngularJS and it features, Advantages and Disadvantages, AngularJS introduction, AngularJS setup.

**JQUERY:** Basics of JQuery, Effects using JQuery, JQuery HTML, JQuery traversing.

**AJAX:** Ajax Introduction, Methods in Ajax (load (), get (), post ()).

**UNIT – II**

Basics of AngularJS, Angular Expressions, Modules, Directives, Controllers.

**UNIT – III**

Angular Models, Data-Binding, Scopes, Filters, Forms, Events

**UNIT – IV**

Angular Tables, Services, Http (Ajax), Routing, AngularJS Dependency Injection, Build Sample AngularJS Applications.

**Learning Resources**

**Text Books:**

- [1] AngularJS, JavaScript, and jQuery All in One, Sams Teach Yourself by Brad Dayley, Brendan Dayley, 2015
- [2] Angular Up and Running: Learning Angular, Step by Step, by Shyam Seshadri, 2018

**Web Resources:**

- [1] <https://www.edureka.co/blog/angular-tutorial/>
- [2] <https://www.w3schools.com/angular/>
- [3] <https://www.guru99.com/angularjs-introduction.html>
- [4] <https://thinkster.io/a-better-way-to-learn-angularjs>
- [5] <https://www.w3schools.com/jquery/default.asp>
- [6] [https://www.w3schools.com/js/js\\_ajax\\_intro.asp](https://www.w3schools.com/js/js_ajax_intro.asp)
- [7] <http://www.tutorialsteacher.com/angularjs/angularjs-tutorials>
- [8] <https://www.javatpoint.com/angularjs-tutorial>
- [9] [https://www.tutorialspoint.com/angularjs/angularjs\\_tutorial.pdf](https://www.tutorialspoint.com/angularjs/angularjs_tutorial.pdf)
- [10] <https://coursetro.com/courses/12/Learn-Angular-4-from-Scratch>
- [11] [https://www.youtube.com/watch?v=nOIROKMjPqI&list=PLvZkOAgBYrsS\\_ugya\\_msNpCgLSmtIXZGiz](https://www.youtube.com/watch?v=nOIROKMjPqI&list=PLvZkOAgBYrsS_ugya_msNpCgLSmtIXZGiz)

**19MCA2551 : PYTHON PROGRAMMING LAB**

<b>Lecture</b>	-	<b>Internal Assessment</b>	40
<b>Tutorial</b>	-	<b>Final Examination</b>	60
<b>Practical</b>	3 hrs/week	<b>Credits</b>	1.5

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:														
	<b>CO1</b>	Understand the basic concepts in development of applications using Python.													
	<b>CO2</b>	Create and use different libraries in Python.													
	<b>CO3</b>	Implement handling exceptions and files.													
	<b>CO4</b>	Implement basic data structures in Python.													
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)</b>		<b>P O 1</b>	<b>P O 2</b>	<b>P O 3</b>	<b>P O 4</b>	<b>P O 5</b>	<b>P O 6</b>	<b>P O 7</b>	<b>P O 8</b>	<b>P O 9</b>	<b>P O 10</b>	<b>P O 11</b>	<b>P O 12</b>	<b>PS O 1</b>	<b>PS O 2</b>
	<b>CO1</b>	M	L	L		L		M							
	<b>CO2</b>	H	M	M		H		M							
	<b>CO3</b>	L	M	M		H		M							
	<b>CO4</b>	M	M	M		H		M							

**LAB CYCLE – I**

1. Write a python code to read 'n' numbers and print their sum , mean.
2. Write a python program to swap two numbers without using third variable. Print the two variables before swap and after swap. (Without arithmetic Operators)
3. Write a python program which prompts the user for a Celsius temperature, convert the temperature in to Fahrenheit and print .
4. Write a python program to prompt for a score between 0.0 and 1.0. If the score is out of range, print an error message. If the score is between 0.0 and 1.0, print the grade.

**LAB CYCLE – II**

5. Write a python program demonstrating the usage type conversion functions and random.
6. Write a python program demonstrating the usage of math functions.
7. Write a python program contains a function that takes username and password as input and returns a string either valid user or not. Allow the user to check for maximum three times only and quits the program.
8. Write a python program that prompts for a list of numbers and at the end print both the maximum and minimum of the numbers and the average numbers. (without sorting)
9. Write a python program demonstrating break, continue keywords and infinite loop.

**LAB CYCLE – III**

10. Write a python program with user defined functions as below:
  - (a) Count the number of characters of a given string
  - (b) Count the number of words in a given line.
 Using above two functions, print the number of characters and number of words of the input.
11. Write a python program demonstrating the usage of string functions.
12. Write a python program to read through a file and print the contents of the file in upper case.
13. Write a python function which saves the first 1000 Fibonacci numbers r in a text file.
14. Write a python function which saves results in two files: random .txt file for store 100 random numbers and repetitions\_random.txt to store those random numbers which got repeated.

**LAB CYCLE – IV**

15. Write a python program to demonstrate the usage of lists and its methods.
16. Write a python program to demonstrate the usage of lists in functions.
17. Write a python program involving the usage of dictionaries and its methods.
18. Write a python program mentioning the usage of Tuples and its methods.

**Learning Resources****Text Book:**

- [1] Charles Severance, “Python for Informatics”, Exploring Information

**Reference Books:**

- [1] Head First Python: A Brain-Friendly, Paul Barry, 2017.
- [2] Allen Downey "Think Python, How to Think Like a Computer Scientist", 2nd edition, Green Tea Press, 2015
- [3] Mark Lutz, — Learning Python, 5th Edition, O'Reilly Media, 2017

**Web Resources:**

- [1] <https://www.coursera.org/course/pythonlearn>
- [2] <https://www.edx.org/course/introduction-computer-science-mitx-6-00-1x-0>
- [3] <https://www.thenewboston.com/videos.php?cat=36>
- [4] <http://diveintopython.org/>

**19MCA2552 : BIG DATA ANALYTICS LAB**

<b>Lecture</b>	-	<b>Internal Assessment</b>	40
<b>Tutorial</b>	-	<b>Final Examination</b>	60
<b>Practical</b>	2 hrs/week	<b>Credits</b>	1

Course Outcomes	Upon successful completion of the course, the student will be able to:															
	CO1	Examine the concepts of Big Data and Big Data Analytics.														
	CO2	Learn to work with ecosystems available in Hadoop.														
	CO3	Acquire knowledge on MapReduce Framework.														
	CO4	Evaluate the process of storing data in Hive.														
Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H- High)		P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	
	CO1			M					H							
	CO2		H			H										
	CO3		H								M					
	CO4				M			M								

**LAB CYCLE – I**

Big Data Analytics:

1. What is Big Data?
2. What is Big Data Analytics?
3. Why is big data analytics important?
4. Benefits & Advantages of Big Data Analytics
5. The Lifecycle Phases of Big Data Analytics
6. Types of Big Data analytics
7. Big Data analytics tools
8. Big Data industry applications

**LAB CYCLE – II**

Hadoop:

- Downloading and installing Hadoop
- Understanding different Hadoop modes
- Start-up scripts
- Configuration files.

**LAB CYCLE – III**

Hadoop file management:

- Adding files and directories
- Retrieving files
- Deleting files

MapReduce: Run a basic Word Count MapReduce program to understand MapReduce Paradigm.

**LAB CYCLE – IV**

Hive Database:

- Install and Run Hive
- Create, alter, and drop databases, tables

**Learning Resources****Text Books:**

- [1] Seema Acharya, Subhashini Chellappan, “**BIG DATA AND ANALYTICS**”, Wiley Publications
- [2] “**BIG DATA Black Book**”, DT Editorial Services, DreamTech Press (2015)
- [3] Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, “**Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data**”, 1<sup>st</sup> Edition, TMH, 2012.

**Web Resources:**

- [1] <https://nptel.ac.in/courses/106/104/106104189/>
- [2] An overview of “Big Data”: Available [http://www.jbonneau.com/doc/2012-04-27-big\\_data\\_lecture\\_1.pdf](http://www.jbonneau.com/doc/2012-04-27-big_data_lecture_1.pdf)
- [3] Hadoop Tutorial: Developing Big-Data Applications with Apache Hadoop: Available <http://www.coreservlets.com/hadoop-tutorial/>
- [4] Random notes on big data – SlideShare: Available [www.slideshare.net/yiranpang/random-notes-on-big-data-26439474](http://www.slideshare.net/yiranpang/random-notes-on-big-data-26439474)
- [5] [https://www.ibm.com/developerworks/community/blogs/Susan\\_Visser\\_Editionntry/flash\\_book\\_understanding\\_big\\_data\\_analytics\\_for\\_enterprise\\_class\\_hadoop\\_and\\_streaming\\_data?lang=en](https://www.ibm.com/developerworks/community/blogs/Susan_Visser_Editionntry/flash_book_understanding_big_data_analytics_for_enterprise_class_hadoop_and_streaming_data?lang=en)

## 19MCA4552 : MINI PROJECT

<b>Lecture</b>	-	<b>Internal Assessment</b>				40							
<b>Tutorial</b>	-	<b>Final Examination</b>				60							
<b>Practical</b>	3hrs/week	<b>Credits</b>				1.5							
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to												
	<b>CO1</b>	Transform the theoretical knowledge studied so far into a working model of a computer/information system.											
	<b>CO2</b>	Gain experience in industry, academic institutions and research laboratories and implementation of a small project.											
	<b>CO3</b>	Acquire the necessary confidence to carry out main project in the final year.											
<b>Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, Medium -M, H- High)</b>		<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
	<b>CO1</b>	H	H	H		H				M			
	<b>CO2</b>	H	H	H		H				H			
	<b>CO3</b>	H	H	M		M				M			

## 19MCA4651: MAJOR PROJECT

Lecture	-	Internal Assessment				40							
Tutorial	-	Final Examination				60							
Practical	-	Credits				12							
Course Outcomes	Upon successful completion of the course, the student will be able to												
	CO1	Develop quality software using the software engineering principles.											
	CO2	Perform coding for the project using latest programming languages.											
	CO3	Perform various systems testing techniques/strategies to include the phases of testing.											
	CO4	Perform various systems testing techniques/strategies to include the phases of testing.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, Medium -M, H- High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
	CO1	H	H	H		H				M			
	CO2	H	H	H		H				H			
	CO3	H	H	M		M				M			
	CO4	H	H	M		M				H			