Osmania University

Faculty of Informatics

Bachelor of Computer Applications (BCA)
Semester I and II
2019 – 2020

Scheme of Instruction
and
Syllabi

Osmania University
Hyderabad

Osmania University
Proposed Scheme of Instruction
Bachelor of Computer Applications (BCA) Scheme
W.E.F 2019-2020

Sem	Course-1	Course-2	Course-3	Course-4	Course-5	Lab-1	Lab-2	Lab-3	Hrs	Cr	Categories
I	Mathematical Foundations of Computer Science (4) BSC	Digital Principles (4) PCC	Programming in C (4) PCC	Introduction to Web Technology (4) PCC	Effective Communication (4) HSC	Programming in C Lab (2) LCC	Web Technology Lab (2) LCC	IT Workshop (2) LCC	32	26	BSC=4 PCC=12 HSC=4 LCC=6
II	Fundamentals of Probability and Statistics (4) BSC	Object Oriented Programming using CPP (4) PCC	Computer Architecture (4) PCC	Data Structures (4) PCC	Data Communications (4) PCC	Object Oriented Programming using CPP Lab (2) LCC	Data Structures Lab (2) LCC	Communication Skills Lab (2) LHC	32	26	BSC=4 PCC=16 LCC=4 LHC=2
III	Applied Mathematics (4) BSC	Core Java Programming (4) PCC	Software Engineering (4) PCC	Operating System Concepts (4) PCC	Database Design (4) PCC	Core Java Programming Lab (2) LCC	Software Engineering Lab (2) LCC	Database Design Lab (2) LCC	32	26	BSC=4 PCC=16 LCC=6
IV	Distributed and Cloud Computing (4) ETC	Algorithm Design (4) PCC	Computer Networks (4) PCC	Data Science using Python Lab (4) ETC	Artificial Intelligence (4) ETC	Data Science using Python Lab (2) LTC	Computer Networks Lab (2) LCC	Technical Seminar (1) LCC	30	25	PCC=8 ETC=12 LCC=3 LTC=2
V	Parallel Programming (4) ETC	Big Data Analytics (4) ETC	Software Quality and Testing (4) ETC	Environmental Science (0) MC	Professional Elective –I Advanced Java Programming / Programming using c# and ASP.NET / Internet Programming using PHP (4) PEC	Big Data Analytics Hadoop Lab (2) LTC	Professional Elective –I Lab (2) LPC	Project Phase -I (2) LCC	32	22	ETC=12 PEC=4 LTC=2 LPC=2 LCC=2
VI	Professional Elective –II	Professional Elective –III	Open Elective Human Relation at	-	-	Project Phase –II (4) LCC			20	16	PEC=8 HSC=4 LCC=4

	Machine Learning / Internet of Things / Blockchain (4) PEC	Information Retrieval Systems / Distributed Databases / Cyber Security (4) PEC	Work / Ethics and Holistic Life / Gender Sensitization (4) HSC						

Categories of Courses and Credits

Abbreviation	Full Form	Credits	Abbreviation	Full Form	Credits
BSC	Basic Science Course	12	LCC	Laboratory Core Course	25
PCC	Professional Core Course	52	LTC	Laboratory Technological Course	4
ETC	Emerging Technological Course	24	LPC	Laboratory Professional Course	2
HSC	Humanities and Social Science Course	8	LHC	Laboratory Humanities Course	2
PEC	Professional Elective Course	12			
Total	**141**				

With effect from the academic year 2019-2020

PROPOSED SCHEME OF INSTRUCTION
BACHELOR OF COMPUTER APPLICATIONS (BCA)
SEMESTER- I

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	BSC101	Mathematical Foundations of Computer Science	**BSC**	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC102	Digital Principles	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
3	PCC103	Programming in C	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC104	Introduction to Web Technology	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
5	HSC105	Effective Communication	**HSC**	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICAL									
6	LCC151	Programming in C Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC152	Web Technology Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
8	LCC153	IT Workshop	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
			Total	**20**	**12**	**26**	**500**	**225**	**-**

Abbreviation	Full Form	Abbreviation	Full Form
BSC	Basic Science Course	LTC	Laboratory Technological Course
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ETC	Emerging Technological Course	LHC	Laboratory Humanities Course
HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2019-2020

PROPOSED SCHEME OF INSTRUCTION
BACHELOR OF COMPUTER APPLICATIONS (BCA)
SEMESTER- II

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	BSC201	Fundamentals of Probability and Statistics	**BSC**	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC202	Object Oriented Programming using CPP	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
3	PCC203	Computer Architecture	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC204	Data Structures	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
5	PCC205	Data Communications	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICALS									
6	LCC251	Object Oriented Programming using CPP Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC252	Data Structures Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
8	LHC253	Communication Skills Lab	**LHC**	**-**	**4**	**2**	**50**	**25**	**3**
			Total	**20**	**12**	**26**	**500**	**225**	**-**

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With effect from the academic year 2020-2021

PROPOSED SCHEME OF INSTRUCTION
BACHELOR OF COMPUTER APPLICATIONS (BCA)
SEMESTER- III

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	BSC301	Applied Mathematics	**BSC**	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC302	Core Java Programming	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
3	PCC303	Software Engineering	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC304	Operating System Concepts	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
5	PCC305	Database Design	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICALS									
6	LCC351	Core Java Programming Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC352	Software Engineering Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
8	LCC353	Database Design Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
			Total	**20**	**12**	**26**	**500**	**225**	**-**

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MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2020-2021

PROPOSED SCHEME OF INSTRUCTION
BACHELOR OF COMPUTER APPLICATIONS (BCA)
SEMESTER- IV

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	ETC401	Distributed and Cloud Computing	**ETC**	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC402	Algorithm Design	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
3	PCC403	Computer Networks	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
4	ETC404	Data Science using Python	**ETC**	**4**	**-**	**4**	**70**	**30**	**3**
5	ETC405	Artificial Intelligence	**ETC**	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICALS									
6	LCC451	Data Science using Python Lab	**LT C**	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC452	Computer Networks Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
8	LCC453	Technical Seminar	**LCC**	**-**	**2**	**1**	**50**	**25**	**3**
			Total	**20**	**10**	**25**	**500**	**225**	**-**

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HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

*With effect from the academic year **2021-2022***

PROPOSED SCHEME OF INSTRUCTION
BACHELOR OF COMPUTER APPLICATIONS (BCA)
SEMESTER-V

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	ETC501	Parallel Programming	**ETC**	**4**	**-**	**4**	**70**	**30**	**3**
2	ETC502	Big Data Analytics	**ETC**	**4**	**-**	**4**	**70**	**30**	**3**
3	ETC503	Software Quality and Testing	**ETC**	**4**	**-**	**4**	**70**	**30**	**3**
4	MC504	Environmental Science	**MC**	**4**	**-**	**Non Credit**	**70**	**30**	**3**
Professional Elective I			**PEC**	**4**	**-**	**4**	**70**	**30**	**3**
4a	PEC511	Advanced Java Programming							
4b	PEC512	Programming using C# and ASP.NET							
4c	PEC513	Internet Programming using PHP							
PRACTICALS									
6	LTC551	Big Data Analytics Hadoop Lab	**LTC**	**-**	**4**	**2**	**50**	**25**	**3**
7	LPC552	Professional Elective-I Lab	**LPC**	**-**	**4**	**2**	**50**	**25**	**3**
8	LCC553	Project Phase I	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
			Total	**20**	**12**	**22**	**500**	**225**	**-**

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HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
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*With effect from the academic year **2021-2022***

PROPOSED SCHEME OF INSTRUCTION
BACHELOR OF COMPUTER APPLICATIONS (BCA)
SEMESTER-VI

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
Professional Elective II			**PEC**	**4**	**-**	**4**	**70**	**30**	**3**
1a	PEC601	Machine Learning							
1b	PEC602	Internet of Things							
1c	PEC603	Blockchain							
Professional Elective III			**PEC**	**4**	**-**	**4**	**70**	**30**	**3**
2a	PEC611	Information Retrieval Systems							
2b	PEC612	Distributed Databases							
3c	PEC613	Cyber Security							
Open Elective			**HSC**	**4**	**-**	**4**	**70**	**30**	**3**
3a	HSC621	Human Relations at Work							
3b	HSC622	Ethics and Holistic Life							
3c	HSC623	Gender Sensitization							
PRACTICALS									
4	LCC651	Project Phase II	**LCC**	**-**	**8**	**4**	**100**	**50**	**3**
Total				**12**	**8**	**16**	**310**	**140**	**-**

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*With effect from the academic year **2019-2020***

PROPOSED SCHEME OF INSTRUCTION
BACHELOR OF COMPUTER APPLICATIONS (BCA)
SEMESTER- I

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	BSC101	Mathematical Foundations of Computer Science	**BSC**	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC102	Digital Principles	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
3	PCC103	Programming in C	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC104	Introduction to Web Technology	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
5	HSC105	Effective Communication	**HSC**	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICAL									
6	LCC151	Programming in C Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC152	Web Technology Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
8	LCC153	IT Workshop	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
			Total	**20**	**12**	**26**	**500**	**225**	**-**

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MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

BCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
BSC101	Mathematical Foundations of Computer Science	BSC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT- I

Fundamentals of Logic: Basic Connectives and Truth Tables, Logical Equivalence, Logical Implication, Use of Quantifiers, Definitions and the Proof of Theorems.

Set Theory: Set and Subsets, Set Operations, and the Laws of Set theory, Counting and Venn Diagrams.

Properties of the Integers: The well – ordering principle, Recursive Definitions, Division Algorithms, Fundamental theorem of Arithmetic.

UNIT-II

Relations and Functions: Cartesian Product, Functions onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions.

Relations: Partial Orders, Equivalence Relations and Partitions.

Principle of Inclusion and Exclusion: Principles of Inclusion and Exclusion, Generalization of Principle.

UNIT–III

Generating Functions: Introductory Examples, Definition And Examples, Partitions of Integers.

Recurrence Relations: First – order linear recurrence relation, second – order linear homogenous recurrence relation with constant coefficients.

UNIT-IV

Algebraic Structures: Algebraic System – General Properties, Semi Groups, Monoids, Homomorphism, Groups, Residue Arithmetic.

UNIT -V

Graph Theory: Definitions and examples, sub graphs, complements and graph Isomorphism, Vertex degree, Planar graphs, Hamiltonian paths and Cycles.

Trees: Definitions, properties and Examples, Rooted Trees, Spanning Trees and Minimum Spanning Trees.

Suggested Reading:

1) Mott Joe L Mott, Abraham Kandel, and Theodore P Baker, **Discrete Mathematics for Computer Scientists & Mathematicians**, Prentice Hall NJ, 2nd Edition, 2015.

2) Jr. P. Tremblay and R Manohar **Discrete Mathematical Structures with Applications to Computer Science**, McGraw Hill, 1987.

3) R.K.Bisht and H.S.Dhami, **Discrete Mathematics** Oxford Higher Education, 2015

4) Bhavanari Satyanarayana, Tumurukota Venkata Pradeep Kumar and Shaik Mohiddin Shaw, **Mathematical Foundation of Computer Science,** BSP, 2016

5) Ralph P. Grimaldi **Discrete and Combinatorial Mathematics**, 5th Edition, Pearson, 2004.

BCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC102	Digital Principles	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I

Binary Systems: Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.

Boolean Algebra and Logic Gates: Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates.

UNIT II

Minimization: K-Map Method – Table Method, POS - SOP, Don't Care Conditions, NAND, NOR Implementation.

Combinational Logic: Combinational Circuits, Analysis and Design Procedure, Binary Adder, Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers.

UNIT III

Synchronous Sequential Logic: Sequential Circuits - Latches, Flip-Flops, An analysis of Clocked Sequential Circuits, State Reduction and Assignment Design Procedure.

UNIT IV

Registers and Counters: Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counters-Johnson Counter.

UNIT V

Asynchronous Sequential Circuit : Introduction, Analysis Procedure, Circuits with Latches, Design Procedure.

Suggested Reading:

1 M.Morris Mano, "Digital Design", 3rd edition, Pearson Education, Delhi, 2007.
2 Donald P Leech, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications", Tata Mc Graw Hill, 2007.

With effect from the academic year 2019-2020

BCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC103	Programming in C	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT – I

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts.

Number Systems: Binary, Octal, Decimal, Hexadecimal

Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements

Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

UNIT-II

Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and Goto statements

Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. **Recursion-** Recursive Functions.

Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.

UNIT – III

Preprocessors: Preprocessor Commands. **Arrays** - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

UNIT - IV

Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, L-value and R-value, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments.

Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.

UNIT - V

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types.

Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Suggested Reading:

1. B.A. Forouzan and R.F. Gilberg, "*A Structured Programming Approach in C"* , Cengage Learning, 2007

2. Kernighan BW and Ritchie DM, "*The C Programming Language"*, 2nd Edition, Prentice Hall of India, 2006.

3. Rajaraman V, "*The Fundamentals of Computer"*, 4th Edition, Prentice-Hall of India, 2006.

With effect from the academic year 2019-2020

BCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC104	Introduction to Web Technology	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT-I

Introduction to World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, HTTP.

HTML5: Introduction, Links, Images, Multimedia, Lists, Tables, Creating Forms, Styling Forms.

UNIT-II

Dynamic HTML – Cascading Style Sheets, Inline Styles, Style Elements, External Style Sheets, Text Flow and Box Model, User Style Sheets

Object Model and Collections – Object Referencing, Collections, Children Frames, Navigator Objects

Event Model - ONCLICK, ONLOAD, Error Handling, ONERRORS, ONMOUSEMOVE, ONMOUSEOVER, ONMOUSEOUT, ONFOCUES, ONBLUR, ONSUBMIT

UNIT-III

Introduction to Java script, Java Script and Forms Variables, Functions, Operators, Conditional Statements and Loops, Arrays DOM, Strings, Event and Event Handling, Java Script Closures.

UNIT-IV

Introduction to Python: Features of Python, Operators, Input/Output Statements, Control Statements, Execution of Simple Python Programs.

UNIT-V

Introduction to XML, XML document structure, Document Type Definition, Namespaces, XML Schemas, XPath Basics, XSLT, XML Processors.

Suggested Reading:

1. Robert W.Sebesta, Programming the World Wide Web, 3rd Edition, Pearson Education, 2006
2. Wendy Willard, HTML5, McGraw Hill Education (India) Edition, 2013
3. John Pollock, Java Script, 4th Edition, McGraw Hill Education (India) Edition, 2013
4. R. Nageswara Rao, Corer Python Programming, Dreamtech Press

With effect from the academic year 2019-2020

BCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
HSC105	Effective Communication	HSC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT – I

Effective Communication: Role and importance of communication; Features of human communication; Process of communication; Barriers to communication; Oral and Written Communication; Importance of listening, speaking, reading, and writing;

Types of communication: Verbal – formal versus informal communication, one-way versus two-way communication, Non-verbal communication.

UNIT – II

Personality Development and Interpersonal Communication: Models of interpersonal development, Johari window, Knapp's model, Styles of communication, Time management, Emotional Quotient, Teamwork, Persuasion techniques.

UNIT – III

Remedial English: Tenses, Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés.

(Note: The focus is on appropriate usage)

UNIT – IV

Vocabulary Building and Written Communication: Roots and affixes;

Words often confused: Homonyms, Homophones, Homographs; One-word substitutes;

Idiomatic usage: Idioms, Phrases, Phrasal Verbs; Synonyms; Antonyms; Paragraph writing; Précis writing; Essay writing; Official letters; E-mail etiquette;

Technical report writing: Feasibility and Progress reports.

UNIT – V

Reading Comprehension: Unseen Passages, A.P.J. Abdul Kalam, Azim Premji, Sachin Tendulkar, Sathya Nadella, Sam Pitroda

(Note: No descriptive questions to be set from this unit and only Reading Comprehension/s from unseen passages should be set in the Examination Question Papers)

Suggested Readings:

1. E. Suresh Kumar, *Engineering English*, Orient BlackSwan, 2014
2. *Language and Life A Skills Approach*, Orient Black Swan, 2018
3. Michael Swan, *Practical English Usage*. OUP, 1995
4. Ashraf Rizvi, M, *Effective Technical Communication*, Tata McGraw Hill, 2009.
5. Meenakshi Raman and Sangeeta Sharma. *Technical Communication: Principles and Practice*. OUP, 2011.

With effect from the academic year 2019-2020

BCA SEM I – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LCC151	Programming in C Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

1. Write programs using arithmetic, logical, bitwise and ternary operators.
2. Write programs simple control statements : Roots of a Quadratic Equation, extracting digits of integers, reversing digits ,finding sum of digit ,printing multiplication tables, Armstrong numbers, checking for prime, magic number,
3. Sin x and Cos x values using series expansion
4. Conversion of Binary to Decimal, Octal, Hexa and Vice versa
5. Generating a Pascal triangle and Pyramid of numbers
6. Recursion: Factorial, Fibonacci, GCD
7. Finding the maximum, minimum, average and standard deviation of given set of numbers using arrays
8. Reversing an array ,removal of duplicates from array
9. Matrix addition , multiplication and transpose of a square matrix .using functions
10. Functions of string manipulation**:** inputting and outputting string , using string functions such as strlen( ),strcat( ),strcpy( )……etc
11. Writing simple programs for strings without using string functions.
12. Finding the No. of characters, words and lines of given text file
13. File handling programs : student memo printing

With effect from the academic year 2019-2020

BCA SEM I – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LCC152	Web Technology Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

1. Creating HTML Pages to test different tags
    a. Headers
    b. Linking Images
    c. Images as Anchors Text Formatting
    d. HTML Table Formatting
    e. Ordered and Unordered Lsits
    f. Creations of Frames
2. Develop HTML5 form with client validations using Java Script
3. Methods of date and time objects
4. Using CSS perform the following
    a. Aligning Text
    b. Setting box dimensions
    c. Floating alerts
5. Demonstrating object hierarchy using collection
6. Using HTML events
7. Develop College Website using HTML5 and CSS
8. Develop Time Table Website using HTML5 and CSS
9. Write basic Python programs
10. Write basic XML programs

With effect from the academic year 2019-2020

BCA SEM I – Laboratory			Hours /week			Scheme of Examination			
						Max Marks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LCC153	IT Workshop	LCC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

1. System Assembling , Disassembling and identification of Parts / Peripherals
2. Operating System Installation – Install Operating Systems like Windows, Linux along with necessary Device Drivers.

3. Introducing to programming Environment(Linux commands, editing tools such as vi editor, sample program entry, compilation and execution)

4. MS-Office / Open Office
   a. Word – Formatting Page Borders, Reviewing Equations, symbols
   b. Spread Sheet – organize data, usage of formula graphs charts
   c. Power point – features of power point, guidelines for preparing an effective presentation
   d. Access – creation of database, validate data
5. Network Configuration & Software Installation: Configuring TCP/IP, proxy and firewall settings. Installing application software system software & tools.
6. Internet and World Wide Web-Search Engines. Types of search engines, netiquette, Cyber hygiene.
7. Trouble Shooting – Hardware trouble shooting, Software trouble shooting.

Suggested Reading:

1. K. L. James, Computer Hardware, Installation, Interfacing Troubleshooting and Maintenance, Eastern Economy Edition.
2. Gary B.Shelly, Misty E Vermaat and Thomas J. Cashman, Microsoft Office 2007 Introduction Concepts and Techniques, Windows XP Edition, 2007, Paperback.
3. Leslie Lam port, LATEX-User‟s Guide and Reference manual, Pearson, LPE, 2nd Edition.
4. Rudraprathap, Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, Oxford University Press, 2002.
5. Scott Mueller‟s, Upgrading and Repairing PCs, 18th Edition, Scott. Mueller, QUE, Pearson, 2008.
6. Cherry l A Schmidt, The Complete Computer Upgrade and Repair Book, 3rd Edition , Dream tech.
7. Vikas Gupta, Comdex Information Technology Course Tool Kit , WILEY Dream tech.
8. ITL Education Solutions Limited, Introduction to Information Technology, Pearson Education.

With effect from the academic year 2019-2020

PROPOSED SCHEME OF INSTRUCTION
BACHELOR OF COMPUTER APPLICATIONS (BCA)
SEMESTER- II

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	BSC201	Fundamentals of Probability and Statistics	**BSC**	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC202	Object Oriented Programming using CPP	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
3	PCC203	Computer Architecture	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC204	Data Structures	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
5	PCC205	Data Communications	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICALS									
6	LCC251	Object Oriented Programming using CPP Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC252	Data Structures Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**
8	LHC253	Communication Skills Lab	**LHC**	**-**	**4**	**2**	**50**	**25**	**3**
			Total	**20**	**12**	**26**	**500**	**225**	**-**

Abbreviation	Full Form	Abbreviation	Full Form
BSC	Basic Science Course	LTC	Laboratory Technological Course
PCC	Professional Core Course	LPC	Laboratory Professional Course
ETC	Emerging Technological Course	LHC	Laboratory Humanities Course
HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2019-2020

BCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
BSC201	Fundamentals of Probability and Statistics	BSC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT-I

Data Validation and Information Abstraction: Methods of collecting data efficiently, Gathering information from data charting.

UNIT-II

Probability: Laws of Probability, Probability distributions, Discrete, Equiprobable, binomial, Poisson.

UNIT-III

Continuous Distributions: Rectangular, normal, gamma and beta.

UNIT-IV

Statistical Methods : Frequency distributions, Mathematical Expectation, Moments, Skewness and Kurtosis.

UNIT-V

Correlation and Regression, Introduction to tests of Significance, u, t, x tests.

Suggested reading:

1. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics" , 1989.
2. William Mendenhall, Robert J. Beaver, Barbara M.. Beaver, "Introduction to Probability and Statistics", Thomson Brooks / Cole, Eleventh Edition, 2003.\
3. Richard A. Johnson, "Probability and Statistics for Engineers", Prentice Hall of India, Seventh Edition, 2005.

With effect from the academic year 2019-2020

BCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC202	Object oriented Programming using CPP	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I

Introduction to OOP: Procedure oriented programming, object oriented programming, basic concepts of OOP, benefits and applications of OOP, simple C++ program, namespace scope, structure of C++ Program, creating, compiling and linking a file.

Tokens : Keywords, identifiers, constants, basic data types, user defined data types, storage classes, derived data types, dynamic initialization of variables, reference variables, operators in C++, scope resolution operator, member dereferencing operators, memory management operators.

UNIT II

Control Structures: if, if..else, elseif ladder, nested if, switch, for, while, do..while, break, continue, exit, goto.

Classes and Objects: Specifying a class, defining member functions, C++ program with class, private member functions, arrays within class, memory allocation for objects, static data members, static member functions, arrays of objects, returning objects.

Functions in C++: Main function, function prototyping, call by reference, return by reference, inline functions, default arguments.

UNIT III

More about Functions: Function overloading, friend function, a function friendly to two classes, objects as function arguments.

Constructors & Destructors: Constructors, parameterized constructors, multiple constructors in a class, constructors with default arguments, copy constructors, dynamic constructors, destructors.

UNIT IV

Inheritance: Introduction to inheritance, single inheritance, multi-level inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance.

Operator Overloading: Rules for overloading operators, overloading unary operators, overloading binary operators.

Pointers: Introduction to pointers, declaring and initializing pointers, arithmetic operations on pointers, pointers with arrays, arrays of pointers, pointers to objects, 'this' pointer.

UNIT V

Polymorphism and Virtual Functions: Compile-time polymorphism, runtime polymorphism, virtual functions.

Templates: Introduction, function templates, class templates.

Exception Handling: Introduction, exception handling mechanism, throwing mechanism, catching mechanism.

Suggested Reading:

1. E. Balagurusamy, Object Oriented Programming with C++, 6/e, McGraw Hill, 2013.
2. Behrouz A. Forouzan and Richard F. Gilberg, Computer Science : A Structured Approach Using C++, 2/e, Cengage Learning, 2003.
3. Ashok N. Kamthane, Object Oriented Programming with ANSI and Turbo C++, 1/e, Pearson Education, 2006.

With effect from the academic year 2019-2020

BCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC203	Computer Architecture	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I
Basic Structure of Computers
Functional units, Basic operational concepts, Bus structures, Software performance, Memory locations and addresses, Memory operations, Instruction and instruction sequencing, Addressing modes, Assembly language, Basic I/O operations.

UNIT II
Arithmetic Unit
Addition and subtraction of signed numbers, Design of fast adders, Multiplication of positive Numbers, Signed operand multiplication and fast multiplication, Integer division , Floating point numbers and operations.

UNIT III
Basic Processing Unit
Fundamental concepts, Execution of a complete instruction,
Hardwired control, Microprogrammed control, Pipelining, Basic concepts, Data hazards, Instruction hazards, Influence on Instruction sets, Data path and control consideration.

UNIT IV
Memory System
Basic concepts, Semiconductor RAMs, ROMs, Speed, size and cost, Cache memories, Performance consideration, Virtual memory, Memory Management requirements, Secondary storage.

UNIT V
I/O Organization
Accessing I/O devices, Interrupts, Direct Memory Access , Buses, Interface circuits, Standard I/O Interfaces (PCI, SCSI, USB).

Suggested Reading:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, 5th Edition "Computer Organization", McGraw-Hill, 2002.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", 6th Edition, Pearson Education, 2003.
3. David A.Patterson and John L.Hennessy, "Computer Organization and Design: The hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002.
4. John P.Hayes, "Computer Architecture and Organization", 3rd Edition, McGraw Hill, 1998.

With effect from the academic year 2019-2020

BCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC204	Data Structures	**PCC**	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT-I

Introduction to Data Structures: Definition, Uses, Types.

Arrays: Abstract Data Types and the C++ Class, Array as an Abstract Data Type, Representation of Arrays, Matrices, Special Matrices Sparse Matrices, Strings.

UNIT-II

Stacks and Queues: Representation of Stacks, Representation of Queue, Operations on Stacks, Operations on Queues, Types of Queues.

UNIT-III

Linked Lists: Singly Linked Lists, Doubly Linked Lists, Circular Lists.

Hashing: Static Hashing, Hash Tables, Hash Functions, Overflow Handling.

UNIT-IV

Trees: Introduction, Binary Trees, Representation of Binary Tree, Binary Tree Traversal, Binary Search Tree, Operations on Binary Search Tree, Heap tree, B-tree.

Graphs: Terminology, Types, Representation of Graph, Elementary Graph operations- DFS and BFS.

UNIT-V

Sorting: Bubble, Selection, Insertion sort, Quick sort, Merge sort, Heap sort, shell sort.

Searching Techniques: Linear Search, Binary Search

Suggested Reading:

1. Ellis Horowitz, Dinesh Mehta, S. Sahani. Fundamentals of Data Structures in C++, Universities Press. 2007.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education 2006.
3. Michael T. Goodrich, Roberto Tamassia, David Mount, Data Structures and Algorithms in C++, Wiley India Pvt. Ltd, 2004.

BCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC205	Data Communications	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I

Data communication, Data networking and the Internet: A communication model, data communications, networks, the internet.

Protocol Architecture: Need for protocol architecture, TCP/IP protocol architecture, OSI model, TCP/IP Vs OSI model.

UNIT II

Data transmission: Concepts and terminology, analog and digital data transmission, transmission impairments.

Transmission Media: Guided and unguided.

UNIT III

Signal encoding techniques: Digital data to digital signals, digital data to analog signals, analog data to digital signals, analog data to analog signals.

UNIT IV

Digital Data Communication Techniques: Asynchronous and synchronous transmission, types of errors, error detection techniques.

Data link control protocols: Flow control, error control, high level data link control (HDLC) protocol.

UNIT V

Multiplexing: Frequency division multiplexing, characteristics, synchronous time division multiplexing, characteristics. Statistical time division multiplexing, characteristics.

Suggested Readings:

1. William Stallings, Data and Computer Communications, 8/e, Pearson Education., 2013.
2. Fred Harshall, Data Communications, Computer Networks and Open systems, 4/e, Pearson Education, 2005.
2. Behrouz A Forouzan, Data Communications and Networking, 4/e, McGraw Hill, 2012.

With effect from the academic year 2019-2020

BCA SEM II – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LCC251	Object oriented Programming using CPP Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

1. Write a program that contains a function to exchange (swap) values of two arguments by using pointers and References parameters.
2. Write a program to check the given string is palindrome or not using a private member function.
3. Write a program to find transpose of 2-D matrix by allocating memory dynamically to the matrix. Initialize and display contents of the matrix and deallocate memory.
4. Write a program to add corresponding elements of two 2-D matrices using friend function. Create two classes each capable of storing one 2-D matrix. Declare the matrices under private access specifier and access them outside the class.
5. Write a program for finding area of different geometric shapes (Circle, Rectangle and Cube) using function overloading.
6. Write a Program to generate Fibonacci Series by using Constructor to initialize the Data Members.
7. Write a program to add two matrices of same copy. Create two objects of the class and each of which refers to one 2-D matrix. Use constructor to allocate memory dynamically and use copy constructor to allocate memory when one array object is used to initialize another.
8. Write a program to demonstrate single inheritance distinguishing public and private derivation.
9. Write a program to illustrate the implementation of both Multilevel and Multiple (Hybrid) inheritance.
10. Write a program to find transpose of a given matrix of mxn size using unary operator overloading.
11. Write a program to add two matrices of mxn size using binary operator overloading.
12. Write a program to demonstrate the usage of virtual functions.
13. Write a program to sort a given set of elements using function template.
14. Write a program to search a key element in a given set of elements using class template.
15. Write a program to find average marks of the subjects of a student. Throw multiple exceptions and define multiple catch statements to handle division by zero as well as array index out of bounds exceptions.

With effect from the academic year 2019-2020

BCA SEM II – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LCC252	Data Structures Lab	**LCC**	**-**	**4**	**2**	**50**	**25**	**3**	**2**

Experiments:

1. Write a C++ program for the implementation of Array.
2. Write a C++ program for the implementation of Special Matrices.
3. Write a C++ program for the implementation of Sparse Matrices
4. Write a C++ program for the implementation of String
5. Write a C++ program to implement the following using array
   a) Stack
   b) Queue
6. Write a C++ program to implement the following using a) single linked list b) Doubly linked list c)Circular linked list
7. Write a C++ program to implement stack using linked list.
8. Write a C++ program to implement queue using linked list.
9. Write a C++ program to implement binary tree.
10. Write C++ program for implementing the following sorting methods
    a) Bubble sort
    b) Selection sort
    c) Insertion sort
    d) Quick sort
    e) shell sort
    f) Merge sort
    g) g) Heap sort
11. Programs on Linear Search and Binary Search using recursion and iteration

With effect from the academic year 2019-2020

BCA SEM II – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LHC253	Communication Skills Lab	LHC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

1. **Introduction to English Phonetics**: Organs of Speech: respiratory, articulatory and phonatory systems; Sounds of English: Introduction to International Phonetic Alphabet; Minimal pairs; Syllable; Word Stress; Introduction of rhythm and intonation; Difficulties of Indians speakers with stress and intonation.
2. **Speaking Activities**: Self Introduction, Picture perception, JAM.
3. Group discussion, Debate, Presentation skills
4. **Listening Activities**: Listening to different types of materials for effective comprehension
5. **Role play:** Use of dialogues in a variety of situations and settings

Suggested Readings:

1. E. Suresh Kumar. *A Handbook for English Language Laboratories (with CD).* Revised edition, Cambridge University Press India Pvt. Ltd. 2014
2. T. Balasubramanian. *A Textbook of English Phonetics for Indian Students.* Macmillan, 2008.
3. J. Sethi et al., *A Practical Course in English Pronunciation (with CD).* Prentice Hall of India, 2005.
4. Hari Mohan Prasad. *How to Prepare for Group Discussions and Interviews*. Tata McGraw Hill, 2006.

Osmania University

Faculty of Informatics

Master of Computer Applications (MCA)

Semester I and II

2019 – 2020

Scheme of Instruction

and

Syllabi

Osmania University
Hyderabad

Osmania University
Proposed Scheme of Instruction
Master of Computer Applications (MCA) Scheme W.E.F 2019-2020

Sem	Course-1	Course-2	Course-3	Course-4	Course-5	Lab-1	Lab-2	Lab-3	Hours	Credits	Categories
I	Discrete Mathematics (4) BSC	Introduction to Logic Theory (4) PCC	Python Programming (4) ETC	Data Structures with CPP (4) PCC	Data Communications (4) PCC	Python Programming Lab (2) LTC	Data Structures with CPP Lab (2) LCC	Soft Skills Lab (2) LHC	32	26	BSC=4 PCC=12 ETC=4 LCC=2 LHC=2 LTC=2
II	Probability and Statistics (4) BSC	Operating Systems (4) PCC	Computer Organization (4) PCC	Java Programming (4) PCC	Database Management Systems (4) PCC	Operating Systems Lab (2) LCC	Java Programming Lab (2) LCC	Database Management Systems Lab (2) LCC	32	26	BSC=4 PCC=16 LCC=6
III	Design and Analysis of Algorithms (4) PCC	Computer Networks (4) PCC	Web Programming (4) PCC	Automata Theory and Compiler Design (4) PCC	Distributed Computing (4) ETC	Algorithms Design Lab (2) LCC	Computer Networks Lab (2) LCC	Web Programming Lab (2) LCC	32	26	PCC=16 ETC=4 LCC=6
IV	Data Mining (4) ETC	Artificial Intelligence (4)ETC	Software Engineering (4) PCC	Professional Elective – I Advanced Java Programming / Programming using C# and ASP.NET / Internet Programming using PHP (4)PEC	Open Elective - I Human Relation at Work/Ethics and Holistic Life / Gender Sensitization (4) HSC	Data Mining Lab (2) LTC	Software Design Lab using UML (2) LCC	Professional Elective –I Lab (2) LPC	32	26	PCC=4 ETC=8 PEC=4 HSC=4 LCC=2 LPC=2 LTC=2
V	Cryptographic Algorithms and Network Security (4) PCC	Big Data and Hadoop (4) ETC	Cloud Computing (4) ETC	Professional Elective – II Adhoc and Sensor Networks /Internet of Things /Blockchain	Open Elective – II Economics for Engineers/ Fundamentals of Management for Engineers / Project Managemen	Big Data and Hadoop Lab (2) LTC	Technical Seminar (1) LCC	--	26	23	PCC=4 ETC=8 PEC=4 MGC=4 LCC=1 LTC=2

				(4) PEC	t and Entrepreneurship (4) MGC						
VI	Main Project Dissertation and Presentation (4) LCC								8	4	LCC=4

Categories of Courses and Credits

Abbreviation	Full Form	Credits	Abbreviation	Full Form	Credits
BSC	Basic Science Course	8	PEC	Professional Elective Course	8
PCC	Professional Core Course	52	LCC	Laboratory Core Course	21
ETC	Emerging Technological Course	24	LTC	Laboratory Technological Course	6
HSC	Humanities and Social Science Course	4	LPC	Laboratory Professional Course	2
MGC	Management Course	4	LHC	Laboratory Humanities Course	2
Total	**131**				

Abbreviation	Full Form	Abbreviation	Full Form
BSC	Basic Science Course	LTC	Laboratory Technological Course
PCC	Professional Core Course	LPC	Laboratory Professional Course
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HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

PROPOSED SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER- I

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	BSC101	Discrete Mathematics	BSC	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC102	Introduction to Logic Theory	PCC	**4**	**-**	**4**	**70**	**30**	**3**
3	ETC103	Python Programming	ETC	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC104	Data Structures with CPP	PCC	**4**	**-**	**4**	**70**	**30**	**3**
5	PCC105	Data Communications	PCC	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICAL									
6	LTC151	Python Programming Lab	LTC	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC152	Data Structures with CPP Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**
8	LHC153	Soft Skills Lab	LHC	**-**	**4**	**2**	**50**	**25**	**3**
			Total	**20**	**12**	**26**	**500**	**225**	**-**

Abbreviation	Full Form	Abbreviation	Full Form
BSC	Basic Science Course	LTC	Laboratory Technological Course
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MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2019-2020

PROPOSED SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER- II

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	BSC201	Probability and Statistics	BSC	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC202	Operating Systems	PCC	**4**	**-**	**4**	**70**	**30**	**3**
3	PCC203	Computer Organization	PCC	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC204	Java Programming	PCC	**4**	**-**	**4**	**70**	**30**	**3**
5	PCC205	Database Management Systems	PCC	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICALS									
6	LCC251	Operating Systems Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC252	Java Programming Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**
8	LCC253	Database Management Systems Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**
			Total	**20**	**12**	**26**	**500**	**225**	**-**

Abbreviation	Full Form	Abbreviation	Full Form
BSC	Basic Science Course	LTC	Laboratory Technological Course
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HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2020-2021

PROPOSED SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER- III

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	PCC301	Design and Analysis of Algorithms	PCC	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC302	Computer Networks	PCC	**4**	**-**	**4**	**70**	**30**	**3**
3	PCC303	Web Programming	PCC	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC304	Automata Theory and Compiler Design	PCC	**4**	**-**	**4**	**70**	**30**	**3**
5	ETC305	Distributed Computing	ETC	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICALS									
6	LCC351	Algorithms Design Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC352	Computer Networks Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**
8	LCC353	Web Programming Lab	LCC		**4**	**2**	**50**	**25**	**3**
			Total	**20**	**12**	**26**	**500**	**225**	**-**

Abbreviation	Full Form	Abbreviation	Full Form
BSC	Basic Science Course	LTC	Laboratory Technological Course
PCC	Professional Core Course	LPC	Laboratory Professional Course
ETC	Emerging Technological Course	LHC	Laboratory Humanities Course
HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2020-2021

PROPOSED SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER- IV

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	ETC401	Data Mining	ETC	**4**	**-**	**4**	**70**	**30**	**3**
2	ETC402	Artificial Intelligence	ETC	**4**	**-**	**4**	**70**	**30**	**3**
3	PCC403	Software Engineering	PCC	**4**	**-**	**4**	**70**	**30**	**3**
4	**Professional Elective - I**		PEC	**4**	**-**	**4**	**70**	**30**	**3**
4a	PEC411	Advanced Java Programming							
4b	PEC412	Programming using C# and ASP.NET							
4c	PEC413	Internet Programming using PHP							
5	**Open Elective - I**		HSC	**4**	**-**	**4**	**70**	**30**	**3**
5a	HSC421	Human Relations at Work							
5b	HSC422	Ethics and Holistic Life							
5c	HSC423	Gender Sensitization							
PRACTICALS									
6	LTC451	Data Mining Lab	LTC	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC452	Software Design Lab using UML	LCC	**-**	**4**	**2**	**50**	**25**	**3**
8	LPC453	Professional Elective – I Lab	LPC		**4**	**2**	**50**	**25**	**3**
			Total	**20**	**12**	**26**	**500**	**225**	**-**

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MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2021-2022

PROPOSED SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER-V

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	PCC501	Cryptographic Algorithms and Network Security	PCC	**4**	**-**	**4**	**70**	**30**	**3**
2	ETC502	Big Data and Hadoop	ETC	**4**	**-**	**4**	**70**	**30**	**3**
3	ETC503	Cloud Computing	ETC	**4**	**-**	**4**	**70**	**30**	**3**
4	**Professional Elective - II**		PEC	**4**	**-**	**4**	**70**	**30**	**3**
4a	PEC511	Ad-Hoc and Sensor Networks							
4b	PEC512	Internet of Things							
4c	PEC513	Blockchain							
5	**Open Elective - II**		MGC	**4**	**-**	**4**	**70**	**30**	**3**
5a	MGC521	Economics for Engineers							
5b	MGC522	Fundamentals of Management for Engineers							
5c	MGC523	Project Management and Entrepreneurship							
PRACTICALS									
6	LTC552	Big Data and Hadoop Lab	LTC	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC553	Technical Seminar	LCC		**2**	**1**	**50**	**25**	**3**
			Total	**20**	**6**	**23**	**450**	**200**	**-**

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PEC	Professional Elective Course	L	Lecture
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With effect from the academic year 2021-2022

PROPOSED SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER-VI

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
PRACTICALS				**L**	**P**		**SEE**	**CIE**	**SEE**
1	LCC651	Main Project Dissertation and Presentation	LCC	**-**	**8**	**4**	**100**	**50**	**3**
			Total	**-**	**8**	**4**	**100**	**50**	**-**

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*With effect from the academic year **2019-2020***

PROPOSED SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER- I

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	BSC101	Discrete Mathematics	BSC	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC102	Introduction to Logic Theory	PCC	**4**	**-**	**4**	**70**	**30**	**3**
3	ETC103	Python Programming	ETC	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC104	Data Structures with CPP	PCC	**4**	**-**	**4**	**70**	**30**	**3**
5	PCC105	Data Communications	PCC	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICAL									
6	LTC151	Python Programming Lab	LTC	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC152	Data Structures with CPP Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**
8	LHC153	Soft Skills Lab	LHC	**-**	**4**	**2**	**50**	**25**	**3**
			Total	**20**	**12**	**26**	**500**	**225**	**-**

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PEC	Professional Elective Course	L	Lecture
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With effect from the academic year 2019-2020

MCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
BSC101	Discrete Mathematics	**BSC**	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT- I

Fundamentals of Logic: Basic Connectives and Truth Tables, Logical Equivalence, Logical Implication, Use of Quantifiers, Definitions and the Proof of Theorems.

Set Theory: Set and Subsets, Set Operations, and the Laws of Set theory, Counting and Venn Diagrams.

Properties of the Integers: The well – ordering principle, Recursive Definitions, Division Algorithms, Fundamental theorem of Arithmetic.

UNIT-II

Relations and Functions: Cartesian Product, Functions onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions, Computational Complexity.

Relations: Partial Orders, Equivalence Relations and Partitions.

Principle of Inclusion and Exclusion: Principles of Inclusion and Exclusion, Generalization of Principle, Derangements, Rock Polynomials, Arrangements with Forbidden Positions.

UNIT–III

Generating Functions: Introductory Examples, Definition And Examples, Partitions Of Integers, Exponential Generating Function, Summation Operator.

Recurrence Relations: First – order linear recurrence relation, second – order linear homogenous recurrence relation with constant coefficients, Non homogenous recurrence relation, divide and conquer algorithms.

UNIT-IV

Algebraic Structures: Algebraic System – General Properties, Semi Groups, Monoids, Homomorphism, Groups, Residue Arithmetic, Group Codes and their Applications.

UNIT -V

Graph Theory: Definitions and examples, sub graphs, complements and graph Isomorphism, Vertex degree, Planar graphs, Hamiltonian paths and Cycles, Graph Coloring, Euler & Hamiltonian graphs, and Chromatic number.

Trees: Definitions, properties and Examples, Rooted Trees, Spanning Trees and Minimum Spanning Trees.

Suggested Reading:

1) Mott Joe L Mott, Abraham Kandel, and Theodore P Baker, **Discrete Mathematics for Computer Scientists & Mathematicians**, Prentice Hall NJ, 2nd Edition, 2015.

2) Jr. P. Tremblay and R Manohar **Discrete Mathematical Structures with Applications to Computer Science**, McGraw Hill, 1987.

3) R.K.Bisht and H.S.Dhami, **Discrete Mathematics** Oxford Higher Education, 2015

4) Bhavanari Satyanarayana, Tumurukota Venkata Pradeep Kumar and Shaik Mohiddin Shaw, **Mathematical Foundation of Computer Science,** BSP, 2016

5) Ralph P. Grimaldi **Discrete and Combinatorial Mathematics**, 5th Edition, Pearson, 2004.

MCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC102	Introduction to Logic Theory	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT-I

Boolean Algebra: Axiomatic definition of Boolean Algebra Operators, Postulates and Theorems, Boolean Functions, Canonical Forms and Standard Forms, Simplification of Boolean Functions Using Theorems and Karnaugh Map Method.

UNIT-II

Minimization of Switching Functions: Quine-McCluskey Tabular Method, Determination of Prime Implicants and Essential Prime Implicants.

Combinational Logic Design: Single-Output and Multiple-Output Combinational Circuit Design, AND-OR, OR-AND and NAND/NOR Realizations, Exclusive-OR and Equivalence functions.

UNIT–III

Design of Combinational Logic Circuits: Gate Level design of Small Scale Integration (SSI) circuits, Modular Combinational Logic Elements- Decoders, Encoders, Priority encoders, Multiplexers and De-multiplexers.

Design of Integer Arithmetic Circuits using Combinational Logic: Integer Adders – Binary Adders, Subtractors, Ripple Carry Adder and Carry Look Ahead Adder, and Carry Save Adders.

UNIT-IV

Design of Combinational Circuits using Programmable Logic Devices (PLDs): Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PAL) devices.

Introduction to Sequential Circuit Elements: Latch, Various types of Flip-Flops and their Excitation Tables.

UNIT -V

Models of Sequential Circuits: Moore Machine and Mealy Machine, Analysis of Sequential Circuits-State Table and State Transition Diagrams. Design of Sequential Circuits-Counters. Moore and Mealy State Graphs for Sequence Detection, Methods for Reduction of State Tables and State Assignments.

Suggested Reading:

1) M Morris Mano and Michael D Ciletti, **Digital Design**, Prentice Hall of India, Fourth Edition, 2008.

2) Zvi Kohavi, **Switching and Finite Automata Theory**, Tata McGraw Hill, 2nd Edition, 1979.

MCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
ETC103	Python Programming	ETC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I

Algorithmic Problem Solving

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

Data, Expressions, Statements

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments;

UNIT II

modules and functions: function definition and use, flow of execution, parameters and arguments

Control Flow, Functions

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

UNIT III

Lists, Tuples, Dictionaries

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension.

UNIT IV

Files, Modules, Packages

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages.

UNIT V

Object Oriented Programming

Classes and Objects, Classes and Functions, Classes and Methods, Working with instances, Inheritance and Polymorphism.

Suggested Reading:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016. (http://greenteapress.com/wp/thinkpython/)

2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

References:

1. John V Guttag, ―Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013

2. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

MCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC104	Data Structures with CPP	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT–I

Performance and Complexity Analysis: Space Complexity, Time Complexity, Asymptotic Notation (Big-Oh), Complexity Analysis Examples.

Linear List-Array Representation: Vector Representation, Multiple Lists Single Array. **Linear List-Linked Representation:** Singly Linked Lists, Circular Lists, Doubly Linked Lists, Applications (Polynomial Arithmetic).

Arrays and Matrices: Row And Column Major Representations, Sparse Matrices.

UNIT –II

Stacks: Array Representation, Linked Representation, Applications (Recursive Calls, Infix to Postfix, Postfix Evaluation).

Queues: Array Representation, Linked Representation.

Skip Lists and Hashing: Skip Lists Representation, Hash Table Representation, Application-Text Compression.

UNIT- III

Trees: Definitions and Properties, Representation of Binary Trees, Operations, Binary Tree Traversal.

Binary Search Trees: Definitions, Operations on Binary Search Trees. **Balanced Search Trees:** AVL Trees, and B-Trees.

UNIT –IV

Graphs: Definitions and Properties, Representation, Graph Search Methods (Depth First Search and Breadth First Search)

Application of Graphs: Shortest Path Algorithm (Dijkstra), Minimum Spanning Tree (Prim's and Kruskal's Algorithms).

UNIT -V

Sorting and Complexity Analysis: Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Closest Pair Of Points, and Heap Sort.

Suggested Reading:

1) Sartaj Sahni, **Data Structures--Algorithms and Applications in C++**, 2nd Edition, Universities Press (India) Pvt. Ltd., 2005.

2) Mark Allen Weiss, **Data Structures and Problem Solving using C++**, Pearson Education International, 2003.

3) Michael T. Goodrich, Roberto Tamassia, David M. Mount, **Data Structures and Algorithms in C++**, John Wiley & Sons, 2010.

With effect from the academic year 2019-2020

MCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC105	Data Communications	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT – I

Data Communication and Networking Overview, Protocol Architectures: OSI, TCP/IP and ATM. Data transmission, Guided and Wireless transmission. Data Encoding: digital data-digital signals, digital data-analog signals, analog data-digital signals, analog data-analog signals.

UNIT – II

Multiplexing, Circuit switching and Packet switching, Digital Data Communication Techniques, Asynchronous and Synchronous transmission, DSL and ADSL.

UNIT – III

Data Link Control: Error detection techniques, Interfacing. Line configurations, Flow control, Error control, Data link control protocols, Protocol verification.

UNIT – IV

Local Area Networks, LAN Technologies, MAC sub layer, CSMA/CD, Token Ring, Fibre channel, IEEE Standards, High Speed LAN: Switched, Fast, Gigabit Ethernets.

UNIT – V

Wireless LANs, 802.11 Broadband wireless, 802.16 Bluetooth, Bridge, Spanning Tree Bridge, Source Routing Bridge, Repeaters, Hubs, Switches, Routers and Gateways, Virtual LANs.

Suggested Readings:

1. William Stallings, Data and Computer Communications, 8th Edition, Prentice Hall of India, 2012

2. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, 5th Edition, Pearson, 2012

With effect from the academic year 2019-2020

MCA SEM I – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LTC151	Python Programming Lab	LTC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

1. Write a program to demonstrate different number data types in Python.
2. Write a program to perform different Arithmetic Operations on numbers in Python.
3. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
4. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
5. Write a program to create, append, and remove lists in python.
6. Write a program to demonstrate working with tuples in python.
7. Write a program to demonstrate working with dictionaries in python.
8. Write a python program to find largest of three numbers.
9. Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula : c/5 = f-32/9]
10. Write a Python program to construct the different pattern, using a nested for loop.
11. Write a Python script that prints prime numbers less than 20.
12. Write a python program to find factorial of a number using Recursion.
13. Write a program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides).
14. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
15. Write a python program to define a module and import a specific function in that module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral. 19. Write a Python class to implement pow(x, n)
20. Write a Python class to reverse a string word by word

Note: Use of Python IDEs like PyCharm, Spyder or Anaconda should be used for executing programs.

With effect from the academic year 2019-2020

MCA SEM I – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LCC152	Data Structures with CPP Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

1) Implementation of Singly Linked List, Doubly Linked List and Circular List.
2) Implementation of Stacks, Queues (using both arrays and linked lists).
3) Infix to Postfix conversion, evaluation of postfix expression.
4) Polynomial arithmetic using linked list.
5) Implementation of Binary Search and Hashing.
6) Implementation of recursive and iterative traversals on binary tree.
7) Implementation of Binary Search Tree.
8) Implementation of operations on binary tree (delete entire tree, copy entire tree, mirror image, level order, search for a node etc.)
9) Implementation of Selection, Shell, Merge and Quick sorts.
10) Implementation of Heap Sort.
11) Implementation of Liner Search and Binary Search.
12) Implementation of operations on AVL trees.
13) Implementation of traversal on Graphs.
14) Implementation of B-Trees.

Note: Visual Studio is recommended for the development of programs.
To debug these programs it is recommended to use a debugging tool.

MCA SEM I – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LHC153	Soft Skills Lab	LHC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

Activities

1. Conversation skills, Listening dialogues from TV/radio/Ted talk/Podcast
2. Group discussion
3. Interview skills, Making presentation
4. Listening to Lectures and News Programmes, Listening to Talk show
5. Watching videos on interesting events on Youtube,
6. Reading different genres of tests ranging from newspapers to philosophical treatises
7. Reading strategies - graphic organizers, Reading strategies - summarizing
8. Reading strategies – interpretation, Reports
9. Cover letter, Resume,
10. Writing for publications, Letters, Memos, Emails and blogs
11. Civil Service (Language related), Verbal ability
12. Motivation, Self image
13. Goal setting, Managing changes
14. Time management, Stress management
15. Leadership traits
16. Team work
17. Career and life planning.
18. Multiple intelligences
19. Emotional intelligence
20. Spiritual quotient (ethics)
21. Intercultural communication
22. Creative and critical thinking
23. Learning styles and strategies

Suggested Reading:

1. Business English Certificate Materials, Cambridge University Press.
2. Graded Examinations in Spoken English and Spoken English for Work downloadable materials from Trinity College, London.
2. International English Language Testing System Practice Tests, Cambridge University Press.

3. Interactive Multimedia Programs on Managing Time and Stress.
4. Personality Development (CD-ROM), Times Multimedia, Mumbai.
5. Robert M Sherfield and et al. "Developing Soft Skills" 4th edition, New Delhi: Pearson Education, 2009.

Web Sources:

http://www.slideshare.net/rohitjsh/presentation-on-group-discussion
http://www.washington.edu/doit/TeamN/present_tips.html
http://www.oxforddictionaries.com/words/writing-job-applications
http://www.kent.ac.uk/careers/cv/coveringletters.htm
http://www.mindtools.com/pages/article/newCDV_34.htm

With effect from the academic year 2019-2020

PROPOSED SCHEME OF INSTRUCTION
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER- II

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	BSC201	Probability and Statistics	BSC	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC202	Operating Systems	PCC	**4**	**-**	**4**	**70**	**30**	**3**
3	PCC203	Computer Organization	PCC	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC204	Java Programming	PCC	**4**	**-**	**4**	**70**	**30**	**3**
5	PCC205	Database Management Systems	PCC	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICALS									
6	LCC251	Operating Systems Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**
7	LCC252	Java Programming Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**
8	LCC253	Database Management Systems Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**
			Total	**20**	**12**	**26**	**500**	**225**	**-**

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With effect from the academic year 2019-2020

MCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
BSC201	Probability and Statistics	BSC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT-I

Grouping and displaying data to convey meaning - arrangement of data, examples of raw data, frequency distribution, graphing frequency distribution Measures of central tendency - arithmetic mean, weighted mean, geometric mean, Median, mode, Dispersion, measures of dispersion, average deviation measures, coefficient of variation, exploratory data analysis

UNIT-II

Probability - Basic terminology, Three types, Probability rules, Statistical independence, statistical dependency, Bayes' theorem

Probability distributions - random variables, expected values, binomial distribution, Poisson distribution, normal distribution, choosing correct distribution Sampling and sampling distributions - Random sampling, design of experiments, sampling distributions, operational considerations in sampling

UNIT-III

Estimation - Point estimates, interval estimates, confidence intervals, calculating interval estimates of the mean and proportion, t-distribution, determination of sample size in estimation

Testing Hypotheses - one sample tests, hypotheses testing of mean when the population standard deviation is know, powers of hypotheses test, hypotheses testing of proportions, hypotheses testing of means when std is not known

UNIT-IV

Testing Hypotheses - Two sample tests - tests for difference between means - large sample, small sample, with dependent samples, testing for difference between proportions, probe values Chi-square and analysis of variance - chi-square as test of independence, chi-square as a test of goodness of fit, analysis of variance, inferences about a population variance, inferences about two population variances.

UNIT-V

Simple regression and correlation - Estimation using regression line, correlation analysis, making inferences about population parameters, limitations, errors and caveats in regression and correlation analysis multiple regression and modeling - finding multiple regression equations, inference about population parameters, modeling techniques.

Suggested Reading:

Richard I Levin, David S Rubin - Statistics for Management, Seventh Edition, PHI -1997

With effect from the academic year 2019-2020

MCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC202	Operating Systems	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT-I

Introduction to Operating Systems: OS structure and strategies, Process concepts, Multithreaded Programming, Process scheduling, Process synchronization, Deadlocks.

UNIT-II

Memory management strategies with example architectures: Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging, Virtual memory management : Demand paging, Page replacement, Thrashing.

UNIT-III

File system interface: File concepts, Access methods and protection. File system implementation: File system structure, Allocation methods, Directory implementation of file systems, Mass storage structures, I/O systems 11

UNIT-IV

System Protection : Principles and Domain, Access Matrix and implementation, Access control and access rights, Capability based systems, Language based Protection, **System Security**: Problem, Program threats, cryptography, user authentication, implementing security defenses, Firewalling, Computer security Classification

UNIT-V

Case Studies: The Linux System–Design principles, Kernel modules, Process management, Scheduling, Memory management, File systems, Input and Output, Inter process communication. Windows 7 –Design principles, System components, Terminal services and fast user switching File systems, Networking, Programmer interface.

Suggested Reading:

1. Abraham Silberschatz, Peter B Galvin, Operating System Concepts, 9th edition, Wiley, 2016
2. William Stallings, Operating Systems-Internals and Design Principles, 8th edition, Pearson, 2014
3. Andrew S Tanenbaum, Modern Operating Systems, 4th edition, Pearson, 2016.

With effect from the academic year 2019-2020

MCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC203	Computer Organization	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT -I

Data Representation: Data types, Complements, Fixed and Floating Point representations, and Binary codes.

Overview of Computer Function and Interconnections: Computer components, Interconnection structures, Bus interconnection, Bus structure, and Data transfer.

UNIT-II

Register Transfer Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic, Logic and Shift micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory reference instruction, Input-Output and Interrupt.

UNIT-III

Micro programmed Control: Control memory, Address Sequencing, Micro program example, Design of Control Unit.

Central Processing Unit: General Register Organization, Stack Organization, Instruction formats, Addressing modes, Data Transfer and Manipulation, and Program control.

Computer Arithmetic: Addition and Subtraction, Multiplication, Division, and Floating Point Arithmetic Operations.

UNIT-IV

Memory Organization: Memory Hierarchy, Main Memory, RAM and ROM, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory Management hardware.

UNIT–V

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), I/O Processor, Serial Communication.

Pipeline Processing: Arithmetic, Instruction and RISC Pipelines.

Assessing and Understanding Performance: CPU performance and its factors, Evaluating performance.

Suggested Reading:

1) Morris Mano M, **Computer System Architecture**, Pearson Education India, 3rd Edition, 2007.

2) William Stallings, **Computer Organization and Architecture**, PHI, 7th Edition, 2008.

3) David A Patterson, John L Hennessy, **Computer Organization and Design**, Morgan Kaufmann, 5th Edition, 2013.

4) Carl Hamacher, Zvonko Vranesic, Safwat Zaky, **Computer Organization,** Tata McGraw-Hill Education , 5th Edition, 2002

With effect from the academic year 2019-2020

MCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC204	Java Programming	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT-I

Object Oriented System Development: Understanding Object Oriented Development, Understanding Object Concepts, Benefits of Object Oriented Development.

Java Programming Fundamentals: Introduction, Overview of Java, Data Type, Variables and Arrays, Operators, Control statements, Classes, Methods, Inheritance, Packages and Interfaces, Inner Classes.

UNIT-II

I/O basics, Stream and Byte classes, Character Streams, Reading Console input and output, Print Writer Class, String Handling, Exceptions Handling, Multithreaded Programming.

UNIT-III

Exploring Java Language, Collections Overview, Collections Interfaces, Collections Classes, Iterators, Random Access Interface, Maps, Comparators, Arrays, Legacy classes and interfaces, Sting Tokenizer, BitSet, Date, Calendar, Timer.

UNIT-IV

Introducing AWT working With Graphics: AWT Classes, Working with Graphics.

Event Handling: Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces.

AWT Controls: Control Fundamentals, Labels, Using Buttons, Applying Check Boxes, CheckboxGroup, Choice Controls, Using Lists, Managing Scroll Bars, Using TextField, Using TextArea, Understanding Layout Managers, Menu bars and Menus, Dialog Boxes, FileDialog, Handling events by Extending AWT Components, Exploring the controls, Menus and Layout Managers.

UNIT-V

Introduction to Swing Package, Java I/O classes and interfaces, Reading and Writing Files, Serialization, Introduction to Java Network Programming, Object Class, Exploring Image package.

Suggested Reading:

1) Herbert Schildt, **The Complete Reference Java**, 9th Edition, Tata McGraw Hill, 2005.
2) Bruce Eckel, **Thinking in Java**, 4th Edition, Pearson Education
3) Dietel and Dietel, **Java: How to Program,** 5th Edition, Prentice Hall
4) James M Slack, **Programming and Problem solving with JAVA**, Thomson Learning, 2002
5) C Thomas Wu, **An Introduction to Object Oriented programming with Java**, Tata McGraw Hill, 2005.
6) Kathy Sierra, Bert Bates ,**Head First Java**, 2nd Edition, **A Brain-Friendly Guide**, Publisher: O'Reilly Media, February 2005.

MCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC205	Database Management Systems	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT – I

Introduction: Database System Applications, Purpose of Database Systems, View of Values, Nested Sub-queries, Complex Queries, Views, Modification of the Database, Joined Relations Data, Database Languages, Relational Databases, Database Design, Object–based and Semi-structured Databases, Data Storage and Querying, Transaction Management, Data Mining and Analysis, Database Architecture, Database Users and Administrators. Database Design and the **E-R Model**: Overview of the Design Process, The Entity- Relationship Model, Constraints, Entity-Relationship Diagrams, Entity – Relationship Design Issues, Weak Entity Sets, Extended E-R Features, Database Design for Banking Enterprise, Reduction to Relational Schemas, Other Aspects of Database Design

UNIT – II

Relational Model: Structure of Relational Databases, Fundamental Relational-Algebra Operations, Additional Relational – Algebra Operations, Extended Relational - Algebra Operations, Null Values, Modification of the Databases. Structured Query Language: Data Definition, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null

UNIT – III

Advanced SQL: SQL Data Types and Schemas, Integrity Constraints, Authorization, Embedded SQL, Dynamic SQL, Functions and Procedural Constructs, Recursive Queries, Advanced SQL Features. Relational Database Design: Features of Good Relational Design, Atomic Domains and First Normal Form, Functional-Dependency Theory, Decomposition using Functional Dependencies.

UNIT – IV

Indexing and Hashing: Basic Concepts, Ordered Indices, B+-tree Index Files, B-tree Index Files, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices. Index Definition in SQL Transactions: Transaction Concepts, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability

UNIT – V

Concurrency Control: Lock-based Protocols, Timestamp-based Protocols, Validation-based Protocols, Multiple Granularity, Multi-version Schemes, Deadlock Handling, Insert and Delete Operations, Weak Levels of Consistency, Concurrency of Index Structures. Recovery System: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, Advanced Recovery Techniques, Remote Backup Systems

Suggested Readings:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, Database System Concepts, McGraw-Hill International Edition, 6th Edition, 2010
2. Ramakrishnan, Gehrke, Database Management Systems, McGraw-Hill International Edition, 3rd Edition, 2003
3. Elmasri, Navathe, Somayajulu, Fundamentals of Database Systems, Pearson Education, 4th Edition, 2004

MCA SEM II – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LCC251	Operating Systems Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

1-3. Memory Management Algorithms
4-5. Examples of Multithreading
6. Producer & Consumer problem using Semaphores and Shared memory
7-8. Processor Scheduling algorithms
9. Dining Philosophers problem using Semaphores
10. Readers and Writers problem using Semaphores
11. Shell-programming exercises

With effect from the academic year 2019-2020

MCA SEM II – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LCC252	Java Programming Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

1) Write a program to calculate salary of n employees using concept of classes with constructors and methods.
2) Write a program to demonstrate e-commerce website using inheritance, abstract class and dynamic polymorphism.
3) Write a program to demonstrate various arithmetic calculations using packages.
4) Write a program to demonstrate client-server environment using multithreading.
5) Write a program to demonstrate mutual exclusion using thread synchronization.
6) Write a program to demonstrate Linked list class.
7) Write a program to demonstrate Hash set and Iterator classes.
8) Write a program to demonstrate Enumeration and Comparator interfaces.
9) Write a program to accept data and display output in key, value pair.
10) Write a program to create a registration form with different controls, menus and demonstrate event handling.
11) Write a program to copy data from one file to another file.
12) Write a program to merge contents of two files and display output on console.
13) Write a program to illustrate Serialization.
14) Write a program to retrieve web page using URL class.
15) Write a program to load and display image and perform gray scale.

Note: A minimum of Ten Programs should be done by the end of the semester.

With effect from the academic year 2019-2020

MCA SEM II – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LCC253	Database Management Systems Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

Creation of database (exercising the commands for creation).
1. Simple to Complex condition query creation using SQL Plus.
2. Usage of Triggers and Stored Procedures.
3. Creation of Forms for Student information, Library information, Pay roll etc.
4. Writing PL/SQL procedures for data validation.
5. Report generation using SQL reports.
6. Creating password and security features for applications.
7. Usage of File locking, Table locking facilities in applications.
8. Creation of small full- fledged database application spreading over 3 sessions.

Note: The creation of sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

Osmania University

Faculty of Informatics

Master of Science (Information System)

MScIS

Semester I and II

2019 – 2020

Scheme of Instruction

and

Syllabi

Osmania University
Hyderabad

Osmania University
Proposed Scheme of Instruction
Master of Science – Information Systems (MSc-IS) Scheme
W.E.F 2019-2020

Sem	Course-1	Course-2	Course-3	Course-4	Course-5	Lab-1	Lab-2	Lab-3	Hours	Credits	Categories
I	Advanced Data Structures and Algorithm (4) PCC	Mobile and Pervasive Computing (4) ETC	Distributed System (4) PCC	Software Project Management (4) PCC	Machine Learning (4) ETC	Advanced Data Structures and Algorithm Lab (2) LCC	Machine Learning Lab (2) LPC	Communication Skills (1) LHC	30	25	PCC=12 ETC=8 LCC=2 LPC=2 LHC=1
II	Cloud Computing (4) ETC	Network Security (4) PCC	Natural Language Processing (4) ETC	Advanced Software Engineering (4) PCC	Professional Elective-I Network Design and Technologies / Web Engineering / Information Retrieval System (4) PEC	Network Security Lab (2) LTC	Natural Language Processing Lab (2) LTC	Technical Seminar (1) LPC	30	25	ETC=8 PEC=4 PCC=8 LTC=4 LPC=1
III	Big Data Analytics (4) ETC	Principles of Programming(4) ETC	Software Architecture and Design Patterns (4) ETC	Financial Management Accounting (4) MGC	Open Elective Soft Computing / Web Mining / Grid Computing (4) PEC	Big Data Analytics Lab (2) LTC	Research Seminar (1) LHC	-	26	23	PEC=4 ETC=12 MGC=4 LTC=2 LHC=1
IV	Main Project Dissertation and Presentation (4) LCC								8	4	LCC=4

Categories of Courses and Credits

Abbreviation	Full Form	Credits	Abbreviation	Full Form	Credits
PCC	Professional Core Course	20	LCC	Laboratory Core Course	6
ETC	Emerging Technological Course	28	LTC	Laboratory Technological Course	6
MGC	Management Course	4	LPC	Laboratory Professional Course	3
PEC	Professional Elective Course	8	LHC	Laboratory Humanities Course	2
Total	**77**				

PROPOSED SCHEME OF INSTRUCTION

MASTER OF SCIENCE INFORMATION SYSTEMS (MSCIS)

SEMESTER- I

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	PCC101	Advanced Data Structures and Algorithms	PCC	**4**	**-**	**4**	**70**	**30**	**3**
2	ETC102	Mobile and Pervasive Computing	ETC	**4**	**-**	**4**	**70**	**30**	**3**
3	PCC103	Distributed System	PCC	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC104	Software Project Management	PCC	**4**	**-**	**4**	**70**	**30**	**3**
5	ETC105	Machine Learning	ETC	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICALS									
6	LCC151	Advanced Data Structures and Algorithm Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**
7	LPC152	Machine Learning Lab	LPC	**-**	**4**	**2**	**50**	**25**	**3**
8	LHC153	Communication Skills	LHC		**2**	**1**	**50**	**25**	**3**
			Total	**20**	**10**	**25**	**500**	**225**	**-**

Abbreviation	Full Form	Abbreviation	Full Form
BSC	Basic Science Course	LTC	Laboratory Technological Course
PCC	Professional Core Course	LPC	Laboratory Professional Course
ETC	Emerging Technological Course	LHC	Laboratory Humanities Course
HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2019-2020

PROPOSED SCHEME OF INSTRUCTION
MASTER OF SCIENCE INFORMATION SYSTEMS (MSCIS)
SEMESTER- II

SNo	Course Code	Course Title	Cate-Gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	ETC201	Cloud Computing	ETC	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC202	Network Security	PCC	**4**	**-**	**4**	**70**	**30**	**3**
3	ETC203	Natural Language Processing	ETC	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC204	Advanced Software Engineering	PCC	**4**	**-**	**4**	**70**	**30**	**3**
		Professional Elective - I		**4**	**-**	**4**	**70**	**30**	**3**
5a	PEC211	Network Design and Technologies	PEC						
5b	PEC212	Web Engineering	PEC						
5c	PEC213	Information Retrieval System	PEC						
PRACTICALS									
6	LTC251	Network Security Lab	LTC		**4**	**2**	**50**	**25**	**3**
7	LTC252	Natural Language Processing Lab	LTC	**-**	**4**	**2**	**50**	**25**	**3**
8	LPC253	Technical Seminar	LPC	**-**	**2**	**1**	**50**	**25**	**3**
			Total	**20**	**10**	**25**	**500**	**225**	**-**

Abbreviation	Full Form	Abbreviation	Full Form
BSC	Basic Science Course	LTC	Laboratory Technological Course
PCC	Professional Core Course	LPC	Laboratory Professional Course
ETC	Emerging Technological Course	LHC	Laboratory Humanities Course
HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2020-2021

PROPOSED SCHEME OF INSTRUCTION
MASTER OF SCIENCE INFORMATION SYSTEMS (MSCIS)
SEMESTER- III

SNo	Course Code	Course Title	Cate-Gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	ETC301	Big Data Analytics	ETC	**4**	**-**	**4**	**70**	**30**	**3**
2	ETC302	Principles of Programming	ETC	**4**	**-**	**4**	**70**	**30**	**3**
3	ETC303	Software Architecture& Design Patterns	ETC	**4**	**-**	**4**	**70**	**30**	**3**
4	MGC304	Financial Management Accounting	MGC	**4**	**-**	**4**	**70**	**30**	**3**
		Open Elective		**4**	**-**	**4**	**70**	**30**	**3**
5a	PEC311	Soft Computing	PEC						
5b	PEC312	Web Mining	PEC						
5c	PEC313	Grid Computing	PEC						
PRACTICALS									
7	LTC352	Big Data Analytics Lab	LTC	**-**	**4**	**2**	**50**	**25**	**3**
8	LHC353	Research Seminar	LHC	**-**	**2**	**1**	**50**	**25**	**3**
			Total	**20**	**6**	**23**	**450**	**200**	**-**

Abbreviation	Full Form	Abbreviation	Full Form
BSC	Basic Science Course	LTC	Laboratory Technological Course
PCC	Professional Core Course	LPC	Laboratory Professional Course
ETC	Emerging Technological Course	LHC	Laboratory Humanities Course
HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2020-2021

PROPOSED SCHEME OF INSTRUCTION
MASTER OF SCIENCE INFORMATION SYSTEMS (MSCIS)
SEMESTER- IV

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
PRACTICALS				**L**	**P**		**SEE**	**CIE**	**SEE**
1	LCC401	Main Project Dissertation and Presentation	LCC	**-**	**8**	**4**	**100**	**50**	**3**
			Total	**-**	**8**	**4**	**100**	**50**	**-**

Abbreviation	Full Form	Abbreviation	Full Form
BSC	Basic Science Course	LTC	Laboratory Technological Course
PCC	Professional Core Course	LPC	Laboratory Professional Course
ETC	Emerging Technological Course	LHC	Laboratory Humanities Course
HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2019-2020

PROPOSED SCHEME OF INSTRUCTION
MASTER OF SCIENCE INFORMATION SYSTEMS (MSCIS)
SEMESTER- I

SNo	Course Code	Course Title	Cate-gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	PCC101	Advanced Data Structures and Algorithms	PCC	**4**	**-**	**4**	**70**	**30**	**3**
2	ETC102	Mobile and Pervasive Computing	ETC	**4**	**-**	**4**	**70**	**30**	**3**
3	PCC103	Distributed System	PCC	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC104	Software Project Management	PCC	**4**	**-**	**4**	**70**	**30**	**3**
5	ETC105	Machine Learning	ETC	**4**	**-**	**4**	**70**	**30**	**3**
PRACTICALS									
6	LCC151	Advanced Data Structures and Algorithm Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**
7	LTC152	Machine Learning Lab	LTC	**-**	**4**	**2**	**50**	**25**	**3**
8	LHC153	Communication Skills	LHC		**2**	**1**	**50**	**25**	**3**
			Total	**20**	**10**	**25**	**500**	**225**	**-**

Abbreviation	Full Form	Abbreviation	Full Form
BSC	Basic Science Course	LTC	Laboratory Technological Course
PCC	Professional Core Course	LPC	Laboratory Professional Course
ETC	Emerging Technological Course	LHC	Laboratory Humanities Course
HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2019-2020

MScIS SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC101	Advanced Data Structures and Algorithms	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I

Role of algorithms in computing

Algorithms – Algorithms as a Technology- Insertion Sort – Analyzing Algorithms – Designing Algorithms- Growth of Functions: Asymptotic Notation – Standard Notations and Common Functions- Recurrences: The Substitution Method – The Recursion-Tree Method

UNIT II

Hierarchical data structures

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red-Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion -B-Trees: Definition of B-trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Fibonacci Heaps: structure – Mergeable-heap operations- Decreasing a key and deleting a node-Bounding the maximum degree.

UNIT III

Graphs

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra‘s Algorithm; All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Wars hall Algorithm;

UNIT IV

Algorithm design techniques

Greedy method- General method, applications- Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest path problem.

UNIT V

Algorithm design techniques

Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: An Activity-Selection Problem – Elements of the Greedy Strategy- Huffman Codes.

Suggested Reading:

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, ―Data Structures and Algorithms‖, Pearson Education, Reprint 2006.
2. Robert Sedgewick and Kevin Wayne, ―ALGORITHMS‖, Fourth Edition, Pearson Education.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, ―Introduction to Algorithms‖, Third Edition, Prentice-Hall, 2011.

MScIS SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
ETC102	Mobile and Pervasive Computing	ETC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I

Introduction

History – Wireless communications: GSM – DECT – TETRA – UMTS – IMT – 2000 – Blue tooth, WiFi, WiMAX, 3G ,WATM.- Mobile IP protocols -WAP push architecture- Wml scripts and applications. Data networks – SMS – GPRS – EDGE – Hybrid Wireless100 Networks – ATM – Wireless ATM.

UNIT II

Overview of a Modern 4G Telecommunications System

Introduction. LTE-A System Architecture. LTE RAN. OFDM Air Interface. Evolved Packet Core. LTE Requirements. LTE-Advanced. LTE-A in Release. OFDMA – Introduction. OFDM Principles. LTE Uplink—SC-FDMA. Summary of OFDMA

UNIT III

Pervasive Concepts and Elements

Technology Trend Overview - Pervasive Computing: Concepts - Challenges - Middleware - Context Awareness - Resource Management - Human–Computer Interaction - Pervasive Transaction Processing - Infrastructure and Devices - Wireless Networks - Middleware for Pervasive Computing Systems - Resource Management - User Tracking- Context Management -Service Management - Data Management - Security Management - Pervasive Computing Environments - Smart Car Space - Intelligent Campus

UNIT IV

HCI in Pervasive Computing

Prototype for Application Migration - Prototype for Multimodalities - Human–Computer Interface in Pervasive Environments - HCI Service and Interaction Migration - Context-Driven HCI Service Selection - Interaction Service Selection Overview - User Devices - Service-Oriented Middleware Support - User History and Preference - Context Manager - Local Service Matching - Global Combination - Effective Region - User Active Scope - Service Combination Selection Algorithm

UNIT V

Pervasive Mobile Transactions

Pervasive Mobile Transactions - Introduction to Pervasive Transactions - Mobile Transaction Framework - Unavailable Transaction Service - Pervasive Transaction Processing Framework - Context-Aware Pervasive Transaction Model - Context Model for Pervasive Transaction Processing - Context-Aware Pervasive Transaction Model - A Case of Pervasive Transactions - Dynamic Transaction Management - Context-Aware Transaction Coordination Mechanism - Coordination Algorithm for Pervasive Transactions - Participant Discovery - Formal Transaction Verification - Petri Net with Selective Transition.

Suggested Reading:

1. Alan Colman, Jun Han, and Muhammad Ashad Kabir, Pervasive Social Computing Socially-Aware Pervasive Systems and Mobile Applications, Springer, 2016.
2. J.Schiller, ―Mobile Communication‖, Addison Wesley, 2000.
3. Juha Korhonen, ―Introduction to 4G Mobile Communications‖ , Artech House Publishers, 2014
4. Kolomvatsos, Kostas, Intelligent Technologies and Techniques for Pervasive Computing, IGI Global, 2013.
5. M. Bala Krishna, Jaime Lloret Mauri, ―Advances in Mobile Computing and Communications: Perspectives and Emerging Trends in 5G Networks‖, CRC 2016
6. Minyi Guo, Jingyu Zhou, Feilong Tang, Yao Shen, ― Pervasive Computing: Concepts, Technologies and Applications ‖ CRC Press, 2016

With effect from the academic year 2019-2020

MScIS SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC103	Distributed System	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT-I

Introduction: Goals and Types of Distributed systems

Architectures: Architectural Styles, System Architectures, Architectures versus Middleware, Self Management in Distributed Systems

Processes: Threads, Virtualization, Clients, Servers, and Code Migration.

Communication: Fundamentals, Remote Procedure Call, Message Oriented Communication, Stream oriented communication and Multicast communication

UNIT-II

Naming: Names, Identifiers and Addresses, Flat Naming, Structured namaaing, and Attribute based naming.

Synchronization: clock synchronizations, Logical Clocks, Mutual Exclusion, Global Positioning of Nodes and Election Algorithms**.**

Consistency and Replication: Introduction, Data centric consistency Models, Client centric consistency models, Replica Management and consistency protocols

UNIT-III

Fault Tolerance: Introduction to fault tolerance, Process Resilience, Reliable Client-Server communication, Reliable Group communication, Distributed commit and Recovery

Distributed Object Based System: Architecture, Processes, Communication, Naming, Synchronization, consistency and replication, Fault tolerance and security

UNIT IV

Distributed File System: Architecture, Processes, Communication, Naming, Synchronization, consistency and replication, Fault tolerance and security.

Distributed Web-Based Systems: Architecture, Processes, Communication, Naming, Synchronization, consistency and replication, Fault tolerance and security

UNIT -V

Distributed Coordination-Based Systems: Introduction to coordination Models, Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault tolerance and security.

Suggested Readings:

1. Andrew S. Tanenbaum and Maarten Van Steen, "Distributed Systems", PHI 2nd Edition, 2009.
2. R.Hill, L.Hirsch, P.Lake, S.Moshiri, "Guide to cloud computing, Principles and Practice", Springer, 2013.
3. R.Buyya, J.Borberg, A.Goscinski, " Cloud Computing-Principles and Paradigms", Wiley 2013.

With effect from the academic year 2019-2020

MScIS SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC104	Software Project Management	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT – I
Conventional Software Management, Evolution of Software Economics, Improving Software Economics, Old Way & New.

UNIT – II
Life – Cycle phases, Artifacts of the process, Model Based Software Architectures, Workflows of the Process, Checkpoints of the process.

UNIT – III
Iterative Process Planning, Project Organizations & Responsibilities, Process Automation, Project Control of Process Instrumentation, Tailoring the Process.

UNIT – IV
Modern Project profiles, Next Generation Software Economics, Modern process Transitions, Managing Contacts, Managing People & Organizing Terms.

UNIT – V
Process improvement & mapping to the CMM, ISO 12207 – an overview, programme management.

Suggested Reading:
1. Walker Royce, *Software Project Management – A Unified frame work*, Pearson Education, Addision, 1998,
2. Bob Hughes and Mike Cotterell , *Software Project Management*, Tata Mc Graw Hill, 3rd Edition, 2010.
3. Watt.S. Humphery, *Managing Software Process* , Addison - Wesley, 2008.

MScIS SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
ETC105	Machine Learning	ETC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I

Introduction

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.

UNIT II

Linear Models

Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

UNIT III

Tree And Probabilistic Models

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map

UNIT IV

Dimensionality Reduction And Evolutionary Models

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process

UNIT V

Graphical Models

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

Suggested Reading:

1. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.

2. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.
3. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
4. Tom M Mitchell, ―Machine Learning‖, First Edition, McGraw Hill Education, 2013.

With effect from the academic year 2019-2020

MScIS SEM I – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LCC151	Advanced Data Structures and Algorithm Lab	LCC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

EXPERIMENTS:

1. Implementation of Merge Sort and Quick Sort-Analysis
2. Implementation of a Binary Search Tree
3. Red-Black Tree Implementation
4. Heap Implementation
5. Fibonacci Heap Implementation
6. Graph Traversals
7. Spanning Tree Implementation
8. Shortest Path Algorithms (Dijkstra's algorithm, Bellmann Ford Algorithm)
9. Implementation of Matrix Chain Multiplication
10. Activity Selection and Huffman Coding Implementation.

With effect from the academic year 2019-2020

MScIS SEM I – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LPC152	Machine Learning Lab	LPC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

Description: 1. The programs should be implemented in Python 3. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Python 3. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

Lab Experiments:

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

With effect from the academic year 2019-2020

MScIS SEM I – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LHC153	Communication Skills Lab	LHC		**2**	**1**	**50**	**25**	**3**	**2**

1. **Introduction to English Phonetics**: Organs of Speech: respiratory, articulatory and phonatory systems; Sounds of English: Introduction to International Phonetic Alphabet; Minimal pairs; Syllable; Word Stress; Introduction of rhythm and intonation; Difficulties of Indians speakers with stress and intonation.
2. **Speaking Activities**: Self Introduction, Picture perception, JAM.
3. Group discussion, Debate, Presentation skills
4. **Listening Activities**: Listening to different types of materials for effective comprehension
5. **Role play**: Use of dialogues in a variety of situations and settings

Suggested Readings:

1. E. Suresh Kumar. A Handbook for English Language Laboratories (with CD). Revised edition, Cambridge University Press India Pvt. Ltd. 2014
2. T. Balasubramanian. A Textbook of English Phonetics for Indian Students. Macmillan, 2008.
3. J. Sethi et al., A Practical Course in English Pronunciation (with CD). Prentice Hall of India, 2005.
4. Hari Mohan Prasad. How to Prepare for Group Discussions and Interviews. Tata McGraw Hill, 2006.

PROPOSED SCHEME OF INSTRUCTION
MASTER OF SCIENCE INFORMATION SYSTEMS (MSCIS)
SEMESTER- II

SNo	Course Code	Course Title	Cate-Gory	Hours/ Week		No of Credits	Scheme of Examination		
							Max Marks		Duration (hrs)
THEORY				**L**	**P**		**SEE**	**CIE**	**SEE**
1	ETC201	Cloud Computing	ETC	**4**	**-**	**4**	**70**	**30**	**3**
2	PCC202	Network Security	PCC	**4**	**-**	**4**	**70**	**30**	**3**
3	ETC203	Natural Language Processing	ETC	**4**	**-**	**4**	**70**	**30**	**3**
4	PCC204	Advanced Software Engineering	PCC	**4**	**-**	**4**	**70**	**30**	**3**
		Professional Elective - I		**4**	**-**	**4**	**70**	**30**	**3**
5a	PEC211	Network Design and Technologies	PEC						
5b	PEC212	Web Engineering	PEC						
5c	PEC213	Information Retrieval System	PEC						
PRACTICALS									
6	LTC251	Network Security Lab	LTC		**4**	**2**	**50**	**25**	**3**
7	LTC252	Natural Language Processing Lab	LTC	**-**	**4**	**2**	**50**	**25**	**3**
8	LPC253	Technical Seminar	LPC	**-**	**2**	**1**	**50**	**25**	**3**
			Total	**20**	**10**	**25**	**500**	**225**	**-**

Abbreviation	Full Form	Abbreviation	Full Form
BSC	Basic Science Course	LTC	Laboratory Technological Course
PCC	Professional Core Course	LPC	Laboratory Professional Course
ETC	Emerging Technological Course	LHC	Laboratory Humanities Course
HSC	Humanities and Social Science Course	CIE	Continuous Internal Evaluation
MGC	Management Course	SEE	Semester End Evaluation
PEC	Professional Elective Course	L	Lecture
LCC	Laboratory Core Course	P	Practical

With effect from the academic year 2019-2020

MScIS SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
ETC201	Cloud Computing	ETC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I

Virtualization

Basics of Virtual Machines - Process Virtual Machines – System Virtual Machines –Emulation – Interpretation – Binary Translation - Taxonomy of Virtual Machines. Virtualization –Management Virtualization — Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization

UNIT II

Virtualization infrastructure

Comprehensive Analysis – Resource Pool – Testing Environment –Server Virtualization – Virtual Workloads – Provision Virtual Machines – Desktop Virtualization – Application Virtualization - Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

UNIT III

Cloud platform architecture

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design – Layered cloud Architectural Development – Virtualization Support and Disaster Recovery – Architectural Design Challenges - Public Cloud Platforms : GAE,AWS – Inter-cloud Resource Management

UNIT IV

Programming model

Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack, Nimbus

UNIT V

Cloud security

Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud - Key privacy issues in the cloud –Cloud Security and Trust Management

Suggested Reading:

1. Danielle Ruest, Nelson Ruest, ―Virtualization: A Beginner‟s Guide‖, McGraw-Hill Osborne Media, 2009.
2. Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005
3. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
4. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
5. Tim Mather, Subra Kumaraswamy, and Shahed Latif ,"Cloud Security and Privacy", O‘Reilly Media, Inc.,2009.
6. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, 2009.
7. Tom White, "Hadoop: The Definitive Guide", Yahoo Press, 2012.

With effect from the academic year 2019-2020

MScIS SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC202	Network Security	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT-I

Introduction: Attributes of Security, Integrity, Authenticity, Non-repudiation, Confidentiality Authorization, Anonymity, Types of Attacks, DoS, IP Spoofing, Replay, Man-in-the-Middle attacks General Threats to Computer Network, Worms, Viruses, -Trojans

UNIT-II

Secret Key Cryptography : DES, Triple DES, AES, Key distribution, Attacks Public Key Cryptography: RSA, ECC, Key Exchange (Diffie-Hellman), Java Cryptography Extensions, Attacks

UNIT-III

Integrity, Authentication and Non-Repudiation : Hash Function (MD5, SHA5), Message Authentication Code (MAC), Digital Signature (RSA, DSA Signatures), Biometric Authentication.

UNIT-IV

PKI Interface: Digital Certificates, Certifying Authorities, POP Key Interface, System Security using Firewalls and VPN's. Smart Cards: Application Security using Smart Cards, Zero Knowledge Protocols and their use in Smart Cards, Attacks on Smart Cards

UNIT-V

Applications: Kerberos, Web Security Protocols (SSL), IPSec, Electronic Payments, E-cash, Secure Electronic Transaction (SET), Micro Payments, Case Studies of Enterprise Security (.NET and J2EE)

Suggested Reading:

1. William Stallings, Cryptography and Network Security, 4th Edition. Pearson,. 2009.
2. Behrouz A Forouzan, Cryptography and Network Security, TMH, 2009
3. Joseph Migga Kizza, A Guide to Computer Network Security, Springer, 2010
4. Dario Cataiano, Contemporary Cryptology, Springer, 2010.

With effect from the academic year 2019-2020

MScIS SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
ETC203	Natural Language Processing	ETC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I
Introduction of Elementary Probability Theory, Essential Information Theory.

UNIT II
Linguistic Essentials Corpus-Based Work Collocations.

UNIT III
Statistical Inference: Bins: Forming Equivalence Classes, Reliability vs. Discrimination, n-gram models, Building ngram models, An Information Theoretic Approach.
Word Sense Disambiguation: Methodological Preliminaries, Supervised and unsupervised learning, Pseudo words, Upper and lower bounds on performance, Supervised Disambiguation, Bayesian classification.

UNIT IV
Evaluation Measures, Markov Models: Hidden Markov Models, Use, General form of an HMM Part-of-Speech Tagging

UNIT-V
Probabilistic Context Free Grammars: Introduction of Clustering **Information Retrieval:** Background, The Vector Space Model.

Suggested Reading:
1. Christopher D. Manning, Hinrich Schutze, *Foundations of Statistical Natural Language Processing*, MIT Press, 1999.
2. James Allan, *Natural Language Understanding*, Pearson Education, 1994.
3. Tanveer Siddiqui, US Tiwary, *Natural Language Processing and Information Retrieval*, Oxford University Press, 2008.

With effect from the academic year 2019-2020

MScIS SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PCC204	Advanced Software Engineering	PCC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I

Introduction

Software engineering concepts – Development activities – Software lifecycle models - Classical waterfall - Iterative waterfall – Prototyping – Evolutionary - Spiral – Software project management – Project planning – Estimation – Scheduling – Risk management – Software configuration management.

UNIT II

Software Requirement Specification

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petrinets – Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modelling – Data Flow Diagram.

UNIT III

Architecture And Design

Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade – Architectural styles – Layered - Client-server - Tiered - Pipe and filter.- User interface design

UNIT IV

Testing

Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Regression testing – Debugging - Program analysis – Symbolic execution – Model Checking

UNIT V

Devops

DevOps:Motivation-Cloud as a platform-Operations- Deployment Pipeline:Overall Architecture-Building and Testing-Deployment- Case study: Migrating to Microservices.

Suggested Reading:

1. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2nd edition, Pearso Education, 2004.
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.
3. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.

4. Len Bass, Ingo Weber and Liming Zhu, ―DevOps: A Software Architect‘s Perspective‖, Pearson Education, 2016
5. Rajib Mall, Fundamentals of Software Engineering, 3rd edition, PHI Learning Pvt. Ltd., 2009.
6. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007.

With effect from the academic year 2019-2020

MScIS SEM II – ELECTIVE			Hours /week			Scheme of Examination			
						Max Marks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PEC211	Network Design and Technologies	PEC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I

Network Design

Advanced multiplexing – Code Division Multiplexing, DWDM and OFDM – Shared media networks – Switched networks – End to end semantics – Connectionless, Connection oriented, Wireless Scenarios –Applications, Quality of Service – End to end level and network level solutions. LAN cabling topologies – Ethernet Switches, Routers, Firewalls and L3 switches – Remote Access Technologies and Devices – Modems and DSLs – SLIP and PPP – Core networks, and distribution networks.

UNIT II

Wireless Networks

IEEE802.16 and WiMAX – Security – Advanced 802.16 Functionalities – Mobile WiMAX - 802.16e – Network Infrastructure – WLAN – Configuration – Management Operation – Security – IEEE 802.11e and WMM – QoS – Comparison of WLAN and UMTS – Bluetooth – Protocol Stack – Security – Profiles

UNIT III

Cellular Networks

GSM – Mobility Management and call control – GPRS – Network Elements – Radio Resource Management – Mobility Management and Session Management – Small Screen Web Browsing over GPRS and EDGE – MMS over GPRS – UMTS – Channel Structure on the Air Interface – UTRAN –Core and Radio Network Mobility Management – UMTS Security

UNIT IV

4g Networks

LTE – Network Architecture and Interfaces – FDD Air Interface and Radio Networks – Scheduling – Mobility Management and Power Optimization – LTE Security Architecture – Interconnection with UMTS and GSM – LTE Advanced (3GPPP Release 10) - 4G Networks and Composite Radio Environment – Protocol Boosters – Hybrid 4G Wireless Networks Protocols – Green Wireless Networks – Physical Layer and Multiple Access – Channel Modelling for 4G – Introduction to 5G

UNIT V

Software Defined Networks

Introduction – Centralized and Distributed Control and Data Planes – Open Flow – SDN Controllers – General Concepts – VLANs – NVGRE – Open Flow – Network Overlays – Types – Virtualization – Data Plane – I/O – Design of SDN Framework

Suggested Reading:

1. Erik Dahlman, Stefan Parkvall, Johan Skold, ―4G: LTE/LTE-Advanced for Mobile Broadband‖, Academic Press, 2013.
2. Jonathan Rodriguez, ―Fundamentals of 5G Mobile Networks‖, Wiley, 2015.
3. Larry Peterson and Bruce Davie, ―Computer Networks: A Systems Approach‖, 5th edition, Morgan Kauffman, 2011
4. Martin Sauter, "From GSM to LTE, An Introduction to Mobile Networks and Mobile Broadband", Wiley, 2014.
5. Martin Sauter, ―Beyond 3G - Bringing Networks, Terminals and the Web Together: LTE, WiMAX, IMS, 4G Devices and the Mobile Web 2.0‖, Wiley, 2009.
6. Naveen Chilamkurti, Sherali Zeadally, Hakima Chaouchi, ―Next-Generation Wireless Technologies‖, Springer, 2013.
7. Paul Goransson, Chuck Black, ―Software Defined Networks: A Comprehensive Approach‖, Morgan Kauffman, 2014.
8. Savo G Glisic, ―Advanced Wireless Networks – 4G Technologies‖, John Wiley & Sons, 2007.
9. Thomas D.Nadeau and Ken Gray, ―SDN – Software Defined Networks‖, O‟Reilly Publishers, 2013.
10. Ying Dar Lin, Ren-Hung Hwang and Fred Baker, ―Computer Networks: An Open Source Approach‖, McGraw Hill, 2011

With effect from the academic year 2019-2020

MScIS SEM II – ELECTIVE			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PEC212	Web Engineering	PEC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I

INTRODUCTION TO WEB ENGINEERING

Motivation, Categories of Web Applications, Characteristics of Web Applications. Requirements of Engineering in Web Applications- Web Engineering-Components of Web Engineering-Web Engineering Process-Communication-Planning.

UNIT II

WEB APPLICATION ARCHITECTURES & MODELLING WEB APPLICATIONS

Introduction- Categorizing Architectures- Specifics of Web Application Architectures, Components of a Generic Web Application Architecture- Layered Architectures, 2-Layer Architectures, N-Layer Architectures-Data-aspect Architectures, Database-centric Architectures- Architectures for Web Document Management- Architectures for Multimedia Data- Modeling Specifics in Web Engineering, Levels, Aspects, Phases Customization, Modeling Requirements, Hypertext Modeling, Hypertext Structure Modeling Concepts, Access Modeling Concepts, Relation to Content Modeling, Presentation Modeling, Relation to Hypertext Modeling, Customization Modeling, Modelling Framework-Modeling languages-Analysis Modeling for Web Apps-The Content Model-The Interaction Model-Configuration Model.

UNIT III

WEB APPLICATION DESIGN

Design for WebApps- Goals-Design Process-Interactive Design- Principles and Guidelines-Workflow-Preliminaries-Design Steps- Usability- Issues- Information Design- Information Architecture- structuring- Accessing Information-Navigation Design- Functional Design-Wep App Functionality- Design Process- Functional Architecture- Detailed Functional Design.

UNIT IV

TESTING WEB APPLICATIONS

Introduction-Fundamentals-Test Specifics in Web Engineering-Test Approaches-Conventional Approaches, Agile Approaches- Testing concepts- Testing Process -Test Scheme- Test Methods and Techniques- Link Testing- Browser Testing-Usability Testing-Load, Stress, and Continuous Testing, Testing Security, Test-driven Development, -Content Testing-User Interface testing-Usability Testing-Compatibility Testing-Component Level Testing-Navigation Testing-Configuration testing-Security and Performance Testing- Test Automation.

UNIT V

PROMOTING WEB APPLICATIONS AND WEB PROJECT MANAGEMENT

Introduction-challenges in launching the web Application-Promoting Web Application-Content Management-Usage Analysis-Web Project Management-Challenges in Web Project Management-Managing Web Team- Managing the Development Process of a Web Application- Risk, Developing a Schedule, Managing Quality, Managing Change, Tracking the Project. Introduction to node JS - web sockets.

Suggested Reading:

1. Chris Bates, ―Web Programming: Building Internet Applications‖, Third Edition, Wiley India Edition, 2007.
2. Gerti Kappel, Birgit Proll, ―Web Engineering‖, John Wiley and Sons Ltd, 2006.
3. Guy W. Lecky-Thompson, ―Web Programming‖, Cengage Learning, 2008.
4. John Paul Mueller, ―Web Development with Microsoft Visual Studio 2005‖, Wiley Dream tech, 2006.
5. John Paul Mueller, ―Web Development with Microsoft Visual Studio 2005‖, Wiley Dream tech, 2006.

With effect from the academic year 2019-2020

MScIS SEM II – ELECTIVE			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
PEC213	Information Retrieval Systems	PEC	**4**	**-**	**4**	**70**	**30**	**3**	**1**

UNIT I

Introduction and Motivation

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval –Retrieval Evaluation – Open Source IR Systems–History of Web Search – Web Characteristics–The impact of the web on IR ―IR Versus Web Search– Components of a Search engine.

UNIT II

Modeling

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model - Term Weighting – Scoring and Ranking –Language Models – Set Theoretic Models - Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing.

UNIT III

Indexing

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching - Sequential Searching and Pattern Matching. Query Operations -Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency.

UNIT IV

Classification And Clustering

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering –Matrix decompositions and latent semantic indexing – Fusion and Meta learning.

UNIT V

Searching The Web

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries

Suggested Reading:

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schutze, ―Introduction to Information Retrieval‖, Cambridge University Press, First South Asian Edition, 2008.
2. Implementing and Evaluating Search Engines‖, The MIT Press, Cambridge, Massachusetts London, England, 2010
3. Ricardo Baeza – Yates, Berthier Ribeiro – Neto, ―Modern Information Retrieval: The concepts and Technology behind Search‖ (ACM Press Books), Second Edition, 2011.
4. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, ―Information Retrieval

With effect from the academic year 2019-2020

MScIS SEM II – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LTC251	Network Security Lab	LTC		**4**	**2**	**50**	**25**	**3**	**2**

Experiments

1. Implementation of Ciphers
(A) Caesar Cipher
(B) Playfair Cipher
(C) Hill Cipher
(D) Vigenere Cipher
(E) Rail fence – row & Column Transformation

2. Implementation of Security Algorithms
(A) Data Encryption Standard(DES)
(B) RSA Algorithm
(C) Diffiee-Hellman Algorithm
(D) MD5
(E) SHA-1

3 Implement the Signature Scheme for Digital Signature Standard

4 Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG)

5 Installation of rootkits and study about the variety of options

With effect from the academic year 2019-2020

MScIS SEM II – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LTC252	Natural Language Processing Lab	LTC	**-**	**4**	**2**	**50**	**25**	**3**	**2**

Experiments

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1. Language Processing and Python
2. Accessing Text Corpora and Lexical Resources
3. Processing Raw Text
4. Writing Structured Programs
5. Categorizing and Tagging Words
6. Learning to Classify Text
7. Extracting Information from Text
8. Analyzing Sentence Structure
9. Building Feature Based Grammars
10. Analyzing the Meaning of Sentences
11. Managing Linguistic Data
12. Afterword: Facing the Language Challenge

Reference:

https://www.nltk.org/book/

With effect from the academic year 2019-2020

MScIS SEM II – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L	P	Cre-dits	SEE	CIE	SEE	CIE
LPC253	Technical Seminar	LPC	**-**	**2**	**1**	**50**	**25**	**3**	**2**

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad are his/her specialization.
Seminar topics can be chosen by the students with the advice from the faculty members.
Students are to be exposed to following aspects of seminar presentation.
Literature Survey
Organization of material
Preparation of Power point Presentation slides and Technical Writing.
Each Student is required to:
1. Submit one page of synopsis of the seminar talk two days before for display on notice board.
2. Give 20 minutes presentation through MS-Power Point presentation slides followed by 10 minutes discussion.
3. Submit a report on the seminar topic with a list of references and slides used within a week