SECOND YEAR: INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EXAMINATION

(RC 2019-20)

SEMESTER – III

Course Code	Nomenclature of the Course	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Duration (Hrs)	Marks					Credits
						Th	IA	TW**	P	Total	
IT310	Mathematics –III	3	1	--	3	100	25	25	--	150	4
IT320	Integrated Electronics	3	--	--	3	100	25	--	--	125	3
IT330	Computer Networks	3	--	--	3	100	25	--	--	125	3
IT340	Data Structures and Algorithms with C++	3	1	--	3	100	25	25	--	150	4
IT350	Software Engineering	3	--	--	3	100	25	--	--	125	3
IT360	Computer Hardware Lab	--	--	4	--	--	--	25	50	75	2
IT370	Computer Software Lab	--	--	4	--	--	--	25	50	75	2
HM001	Technical Communication	2	--	--	--	--	--	75	--	75	2
AC390	Mathematics I & II (*Bridge Course)	2	--	--	--	--	--	--	--	--	0
	TOTAL	19	2	8	--	500	125	175	100	900	23

*Applicable to direct second year /lateral entry students

**Term Work marks are to be awarded through continuous evaluation

LEGEND

Abbreviation	Description
L	Lecture
T	Tutorial
P	Practical
O	Oral
Th	Theory
TW	Term Work
IA	Internal Assessment

SECOND YEAR: INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EXAMINATION

(RC 2019-20)

SEMESTER – IV

Course Code	Nomenclature of the Course	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Duration (Hrs)	Marks					Credits
						Th	IA	TW**	P	Total	
IT410	Computational Techniques	3	1	--	3	100	25	25	--	150	4
IT420	Embedded Systems	3	--	--	3	100	25	25	--	150	3
IT430	Object Oriented Programming using Java	3	--	--	3	100	25	--	--	125	3
IT440	Operating System	3	--	--	3	100	25	--	--	125	3
IT450	Design and Analysis of Algorithm	3	1	--	3	100	25	--	--	125	4
IT460	Algorithms & Programming Lab	--	--	4	--	--	--	25	50	75	2
IT470	Software Systems Lab	--	--	4	--	--	--	25	50	75	2
HM004	Management & Organizational Behaviour	3	--	--	3	100	25	--	--	125	3
	TOTAL	18	2	8	--	600	150	100	100	950	24

**Term Work marks are to be awarded through continuous evaluation

LEGEND

Abbreviation	Description
L	Lecture
T	Tutorial
P	Practical
O	Oral
Th	Theory
TW	Term Work
IA	Internal Assessment

MATHEMATICS – III					
Course Code	**IT310**		**Credit**	**4**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	3	**1**	**0**	**42 hours/sem**	
Scheme of Examination TOTAL= 150 marks	**IA**	**TW**	**TM**	**P**	**O**
	25	**25**	**100**	**0**	**0**

Course Objectives:

The course aims at getting students well versed in mathematics that arises in engineering. This will help them competently deal with linear systems, differential equations, recurrence relations and probabilistic models.

Course Outcomes:

The student will be able to:

CO1	Understand the mathematics of matrices, various transforms used in Engineering and basic concepts of probability.
CO2	Compute the rank, Eigen values, Eigen vectors of a given matrix and transforms of continuous and discrete functions.
CO3	Solve differential equations, integral equations and difference equations using the various transforms and analyzing the consistency of a linear system of equations.
CO4	Model real life problems with matrices and probability distributions.

UNIT 1	
Matrices : Types of matrices, Determinant, inverse of matrix, Elementary transformations, Elementary matrices, Rank of matrix, Reduction to normal form, Canonical form, Rank using elementary transformation, Linear independence and dependence of vectors, System of the form AX = 0, and AX = B, and their solutions, Eigen values, Eigen vectors with properties, Cayley-Hamilton theorem with its applications, minimal polynomial, Diagonalization.	10 hrs
UNIT 2	
Laplace Transforms: Definition. Existence conditions, properties, inverse Laplace transforms. Laplace transform of periodic functions, Convolution theorem, Laplace transform of Dirac-Delta function, Application of Laplace transforms in solving linear differential equations with initial conditions and system of linear simultaneous differential equations.	11hrs
UNIT 3	
Fourier Transform : Fourier Transform, Inverse Fourier transform, Fourier Sine and Cosine transform Convolution and application. **Z-Transform**: Definition, region of convergence, properties, Z-transform on impulse function, Convolution theorem, application to difference equations.	10 hrs
UNIT 4	
Probability: Definition, properties, Axioms of probability, conditional probability,	11hr

theorem on total probability, Baye's theorem; Random variables-discrete & continuous; Expectation and Variance, Standard deviation, Moment Generating Function & properties, Standard distributions: discrete-Binomial, Geometric & Poisson; continuous- Uniform, Normal, exponential.	s

TEXTBOOKS	
1	B. S. Grewal;Higher Engineering Mathematics; Khanna Publications, New Delhi.
2	Erwin Kreyzing; Advanced Engineering Mathematic; New International Limited.
REFERENCES	
1	P. Kandasamy; Engineering Mathematics; Chand & Co., New Delhi.
2	Srimanta Pal, Subodh C. Bhunia; Engineering Mathematics; Oxford University Press
3	D. S. Chandrasekhraiah; Engineering Mathematics- Part III ; Prism Books Pvt. Ltd.
4	Montgomery, D. C., Probability and Statistics for Engineers; Prentice Hall of India.

INTEGRATED ELECTRONICS					
Course Code	**IT320**		**Credit**	**3**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	3	**0**	**0**	**42 hours/sem**	
Scheme of Examination TOTAL= 125 marks	**IA**	**TW**	**TM**	**P**	**O**
	25	**0**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide the knowledge of logic circuits, computer system's processors & organization. The characteristics of boolean laws, performance measures of analog circuits, instruction pipelining concepts and interfacing mechanism of a computer system is also imparted to the students.

Course Outcomes:

The student will be able to:

CO1	Understand the logic circuits, computer system's processors & organization
CO2	Apply boolean laws, bus interconnection techniques & logical instructions for a given problem statement
CO3	Analyze performance measures of analog circuits, cache memory concepts & architecture of microprocessors and its functionality
CO4	Evaluate flip-flops, timers working, instruction pipelining & interfacing mechanism of a computer system

UNIT 1	
DIGITAL LOGIC SYSTEM Boolean algebra, NOR and NAND Gates, And or Invert Gates, De Morgan's theorem, Positive and Negative LogicArithmetic Circuits, Binary Addition & Subtraction **COMBINATIONAL LOGIC CIRCUITS:**Boolean laws and theorems, Sum of Products, Truth table, Pairs, Quads, and Octets, Karnaugh mapping, Product of Sums Method and Simplification. **FLIP-FLOP:**RS Flip-Flops, D and JK Flip-Flops, Counters: Asynchronous Counter, Registers: Types of Registers, Serial-in-serial out, Ring Counter, Johnson Counter	11hrs
UNIT 2	
ANALOG SYSTEMS OPAMP -Ideal characteristics, Op-Amp-as inverting amplifier,Op-Ampas non-inverting amplifier, input offset voltage,input offset current, slew rate, CMRR	10hrs

Application of Op –Amp: adder, subtractor, integrator, differentiator.555 Timers: Astable Multivibrator and Monostable Mutivibrator and their applications. Voltage Regulators: Definition, design using IC 723.	
UNIT 3	
COMPUTER ORGANISATION **INTRODUCTION:**Organization and Architecture, Structure and function. A top level view of Computer Function and Interconnection: Computer Components, Computer Function, Interconnection structure, Bus interconnection. Arithmatic and Logic Unit. **CACHE MEMORY:**Computer memory system Overview, Cache Memory Principles, Elements of Cache Design Interrupt Driven I/O, Direct Memory Access (DMA Controller) The instruction cycle, Instruction Pipelining.	11 hrs
UNIT 4	
MICROPROCESSOR AND INTERFACING **MICROPROCESSOR 8086:**Detail study of 8086 architecture, addressing modes, instruction formats, data transfer instructions, string instructions, logical instructions, arithmetic instructions, processor control instructions, Interrupt and Interrupt responses **INTERRUPT CONTROLLER:** Features of 8259, block diagram of 8259, Interrupt sequence, priority modes, Programming the 8259 and interfacing.	10 hrs

TEXTBOOKS	
1	R. P. Jain; Modern Digital Electronics;Tata Mac Graw Hill; Second Edition.
2	William Stalling; Computer Organization and Architecture: Designing for performance; Pearson Education; 2010; 8/e ; . ISBN978-81-317-3245-8
3	Douglas V. Hall; Microprocessors and Interfacing: Programming and Hardware; TMH.
REFERENCES	
1	Botkar; Integrated Circuits; Ninth Edition; Khanna Publishers
2	Millman and Halkias; Integrated Electronics: Analog and Digital Electronic Circuits and Systems; Tata MacGraw Hill
3	Morris Mano ; Computer system architecture; Pearson Education; 1993; 3/e; ISBN81-7808-687-5

COMPUTER NETWORKS					
Course Code	**IT330**		**Credit**	**3**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	3	**0**	**0**	**42 hours/sem**	
Scheme of Examination TOTAL= 125 marks	**IA**	**TW**	**TM**	**P**	**O**
	25	**0**	**100**	**0**	**0**

Course Objectives:

This course is to provide students with an overview of the concepts and fundamentals of data communication and computer networks. Topics to be covered include: data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication, network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols, various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.

Course Outcomes (COs)

The students will be able to:

CO1	Build an understanding of the fundamental concepts of of data communication and computer networks.
CO2	Summarize with the basic taxonomy and terminology in the computer networking area.
CO3	Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.
CO4	Generate optimal routing/congestion control algorithms as per the specific equirements of the organizational implicational needs.

UNIT 1	
NETWORK MODELS AND PHYSICAL LAYER Layered Task, The OSI Reference Model, TCP/IP protocol Suite, Addressing. Topology: Mesh, Star, Tree, Bus and Ring and Hybrid Technologies. Transmission Modes: Simplex, half Duplex and Full-Duplex. Categories of Networks – LAN, MAN and WAN, Inter networks. Transmission Media: Guided Media – Twisted–pair cable, Coaxial cable and Optical fibre. Unguided Media – Wireless Communication, Terrestrial microwave, satellite communication and cellular telephony. Transmission Impairments: Distortion, attenuation and noise, Shannon's Theorem, Comparison of different Media Data Encoding: Analog Data, Digital Data, Analog Signal and Digital Signals. Spread Spectrum: Direct Sequence and Frequency Hopping, CDMA.	11hrs
UNIT 2	
DATA LINK LAYER	10hrs

Flow Control – Stop and Wait Flow Control, Sliding Window , Error Detection: Types of errors, Detection Methods, Parity Check, Cyclic Redundancy Check using modulo-2, Polynomials (CRC-16, CRC-32), Error Control – Stop and Wait ARQ, Go-Back-N ARQ and Selective-Reject ARQ. Switching - Packet Switching, Message Switching and circuit switching Medium Access Control Sub layer (MAC), the channel allocation problem, Multiple Access Protocols: ALOHA, Carrier Sense Multiple Access (CSMA) protocols, Collision-free protocol, Bit-Map Protocol, Binary Countdown, Limited contention protocols, Adaptive Tree Walk Protocol.	
UNIT 3	
NETWORK LAYER Network Layer: Network Layer design issues, Routing Algorithms - optimality principle, shortest path, flooding, Distance Vector Routing, Link state Routing, Need for congestion control. Internet Protocol, IP Address, IP ver. 4, IP ver. 6, DHCP. Brief introduction to Address Resolution Protocol, Reverse Address Resolution Protocol, Internet Control Message Protocol, Internet Group Message Protocol.	11hrs
UNIT 4	
TRANSPORT LAYER, APPLICATION LAYER AND WIRELESS NETWORK Transport Layer: UDP, Purpose of UDP, UDP Header, TCP, the TCP Service Model, The TCP Segment Header, TCP Connection Establishment, The TCP Connection Release, Comparison of TCP and UDP. Sockets. Application Layer: Domain Name System – DNS, FTP, TFTP, Telnet Protocol, Hyper Text Transfer Protocol (HTTP), Simple Mail Transfer Protocol (SMTP), Simple Network Management Protocol (SNMP). Wireless Networks: Wireless concepts, IEEE 802.11 Wireless LANs (Wi-Fi), 802.16 Wi-MAX.	10hrs

TEXTBOOKS	
1	Behrouz A. Forouzan; Data Communications and Networking; TMH; 2013, 5/e
2	William Stallings; Data and Computer Communication; 7/e.
3	Andrew S Tanenbaum; Computer Networks; Pearson Education; 5/e
REFERENCES	

1	Bud Bates; Wireless Networked Communications: Concepts, Technology and Implementation
2	Jim Kurose, Keith Ross;Computer Networking: A Top-down Approach; Addison-Wesley2009,5/e
3	J.S Katre; Computer Network Technology; Tech-Max Publications; 2010.

DATA STRUCTURES AND ALGORITHM WITH C++					
Course Code	**IT340**		**Credit**	**4**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	3	**1**	**0**	**40hours/sem**	
Scheme of Examination TOTAL= 150 marks	**IA**	**TW**	**TM**	**P**	**O**
	25	**25**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide knowledge of different data structures ,searching and sorting techniques. The data structures like stack ,queue ,list, tree and graphs will help in building applications and solving real world problems.

Course Outcomes (COs)

The students will be able to:

CO1	Describe different sorting/searching techniques and different data structures like stack ,queue ,linked list, trees and graph.
CO2	Demonstrate and use different sorting/searching techniques and different data structures like stack ,queue ,linked list, trees and graph to develop application.
CO3	Select appropriate data structures and sorting techniques to solve real world problems.
CO4	Develop complete applications using appropriate data structures.

UNIT 1	
INTRODUCTION TO DATA REPRESENTATION & DATA STRUCTURES Representation of arrays and their applications. **STACKS:**representation of stacks and its applications,Recursion, Tower of Hanoi, Implementation of recursive procedures by stacks. **QUEUES:**representation of queues and its applications, circular queues, priority queues, dequeue.	10hrs
UNIT 2	
LISTS & TREES **LISTS:**Singly linked list, doubly linked list, circular linked list, linked stacks and queues and its applications. **TREES:**Basic terminology, binary trees and their representations, traversals of trees, applications of trees – infix/postfix representation if expressions and inter-conversion, B-tree, AVL.	10hrs
UNIT 3	
SORTING & SEARCHING **SORTING:**Basic concept, Exchange sort, Selection sort, Insertion sort, Quick sort, Tree sort, Merge sort, Radix sort,	10hrs

Heaps and Heap sort. **SEARCHING:**Basic searching techniques, sequential and binary search, tree searching. **HASHING:**Hash function, collision handling mechanisms.	
UNIT 4	
GRAPHS & ITS APPLICATIONS **GRAPHS:**Basic terminology, representation of graphs, directed and undirected graphs and their traversals, depth first and breadth first search, spanning trees. **APPLICATIONS OF GRAPHS:**Shortest path problem, topological sorting, matching.	10hrs

TEXTBOOKS	
1	S.K.Srivastava;Data Structures Through C In Depth; BPB publications
2	YedidyahLangson, MoshejAugenstein, Aaron M. Tenenbaum; Data Structures using C & C++; Prentice Hall of India.
REFERENCES	
1	Robert L. Kruse; Data Structures and Program Design in ; PHI.
2	Rajesh K.Shukla:Data structures using c and c++;Wiley India,2009
3	Sahni; Data Structures, Algorithms and Applications in C++; MGH.
4	Ellis HOROwitz and Sartaj Sahni; Fundamentals of Data Structures; Galgotia Publications.

SOFTWARE ENGINEERING					
Course Code	**IT350**		**Credit**	**3**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	3	**0**	**0**	**42 hours/sem**	
Scheme of Examination TOTAL= 125 marks	**IA**	**TW**	**TM**	**P**	**O**
	25	**0**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide knowledge of applying the principles of software engineering to develop a systematic, well planned ,managed software.

Course Outcomes:

The student will be able to:

CO1	Understand the different phases of Software development
CO2	Apply the principles of software engineering to design, develop and manage a software system.
CO3	Analyze the necessity and requirements of software development for an organization
CO4	Design and Create a software using the different phases of software development.

UNIT 1	
Introduction to Software Engineering: scope of software engineering, The software process- client, developer. **Software development life cycle**: user requirement phase, specification phase, design phase, implementation phase, integration phase, maintenance phase. **Capability maturity models** and KPA's, Software life cycle models and comparison of all life cycle models.	11 hrs
UNIT 2	
Requirements gathering- Data dictionary, Data flow diagrams. IEEE standards for software requirements. **Effort estimation and scheduling**: LOC, Function point analysis and Basic COCOMO model. Basic design concepts: Cohesion and its various types, Coupling and its various types. **Testing**: Software quality Assurance, Walkthroughs, Inspections, Attributes to be tested, Introduction to Black box v/s White box testing.	10hrs
UNIT 3	
Object modeling using UML: UML overview, nature and purpose of models. Use case diagrams, class diagrams, activity diagram, sequence diagram, interaction diagram. Sample Tool- Argo UML, an open source tool.	10hrs
UNIT 4	

Project planning: process database, process capability baseline, Process planning: process tailoring & requirements change management. **Quality management**: quality concepts, quality process planning, defect prevention planning, Risk management: concepts, risk management activities, risk assessment, identification& prioritization. **Project management plan**: team management, Software configuration management process, Project execution : review process, Project monitoring and control: project tracking & milestone analysis. **Project closure analysis** :role & closure analysis report.	11 hrs

TEXTBOOKS	
1	Stephen R.Schah ; Object Oriented and Classical Software Engineering; TMH.
2	James Rumbaugh, Ivar Jacobson, Grady Booch; The Unified Modeling Language Reference Manual, Pearson education; 2/e.
3.	Pankaj Jalote ; Software Project Management in practice; PEA.
REFERENCES	
1	Roger S. Pressman ; Software Engineering – A practitioner's approach; McGraw Hill; 6/e.
2	J.Rumbaugh et al; Object Oriented Modelling & Design; PHI.

COMPUTER HARDWARE LAB					
Course Code	**IT360**		**Credit**	**2**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	0	**0**	**4**	**52 hours/sem**	
Scheme of Examination TOTAL= 75 marks	**IA**	**TW**	**TM**	**P**	**O**
	0	**25**	**0**	**50**	**0**

List of Experiments from Computer networks and Integrated Electronics (Any 10)

1. Implementation of Basic Gates, Use of NAND and NOR gates as universal gates.
2. Implementation of Multiplexer and Demultiplexer
3. Implementation of SR Flip-Flop and D Flip-Flop.
4. Design Non-Inverting Amplifier using Opamp 741IC closed loop voltage gain = 10.
5. Design Opamp Amplifier 741 IC as summing, scaling and averaging amplifier.
6. Design Opamp amplifier 741IC as an Integrator.
7. Installation of Cisco Packet Traces and Network Topology Implementation
8. To configure a Network using Distance Vector Routing Protocol
9. Configuration of DNS, SMTP,FTP and Web Server

10. Program to convert a decimal number into binary value
11. Program to Implement Floating-Point Addition
12. Write an ALP for 8086 Microprocessor 8 - bit addition of two numbers.
13. Write an ALP for 8086 Microprocessor for finding smallest element from an array.
14. Write an ALP for 8086 Microprocessor to implement Fibonacci series.

COMPUTER SOFTWARE LAB					
Course Code	**IT370**		**Credit**	**2**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	0	**0**	**4**	**52 hours/sem**	
Scheme of Examination TOTAL= 75 marks	**IA**	**TW**	**TM**	**P**	**O**
	0	**25**	**0**	**50**	**0**

List of Experiments :

List of Experiments from Data Structures

1. Implement a program to convert infix to postfix expression.
2. Implementation of Queue
3. Implementation of Stack
4. Implementation of Linked List
5. Implement binary search tree.
6. Implement hashing techniques.
7. Implementation of sorting techniques
8. Implementation of searching techniques

List of Experiments from Software Engineering

1. Develop IEEE SRS document
2. Design dataflow diagram and a data dictionary
3. Designing UML diagrams (using ArgoUML tools)
4. Mini Project development using SDLC

Technical Communication					
Course Code	**HM001**		**Credit**	**2**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	2	**0**	**0**	**26 hours/sem**	
Scheme of Examination TOTAL= 75 marks	**IA**	**TW**	**TM**	**P**	**O**
	0	**75**	**0**	**0**	**0**

Course Objective:

To ensure understanding of the basics of communication through English, aspects of verbal & non verbal communication. To speak a neutral & correct form of English. To appreciate & develop skills required for the competitive world.

Course Outcomes:

The student will be able to:

CO1	Demonstrate precise language skills with suitable vocabulary and apt style.

CO2	Develop life skills/interpersonal skills to progress professionally.
CO3	Apply traits of suitable candidature for a job/higher education.
CO4	Deliver formal presentations and effectively implementing the verbal and non-verbal skills.

UNIT -1	7
Communication **Oral Communication** Listening, Speaking, Reading, Writing (LSRW), Conversational Dialogues, Role Play, Barriers to Oral Communication, Effective Oral Communication, Principles of Communication, Dos and Don'ts of Group Discussion **Global Communication** Social Media, People Analytics, Models of Culture, Cross-Cultural Communication, Compare Cultures of the World, Impact of Cultural Differences on Managerial Communication, Effective Communicator in a Cross-Cultural setting	
UNIT -2	7
Personality Development Social Etiquette, Email Etiquette, Table Etiquette, Telephone Etiquette, SWOC Analysis, Life Coaching, Emotional Intelligence, Leadership, Time Management, Motivation, Goal Setting, Team Work and Collaboration, Critical Thinking and Problem Solving, Professional Attitude, Persuasion, Anxiety and Stress Management, Social Responsibility	
UNIT -3	6
Career Development Resume Building, Interviewing Skills, Job Search, Personal Networking and Branding, Personal Finance, Build Professional Portfolio	
UNIT -4	6
Public Speaking Methods to overcome anxiety, Build Confidence, Use of Media Aids, Craft an Impactful Speech, Design Impactful Presentations, Effective Presentation Delivery	

TEXTBOOKS	
1	Meenakshi Raman and Sangeeta Sharma; Technical Communication: Principles and Practice, 3rd ed; Oxford University Press
2	Meenakshi Raman, Prakash Singh; Business Communication; 2nd ed.; Oxford University Press
3	Dr. K. Alex; Soft Skills: Know Yourself and Know The World; 3rd ed; S. Chand Publishing
REFERENCES	
1	Nicky Stanton; Mastering Communication; 5th ed.; Palgrave Master Series; Red Globe Press
2	Ghosh, B. N.; Managing Soft Skills for Personality Development; Tata McGraw

	Hill; 2012
3	Wallace and Masters; Personal Development for Life and Work;10th edition; Thomson Learning
4	Lehman, Dufrene, Sinha; BCOM : A South-Asian Perspective with CourseMate; 2nd edition; Cengage Learning
5	Ashraf Rizvi; Effective Technical Communication; Tata McGraw-Hill; 2005
6	MolefiKete Asante, William B. Gudykunst, Bella Mody; Handbook of International and Intercultural Communication; 2nd ed.; Sage Publications

MATHEMATICS- I& II (*BRIDGE COURSE)					
Course Code	**AC390**		**Credits**	**0**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**2**	**0**	**0**	**26 hrs/sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 0 marks	**0**	**0**	**0**	**0**	**0**

Course Outline:

This is an audit course.

*This course is compulsory to direct second year/lateral entry students. It is introduced to reduce the knowledge gap in the students.

The syllabus is selected topics from FE110 Mathematics I and FE120 Mathematics II.

The Text books and References are same as shown in FE110 Mathematics I and FE120 Mathematics II.

COMPUTATIONAL TECHNIQUES					
Course Code	**IT410**		**Credit**	**4**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	3	**1**	**0**	**52 hours/sem**	
Scheme of Examination TOTAL= 150 marks	**IA**	**TW**	**TM**	**P**	**O**
	25	**25**	**100**	**0**	**0**

Course Objectives:

This course is designed to introduce students to the techniques, algorithms, and reasoning processes involved in the study of discrete mathematical structures that are essential to the field of Computer Science and to use these techniques in subsequent courses in the design and analysis of algorithms, computability theory, software engineering, and computer systems.

Course Outcomes:

The student will be able to:

CO1	Understand operations on discrete structures such as sets, functions, relations, equivalence relations, partial orderings and numerical methods.
CO2	Solve combinatorial problems using the basic principles of counting theory, including permutations, combinations, pigeonhole principle, recurrence relations.
CO3	Apply numerical techniques to solve engineering problems
CO4	Construct mathematical arguments using logical connectives and quantifiers and verify the correctness of an argument using propositional and predicate logic and truth tables.

UNIT 1	
Set Theory : Sets, Set Operations, inclusion-Exclusion principle, Relations and their properties, Equivalence Relations, partial orderings. **Functions:** One-to-One and Onto Functions, Inverse Function, Composition of functions, Graphs of functions and some important functions used in computer science. **Integers:** Integers and division, primes and greatest common divisors, Euclidean algorithm, Congruence Basic properties, Modular arithmetic.	10hrs
UNIT 2	
Propositional Calculus: Propositional logic, propositional equivalences, predicates and quantifiers, rules of inference. **Mathematical Induction:** Principle of Mathematical Induction and applications. **Counting:** The fundamental rules of counting, permutations and combinations, pigeonhole principle, binomial coefficients. **Advanced Counting Techniques:** Recurrence relations, formulation, solving linear recurrence relations using characteristic roots.	11hrs
UNIT 3	
Solutions of Non-linear equations : Bisection Method, False Position Method, Newton Raphson method, Secant method.	10 hrs

Interpolation: Forward and backward differences, Central differences, Divided differences, Difference tables, Interpolating polynomials Newton Forward & Backward difference interpolation formula, Lagrange's interpolation formula, Newton's Divided difference interpolation formula.	
UNIT 4	
Solution of ordinary Differential equations: Numerical Solution of a differential equation with initial value. Euler's method, Euler's predictor-corrector method, Runge-Kutta 2^{nd} & 4^{th} order method. **Numerical Integration**: Trapezoidal Rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Romberg Integration.	11 hrs

TEXTBOOKS	
1	Kenneth H. Rosen; Discrete Mathematics and Its Applications; Tata McGraw Hill (6th edition).
2	G.V.Kumbhojkar; Discrete Structures And Graph Theory; Pradeep Prakashan.
REFERENCES	
1	J. P. Tremblay and R. Manohar, McGraw Hill; Discrete Mathematical Structures with Applications to Computer Science; New York McGraw Hill.
2	Swapan Kumar Sarkar; Discrete Mathematics; S. Chand Publication.
3	Dr. D. S. C ; Discrete Mathematical Structures; Prism Books Pvt. Ltd.
4	Ralph P. Grimaldi , Discrete and Combinatorial Mathematics: An Applied Introduction, 5th Edition, Pearson.

EMBEDDED SYSTEM					
Course Code	**IT420**		**Credit**	**3**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	3	**0**	**0**	**40 hours/sem**	
Scheme of Examination TOTAL= 150 marks	**IA**	**TW**	**TM**	**P**	**O**
	25	**25**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide basic understanding of design process in embedded systems, microcontrollers, and hardware architecture. It covers the concepts of jump and call instructions, Timer/Counter programming, Serial Communication. The course also briefly covers Arduino Kit programming and Introduces Raspberry Pi programming.

Course Outcomes:

The student will be able to:

CO1	Understand the basic operation of embedded system, microcontrollers, and the features of Arduino, Raspberry Pi.
CO2	Apply the instruction set commands and programming concepts to develop a prototype.
CO3	Analyze the properties and features of embedded system, microcontrollers, and advance programming languages.
CO4	Design and develop an efficient embedded system, and implement programs using Arduino, Raspberry Pi.

UNIT 1	
Introduction to Embedded System **8051 Microcontroller Architecture:** Hardware, Input/output pins, Ports and circuits. **8051 Instruction Set:** Addressing Modes, Data movement instruction: External Data move. Code **Memory Read-Only-Data moves.** Logic operation: Bit and Byte level, Rotate and Swap. Arithmetic operations: Flags, Incrementing, Decrementing, Addition, subtraction, Multiplication and division, Decimal arithmetic.	10 hrs
UNIT 2	
Jump and call Instructions: Jump and call program range, Jumps, Call and subroutine, Interrupts and returns in details. **Timer|Counter Programming:** Programming 8051 timer, Counter programming, Programming timer 0 and 1 in 8051 C. **Serial Communication:** Basics of Serial Communication, 8051 connections to RS-232, 8051 serial Communication Programming in C.	10hrs
UNIT 3	
Prototyping Embedded Devices: Electronics, Sensors, Actuators, Scaling	10

up the Electronics. **Embedded Computing Basics:** Microcontrollers, System-on-chips, choosing platform. **Arduino:** Developing on Arduino, hardware, Openness, Simple Programs/Projects	hrs
UNIT 4	
Introduction to Raspberry Pi: Structure of the boards, Peripherals, Configuring Your PI **Linux and Raspberry:** Command Line, Linux Commands **Basic Input and Output:** Using Inputs and Outputs, Digital Output, Digital Input**Programming inputs and outputs.**	10 hrs

TEXTBOOKS	
1	Kenneth J. Ayala, Penram International; The 805I Microcontroller, Architecture, Programming & Application ; Second Edition
2	Muhammad Ali Mazidi and Janice Mazidi, Prentice; The 805I Microcontroller and embedded system using assembly & C
3.	Adrian McEwen & Hakim Cassimally; Designing the Internet of Things
4.	Matt Richardson & Shawn Wallace; Getting started with Raspberry Pi
REFERENCES	
1	Ruth Suehle & Tom Callaway ; Raspberry Pi Hacks;

OBJECT ORIENTED PROGRAMMING USING JAVA					
Course Code	**IT430**		**Credit**	**3**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	3	**0**	**0**	**40 hours/sem**	
Scheme of Examination TOTAL= 125 marks	**IA**	**TW**	**TM**	**P**	**O**
	25	**0**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide the principles and techniques of object-oriented programming using Java and to learn and implement object-oriented features such as encapsulation, inheritance and polymorphism along with error-handling techniques .

Course Outcomes (COs)

The students will be able to:

CO1	Discuss the OOP's concept and Apply the concepts to design, implement, compile, test and execute simple Java programs.

CO2	To apply the major object-oriented concepts to implement object oriented programs in Java like: encapsulation, inheritance and polymorphism.
CO3	To design and develop object-oriented programs and software using Java
CO4	Illustrate multithreading concepts by experimenting with programs

UNIT 1	
Introduction to Java : Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java. Objects and Classes : Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference	10 hrs
UNIT 2	
Inheritance and Polymorphism : Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.	10 hrs
UNIT 3	
Event and GUI programming : Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swingstreams and classes, Manipulators, File Handling	10 hrs
UNIT 4	
I/O programming : Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files Multithreading in java : Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming..	10 hrs

TEXTBOOKS	
1	Programming with Java, 6th edition, Balagurusamy, Mc Graw Hill
2	Complete Reference Java J2se, Herbert Schildt, Tata McGraw Hill.
REFERENCES	
1	Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson..
2	Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.
3	Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson

	Education.
4	Java Programming, D. S. Malik, Cengage Learning.

OPERATING SYSTEMS					
Course Code	**IT440**		**Credit**	**3**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	3	**0**	**0**	**40 hours/sem**	
Scheme of Examination TOTAL= 125 marks	**IA**	**TW**	**TM**	**P**	**O**
	25	**0**	**100**	**0**	**0**

Course Objectives:

The subject aims to provide the student with an understanding of how Operating systems work and in addition understanding the concepts of scheduling, memory management and deadlock management.

Course Outcomes:

The student will be able to:

CO1	Identify and reproduce the basic concepts of Modern operating systems and Understand the various operating system mechanisms and operations.
CO2	Apply concepts of memory management including virtual Memory and Page Replacement to the issues that occur in Real time applications
CO3	Analyze issues related to file system interface, implementation, disk management, multiprocessor Operating systems, protection and security mechanisms
CO4	Create simple shell scripts and android applications that can be used for easing daily tasks.

UNIT 1	
OVERVIEW OF OPERATING SYSTEM AND PROCESS MANAGEMENT : Introduction to Operating Systems: Overview and working of different operating systems. Functions of operating systems, Design approaches: layered, kernel based and virtual machine approach. Process management Concepts, Threads, CPU Scheduling, Process Synchronization.	10hrs
UNIT 2	

DEADLOCKS AND MEMORY MANAGEMENT Deadlocks Concept, Deadlock prevention, Deadlock avoidance, Deadlock detection and recovery Memory management: Concept, Swapping, Contiguous memory allocation, Paging, Segmentation, Segmentation with paging. Virtual memory: Concept, Demand paging, Page replacement, Thrashing.	10hrs
UNIT 3	
FILE SYSTEMS ,I/O SYSTEMS AND MULTIPROCESSOR OPERATING SYSTEMS : File system interface: File Concepts, Types, Access Methods, Directory structures. File system implementation: Directory Implementation, Allocation methods, Free space management. I/O Systems: Overview of I/O Systems, Secondary storage structure: Disk structure, Disk scheduling, Disk management, swap space management. Multiprocessor Operating Systems - Introduction, structure of multiprocessor operating system, Processor scheduling: Issues, Smart scheduling ,Affinity based scheduling.	10hrs
UNIT 4	
SHELL PROGRAMMING AND ANDROID BASICS Unix Concepts: understanding UNIX commands, general purpose utilities, file system, handling ordinary files , basic file attributes, VI editor , Basic shell scripts. Android programming : What is android, versions , Features, Architecture, Devices , Tools required , Creating your first android application, Understanding activities, Designing UI.	10 hrs

TEXTBOOKS	
1	Silberschatz and Galvin;The Operating System Concepts;Wesley Publishing Co.;3rd Edition
2	M Singhal and NG Sivaratri;Advanced Concepts in Operating Systems;TMH;
3	SumitabhaDas;UNIX - Concepts and applications;TMH;3rd edition
4	Wei-Meng Lee;Beginning Android Application Development.
REFERENCES	
1	Operating Systems by W Stallings. PHI. (page numbers given in syllabus as per the 5^{th}edition)
2	Operating systems, Design and implementation by A.S Tanenbaum,PHI.
3	Operating Systems by Achyut S. Godbole, Tata McGraw Hill

DESIGN AND ANALYSIS OF ALGORITHMS					
Course Code	**IT450**		**Credits**	**4**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**3**	**1**	**0**	**42 hrs/sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 125 marks	**25**	**0**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to learn the different algorithm design techniques and their complexities in order to use the effective technique to solve a problem.

Course Outcomes:

The student will be able to:

CO1	Explain the common algorithms, algorithmic paradigm and data structures used to solve various problems.
CO2	Apply the different algorithm design techniques like divide and conquer strategy , greedy approach, dynamic programming for problem solving.
CO3	Analyze the pros and cons of applying the different algorithm design techniques in terms of time and space complexity.
CO4	Choose an efficient and effective algorithmic solution for different real world problems.

UNIT 1	
Algorithm Analysis & Complexity: Algorithm Definition and Specification, Performance analysis (Space complexity, Time complexity, Asymptotic Notations), Recurrences – Iteration, recursion tree and master method, Performance measurement, Performance analysis of recursive algorithms, Recursion, Towers of Hanoi problem, Comparison of recursion and Iteration. Dynamic Storage Management, Garbage Collection.	10 hrs
UNIT 2	
Divide and Conquer strategy: General method, Binary search, Finding Maximum and Minimum, Merge sort technique, Quick sort technique **Greedy method strategy:** General method, Knapsack problem, Job sequencing with deadlines, Minimum cost Spanning trees (Prims &Kruskals algorithm), Optimal storage on tapes, Optimal merge patterns, Single source Shortest paths.	11 hrs
UNIT 3	
Dynamic Programming: General method, Multistage graphs, All pairs shortest paths, Single Source Shortest paths, Knapsack	

problem, Travelling Sales person problem. **Search & Traversal Techniques**: Techniques for graphs- Breadth first search, Depth first search, Connected components and spanning trees, Biconnected components.	10 hrs
UNIT 4	
Text processing algorithms (pattern matching): Naïve string matching algorithm, Rabin Karp algorithm, Knuth-Morris-Pratt algorithm. **Backtracking:** General method, 8-queens problem, Sum of subsets Problem, Graph Coloring, Hamiltonian Cycles. NP-Hard and NP-Complete Problems: Basic concepts- non-deterministic algorithms, NP-Hard and NP- Complete classes.	11 hrs

TEXTBOOKS	
1	E.Horowitz, S. Sahini, S. Rajasekaran ; Fundamentals of Computer Algorithms; Galgotia publication.
2	T.H.Cormen, C.E. Leiserson, R.L.Rivest ; Introduction to Algorithms; PHI.

REFRENCES	
1	M. T. Goodrich, R. Tamassia; Algorithm Design; Wiley
2	G. Brassard, P. Bratley; Fundamentals of Algorithmics; Pearson.
3	Robert Sedjewick; Algorithms; Addison Wesley.

ALGORITHM AND PROGRAMMING LAB					
Course Code	**IT460**		**Credit**	**2**	
Scheme of Instructions hours/weeks	**L**	**T**	**P**	**Total**	
	0	**0**	**4**	**52 hours/sem**	
Scheme of Examination TOTAL= 75 marks	**IA**	**TW**	**TM**	**P**	**O**
	0	**25**	**0**	**50**	**0**

List of Experiments (Design and Analysis of Algorithms) (Any five)

1. To implement the following using array data structure and analyze its time complexity
   a)Insertion sort b) Selection sort c) Bubble sort d) Quick sort e)Merge sort
2. To implement Linear and Binary search and analyze its time complexity.
3. To implement Dijkstra's algorithm and analyze its time complexity.
4. To implement minimum spanning trees using Kruskal's algorithm.
5. To implement minimum spanning trees using Prim's algorithm.
6. To implement a program for travelling salesman problem.

7. To implement DFS and BFS and analyze their time complexities.
8. To implement following string matching algorithms and analyze time complexities:
   a)Rabin Karp b) Knuth Morris Pratt
9. To implement Hamiltonian cycle problem

List of Experiments (Object Oriented programming using Java) (Any five)

1. Define structure of basic Java program
2. Constructors and Destructors with
3. Classes, methods and objects, Method Overloading.
4. Inheritance and Method overriding.
5. Packages
6. Multithreading
7. Exception Handling.
8. I/O operations
9. Applet structure and Event handling
10. Layout managers.

SOFTWARE SYSTEMS LAB					
Course Code	**IT470**		**Credits**	**2**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**0**	**0**	**4**	**52 hrs/sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 75 marks	**25**	**0**	**0**	**50**	**0**

List of Experiments from Operating Systems

1.CPU Scheduling
2.DeadlockDetection/ Avoidance
3.Page Replacement Algorithms
4.Threading and Synchronization
5.Shell Programming
6. Android Programming

List of Experiments from Embedded systems

1. Mini project using Arduino/ Raspberry Pi kit.

MANAGEMENT & ORGANIZATIONAL BEHAVIOUR					
Course Code	**HM004**		**Credits**	**3**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**3**	**1**	**0**	**40 hrs/sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 125 marks	**25**	**0**	**100**	**0**	**0**

Course objectives:

To help students understand the management of behavior in organizations and to know how organizational behavior affects performance and effectiveness .To understand the dynamics of individual and group behavior in organizations. To help students understand how perceptions, attitudes and values influence their work and professional relationships.

Course outcomes:

The students will be able to

CO1	Explain why organizational behavior is important for managerial decision making and creating a functional organization.
CO2	To appreciate and accommodate differences in perceptions , attitudes and personality and use this to work effectively with diverse individuals and heterogeneous groups.
CO3	To understand how emotions and stress impact the management of organizational functioning.
CO4	To understand organizational dilemmas from an individuals and interpersonal lens

UNIT 1	
Introduction to organizational behavior , to review the reasons for joining organizations. Understanding the importance of organizational behavior in organizations . Understanding the self – to be able to reflect , understand and observe patterns of being in self. Understanding the Johari Window Framework . Perception: Definitions and concept of perception, exploring the factors that influence perception, the perceptual processes that affect the communicator's perception of others . Individual decision making- the cognitive shortcuts and biases the individual has and how they affect decision making.	10 hrs
UNIT 2	
The role of individual in the organization Attitudes and job satisfactions – nature of attitudes- type of work attitudes , job	10 hrs

satisfaction, job involvement, organizational commitment, types of organizational commitment , developing organizational commitment , job satisfaction and employee performance. Personality and values: Definition and concept of personality, factors that determine an individual's personality . The Big Five personality model – Personality traits relevant to organizational behavior . Linking an individual's personality and values to the workplace. Motivation – Theories of work motivations, contemporary approaches and applications- linking employee involvement programs and motivation theories . Employee recognition , employee involvement , variable pay and flexible benefits .	
UNIT 3	
Interpersonal skills and group processes **12hrs.** Understanding teams – creating effective teams- turning individuals Into team players – evaluating team performance and understanding team diversity – the management and assimilation of cultural differences Team processes , team work, factors determining the success of a team , team work . Difference between group and team Stages of group development- group norms, group structure, group status Group cohesiveness and group performance Group decision making – groupthink, groupshift- group decision making techniques The nature of interpersonal skills- how interpersonal relationships influence teams and what managers do. Communication: Functions of organizational communications- the communication process . Electronic communications, managing informations, the grapevine Barriers to communications Managing leadership and communication Trait Theories. Behavioral Theories The leadership construct and the need for creating leaders in the managerial world	10 hrs
UNIT 4	
Organizational culture Definition and concept of organizational culture What do cultures do? – Creating and sustaining cultures. Notion of ethics and spirituality in organizations	10 hrs

Power and politics: Understanding the dynamics of power and politics- social influence, individual power , the tactics of power , organizational politics and factors contributing to political behavior Conflict management – views of conflict Organizational change and stress management Defining stress and identifying its potential sources . Identifying the consequences of stress Individual and organization approach to stress.	

TEXTBOOKS	
1	Greenberg J. and Baron R. – Behavior in Organizations , 8th Edition, Pearson Prentice Hal
2	Newstrom, J. and Davis, K. (1989)- Organizational Behavior : readings and exercises : 8th edition , New York: Mc graw Hill

REFRENCES	
1	Aswathappa K. (2012) Organizational Behavior : Texts, cases and games , 10th edition, Himalaya Publishing House
2	Robbins, Timothy Judge, Neharika Vohra , 14th edition Pearson – Organisational Behavior
3	K. Aswathappa , Human Resource Management : Text and cases , 7th edition , Mc Graw Hill Education 2015

ANNEXURE A

THIRD YEAR: INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EXAMINATION

(RC 2019-20)

SEMESTER – V

Course Code	Nomenclature of the Course	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Duration (Hrs)	Marks					Credits
						Th	IA	TW*	P	Total	
IT510	Database Management System	3	--	--	3	100	25	--	--	125	3
IT520	Theory of Computation	3	--	--	3	100	25	--	--	125	3
IT531	Cloud Computing										
IT532	Software Testing & Quality Assurance										
IT533	Digital Signal Processing										
IT534	Internet of Things	3	--	--	3	100	25	--	--	125	3
IT541	Computer Graphics										
IT542	Statistical Models for Information Science										
IT543	Advanced Computer Architecture										
IT544	Graph Theory	3	--	--	3	100	25	--	--	125	3
IT550	Database Application Lab	--	--	4	--	--	--	25	50	75	2
IT560	Modelling & Computing Lab	--	--	4	--	--	--	25	50	75	2
**	Open Elective	3	--	--	3	100	25	--	--	125	3
HM009	Ethics & Entrepreneurship	3	--	--	3	100	25	--	--	125	3
	TOTAL	18	0	8	--	600	150	50	100	900	22

*Term Work marks are to be awarded through continuous evaluation

** Student will have to enter the course code that he/she takes as part of the open elective

Database Application Lab : DBMS + Prof Elective 1 subject(Cloud Computing, Software Testing & Quality Assurance , Digital Signal Processing, Internet of Things)

Modelling & Computing Lab : TOC + Prof Elective 2 subject (Computer Graphics , Statistical Models for Information Science , Advanced Computer Architecture, Graph Theory)

LEGEND

L	T	P	O	Th	TW	IA
Lecture	Tutorial	Practical	Oral	Theory	Term Work	Internal Assessment

THIRD YEAR: INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EXAMINATION

(RC 2019-20)

SEMESTER – VI

Course Code	Nomenclature of the Course	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Duration (Hrs)	Marks					Credits
						Th	IA	TW*	P	Total	
IT610	Principles of Compilers	3	--	--	3	100	25	--	--	125	3
IT620	Web Technology	3	--	--	3	100	25	--	--	125	3
IT631	Natural Language Processing										
IT632	Artificial Intelligence and Fuzzy Logic										
IT633	Distributed System										
IT634	Queuing theory and modelling	3	--	--	3	100	25	--	--	125	3
IT641	Java Programming										
IT642	Open Source s/w development										
IT643	Computer Forensics and Cyber Security										
IT644	E Commerce	3	--	--	3	100	25	--	--	125	3
IT650	Web Development Lab	--	--	4	--	--	--	25	50	75	2
IT660	Software Applications Lab	--	--	4	--	--	--	25	50	75	2
**	Open Elective	3	--	--	3	100	25	--	--	125	3
HM002	Technical English & Report Writing	3	--	--	3	100	25	--	--	125	3
	TOTAL	18	0	8	--	600	150	50	100	900	**22**

*Term Work marks are to be awarded through continuous evaluation

** Student will have to enter the course code that he/she takes as part of the open elective.

Web development Lab :Web Technology + Prof Elect 4 subject(Java Programming, Open Source s/w development, Computer Forensics and Cyber Security , E Commerce)

Software Applications Lab : POC + Prof Elect 3 subject(Natural Language Processing , Artificial Intelligence and Fuzzy Logic, Distributed System, Queuing theory and modelling)

LEGEND

L	T	P	O	Th	TW	IA
Lecture	Tutorial	Practical	Oral	Theory	Term Work	Internal Assessment

FOURTH YEAR: INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EXAMINATION

(RC 2019-20)

SEMESTER – VII

Course Code	Nomenclature of the Course	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Duration (Hrs)	Marks					Credits
						Th	IA	TW*	O	Total	
IT710	Image Processing	3	--	--	3	100	25	--	--	125	3
IT721	Professional Elective V Data Analytics										
IT722	Wireless Sensor Networks										
IT723	Genetic Algorithms										
IT724	Object Oriented Modelling using UML	3	--	--	3	100	25	--	--	125	3
IT730	Advanced Computing Lab	--	--	4	--	--	--	25	50	75	2
**	Open Elective III	3	--	--	3	100	25	--	--	125	3
IT740	Internship	--	--	6	--	--	--	50	50	100	3
IT750	Project Work -I	--	--	6	--	--	--	50	75	125	3
	TOTAL	9	0	16	--	300	75	125	175	675	**17**

*Term Work marks are to be awarded through continuous evaluation

** Student will have to enter the course code that he/she takes as part of the open elective.

Advanced Computing Lab : image processing + Prof Elective 5 subject(Data Analytics, Wireless Sensor Networks, Genetic Algorithms, Object Oriented Modelling using UML)

LEGEND

Abbreviation	Description
L	Lecture
T	Tutorial
P	Practical
O	Oral
Th	Theory
TW	Term Work
IA	Internal Assessment

FOURTH YEAR: INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EXAMINATION

(RC 2019-20)

SEMESTER – VIII

Course Code	Nomenclature of the Course	Scheme of Instruction Hrs/Week			Scheme of Examination					
		L	T	P	Duration (Hrs)	Marks				Credits
						Th	IA	TW*	O	Total	
IT810	Cryptography and Network Security	3	--	--	3	100	25	--	--	125	3
IT821	Computer Vision										
IT822	Mobile Computing										
IT823	Advanced Data Structures										
IT824	Social Networking	3	--	--	3	100	25	--	--	125	3
IT830	Elect (nptel/mooc/swayam) student can take this on-line course between 6 to 8 sem. grades will be awarded in 8th sem.	3	--	--	--	--	--	50	50	100	3
IT840	Project Work -II	--	--	18	--	--	--	200	200	400	9
	TOTAL	9	0	18	--	200	50	250	250	750	18

*Term Work marks are to be awarded through continuous evaluation

LEGEND

Abbreviation	Description
L	Lecture
T	Tutorial
P	Practical
O	Oral

Th	Theory
TW	Term Work
IA	Internal Assessment

ANNEXURE B

SYLLABUS

DATABASE MANAGEMENT SYSTEM

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT510	DATABASE MANAGEMENT SYSTEM	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. To understand the relational database design principles.
4. To become familiar with the basic issues of transaction processing and concurrency control.

Course Outcomes:

The student after undergoing this course will be able to:

1. Demonstrate the basic elements of a relational database management system
2. Identify the data models for relevant problems.
3. Design an entity relationship model, convert entity relationship diagrams into RDBMS and formulate SQL queries.
4. Apply normalization for the development of application software.

UNIT 1	
Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages - DDL, DML, Database Architecture, Database Users and Administrators. Introduction to Data base design, ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model: Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data.	10hrs
UNIT 2	
Relational Query Languages, Relational Operations. Relational Algebra – Selection and projection, Set operations, renaming, Joins, Division.Relational calculus – Tuple relational Calculus – Domain relational calculus. Overview of the SQL Query Language – Basic Structure of SQL Queries, Set Operations, Aggregate Functions – GROUPBY – HAVING, Nested Sub queries, Views, Triggers.	10hrs
UNIT 3	
Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Lossless join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design - Multi valued Dependencies - FOURTH Normal Form.	10hrs
UNIT 4	

File organization: – File organization – various kinds of indexes. Query Processing – Measures of query cost - Selection operation – Projection operation, - Join operation – set operation and aggregate operation – Relational Query Optimization – Transacting SQL queries – Estimating the cost –Equivalence Rules.	9 hrs

Text Books:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rd Edition, 2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VI edition, 2006.

Reference Books

1. Database Systems, 6th edition, RamezElmasri, Shamkat B. Navathe, Pearson Education, 2013.
2. An Introduction to Database systems, C.J. Date, A.Kannan, S.SwamiNadhan, Pearson, Eight Edition.

THEORY OF COMPUTATION

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT520	THEORY OF COMPUTATION	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

The subject aims to provide the students with:

1. An ability to understand how efficiently problems can be solved on a model of computation, using an algorithm.
2. An understanding of the basic concepts in theoretical computer science, and the formal relationships among machines, languages and grammars.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain the basic concepts of deterministic and non-deterministic finite automata.
2. Design a finite automaton to recognize a given regular language.
3. Analyse the formal relationships among machines, languages and grammars
4. Constructing minimalist automata for recursively enumerable languages

UNIT 1	
Regular Languages and Finite Automata – Basic terminology(Language, Alphabet, String), Regular Languages and Regular Expressions, Deterministic Finite Automata (DFA), Automata to implement union, intersection and complement operations. Nondeterminism and Kleene's Theorem – Nondeterministic Finite Automata (NFA), Nondeterministic Finite Automata with Λ-transitions (ε-NFA), Kleene's Theorem. Regular and Non-Regular Languages – Minimization of Finite Automata, The Pumping Lemma for Regular Languages, Moore and Mealy Machines.	10hrs
UNIT 2	
Context–Free Languages and Push down Automata –Definitions & Examples, Regular Grammars, Derivation Trees and Ambiguity, Simplification of CFGs (Elimination of Null & Unit Productions), Chomsky Normal Form, Greibach Normal Form, The Pumping Lemma for Context–Free Languages. Push Down Automata –Definition, Deterministic Pushdown automaton, A PDA corresponding to a given CFG, A CFG corresponding to a given PDA.	11hrs
UNIT 3	
Turing Machine - Computing a Partial function with a Turing machine, Variations of Turing Machine, Nondeterministic Turing Machine, Church- Turing thesis.	09hrs
UNIT 4	
Recursively Enumerable languages &Unsolvable Problems - Recursively Enumerable and Recursive languages, Unrestricted Grammars ,Context-Sensitive Language and Chomsky Hierarchy, The halting problem, Rice's Theorem.	09hrs

Text Books:

1. Introduction to languages and the theory of computation By John C. Martin, Tata McGraw Hill.
2. Introduction to Automata Theory, Languages and Computation by Hopcraft and Ullman, Narosa Publishing House.
3. Theory of Computer Science, Automata Languages & Computations by N.Chandrashekhar and K.L.P. Mishra, PHI publication.

CLOUD COMPUTING

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT531	CLOUD COMPUTING	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. Analyze the components of cloud computing showing how business agility in an organization can be created.
2. Evaluate the deployment of web services from cloud architecture.
3. Critique the consistency of services deployed from a cloud architecture.
4. Compare and contrast the economic benefits delivered by various cloud models based on application requirements, economic constraints and business requirements.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain the principles of Cloud Computing.
2. Describe the architecture of Cloud Computing Resources.
3. Demonstrate the applications of Cloud Computing for Business.
4. Apply the skills and knowledge to incorporate agility in an organization.

UNIT 1	
CLOUD COMPUTING FUNDAMENTAL: Cloud Computing definition, Roots of Cloud Computing, Advantages and disadvantages of Cloud Computing, Features of Cloud Computing, Deployment model: private, public, hybrid, community cloud. Cloud Service models: Infrastructure as a service (IaaS), Platform as a service (PaaS), Software as a service (SaaS). Applications of Clouds.	10hrs
UNIT 2	
Cloud Architecture and Services: Cloud Computing stack, Virtualization layer: Definition, Types, Benefits, Virtualization models and Implementation techniques. IaaS architecture with Amazon and Google Cloud. PaaS architecture with Amazon and Google Cloud. SaaS architecture. Technologies and the processes required when deploying web services. **Cloud Storage NoSQL:** Data centre, Design of HBase: What is HBase, HBase Architecture, Components, Data model, Storage Hierarchy, Cross-Datacenter Replication.	10hrs
UNIT 3	
Cloud Security and Privacy: Overview, Challenges and Risks, Security Architecture, Security Controls, Data Security, Application security, Virtual machine security. Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment.	10hrs
UNIT 4	
Analysis of case studies: **Amazon Cloud:** EC2, Simple Storage Service (S3), Amazon RDS, AWS Cloud Development kit **Google Cloud:** Compute, Database, Storage, Developers tools, Cloud tools for Eclipse. **Hadoop:** MapReduce: Paradigm, Programming Model, Applications, Scheduling, Fault-Tolerance, Implementation Overview, Examples.	9 hrs

Text Books:

1. Gautam Shroff; Enterprise Cloud Computing Technology Architecture Applications; Cambridge University Press; 1st edition; 2010.
2. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

Reference books

1. Mastering Cloud Computing; Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill, 1/e/2013

*Students are advised to refer to the resources available in Internet for more information.

SOFTWARE TESTING AND QUALITY ASSURANCE

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT532	SOFTWARE TESTING AND QUALITY ASSURANCE	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. An understanding of importance of an effective testing strategy.
2. Skills to plan and prepare appropriate tests for all phases of software development.
3. An Understanding of measures and controls for the quality of testing
4. Techniques for early detection of errors and to resolve the same. Learning different technologies to building different real-world applications.

Course Outcomes:

After successful completion of this course the student will be able to:

1. Manage, plan and prepare rigorous, formal, visible and repeatable tests that will fully exercise software, in the development of quality systems.
2. Apply different testing approaches to all stages of software development
3. Prepare test plans, strategy, specifications, procedures and controls to provide a structured approach to testing.
4. Apply the techniques and methods covered to testing packages.

UNIT 1	
Basic Concepts and Preliminaries: Role of Testing, Verification and Validation, Failure, Error, fault and Defect, Notion of Software Reliability, Objectives of Testing, What is a Test case? Expected Outcome, Concept of Complete Testing, Central Issue in Testing, testing Activities, Test Levels, White-box and Black-box Testing, Monitoring and Measuring Test Execution, Test Team Organization and Management. Software Quality: 5 views of SW Quality, McCall's Quality Factors and Criteria, ISO 9126 Quality Characteristics, ISO 9000:2000 Software Quality Standard.	08hrs
UNIT 2	
Unit Testing: Concept of Unit Testing, Static & Dynamic Unit Testing, Defect Prevention, Mutation Testing, Debugging. Control Flow Testing: Basic Idea, Outline, Paths in a Control Flow Graph, Path Selection Criteria, Generating Test Input. Data Flow Testing: General Idea, Data Flow Anomaly, Overview of Dynamic Data Flow Testing, Data Flow Graph & Terms, Data Flow Testing Criteria, Comparison of Testing Techniques.	11hrs
UNIT 3	
Functional Testing: Concepts of Howden, Complexity of applying Functional Testing, Pair wise Testing, Equivalence Class Partitioning, Boundary Value Analysis, Decision Tables, Error Guessing. System Integration Testing: Concept, Different types of Interfaces & Interface Errors, Granularity of System Integration Testing, Techniques, Software Hardware Integration, Test Plan for System Integration, Off-the-shelf Component Integration.	10hrs

UNIT 4	
System Test Design: Test Design Factors, Requirements Identification, Characteristics of Testable Requirements, Test Objective Identification, Modelling a Test Design Process & Results, Test Case Design Effectiveness. System Test Planning and Automation: Structure of a System Test Plan, Intro & Feature Description, Assumptions, Test Approach, Test Suite Structure, Test Environment, test Execution Strategy, test Effort Estimation, Scheduling & Test Milestones, System test Automation, Evaluation & Selection of Test Automation Tools, Characteristics of Automated Test cases, Structure of an Automated Test case.	10hrs

Text Books:

1. Kshirasagar Naik and Priyadarshi Tripathy; Software Testing and Quality Assurance: Theory and Practice; Wiley Publications.2008
2. William E. Perry; Effective Methods for Software Testing Third Edition; Wiley Publications. 2006
3. Jeff Tian ; Software Quality Engineering – Testing, Quality Assurance and Quantifiable Improvement; Edition 2006, ISBN: 81-265-0805-1, 2005

Reference Books

1. Louise Tamares ; Introducing Software testing; ISBN: 81-7808-678-6, 2008

DIGITAL SIGNAL PROCESSING

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT533	DIGITAL SIGNAL PROCESSING	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:
The students will be able to:

1. Introduce the concepts and techniques associated with the understanding of signals and systems modeling concept and definitions.
2. Familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete time systems which provides foundation for more advanced subjects.
3. Understand the key theoretical principles underpinning Digital Signal Processing in a design procedure through FIR and IIR filters.

Course Outcomes:
On completion of this course the students will be able to:

1. Characterize and analyze the properties of CT and DT signals and systems
2. Represent CT and DT systems in the Frequency domain using Fourier analysis tools.
3. Apply digital signal processing techniques to design discrete time systems and digital filters
4. Illustrate the fundamentals and implementation of DSP techniques with practical examples and real-world applications.

UNIT 1	
Fundamentals of Signals and Systems: Signals,Systems,Fourier Analysis of Discrete Time Signals, Fourier Analysis of Continuous Time Signals. Z-Transform and ROC.	10hrs
UNIT 2	
Discrete Time Processing of Continuous Time Signals: Introduction Structure of a Digital Filter, Frequency Domain Analysis of a Digital Filter, Quantization Errors **Fourier Analysis of Discrete Time Signals:** Introduction, Discrete Time Fourier Transform (DTFT),Discrete Fourier Transform (DFT), The DFT as an Estimate of the DTFT, DFT for Spectral Estimation, DFT for Convolution, DFT/DCT for Compression, The Fast Fourier Transform (FFT)	10hrs
UNIT 3	
Digital Filters : Introduction, Ideal Versus Non-ideal Filters, Finite Impulse Response (FIR) Filters, Infinite Impulse Response (IIR) Filters	10hrs

UNIT 4	
Digital Filters Implementation: Introduction Elementary Operations, State Space Realization of Digital Filters, Robust Implementation of Digital Filters, Robust Implementation of Equiripple FIR Filters.	9 hrs

Text Book:

1. Modern Digital Signal Processing – by Roberto Cristi, Thomson Brooks/Cole (Thomson Learning) ISBN 981-243-899-8.

References:

1. Digital Signal Processing, Algorithm and Applications: by Proakis, John G.; Manolakis, Dimitris G., 4th Edition, ISBN: 9780131873742/9788131710005, published by Pearson Education, Inc-2007

INTERNET OF THINGS

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT534	INTERNET OF THINGS	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To impart knowledge on IoT general concepts and Architecture.
2. To introduce the concept of M2M (machine to machine) with necessary protocols.
3. To introduce the Python Scripting Language which is used in many IoT devices.
4. To introduce the Raspberry PI platform, that is widely used in IoT applications.

Course Outcomes:

The student after undergoing this course will be able to:

1. Understand the concept of IoT and M2M.
2. Study applications in various fields.
3. Analyse different scenarios for implementation of IoT
4. Design and implement IoT applications in different domain.

UNIT 1	
Introduction to IoT, Definition and Characteristics of IoT, Physical Design of IoT-Things in IoT, IoT Protocols, LogicalDesign of IoT- IoT functional Blocks, IoT communication models, IoT Communication APIs ,IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Deployment Templates. Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.	10hrs
UNIT 2	
IoT& M2M Machine to Machine, Difference between IoT and M2M, Software defined networks, network function virtualization. Basics of IoT System Management with NETCONF, YANG- NETCONF, YANG, SNMP NETOPEER	9 hrs
UNIT 3	
Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling. Python packages - JSON, XML, HTTP Lib, URL Lib, SMTP Lib.	10hrs
UNIT 4	
IoT Physical Devices and Endpoints - Introduction to Raspberry PI - Interfaces (serial, SPI, I2C). Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.	10hrs

Text Books:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
2. Matt Richardson & Shawn Wallace, Getting Started with Raspberry Pi, O'Reilly (SPD), 2014, ISBN: 9789350239759

3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

Reference books

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1stEdition, Apress Publications, 2013.

*Students are advised to refer to the resources available in Internet for more information.

COMPUTER GRAPHICS

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT541	COMPUTER GRAPHICS	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. Introduction to the contemporary terminology and progress in Computer Graphics.
2. Introduction to various issues and trends in Computer Graphics.
3. An Understanding of 2D and 3D transformations.
4. An understanding of the animation techniques.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain the concepts of computer graphics system
2. Implement the algorithms for two dimensional transformations.
3. Demonstrate the techniques of clipping
4. Explain the basics of 3D Graphics and three dimensional transformations.
5. Design a simple animation system.

UNIT 1	
Overview of graphic systems: Raster scans systems, Random scan systems. Output Primitives. Points and lines, Line drawing algorithms, DDA, Bresenhams line algorithm Circle generating algorithms, Properties of circles, Midpoint circle algorithm, Ellipse generating algorithm, Properties of Ellipses, Midpoint ellipse algorithm, Filled area primitives, Scan line polygon Fill algorithm, Inside – outside tests, Scan line fill of curved boundary, Boundary fill algorithm, Flood fill algorithm, Fill area functions.	10hrs
UNIT 2	
Two Dimensional Geometric Transformations: Basic Transformations, Translation, Rotation, Scaling, Composite transformation, Translations, Rotations, Scaling, Other transformations, Reflection, Shear. Two-Dimensional Viewing: The viewing pipeline, Viewing coordinate reference frame, Window to viewport coordinate transformation, 2-D viewing functions, Clipping operations, Point Clipping, Line clipping , Cohen- Sutherland Line Clipping, Polygon Clipping, Sutherland Hodgeman Polygon clipping, Weiler- Atherton Polygon Clipping, Other polygon clipping algorithm. Curve clipping, Text clipping.	10hrs
UNIT 3	
Three Dimensional Concepts: 3- Dimensional display methods, Parallel projections Perspective projection, Depth cueing, Surface rendering, Exploded and cutaway views. Three Dimensional Geometric and Modeling transformations-Translation Rotation, Coordinate Axes, rotations , Scaling , Reflections , Shears. Classification of visible – surface detection algorithms Back – Face detection , Depth buffer method , A – Buffer method , Scan – Line method , Depth Sorting method , BSP- Tree method, Area Sub-division method.	10hrs
UNIT 4	

Color Models and Color Applications- Properties of light ,Standard primaries and the, Chromaticity Diagram, XYZ Color model, CIE Chromaticity Diagram, RGB color model, YIQ Color Model , CMY Color Model, HSV Color Model, HLS Color Model. Computer Animation: Design of animation sequences, General computer animation functions, Raster Animations, Computer animation languages, Motion specification, Direct motion specification, Goal directed systems Kinematics and dynamics.	9 hrs

Text Book:

Computer Graphics c version by Donald D. Hearn and M. Pauline Baker, published by Dorling Kindersley(India) Pvt.Ltd,licensees of Pearson Education in South Asia ,ISBN 978-81-7758-765-4

References:

1. Computer Graphics 2e - A Programming Approach Publisher: Tata McGraw-Hill Education India ISBN: 9789339204808, 9789339204808 Indian Edition
2. Introduction to Computer Graphics 1st Edition Publisher: McGraw Hill India ISBN: 9780070435360, 0070435367

STATISTICAL MODELS FOR INFORMATION SCIENCE

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT542	STATISTICAL MODELS FOR INFORMATION SCIENCE	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To understand different methods of data collection.
2. To study behavior of information in terms of its dispersion, skewness etc.
3. To understand sampling and non-sampling errors.
4. To understand various test and regression analysis.

Course Outcomes:

The student after undergoing this course will be able to:

1. Understand Sampling System.
2. Evaluate Hypothesis testing for various Conditions.
3. Analyze Chi- Square Tests.
4. Perform the analysis of Variance.

UNIT 1	
Introduction to Data collection, Experiments and Surveys, Collection of Primary Data – Observation method, Interview method, Collection of data through questionnaire, Collection of data through schedules, Difference between schedules and questionnaire, other methods of data collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Data Preparation: Data Preparation process, Problems in Preparation Process, Missing Values and Outliers, Types of Analysis, Statistics in Research, Measures of Central Tendency: Mean, Median, Mode, Measures of Dispersion, Mean Deviation, Measures of Skewness, Kurtosis and Measures of Relationship.	10hrs
UNIT 2	
Sampling and Statistical Inference: Parameter and Statistics, Sampling and Non-sampling Errors, Types of Non Sampling errors, Sampling Distribution, Degree of Freedom, Standard Error, Central Limit Theorem, Finite Population Correction, Statistical Interference. Hypothesis: Characteristics of Hypothesis, Null and Alternative Hypothesis, Types I and II errors, Level of Significance, Testing the Hypothesis, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Limitations of the Tests of Hypothesis.	10hrs
UNIT 3	
Chi-Square Tests: Test of Difference of more than Two Proportions, Test of Independence of Attributes – Alternative Formula, Yates Correction, Test of Goodness of Fit – Goodness of Fit Test for Normal Distribution, Caution in Using Chi Square Tests. ANOVA: The ANOVA Technique, The Basic Principle of ANOVA, One Way ANOVA – Analysis of Variance Table, Short-cut Method for one-way ANOVA; Two Way ANOVA – One Observation per cell, Latin-square Design.	9 hrs

UNIT 4	
Dependent and Independent Variables, Simple Linear Regression Model - Standard Error, Assumptions or Conditions Required, Multiple Linear Regression Model - Standard Error, Assumptions or Conditions Required, Problem of Multicollinearity – Variable Elimination, Principle Components Method. Factor Analysis, Definition: Factor, Factor loadings, Communality, Eigen Values, Rotation, Factor Scores, Total sum of squares, Rotation in Factor Analysis, R-Type and Q-Type Factor Analysis, Merits and Demerits of Factor Analysis.	10hrs

Text Books:

1. C. R. Kothari, Gaurav Garg; Research Methodology – Methods and Techniques; New Age International (P) Limited, Publishers; Third Edition.
2. Ghosh B.N., Scientific Methods and Social Research; Sterling Publishers Pvt. Ltd. New Delhi; 1982.

Reference Books

1. Freedman P. The Principles of Scientific Research; Pergamon Press, New York, 1960; Second Edition.
2. John, Peter W.M.; Statistical Design and Analysis of Experiments; The MacMillan Co. New York, 1971
3. Yamane, T.; Statistics: An Introductory Analysis; Harper and Row, New York 1973; Third Edition

ADVANCED COMPUTER ARCHITECTURE

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT543	ADVANCED COMPUTER ARCHITECTURE	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To understand concept of parallelism.
2. To give students an insight into the various types of processors and their internal architecture.
3. To familiarize the students, how modern computer systems work and are built.

Course Outcomes:

The student after undergoing this course will be able to:

1. Understand various types of processor along with their internal architecture.
2. Learn how modern systems are built.
3. Illustrate the concept of parallelism.
4. Build/Construct/ Design parallel systems.

UNIT 1	
Solving Problems in Parallel: Utilizing temporal parallelism, Utilizing DataParallelism, Comparison of Temporal and Data Parallel Processing Parallel computer structures, Architectural classification schemes, Parallel processing applications **Principles of pipelining**: Linear pipeline processor, Non-linear pipeline processors,Instruction and Arithmetic pipeline design, principles of designing pipelined processors.	10hrs
UNIT 2	
Structures and Algorithms for Array Processors: Introduction to SIMDComputer Organization, Interconnection networks, parallel algorithms for array processors **Associative array processing:** Associative memory organization**.**	10hrs
UNIT 3	
Multiprocessors Architecture and Programming: Functional structures,Interconnection networks, Cache coherence and solutions, interleaved memory organization, Multiprocessor operating systems, Language features to exploit parallelism, detection of parallelism in programs.	10hrs
UNIT 4	
Core level parallel processing: Generalized structure of chip multiprocessors(CMP), Muti-core processors or CMPs, cache coherence in CMPs, Intel Core I7 architecture. CMPs using interconnection networks: Ring interconnection of processors, Ring bus CMPs General purpose graphics processing unit (GPGPU).	9 hrs

Text Books:

1. Hwang and Briggs; Computer architecture and parallel processing; TMH, ISBN:0-07 031556-6
2. V. Rajaraman and C. Siva Ram Murthy; Parallel Computers – Architecture and Programming; PHI, 2/e
3. Kai Hwang; Advanced computer architecture; TMH, ISBN: 0-07-031622-8

GRAPH THEORY

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT544	GRAPH THEORY	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. Familiarity with the most fundamental Graph Theory topics and results.
2. Exposure to the techniques of proofs and analysis about graphs and graph algorithms.
3. Knowledge of algorithms by solving concrete problems.

Course Objectives:

Upon completion of the course, the students should be able to:

1. Write precise and accurate mathematical definitions of objects in graph theory.
1. Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples
2. Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory
3. Reasons from definitions to construct valid mathematical proofs.

UNIT 1	
Graph Preliminaries: Definitions, incidence, adjacency and degree of a vertex. Types of graphs**:** Complete graph, bipartite graphs, complement graphs, self-Complementary graph and Regular graphs. Isomorphism, Sub graphs, matrix representations, degree, operations on graphs, degree sequences. **Connected graphs:** Walks, Trails, Paths, Circuits, Connected graphs, distance, cut-vertices, cut-edges, blocks, connectivity, weighted graphs, Disconnected Graphs, Components.	10hrs
UNIT 2	
Blocks and Trees: Cut points, bridges and blocks. Block graphs and Cut point graphs. Definitions of trees, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes. **Planarity:** Combinatorial graph, planar graphs, Kuratowski's two graphs, different representations of a graph, Euler's polyhedral formula, detection on planarity, outer planar graphs, and other characterizations of planar graphs. Geometrical dual. Genus, thickness and crossing numbers.	10hrs
UNIT 3	
Matrix Representation and Diagraphs: Incidence matrix, adjacency matrix, sub matrices, circuit matrix, fundamental circuit matrix, and rank. Cut set matrix, path matrix, and relation between them. Types of Digraphs and Binary Relations. Directed Paths and Connectedness. Trees with directed Edges – Fundamental Circuits in Digraph – Matrices A, B, and C of Diagraphs – Adjacency Matrix of a Diagraph – Tournaments.	09hrs
UNIT 4	
Coloring: Vertex coloring and edge coloring. Chromatic Number, Chromatic Polynomial, matching, coverings. The four-Color Problem, maximal independent set, point independence number.	10hrs

Optimization: Dijkstra's Shortest Path Algorithm, Minimal Spanning Trees – The algorithms of Kruskal's and Prim, Transport Networks –Max-flow, Min-cut Theorem, Matching Theory.	

Text Books:

1. NarsinghDeo, "Graph Theory: With Application to Engineering and Computer Science", Prentice Hall of India, 2003.
2. Grimaldi R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", Addison Wesley, 1994.

Reference:

1. Clark J. and Holton D.A, "A First Look at Graph Theory", Allied Publishers, 1995.

ETHICS AND ENTREPRENEURSHIP					
Course Code	**HM009**		**Credits**	**3**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**3**	**0**	**0**	**40hrs/sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 75 marks	**25**	**0**	**100**	**0**	**0**

Course Objectives:

The course aims to provide the student with:

1. Acquaint to standard concepts of ethics that they wilfind useful in their professionallife.
2. An understanding of the various concepts inEthics.
3. Familiarization to the basic principles ofentrepreneurship.
4. Acquaint to standard concepts of entrepreneurship that they will find useful in their profession or during the process of starting their ownenterprise.

Course Outcomes:

After completion of the course the student will be able to :

CO1	Appreciate and assimilate ethics and interpersonal behaviour. Also to understand the use of ethical theories.
CO2	Understand code of ethics in various fields, safety responsibility and rights as an engineer.
CO3	Understand the concept of entrepreneurship and demonstrate the skills for project identification, development and implementation.
CO4	Understand the basics of financing a project. From the options of choosing the project and source of finance, to finding ways of sustaining the project.

UNIT -1	
What is Ethics? Ethics and Rights, Ethics and Responsibility, Why Study Ethics, Attributes of an ethical personality, CaseStudy Work Ethics, Integrity, Honesty Engineering Ethics – History, Engineering Ethics Professional Roles to be played by an engineer, Functions of an Engineer, Self-Interest, Customs and Religion, Profession al Ethics, Types of Inquiry, Engineering and Ethics, Kohlberg's Theory Theories of Ethics – Moral issues, Moral dilemmas, Theories, Uses of Ethical Theories, Factors influencing Ethical Behaviour	10 hrs
UNIT -2	
Code of Ethics Safety Responsibility and Rights: Responsibility of Engineers, Risk-Benefit Analysis, Ethical issues in Cost-benefit Analysis, Ethics and Risk Management, Reducing Risk., Conflict of Interest, Occupational Crime, Intellectual property Environmental Ethics – Introduction, Affecting Environment, Engineers as Managers, Role of Engineers, IEEE code of Ethics Rights of Engineers –Professional Rights, Employees Rights Whistle -blowing	10 hrs
UNIT -3	
Definition and clarification of concept of entrepreneurship: Qualities and skills required for entrepreneurship, Functions of an entrepreneur, Importance of entrepreneur in economicdevelopment. Theories of Entrepreneurship: Economic theory, Sociological theory, Psychological theory. Types of entrepreneurs: Based on type of business, Based on use of technology, Based on motivation, Based on stages of development, Based on motive, Based on capital ownership, Danhof's classification. Project identification: External environment analysis, Meaning and characteristics of a project, Classification of projects, Project life-cycle, Sources and screening of projectideas. Project formulation: Meaning and significance, Feasibility analysis, Techno-economic analysis, Input analysis, Financial analysis, Social cost benefit analysis. Project feasibility. Pre-feasibility study: Project feasibility report - Meaning, Importance and Contents.	10 hrs
UNIT -4	
Project financing and institutional finance: Classification of capital – Fixed capital - Meaning, Factors governing fixed capital requirements, Working capital – Meaning and concepts, Types, Factors determining working capital requirements. Sources of finance – Share capital, Debenture capital, Lease finance and term loans from commercial banks. Financial aspects: Break even analysis, Income statement, Balance sheet, Fund flow statement, Ratio analysis – Liquidity, leverage and profitability ratios. Capital budgeting – Need, Importance, Process, methods of project evaluation: Payback period, Net Present ValueIndex.	10 hrs

TEXTBOOKS	
1	A. Alavudeen, R. Kalil Rahman, M. Jayakumaran; Professional Ethics and HumanValues, Firewall Media, 2008.
2	Jayshree Suresh, B. Raghavan; Professional Ethics: Values and Ethics ofProfession, S. Chand Co. Ltd (2005)
3	C.B.Gupta and N.P.Srinivasan ; Entrepreneurship; Sultan Chand and Sons ,4/e,1997
4	Prassanna Chandra; Fundamentals of Financial Management; Tata McGraw Hill3/e.; 2001.

REFERENCES	
1	Charles B. Fleddermann; Engineering Ethics,Pearson; 4 edition (August 2011)
2	C.B. Gupta and S.S. Khanka; Entrepreneurship and Small Business Management;Sultan Chand and Sons; 1997,2/e.
3	Richard M. Lynch, Robert W. Williamson; Accounting for Management, Planningand Control; Third Edition, Tata McGraw-Hill, New Delhi.

DATABASE APPLICATION LAB

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT550	DATABASE APPLICATION LAB	Hrs/week	-	-	4		Th	S	TW	P	O	TOTAL
		Credits	-	-	2	Duration (min)	-	-	-	-	-	-
						Marks	-	-	25	50	-	75

*Experiment List for Database Management System
1. To study Data Definition language Statements and Data Manipulation Statements.
2. To Study: SELECT command with different clauses GROUP functions (avg, count, max, min, Sum) and various type of SET OPERATORS (Union, Intersect, Minus).
3. To Study of Various types of JOINS.
4. Mini Project: Develop database application using front-end tool and back-end DBMS.
+ ***Experiment list of Chosen elective 1**
Experiment List for Cloud Computing
1. To demonstrate practically all the services of the Cloud.
2. To develop & deploy our own application on Cloud.
3. To install and configure HORTONWORKS SANDBOX HADOOP by using Oracle Virtual Box on Windows Operating System.
4. Create an application (Ex: Word Count) using Hadoop Map/Reduce.
Experiment List for Software Testing and Quality Assurance
1. Study and use of any one Software Testing Tools.
2. Conducting a Test Suite for a Website.
3. Software Requirement Specification of Mini project from IT510 Course.
4. Testing of project from IT510 Course.
Experiment List for Digital Signal Processing
1. To find DFT/DTFT of given DT signal.
2. Implementation of LP/HP FIR filter for a given sequence.

3. Implementation of LP/HP IIR filter for a given sequence.
4. Implementation of Linear and circular convolution of two given sequences using DFT and IDFT.
Experiment List for Internet of Things
1. Python program using functions.
2. Exercise on working principle of Raspberry Pi.
3. Experiment on connectivity of Raspberry Pi with existing system components.
4. Programming Raspberry Pi with Python.

*Note: Experiment list can be modified by the respective subject Faculty

MODELLING & COMPUTING LAB

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT560	MODELLING & COMPUTING LAB	**Hrs/week**	**-**	**-**	**4**		**Th**	**S**	**TW**	**P**	**O**	**TOTAL**
		Credits	**-**	**-**	**2**	**Duration (min)**	**-**	**-**	**-**	**-**	**-**	**-**
						Marks	**-**	**-**	**25**	**50**	**-**	**75**

***Experiment List for Theory of Computation**
1. Regular Languages & Regular Expressions.
2. To implement a Deterministic Finite Automata (DFA).
3. To implement a Non-deterministic Finite Automata (NFA).
4. To implement a Mealy/Moore Machine.
5. To implement Push-down automata.
6. To implement a Turing machine.
7. A Study on Context-free & Context-sensitive languages and grammars.

+

***Experiment list of Chosen elective 2**
Experiment List for Computer Graphics
1. To implement Digital Differential Analyzer (DDA) using MFC.
2. To implement Midpoint Circle Drawing Algorithm using MFC.
3. To implement 2d geometric transformation.
4. To implement Clipping algorithm.
5. To implement Animation using MFC Application.
Case Studies for Statistical Models for Information Science
1. Case Study: Data Preparation
2. Case Study : Latin Square Design
3. Case Study : ANOVA
4. Case Study : Factor Analysis
Experiment list / Case Studies for Graph Theory
1. Case Study: Connected Graphs – cut vertex, cut edge, cut set of a graph, vertex connectivity
2. Case Study: Graph Coloring

3. To implementSpanning trees.
4. To implement Dijkstra's Shortest Path Algorithm/Kruskal's Algorithm/Prim's Algorithm.
Case Studies for Advanced Computer Architecture
1. Case Study: Pipelined Processors
2. Case Study: Associative Cache Design
3. Case Study: CPU Design
4. Case Study: Directly Mapped Design

*Note: Experiment list can be modified by the respective subject Faculty

PRINCIPLES OF COMPILERS

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT610	PRINCIPLES OF COMPILERS	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To introduce essential theory, algorithms, and tools used in compiler construction.
2. To study the design of lexical, syntax, and semantic analysis of source files.
3. To study the construction of syntax trees, and symbol tables.
4. To understand code generation and optimization techniques.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain how compilers translate source code to machine executable.
2. Understand tools to automate compiler construction such as LEX and YACC
3. Describe the process of parsing and simple code optimizations.
4. Apply the concepts to design, implement, and test a compiler for a simple language.

UNIT 1	
A language processing system, an overview of Assemblers, Macro processors, Linkers, Loaders, Debugger, Text editor, Compiler, Interpreter. Introduction to Language Translator, Phases of compilation, Bootstrapping and Porting, Compiler writing tools. The role of a lexical analyser. Design of lexical analyzer. Implementation of lexical analyzer. A Language for specifying lexical analyzer. Study of the features and applications of LEX/FLEX tool	08 hrs
UNIT -2	
Overview of Context free grammar. Derivations and Parse trees, Ambiguity, Left recursion, Left factoring. Top down parsing: Recursive descent parsing and Predictive parsers. Bottom up parsing: Shift-reduce parsers. Operator precedence parsers, LR parsers. Study of YACC Tool: Programming with YACC. Combining YACC and FLEX.	12hrs
UNIT 3	
Intermediate Code Generation: Intermediate Language, Declarations, Assignment statements, Boolean expressions, Case statement, Procedure call. Run Time environments: Source language issues, Storage organization, Storage allocation strategies. Symbol tables: The content of a symbol table, Data structures for Symbol Table. Error detection and recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.	09 hrs
UNIT 4	

Code generation: Issues in the design of a code Generator, Basic blocks and flow graphs, Next-use information, A simple Code generator, The DAG representation of Basic blocks, Peephole Optimization, Generating code from DAGS. Code optimization: The principle sources of optimization, Optimization of basic blocks, Machine dependent optimization, Register allocation optimization.	10 hrs
Text Books:	
1. Aho and Ulman ; Principles of Compiler Design; Publisher: Narosa publishing House, ISBN: 81-85015-61-9, Second Edition, 2002. 2. Aho, Ulman and Sethi; Compilers, Principles, techniques and tools; Publisher:Pearson Education Inc, 1986,2006 ISBN: 0-201-10088-6. **Reference Books:** 1. Vinu V. Das ; Compiler design with FLEX and YACC; PHI publication,2007 ISBN:978-81-203-3251-4. 2. Louden; Compiler Construction, Principles and Practice; Galgotia Publication, ISBN:0-534-93972-4,Second Edition,1998.	

WEB TECHNOLOGY

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT620	WEB TECHNOLOGY	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Outcomes:

1. Explain web application architecture, technologies, frameworks and e-commerce concept
2. Analyse and Evaluate the various technologies used in creating web applications
3. Apply the knowledge of web technologies to create simple applications
4. Create dynamic and interactive web applications that meet specific requirements by combining multiple web technologies

Course objectives:

The subject aims to provide the student with:

1. Introduction to the technologies behind today's web-based applications.
2. An Understanding of building real web applications.
3. An understanding of the basic design principles of the web model of computing.
4. Learning different technologies to building different real world applications.

UNIT 1	
Introduction to Web: Web Architecture, Web Applications¸ Web servers, Web Browsers, Overview of HTTP **HTML:** Elements, Attributes, Tags, Forms, Frames, Tables, Overview and features of HTML5 **Cascading Style Sheets:** Need for CSS, basic syntax and structure of CSS, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, Overview and features of CSS3. **XML:** Introduction to XML, uses of XML, XML key components, DTD and Schemas, Transforming XML using XSL and XSL	11 Hrs
UNIT -2	
JavaScript: Introduction to client side scripting, documents, forms, statements, comments, variables, operators, conditional statements, loops, events, objects, functions. **jQuery:** Introduction, Syntax, jQuery Selector, jQuery Events, jQuery effects, jQuery and HTML	09 Hrs
UNIT 3	
AJAX: JavaScript for AJAX, Asynchronous data transfer with XML Http Request, Implementing AJAX Frameworks **PHP:** Variables and Constants, Controlling Program Flow, Functions, Arrays, Files, Directories, Forms and Database, Exploring Cookies, Sessions, and PHP Security	10 Hrs

UNIT 4	
Web Applications in ASP.Net: Developing a web application, Application Structure and State, Web Forms: Standard Controls, Navigation Controls: TreeView, Menu and SiteMapPath, Validation Controls, Working with Database Controls: GridView, DataList, DetailsView, FormView, ListView, Repeater, DataPager, SqlDataSource	9 Hrs
Text Books:	
1. Web Technologies: HTML, Javascript, PHP, Java, JSP, ASP.NET, XML and AJAX, Black Book; Publisher: Dreamtech Press(2015) ; ISBN: 978-81-7722-997-4 2. Duckett; JavaScript and JQuery: Interactive Front-End Web Development. Publisher : Wiley (2014); ISBN-13 : 978-1118531648 **Reference Books:** 3. Paul Deitel, Harvey Deitel, Abbey Deitel; Internet and World wide Web. How to program; Fifth Edition; Publisher : Pearson Education India (2018); ISBN: 978-9352868599 4. Achyut Godbole, Atul Kahate; Web Technologies: TCP/IP, Web/ Java Programming, and Cloud Computing, Third Edition; Publisher : McGraw Hill (2013) 5. Mridula Parihar, et. al. – ASP .NET Bible; Publisher: John Wiley & Sons (2002); ISBN: 978-0764548161	

NATURAL LANGUAGE PROCESSING

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT631	NATURAL LANGUAGE PROCESSING	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

The subject aims to provide the students with:

1. To understand the basics of Natural Language processing.
2. To develop an understanding of various techniques used in Natural Language Processing
3. Analyse the various application areas for NLP.
4. Implement NLP

Course Outcomes:

1. Understand the fundamentals and complexities of NLP
2. Explore the core techniques of NLP
3. Analyze the domains in which NLP can be applied effectively and efficiently
4. Develop and implement NLP Systems

UNIT -1	
Regular Expression, Finite State Automata, Formal Languages, Non Deterministic FSAs, Relating Deterministic and Non-Deterministic Automata, Regular Languages and FSAs, Morphology, Finite State Morphological Parsing, Finite State Transducers, Sequential Transducers and Determinism, The Combination of an FST, Lexicon and Rules, Lexicon-Free FSTs, The Porter Stemmer, Word and Sentence Tokenization, Detection and Correction of Spelling Error, Minimum Edit Distance. Simple (Unsmoothed) N-grams, Training and Test Sets, N-gram Sensitivity to the Training Corpus.	09 hrs
UNIT -2	
Markov Models, Hidden Markov Models, Three Fundamental Questions for HMMs, HMMs – Implementation Properties and Variants. Part of Speech Tagging, The Probabilistic Model, The Viterbi Algorithm, Applying HMMs to POS Tagging, The Effect of Initialization on HMM Training. Transformations**,** The Learning Algorithm.	10 hrs
UNIT 3	
Probabilistic Context Free Grammar, Finding the most likely Parse for a sentence, Training a PCFG, Problems with Inside-Outside Algorithm. Probabilistic Parsing, Parsing for Disambiguation, Treebanks, Weakening the independence assumptions of PCFGs, Tree probabilities and derivational probabilities. Clustering, Single-Link and Complete-Link Clustering, Group-Average Agglomerative Clustering,	10 hrs

Top-Down Clustering, K-means, EM Algorithm. Information Retrieval, The Probability Ranking Principal (PRP), Vector Space Model, The Poisson Distribution, The K-Mixture, Inverse Document Frequency, Latent Semantic Indexing.	
UNIT 4	
The Representation of Meaning: Computational Desiderata for Representations, Canonical Form, Inference and Variables, First Order Logic, Lambda Notation, The Semantics of First Order Logic. Information Extraction: Named Entity Recognition, NER – Sequence Labeling, Practical NER Architectures, Relation Detection and Classification. Supervised Learning Approach to Relation Analysis, Temporal and Event Processing, Temporal Expression Recognition, Temporal Normalization. Machine Translation, Typology, Lexical Divergence, Classical MT and the Vauquois Triangle, Direct Translation, Transfer, The Interlingua Idea : Using Meaning, Statistical MT, Using Human Raters, Automatic Evaluation: BLEU Question Answering and Summarization, Information Retrieval, Evaluation of Information Retrieval System, Homonymy, Polysemy and Synonymy, Summarization	10 hrs
Text Books:	
1. Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition by Daniel Jurafsky and James H. Martin, Second Edition, Pearson. ISBN-13: 978-0131873216 2. Foundation of Statistical Natural Language Processing, Christopher D. Manning and Hinrich Schutze ISBN-0-262-13360-1 **Reference Books:** 1. Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O'Reilly Media; 1 edition, 2009. 2. Natural Language Understanding 2nd Edition Allen J ,Benjamin Cummings, 1995.	

ARTIFICIAL INTELLIGENCE AND FUZZY LOGIC

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT632	ARTIFICIAL INTELLIGENCE AND FUZZY LOGIC	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objective

1. To introduce students for problem solving in Artificial Intelligence.
2. To familiarize students with the methods and tools required for problem solving.
3. To equip students with a strong foundation to take up advanced courses in Machine Learning.

Course Outcomes

Upon completion of this course, students will be able to:

1. Explain the basic concepts of Artificial intelligence .
2. Demonstrate the use of appropriate algorithms for solving real world problems
3. Construct effective learning models
4. Apply the knowledge of reasoning for planning and decision making

UNIT 1	
INTRODUCTION TO AI AND KNOWLEDGE REPRESENTATION Introduction – What is AI, Foundations Solving problems by searching – Introduction, Uninformed Search – BFS, DFS, ID-DFS, Informed Search – Greedy BFS, A*, IDA*,Heuristic Functions, Local Search algorithm –Hill Climbing Adversarial Search – Optimal decisions in games, Alpha-Beta pruning Constraint Satisfaction Problems: Defining and formalism of problems Knowledge representation using First Order Logic, Unification, Resolution	10 hrs
UNIT -2	
PLANNING AND PROBABILISTIC REASONING Defining Classical Planning Problems using PDDL Forward and Backward State Space Search, Partial Order Planning Acting under uncertainty, Basic Probability Notations Fully Joint Distribution, Independence Baye's Rule and its uses, Reasoning using Bayesian Networks	10hrs
UNIT 3	
INDUCTIVE LEARNING Learning Agent, Forms of Learning Learning Decision Trees Artificial Neural Networks - Structure, Perceptron, Multilayer Perceptron - feed forward and back propagation approaches. Introduction to Deep Neural Networks- ConvolutionalNeural Network, Recurrent Neural Networks – structure, working	10hrs
UNIT 4	

FUZZY LOGIC Fuzzy sets-: Fuzzy relation,Fuzzification, Defuzzification, Fuzzy rules. Membership function: Knowledge base-Decision making logic Optimizations of membership function using neural networks Applications of fuzzy logic control systems	09hrs
Text Books:	
1. Stuart Russel and Peter Norvig "AI – A Modern Approach", 3RDEdition, Pearson Education 2016, ISBN 978-93-325-4351-5. 2. Charu C. Aggarwal "Neural Networks and Deep Learning: A Textbook", Springer 2019. 3. Kosko, B, "Neural Networks and Fuzzy Systems: A Dynamical Approach to Machine Intelligence", PrenticeHall, NewDelhi, 2004. **Reference Books** 1. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill-2008. 2. John yen, Reza langari, "Fuzzy logic: intelligence control & information", Pearson publication eighth edition-2003 ISBN : 978-81-317-0534-6.	

DISTRIBUTED SYSTEMS

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT633	DISTRIBUTED SYSTEMS	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

The subject aims to provide the student with:

1. Understand the major technical challenges in distributed systems design and implementation.
2. To present the principles underlying the functioning of distributed systems
3. Expose students to past and current research issues in the field of distributed systems
4. Provide experience in the implementation of typical algorithms used in distributed systems

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain what a distributed system is, why you would design a system as a distributed system and what the desired properties of such systems are.
2. List the principles underlying the functioning of distributed systems, describe the problems and challenges associated with these principles, and evaluate the effectiveness and shortcomings of their solutions
3. Recognize how the principles are applied in contemporary distributed systems, explain how they affect the software design.
4. Identify features and design decisions that may cause problems.

UNIT 1	
Introduction to Distributed System. Goals: making resources accessible, distribution transparency, openness, scalability. **Types of Distributed Systems:** Distributed Computing Systems, Distributed Information systems, Distributed Pervasive systems **Architectures. System Architectures:** Centralized Architectures, Decentralized Architectures, Hybrid Architectures **Communication Fundamentals:** Layered protocols, Types of Communication **Remote Procedure Call:** Basic RPC Operation, Parameter Passing, Asynchronous RPC.	10hrs
UNIT -2	
Processes. **Threads:** Introduction to Threads, Threads in Distributed Systems. **Virtualization:** Role of Virtualization in Distributed Systems. **Clients:** Client-side software for Distribution Transparency. **Servers:** General Design Issues, Server Clusters. **Code Migration**: Approaches to Code Migration **Synchronization**.**Clock Synchronization:** Physical Clocks. **Logical Clocks:**Lamport's Logical Clocks, Vector Clocks. **Mutual Exclusion:**Centralized Algorithm, Decentralized Algorithm, Distributed Algorithm, Token Ring Algorithm. **Election Algorithms:** Traditional Election Algorithms.	09 hrs
UNIT 3	
Introduction to Consistency and Replication. **Introduction:** Reasons for Replication, Replication as Scaling Techniques. **Data-Centric Consistency Models:** Continuous Consistency. **Client-Centric Consistency Models:** Eventual Consistency, Monotonic Reads, Monotonic Writes,	10hrs

Read Your Writes, Write Follow Reads. **Replica Management:** Replica-Server Placement. **Introduction To Fault Tolerance**. **Introduction:** Basic Concepts, Failure Models, Failure Masking by Redundancy. **Process Resilience:** Design Issues, Failure Masking and Replication. **Reliable Client-Server Communication:** Point-to-Point Communication, RPC Semantics in the Presence of Failures. **Reliable Group Communication:** Basic Reliable-Multicasting Schemes.	
UNIT 4	
Distributed Object-Based Systems. Architectures: Distributed Objects. **Processes:** Object Servers. **Communication:** Binding a client to an Object, Static versus Dynamic Remote Method Invocations, Parameter Passing. **Synchronization** **Distributed File Systems**. **Architectures:** Client-Server Architectures, Cluster-Based Distributed File Systems, Symmetric Architectures. **Processes. Communication:** RPCs in NFS, The RPC2 Subsystem. **Synchronization:** Semantics of File Sharing	10hrs
Text Books:	
1. Distributed Systems: Principles and Paradigms by Andrew S. Tanenbaum and Maarten Van Steen; Second Edition, ISBN - 978-81-203-3498-4, published by Prentice Hall of India, Private Limited publication 2007 2. Distributed Systems : Concept and Design by George Coulouris, Jean Dollimore & Tim Kindberg; Pearson (LPE); 4th Edition; ISBN 978-81-317-1840-7, published by Pearson publication 2009 **Reference Book:** 1. Distributed Operating System and Algorithm Analysis by Randay Chow and Theodore John son; Pearson; First Edition; ISBN 978-02-014-9838-7, published by Pearson publication 1997	

QUEUING THEORY AND MODELLING

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT634	QUEUING THEORY AND MODELLING	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering
2. To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
3. To understand the basic concepts of random processes which are widely used in IT fields.
4. To understand the concept of queueing models and apply in engineering.
5. To understand the significance of advanced queueing models.
6. To provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.

Course Outcomes:

1. Explain the basic concepts in probability and random processes for applications such as random signals two dimensional random variables, linear systems in communication engineering.
2. Apply the concepts and principles of queuing models and apply in engineering.
3. Implement and analyze the significance of advanced queuing models.
4. Design the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.

UNIT 1	
PROBABILITY AND RANDOM VARIABLES Probability – Axioms of probability – Conditional probability – Baye‘s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.	09 hrs
UNIT -2	
RANDOM PROCESSES Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.	10 hrs
UNIT 3	
QUEUEING MODELS Markovian queues – Birth and death processes – Single and multiple server queueing models – Little‘s formula - Queues with finite waiting rooms – Queues with impatient customers : Balking and reneging.	10 hrs
UNIT 4	
ADVANCED QUEUEING MODELS Finite source models - M/G/1 queue – Pollaczek Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.	10 hrs

Text Books:

1. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., ―Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014.
2. Ibe, O.C., ―Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
3. Hwei Hsu, "Schaum‘s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.

Reference Books

1. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.
2. Taha H .A., "Operations Research", 9th Edition, Pearson India Education Services, Delhi, 2016.
3. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

JAVA PROGRAMMING

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT641	JAVA PROGRAMMING	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

The subject aims to provide the student with:

1. An ability to plan, design, execute and document sophisticated object orientated program to handle different computing problems using "Java".
2. An understanding of how things work in the web world.
3. An understanding of the client-side implementation of web applications.
4. An ability to understand the generic principles of object oriented programming using "Java".
5. An understanding the use of Event driven Graphics programming in "Java".
6. Understands how data is accessed from the file.

Course Outcomes:

1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity
2. Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved
3. Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development
4. Design & develop complex Graphical user interfaces in Java using Swing, Applets, Java Bean, GUIs and event driven programming

UNIT 1	
Introduction to Java Programming Environment, Constants,Variables and Data types, Operators and Expressions, Decision making,Branching and Looping , JOptionPane **Command-Line Arguments , Classes,Objects ,Methods Constructors,Java Array, String and Vectors.**	10 hrs
UNIT -2	
Interfaces and Packages,Garbage Collection, Exception Handing, Multithreading ,Collections	10hrs
UNIT 3	
GUI : –Applet, AWT, Event Handling **Swings** **JDBC (Java Data Base Connection)** –Introduction to JDBC –Databases and Drivers	9hrs

UNIT 4	
Networking ,Security in Java,**Remote Method Invocation (Distributed Application in Java) , Introduction to struts Framework.**	10 hrs
Text Books:	
1. E. Balagurusamy; Programming with Java A Primer; Tata McGrawHill Companies 5th edition,2014. 2. Java: The Complete Reference, Eleventh Edition, 11th Edition,by Herbert Schildt, December 2018,Publisher(s): McGraw-Hill,ISBN: 9781260440249 **Reference books** 1. Sachin Malhotra, SaurabhChaudhary; Programing in Java; Oxford University Press, 2010. 2. H. M. Deitel and P. J. Deitel; Advanced Java 2 Platform HOW TO PROGRAM;Prentice Hall 9th edition.	

OPEN SOURCE SOFTWARE DEVELOPMENT

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT642	OPEN SOURCE SOFTWARE DEVELOPMENT	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

The objective of the course is to provide students:
1. Basic idea of Open Source Technology & Software Development process so as to understand the role and future of open source software in the industry.
2. Impact of legal, economic and social issues for Open Source Software
3. Understand the difference between open source software and commercial software.
4. Familiarity with Linux operating system.
5. Understanding and development of web applications using open source web technologies like Apache, MySql and PHP (LAMP/XAMP)

Course Outcomes:

Upon completion of the course, the students should be able to:
1. Explain the development model of OSS, and open-source licensing.
2. Demonstrate the installation of Linux by hard disk partitioning and process of working with files, image manipulation tool and Database connectivity.
3. Apply the principles of programming and write clear and effective code.
4. Develop simple applications with database connectivity

UNIT 1	
Software Development Using Open Source Systems: Overview of Open Source System, Open Source Software Development Models, The FOSS Philosophy, Social and Cultural Impacts. **Licensing:** Licensing, Intellectual Proprietary Right, Commercial License vs. Open source license. **Open Source Licensing, Contract and Copyright Law:** Basic principles of copyright law, contract and copyright, open source software licensing, issues with copyrights and patents, warranties.	5hrs
UNIT -2	
Open Source Operating System (LINUX): ***Installation of Linux (Red hat-CentOS):*** Harddisk Partitioning, Swap space, LVM, and Boot loader. *Command Line***:** Basic File System Management Task, working with files, Piping and Redirection, working with VI editor, use of sed and understanding FHS of Linux. **Introduction to image manipulation tool:** Getting started with the tool, creating and saving a document, page layout and back ground editing. Working with images: image size and resolution, image editing,color modes and adjustments,	14hrs

Zooming & Panning an Image, Rulers, Guides & Grids- Cropping & Straightening an Image,image backgrounds, making selections. *Working with tool box:* working with pen tool, save and load selection, working with erasers, working with text and brushes, *Color manipulations:* color modes, Levels, Curves, Seeing Color accurately, Patch tool, Cropping, Reading your palettes, Dust and scratches, Advanced Retouching, smoothing skin	
UNIT 3	
Introduction to Python Programming Language: Strengths and Weaknesses, IDLE, Dynamic Types, Naming Conventions, String Values, String Operations, String Slices, String Operators, Numeric Data Types, Conversions, Built in Functions **Data Collections and Language Component:** Introduction, Control Flow and Syntax, Indenting, if Statement, Relational Operators, Logical, Operators, True or False, Bit Wise Operators, while Loop, break and continue, for Loop, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections. **I/O and Error Handling In Python:** Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data From a File, Additional File Methods, Handling IO Exceptions, Working with Directories, Errors, Run Time Errors	10hrs
UNIT 4	
Open Source Database and Application: **MySQL:** Configuring MySQL Server, working with MySQL Databases, MySQL Tables, MySQL Functions, SQL Commands – INSERT, SELECT, UPDATE, REPLACE, DELETE. Date and Time functions in MySQL. **PHP – MySQL ApplicationDevelopment:** Connecting to MySQL with PHP, Inserting/Retrieving/Updating/Deleting data withPHP.	10hrs
Text Books:	
1. Fadi P. Deek and James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press. 2. Peterson,"The Complete Reference Linux", Tata McGraw HILL 2010 Nicholas Wells, "The complete Guide to LINUX System administration", Cengage Learning 3. Mark Lutz,"Learning Python", 4th Edition, O'Reilly Media Inc, 2013 **Reference Books** 1. James Lee and Brent Ware, "Open Source Web Development with LAMP using Linux, Apache,MySQL, Perl and PHP", Dorling Kindersley (India) Pvt. Ltd, 2008. 2. Julie C Meloni,"PHP, MySQLandApache", Pearson Education. 2009. 3. Steve Suehring, Tim Converse and Joyce Park,"PHP6 and MySQL Bible", Wiley-India, New Delhi 2009	

COMPUTER FORENSICS AND CYBER SECURITY

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT643	COMPUTER FORENSICS AND CYBER SECURITY	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objective:

The subject aims to provide the student with:

1. Familiarization with the types and categories of Cyber Crime
2. Understand concept and scope of Computer Forensics
3. Knowledge and skill required to minimize the occurrence and severity of incidents related to forensics and cyber law.
4. An appropriate level of awareness, knowledge and skill required to minimize the occurrence and severity of incidents related to forensics and cyber law.

Course Outcomes:

The student after undergoing this course will be able to:

1. Define and explain cyber crime, cyber law and various cyber crimes as per the Information Technology Act 2000.
2. Simulate the detailed procedure of computer forensics given a cyber crime scenario.
3. Apply knowledge of cyber law and cyber forensic procedure to collect facts and formulate, maintain and use evidence with regards to cyber crime related cases.
4. Document and prepare a report of digital evidence suitable to be produced to the court.

UNIT 1	
Computer Forensics Fundamentals Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement — Computer Forensic Technology — Types of Business Computer Forensic Technology **Computer Forensics Evidence and Capture** Data Recovery Defined — Data Back-up and Recovery — The Role of Back-up in Data Recovery — The Data-Recovery Solution.	10hrs
UNIT -2	
Evidence Collection and Data Seizure Why Collect Evidence?, Collection Options, Obstacles, Types of Evidence, The Rules of Evidence , Volatile Evidence, General Procedure , Collection and Archiving , Methods of Collection ,Artifacts, Collection Steps , Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene.	09hrs
UNIT 3	
Introduction to cyber security Building the foundation for Ethical Hacking – Introduction to ethical hacking, Cracking the hacker's mindset, Developing your ethical plan. Ethical Hacking in Motion – information gathering, social engineering, passwords.	10hrs
UNIT 4	
Hacking Network host and cyber security Network infrastructure systems- Understanding Network Infrastructure Vulnerabilities, Choosing Tools	

Scanning, Poking, and Prodding the Network, Detecting Common Router, Switch, and Firewall Weaknesses Wireless Networks- Understanding the Implications of Wireless Network Vulnerabilities, Choosing Your Tools, Discovering Wireless Networks, Discovering Wireless Network Attacks and Taking Countermeasures.	10hrs
Text Books:	
1. E Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, Pearson New Delhi.2004 2. MarjieT.Britz; "Computer Forensics and Cyber Crime": An Introduction"; 3rd Edition, Prentice Hall; 2013 **Reference Book** 1. Cyber Crime and Information Technology Act, Vikram Singh Jaswal. Regal Publications 2014	

E-COMMERCE

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT644	E-COMMERCE	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To develop an understanding of different business models of E Commerce.
2. To develop an understanding of Electronic Payment Systems.
3. To develop an understanding of Elements of Supply Chain.
4. To develop an understanding of Security in E-Commerce.

Course Outcomes:

1. Understand the principles of E-business and Role of management.
2. Apply various tools and services to the development of small-scale E-commerce application.
3. Implement and Analyze the Technologies with emphasis of Internet Technology.
4. Create applications in E-commerce for real life scenarios.

UNIT 1	
Introduction to Electronic Commerce: Defining E-Commerce, Components and Features of E-Commerce, Forces Fueling E-Commerce, Electronic Commerce Industry Framework, The Information Superhighway, Multimedia Content and Network Publishing, Messaging and Information Distribution, Common Business Services Infrastructure, Other Key Support Layers, Traditional Commerce versus E-Commerce, Advantages and limitation of E-Commerce, Benefits to Organization and Society, Drivers of E-Commerce, Categories of E-Commerce, E-Business, E-Business versus E-Commerce, E-Business advantages. **Planning and Launching of Online Business**: Business Models, Advantages of Bricks and Clicks business model, Superiority of bricks and clicks over pure online model, Difference between brick and mortar and pure online business model, Launching online business, Life cycle approach for launching an online business, One to One Enterprise.	10hrs
UNIT -2	
Electronic Payment System: Traditional payment systems, Internet based payment system, Essential requirements of E-Payment System, Credit cards, Debit cards, Smart cards, EFT, Electronic or Digital Cash, E-Cheques, E Wallet, Consumer, Legal, and Business Issues. **Payment Gateways**: Payment gateway process, Advantages and Disadvantages of Payment Gateway, Secure Electronic Transaction Protocol. **Electronic Commerce and Banking**: Changing Dynamics in the Banking Industry, Open versus Closed Models, Management Issues in Online Banking, Differentiating Products and Services, Managing Financial Supply Chains, Pricing Issues in Online Banking, Marketing Issues.	10hrs
UNIT 3	
Applications of E-Commerce: Business to Business, Business within Business, Customer to Business, Applications of E-Commerce in Retailing, Economic viability of an Online Firm, Financial Analysis, Business models of E-tailing. **Electronic Commerce and Retailing**: Changing Retail Industry Dynamics, Mercantile Models from the Consumer's Perspective, Types of Purchases, Types of Consumers, Management Challenges in Online Retailing.	10hrs

Intranets and Supply-Chain Management: Supply-Chain Management Fundamentals, Pull versus Push Supply-Chain Models, Elements of Supply-Chain Management, Integrating Functions in a Supply Chain, Managing Retail Supply Chains, The Order Management Cycle (OMC).	
UNIT 4	
Intranets and Customer Asset Management: Challenges in Implementing Customer Asset Management, Customer Asset Management and Supply Chains, Online Sales Force Automation, Elements of Online Sales Automation, Intranets and Sales Automation, Management Issues, Online Customer Service and Support - The Web and Customer Service, The Role of Technology in Customer Service, Technology and Marketing Strategy, Marketing Decision Support Systems. **Security in E-Commerce**: Introduction, Threats to Internet Security, Types of Threats, Security System on Internet, Network Security, Client Server Network Security, Data and Transmission Security, Firewalls, Security Protocols.	09 hrs
Text Books:	
1. Nidhi Dhawan; Introduction to E-Commerce; International Book House Pvt. Ltd; 2010 2. Ravi Kalakota & Andrew B. Whinston; E-Commerce; Pearson Education India	

TECHNICAL ENGLISH & REPORT WRITING

Course Code	Name of the course		L	T	P	Scheme of Examination						
HM002	TECHNICAL ENGLISH & REPORT WRITING	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:
The Students will be able to:

1. Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.
2. Develop their speaking skills to make technical presentations, participate in group discussions.
3. To help them develop their reading skills by familiarizing them with different types of reading strategies.
4. To equip with writing skills needed for academic as well as workplace contexts.
5. Foster their ability to write convincing job applications and effective reports.

Course Outcomes:
The students after undergoing this course will be able to:

1. Communicate effectively in different situations by using specific, technical vocabulary.
2. Write letters and reports effectively in formal and business situations.
3. Speak convincingly, express their opinions clearly, initiate a discussion, negotiate and argue using appropriate communicative strategies.
4. Write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
5. Read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
6. Face the challenges in the interviews at global level.

UNIT 1	
LISTENING SKILLS : Listening process and practice- exposure to recorded and structured talks, problems in comprehension and retention, note taking practice, listening tests, importance of listening in the corporate world, organization- spatial organization, chronological organization, order of increasing and decreasing importance, styles of communication, accuracy, brevity, clarity, objectivity, impersonal language, professional speaking ability, listening process, hearing and listening, types of listening- superficial, appreciative, focused, evaluative, attentive, empathetic. Barriers to listening- physical, psychological, linguistic, cultural. Speech decoding, oral discourse analysis, effective listening strategies, listening in conversational interaction, listening to structured talks, pre-listening analysis, predicting, links between different parts of the speech, team listening, listening to a telephone conversation, viewing model interviews (face-to-face, telephonic and video conferencing) listening to situation based dialogues, identifying the characteristics of a good listener.	10hrs

UNIT 2	
SPEAKING SKILLS: The speech process, message, audience, speech style, feedback, conversation and oral skills, fluency and self-expression, body language phonetics and spoken English, speaking techniques, word stress, correct stress patterns, voice quality, correct tone, types of tones, barriers to speaking, building self-confidence and fluency, Job interview, interview process, characteristics, of the job interview, pre-interview preparation techniques, interview questions and answers, positive image projection techniques. Group discussion- characteristics, subject knowledge, oral and leadership skills, team management, strategies, and individual contribution. Presentation skills-planning, preparation, organization, delivery. Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read) Conversation skills with a sense of stress, intonation, pronunciation and meaning –seeking information – expressing feelings (affection, anger, regret, etc.) Speaking – Role play practice in telephone skills – listening and responding, -asking questions -note taking – passing on messages, role play and mock interview for grasping interview skills.	10hrs
UNIT 3	
READING SKILLS : Introduction to different kinds of reading material: technical and non-technical-the reading process, purpose, different kinds of texts, reference material, scientific and technical texts, active and passive reading, reading strategies-vocabulary skills, eye reading and visual perception,, prediction techniques, scanning skills, distinguishing facts and opinions, drawing inferences and conclusions, comprehension of technical material- scientific and technical texts, instructions and technical manuals, graphic information. Note making- tool for study skills, topicalising, organization and sequencing. Making notes from books, or any form of written materials. Summarizing and paraphrasing. Reading a short story or an article from newspaper, Critical reading, Extensive reading activity (reading stories / novels) Speed reading – reading passages with time limit Reading the job advertisements and the profile of the company concerned.	09hrs
UNIT 4	
REFERENCING & WRITING SKILLS : Methods of referencing, book references, user guides, references for reports, journal references, magazines and newspapers, unpublished sources, internet references, explaining and elucidating. Writing skills- Effective writing- vocabulary expansion- Effective sentence structure, brevity and clarity in writing- cohesion and coherence in writing, emphasis. Paragraph writing. Letter writing skills - form and structure, style and tone. Inquiry letters, Instruction letters, complaint letters, Routine business letters, Sales letters. Reports, Resumes and Job Applications: Introduction to report writing- Types of reports, information and analytical reports, oral and written reports, formal and non-formal reports, printed forms, letter and memo format, manuscript format, proposals, technical articles, journal articles and conference papers, review and research articles. E-mails, Business Memos, Employment Communication- resume design, resume style. Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his / her success, thanking one's friends / relatives) Writing minutes of meeting – format and practice in the preparation of minutes – Writing summary after reading articles from journals – Format for journal, articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) Writing strategies.	10hrs

Text Books:

1. Technical Communication- Principles & Practice by Meenakshi Raman and Sangeeta Sharma, Oxford.
2. Technical writing- B.N. Basu, PHI learning.
3. Professional Communication Skills- Alok Jain, Pravin S.R. Bhatia, A.M. Sheikh. S Chand.
4. Basic Communication Skills for technology- Andrea J Rutherford, Pearson.

WEB DEVELOPMENT LAB

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT650	WEB DEVELOPMENT LAB	Hrs/week	-	-	4		Th	S	TW	P	O	TOTAL
		Credits	-	-	2	Duration (min)	-	-	-	-	-	-
						Marks	-	-	25	50	-	75

***Experiment List for Web Technology**
1.Create a web application which will incorporate HTML5, CSS3 and Javascript
2.Write programs to demonstrate use of XML for maintaining and displaying(XSLT) information.
3.Create a three-tier web application using PHP, AJAX and Database.
4.Create a three-tier web application using ASP .Net and Database.
+ ***Experiment list of Chosen elective 4**
Experiment List for Java Programming
1. Programs using constructor and destructor.
2. Creation of classes and use of different types of functions.
3. Programs on interfaces/packages/Files
4. Programs using JDBC/ Swings/ AWT
Experiment List for Open Source Software application
1. Designing a banner/ Brochure using the functionalities of an open source image manipulation tool
2. Implementing a python program using various constructs and dictionaries
3. Implementing a program using I/O operations and Error handling
4. Implementing PHP database connectivity
Experiment List for Computer Forensic and Cyber Security
1.To perform evidence collection and data seizure with documentation on a dummy crime site.
2.To perform case study on ethical hacking.
3.To Study the concept or remote PC control and perform remote login using ANYDESK application.
4.To list and study the vulnerabilities of accessing data sensitive internet applications using mobile smart phones and suggest the countermeasures.
Experiment List for E-Commerce
1. Study of different type/ category of Websites
2. Designing a website with a payment gateway
3. Configuring Firewalls
4. Case study.

*Note: Experiment list can be modified by the respective subject Faculty

SOFTWARE APPLICATIONS LAB

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT660	SOFTWARE APPLICATIONS LAB	Hrs/week	-	-	4		Th	S	TW	P	O	TOTAL
		Credits	-	-	2	Duration (min)	-	-	-	-	-	-
						Marks	-	-	25	50	-	75

*Experiment List for Principles of Compilers	
1. A LEX program to find if the input is integer, real number or word	
2. A program to obtain First and Follow for a user specified grammar.	
3. A program to convert NFA to DFA.	
4. A YACC program to parse an expression for a given grammar	
+ ***Experiment list of Chosen elective 3**	
Experiment List for Electives : Natural Language Processing	
1. Implementing Depth first Search and breadth first Search	
2. Implement a model that uses linear Interpolation	
3. Implement a simple decision tree	
4. Implement a simple text classification technique.	
Experiment List for Artificial Intelligence and Fuzzy Logic	
1.Implementing algorithms based on informed search strategies.	
2. Implementing Game playing algorithm using adversarial search.	
3. Implement a pattern detection using Convolution Neural Network	
4. Implement a decision support system using Fuzzy operators.	
Experiment List for Distributed Systems	
1.Program to implement Single Client Single Server Chat Application	
2.Program to implement Multiple Clients Single Server Chat Application	
3.Program to implement Remote Method Invocation Application	
4.Program to implement Berkeley's Algorithm/Lamport timestamp for clock synchronization	
Experiment List for Queuing Theory and Modelling	
1.Simulation of Single Server Queuing System using Matlab	
2.Simulation of Two- Server Queuing System using Matlab	
3.Testing Random Number Generators	
4.Practical implementation of Queuing models using C/C++	

*Note: Experiment list can be modified by the respective subject Faculty

IMAGE PROCESSING

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT710	IMAGE PROCESSING	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To focus on imparting knowledge about the conceptual and practical aspects of Image Processing.
2. To analyse the basic principles and signal processing aspect in Image Processing.
3. To understand the behaviour of colour image processing and its usage.
4. To carry out different operations in Image Processing.

Course Outcomes:

The student after undergoing this course will be able to:

1. Describe the concepts, models and analysis in Image Processing and its usage in different fields of application.
2. Apply the principle Image Processing Techniques like image enhancement, morphological operations, and segmentation, image representation and description, object recognition
3. Analyse different filtering operations over an image.
4. Implement different Image Processing algorithms.

UNIT 1	
Introduction to Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. Light and the Electromagnetic Spectrum, Image Sensing and Acquisition. Basic concepts in sampling and quantization, representing digital image. Some Basic Relationships between Pixels – neighbors of a pixel, adjacency, connectivity, regions, boundaries, distance measure. Basics of intensity transformation and spatial filtering. Some Basic Intensity Transformation Functions – Image negatives, log transformation, power law transformations, piecewise – linear transformation functions. Histogram Processing Histogram Equalization. Smoothening spatial filtering – Smoothening linear filter.	10 hrs
UNIT 2	
Filtering in the frequency domain: Sampling and the Fourier transform of sampled function, sampling theorem, aliasing. Properties of 2D discrete Fourier transform – relationship between spatial and frequency intervals, translation and rotation, periodicity, symmetry properties, fourier spectrum and phase angle, 2D convolution theorem. Image smoothening using frequency domain filters – ideal low pass filters, Butterworth lowpass filters, Gaussian lowpass filters. Image sharpening using frequency domain filters – ideal high pass filter, Butterworth highpass filter, Gaussian high pass filter.	10hrs
UNIT 3	
Color Fundamentals, Color Models – the RGB color models, the CMY and CMYK color models, the HSI color models. Basics of Full-Color Image Processing, color edge detection. **Morphological Image Processing:**Erosion and Dilation – erosion, dilation, duality.	

Opening and Closing, The Hit-or-Miss Transformation. Some Basic Morphological Transformation. Some Basic Morphological Algorithms – boundary extraction, hole filling, thinning, thickening. **Image segmentation:**point, line and edge detection – detection of isolated points, line detection. Thresholding – foundation and Basic Global thresholding. Region based segmentation – region growing, region splitting and merging.	10hrs
UNIT 4	
Representation and Description: Representation – Boundary following, chain codes, Boundary Descriptors – simple discriptors, shape numbers, Fourier descriptors. Regional descriptors - Some Simple Descriptors, topological descriptors. **Object Recognition:**Patterns and Pattern Classes. Recognition Based on Decision-Theoretic Methods - Matching, Optimum Statistical Classifiers. Structural Methods - Matching Shape Numbers, String Matching.	09 hrs
Text Books:	
1. R.C. Gonzalez, R.E. Woods; Digital Image Processing; Pearson Prentice Hall; 2009; Third Edition. 2. A.K. Jain; Fundamentals of Digital Image Processing; PHI; **Reference Books** 1. Milan Sonka, Vaclav Hlavac, Roger Boyle; Image Processing, Analysis and Machine Vision; 2. W.K. Pralt; Digital Image Processing; McGraw Hill;	

DATA ANALYTICS

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT721	DATA ANALYTICS	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

The subject aims to provide the student with ability to:

1. Understand the basic concepts and Techniques of Big Data Analytics.
2. Understand the entire life cycle of data analytics including dimensionality reduction.
3. Learn the association rules, classification and prediction methods and the clustering techniques.
4. Learn anomaly detection schemes
5. Understand Advanced Analytical Theory and Methods including Map-Reduce.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain big data analytics fundamentals, mechanisms and data analytics lifecycle Text Analysis and MapReduce techniques.
2. Illustrate the application of data mining techniques.
3. Demonstrate understanding and application of outlier detection techniques.
4. Demonstrate dimensionality reduction techniques and basic skills in R.

UNIT 1	
Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics Data Analytics Lifecycle, Data Analytics Lifecycle Overview, Phase 1: Discovery, Phase 2: Data Preparation, Phase 3: Model Planning, Phase 4: Model Building, Phase 5: Communicate Results, Phase 6: Operationalize, Case Study: Global Innovation Network and Analysis (GINA) Dimensionality Reduction: Eigenvalues and Eigenvectors of Symmetric Matrices, Principal-Component Analysis, CUR Decomposition Review of Basic Data Analytic Methods Using R, Introduction to R, Exploratory Data Analysis, Statistical Methods for Evaluation	10 hrs
UNIT 2	
Introduction to Classification & Prediction: Classification by Decision tree induction, Bayesian Classification, k-Nearest Neighbor Classifier, Classification by Back propagation, Introduction to Prediction Concept. Introduction to Cluster Analysis. Types of data in cluster analysis, Clustering	10hrs

Methods, Partitioning Methods, Hierarchical Methods, Density Methods.	
UNIT 3	
Data Mining Association Rules. Association Rule Mining. Mining Single Dimensional Boolean Association Rules from Transactional Databases. Advanced Analytical Theory and Methods: Regression, Linear Regression, Logistic Regression, Reasons to Choose and Cautions, Additional Regression Models Data Mining Anomaly Detection: Variants of Anomaly/Outlier Detection Problems, Applications. Types of anomaly detection schemes: Graphical & Statistical-based, Distance-based, and Model-based.	10hrs
UNIT 4	
Advanced Analytical Theory and Methods: Text Analysis, Text Analysis Steps, a Text Analysis Example, Collecting Raw Text, Representing Text, Term Frequency—Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments, Gaining Insights Advanced Analytics—Technology and Tools: MapReduce and Hadoop. Analytics for Unstructured Data, the Hadoop Ecosystem, NoSQL.	09 hrs
Text Books:	
1.Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting DataEMC Education Services (Editor) ISBN: 978-1-118-87613-8 March 2015. 2.Data mining - Concepts and Techniques -Jiawei Han and Micheline Kamber, Morgan Kuaffman publisher, ISBN: 1-55860-489-8, 3rd Edition 2012. **Reference Books** 1. Introduction to Data Mining by Pang-Ning Tan, Michael Steinbach, Vipin Kumar, ISBN:813176463X 2. Mining of Massive Datasets, 3rd Edition, Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, ISBN: 9781108476348 (Chapter 11 - Dimensionality Reduction)	

WIRELESS SENSOR NETWORKS

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT722	WIRELESS SENSOR NETWORKS	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. An introduction to wireless sensor network architectures, hardware and applications.
2. An understanding of protocol stack used in wireless sensor networks.
3. An understanding of different strategies used for routing, synchronization, localization etc.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain all the components ,subsystems, time synchronization, localization and power management strategies used in WSN.
2. Evaluate the trade-off associated with WSN for a given application.
3. Analyse the security challenges and applications of WSN.
4. Select appropriate protocols and strategies for use in WSN for a given application.

UNIT 1	
Introduction: Sensor Mote Platforms, WSN Architecture and Protocol Stack. WSN Applications: Military Applications, Environmental Applications, Health Applications, Home Applications, Industrial Applications, **Factors Influencing WSN Design:** Hardware Constraints Fault Tolerance Scalability Production Costs WSN Topology, Transmission Media, Power Consumption, **Physical Layer:** Physical Layer Technologies, Overview of RF Wireless Communication, Channel Coding (Error Control Coding), Modulation, Wireless Channel Effects, PHY Layer Standards	11 hrs
UNIT 2	
Medium Access Control: Challenges for MAC , CSMA Mechanism, Contention-Based Medium Access, Reservation-Based Medium Access, Hybrid Medium Access. **Network Layer:** Challenges for Routing, Data-centric and Flat- Architecture Protocols, Hierarchical Protocols, Geographical Routing Protocols	9 hrs
UNIT 3	
Transport Layer: Challenges for Transport Layer, Reliable Multi- Segment Transport(RMST)Protocol, Pump Slowly ,Fetch Quickly (PSFQ) Protocol, Congestion Detection and Avoidance (CODA) Protocol , Event-to-Sink Reliable Transport (ESRT) Protocol, GARUDA	9 hrs

ApplicationLayer: SourceCoding(DataCompression),Query Processing, Network Management	
UNIT 4	
Time Synchronization: Challenges for Time Synchronization , Network Time Protocol, Timing-Sync Protocol for Sensor Networks(TPSN), Reference-Broadcast Synchronization (RBS), Adaptive Clock Synchronization (ACS) **Localization;** Challenges in Localization, Ranging Techniques, Range-Based Localization Protocols, Range-Free Localization Protocols.	10hrs
Text Books:	
1. Ian F. Akyildiz and Mehmet Can Vuran "Wireless Sensor Networks", JohnWiley&SonsLtd. ISBN 978-0-470-03601-3(H/B), 2010. 2. Ananthram Swami,et.Al., Wireless Sensor Networks Signal Processing and Communications Perspectives", JohnWiley&SonsLtd.ISBN978-0- 470-03557-32007. **Reference Books** 1. WaltenegusW.Dargie; Christian Poellabauer; Fundamentals of Wireless Sensor Networks: Theory and Practice;Wiley-Blackwell 2. FengZhao,LeonidasJ.Guibas,; Wireless SensorNetworks: AnInformation Processing Approach; Morgan Kaufmann, Kazem Sohraby,DanielMinoliandTaiebZnati;WirelessSensorNetworks:Techology, Protocols, and Applications;Wiley-Blackwell	

GENETIC ALGORITHMS

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT723	GENETIC ALGORITHMS	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objective:

The subject aims to provide the student with:

1. Understand the fundamentals of Genetic Algorithms and how they can be applied in search based optimization problems.
2. Identify problems where Genetic Algorithms can be applied.
3. Apply the Advanced concepts of Genetic Algorithms in problem solving
4. Computer implementation of Genetic Algorithms

Course Outcomes:

The student after undergoing this course will be able to:

1. Understanding the fundamentals of Genetic Algorithms.
2. Explore the different techniques and operators for Genetic Algorithms.
3. Analyse the suitability of applying Genetic Algorithms for various problems
4. Develop and Implement Genetic Algorithms for real life problems.

UNIT 1	
Introduction to Genetic Algorithms: Robustness of Traditional Optimization and Search Methods, Goals of Optimization, Difference between Genetic Algorithms and Traditional Methods, Simple Genetic Algorithm and its operators, Example using Genetic Algorithm, Similarity Templates. **Mathematical Foundations:** Fundamental theorem, Schema Processing, Two- armed and K-armed bandit problem, Building block hypothesis, Minimal deceptive Problem, Similarity templates as hyper planes.	10hrs
UNIT 2	
Computer Implementation of Genetic Algorithms: Data structures, Reproduction, Crossover and Mutation, Mapping objective functions to fitness form, Fitness scaling. **Applications Of Genetic Algorithms:** De Jong and Function optimization, Structural optimization via genetic algorithm, Medical image registration with genetic algorithms, Iterated prisoner's dilemma problem.	10hrs
UNIT 3	
Advanced Operators And Techniques In Genetic Algorithm Search: Dominance, Diploidy and Abeyance, Inversion and other Re-ordering Operators, Other Micro operators, Niche and Specialization, Multi objective optimization. Knowledge based techniques, Genetic Algorithms and Parallel processors, Genetic Based machine learning, Classifier systems.	10hrs
UNIT 4	
Industrial Application Of Genetic Algorithms: Data Mining using genetic Algorithms, Approaches to search in data mining. Genetic Algorithm Specifics.	9hrs

Text Books:	
1. David E. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Pearson Education, 6th Edition ISBN81-7808-130-X 2. Charles L Karr and L. Michael Freeman, Industrial applications of Genetic Algorithms, CRC Press, Washington DC, 1999 ISBN:0-8493-9801-0 **Reference Books:** 1. Intelligent agent's adaptive control: Industrial applications- L.C.Jain and C.W. deSilva 2. Handbook of Genetic Algorithms -Davis, Lawrence, ISBN:0-442-00173-8. 3. An Introduction to Genetic Algorithms-Melanie Mitchell, ISBN:81-203-1358-5	

OBJECT ORIENTED MODELLING USING UML

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT724	OBJECT ORIENTED MODELLING USING UML	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. Design software applications using Object oriented Concepts.
2. Express software designs with UML diagrams
3. Identify various scenarios based on software requirements.
4. Understand importance of software quality and testing

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain the basic concepts of Object Oriented modelling
2. Demonstrate the use of UML diagrams to understand requirements.
3. Design UML diagrams for various Scenarios.
4. Map designs to quality code

UNIT 1	
Overview of Object Oriented Systems Development: Concept of Object Oriented Software, Importance of Object Oriented Software, Object Oriented Future, Object Oriented Systems Development Methodology, Overview of Unified Approach. Object Basics: An Object Oriented Philosophy, Objects, Object Behavior, Object Oriented Properties, Association and Aggregation. Object Oriented Systems Development Life Cycle: The Process of Software Development, Developing Good Quality Software.	9 hrs
UNIT 2	
Introduction to UML (Unified modelling language), Static and dynamic Models. Object Oriented Analysis: Use case diagrams, Identifying Use-Cases: Complexity in Object Oriented Analysis. UML Object diagram , Class diagrams: Approaches for Identifying Classes, Class Responsibility Collaboration, Identifying Relationships, Attributes, and Methods, Associations, Inheritance Relationships, A Part of Relationship, Aggregation.	10 hrs
UNIT 3	
UML Behavioural diagrams: State diagrams, Activity diagrams, Sequence diagrams and Interaction diagrams. Introduction to package and deployment diagrams. Introduction to UML tool.	10 hrs
UNIT 4	
Software Quality Assurance: Quality Assurance Tests, Software Testing Techniques(Introduction to Black box/White box testing), Testing Strategies, Impact of Object Orientation on Testing, Test Cases, Test Plan. Introduction to Design patterns: Creational factory method, Structural Bridge.	10 hrs
Text Books:	
1. Ali Bahrami – Object Oriented Systems Development – McGraw Hill International Edition – 1999	

2. Craig Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition, Pearson Education, 2005. **Reference Book** 1. Martin Fowler, ―UML Distilled: A Brief Guide to the Standard Object Modeling Language‖, Third edition, Addison Wesley, 2003.	

ADVANCE COMPUTING LAB

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT730	ADVANCE COMPUTING LAB	Hrs/week	-	-	4		Th	S	TW	P	O	TOTAL
		Credits	-	-	2	Duration (min)	-	-	-	-	-	-
						Marks	-	-	25	50	-	75

***Experiment List for Image Processing**
1. Introduction to image processing and Creating an image in Java
2. Convert a colored image to a grayscale image
3. Histogram of an image
4. Image sharpening
+ ***Experiment list of Chosen elective 5**
Experiment List for Data Analytics
1. Frequent Pattern Mining
2. Classification using Decision Trees
3. Classification using K-nearest neighbor
4. Clustering using K-means
Experiment List for Wireless Sensor Networks
1. Introduction of Wireless sensor network applications and its simulation
2. Study of hardware for wireless sensor node [Arduino/raspberry pi]
3. Study of operating system for wireless sensor node [tinyOS etc.]
4. Performance evaluation of Contention-free MAC protocols [Matlab/NS2]
Experiment List for Genetic Algorithms
1. Case study on traditional and genetic algorithm approach
2. Program to implement cross over and mutation operation
3. Program to map an objective function to fitness form
4. Program to find minimum of a function using genetic algorithm
Experiment List for Object Oriented Modelling using UML
1. Designing Use case and Class diagrams using UML
2. Designing State and Activity diagrams using UML
3. Designing Sequence diagrams using UML
4. Designing test cases.

*Note: Experiment list can be modified by the respective subject Faculty

CRYPTOGRAPHY AND NETWORK SECURITY

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT810	CRYPTOGRAPHY AND NETWORK SECURITY	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To introduce essential theory, algorithms, and tools used in cryptography
2. To study of different cryptography algorithms and perform cryptanalysis
3. To study the Concepts of different network security issues
4. To understand how to secure their network and message passed in the network.

Course Outcomes:

The student after undergoing this course will be able to:

1. Describe different cryptographic techniques.
2. Implement different algorithm for encryption
3. Illustrate how network security is achieved
4. Perform cryptanalysis of different algorithm.

UNIT 1	
Need of Information Security, Security Trends, Security Services, Security Mechanism, Security Attacks, The OSI Security Architecture, Model for Network Security. Symmetric Cipher Model- Substitution Techniques : Caesar Cipher, Mono-alphabetic Cipher, Poly-alphabetic Cipher, Playfair Cipher, Hill Cipher. Problems with Symmetric Cipher Algorithms, Transposition Techniques, Steganography	10 hrs
UNIT 2	
Block Ciphers Principles, Fiestel Structure, Confidentiality Using Symmetric Ciphers: Placement of Encryption Function, Traffic Confidentiality, Key Distribution. Principles of Public Key Cryptosystems, RSA (Rivest–Shamir–Adleman) Algorithm. Key Management, DiffieHellman Key Exchange.	10 hrs
UNIT 3	
Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions. Message Authentication Codes. Hash Algorithms: MD5 Message Digest Algorithm, Digital Signatures and Digital Signature Standard. Authentication Applications: Kerberos, X.509 Authentication Service: Certificates, Obtaining a User's Certificate, Revocation of Certificates, Authentication Procedures.	10 hrs
UNIT 4	
	09 hrs

Malicious Software: Viruses and Related Threats. Electronic Mail Security: Pretty Good Privacy: Services, Cryptographic Keys and Key Rings, Secure Electronic Transaction: SET overview, SET Participants, Dual Signature, Payment Processing. Firewall Design Principles	
Text Books:	
1.William Stallings; Cryptography And Network Security Prentice HallOf India, ISBN:81-203-3018-8 ;4thEdition 2.Behrouz A. Forouzan; Cryptography And Network Security;Tata McGraw Hill;ISBN-13:978-0-07-066046-5 **Reference Book** 1. Atul Kahate;Cryptography And Network Security;Tata McGraw Hill;ISBN-13:978-0-07-064823-	

COMPUTER VISION

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT821	COMPUTER VISION	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To learn the fundamental theories and techniques of computer vision.
2. To apply computer vision and image processing techniques to solve real world problem.
3. To explore and contribute to research and further developments in the field of computer vision.

Course Outcomes:

The student after undergoing this course will be able to:

1. Identify basic concepts, terminology and methods in the field of computer vision.
2. Describe basic methods of computer vision related to representation, edge detection and recognition.
3. Choose appropriate methods for image pre-processing and image segmentation.
4. Understand the geometric relationships between 2D images and the 3D world.

UNIT 1	
Overview of Digital Image Processing: Fundamental Steps in Digital Image Processing, Digital image Properties Components of an Image Processing System. Basic concepts in sampling and quantization, representing digital image. Histogram Processing. Image Segmentation. **Introduction to Computer Vision:** What is Computer Vision, Low-level vision, Mid-level vision, High-level vision , Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, object recognition	09 hrs
UNIT 2	
Image Preprocessing: Zero –crossings of the second derivative, scale in image processing,Canny edge detection, parametric edge models, Edges in multi-spectral images, Adaptive neighbourhood preprocessing. **Segmentation:** Border detection as graph searching, Border detection as dynamic programming.	10hrs
UNIT 3	
Shape representation and description: Region identification, Contour-based shape representation and description-chain codes, simple geometric border representation, Fourier transforms of boundaries. **Object recognition:** knowledge representation, Statistical pattern recognition-Classification principles.	10hrs
UNIT 4	
Image Understanding: Image understanding control strategies-Parallel and serial processing control, Hierarchical control, Bottom-up control strategies **3D Vision, geometry and radiometry:**3D vision tasks, Marr's theory, Basics of projective geometry, The single perspective camera **Use of 3D vision**	10hrs
Text Books:	
1.Image processing,Analysis, and Machine Vision by Milan Sonka ,Vaclav Hlavac, Boyle Roger,4th edition,CENGAGE learning, ISBN: 9781133593690 2.Computer Vision: A Modern Approach by David a.Forsyth , Jean Ponce, Second edition, Pearson Education Limited,ISBN: 9780273764144	

MOBILE COMPUTING

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT822	MOBILE COMPUTING	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To understand the basic concepts and principles in mobile computing.
2. To be acquainted of the major layers of the mobile protocol stack.
3. To learn the basics of the major telecommunication systems GSM and DECT.
4. To understand the basic concepts of the various classes of satellites.
5. To be exposed to the concepts of Bluetooth and Wireless LAN
6. To understand the use of mobile in commercial world

Course Outcomes:

1. Describe the basic concepts and techniques of mobile computing with their application.
2. Apply the concepts and principles of the Mobile Computing Techniques to solve real problems.
3. Implement and analyze Mobile scenarios and mobile networks and its applications.
4. Analyzing and tackling social communication problems.

UNIT 1	
Introduction: Applications, Simplified Reference model. Wireless Transmission: Frequencies for Radio Transmission, Signals, Antenna, Signal Propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems.	09 hrs
UNIT 2	
Medium Access Control: Motivation for a specialized MAC, SDMA, FDMA. TDMA, CDMA, Comparison of S/T/F/CDMA. Telecommunication System: GSM , DECT.	09 hrs
UNIT 3	
Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol, Mobile ad-hoc networks. Mobile Transport Layer: Traditional TCP, Classical TCP improvements, TCP over 2.5/3G wireless networks, Performance Enhancing Proxies.	10 hrs
UNIT 4	
Satellite Systems: History, Applications, Basics, Routing, Localization, Handover. Wireless LAN : Bluetooth. Support for Mobility: Wireless Application Protocol (version 1.x). Mobile platforms and applications: Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.	11 hrs

TextBooks:

1. Mobile Communications by Jochen Schiller, Second Edition, Pearson Education, ISBN: 978-81-317-2426-2.

2. Fundamentals of Mobile Computing by Prasant Kumar Pattnaik, Rajib Mall, Second Edition, PHI Learning Private Limited, ISBN: 978-81-203-5181-3.

Reference Books

1. Wireless Communication Networks and Systems by William Stallings, Copy Beard, Global Edition, Pearson Education, ISBN-13: 978-1-292-10871-1.
2. Mobile Computing Handbook by Mohammad Ilyas, ImadMahgoub, First Edition, CRC Press, Auerbach Publications, ISBN: 0-8493-1971-4.
3. AdHoc Mobile Wireless Networks by C.K. Toh, Pearson Education, Second Edition, ISBN-13: 978-0130078179

ADVANCED DATA STRUCTURES

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT823	ADVANCED DATA STRUCTURES	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To highlight the need for advanced data structures.
2. To familiarize students with the properties of different advanced data structures.
3. To enable students to implement the operations supported by advanced data structures.
4. To help students analyze and use appropriate data structures in algorithms.

Course Outcomes:
After completing this course, the students will be able to:

1. Describe the need for using advanced data structures like dynamic hash tables, heaps, trees and tries.
2. Explain the properties and operations of the data structures studied.
3. Apply the data structures studied appropriately.
4. Analyze the performance of advanced data structures in algorithms.

UNIT 1	
Linked List ADT, Circular List ADT, doubly linked list ADT, Applications of linked list: Polynomial Representation, Sparse Matrix Representation, stack, queue. Heterogenous Lists.	10hrs
UNIT 2	
Dynamic Hashing- Motivation, Extendible hashing, Linear hashing; Bloom Filters; Leftist Trees – Height-based, Weight-based;Binomial Heaps and Cost Amortization, Fibonacci Heaps and need for Cascading-cut, Pairing Heaps.	10hrs
UNIT 3	
Symmetric Min-max Heaps; Interval Heaps; Optimal Binary Search Trees; AVL Trees; Red-Black Trees; 2-3 tree,2-3-4 tree.Splay Trees.	10hrs
UNIT 4	
M-way search trees; B Trees; B+ Trees; Digital Search Trees; Binary Tries; Patricia Tries; Multi-way Tries.	09hrs
Text Books:	
1. "Fundamentals of Data Structures in C++" by Horowitz, Sartaj Sahni, Rajasekharan –	

Galgotia, ISBN: 9788175152571

2. “Introduction to Algorithms” by Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, PHI, ISBN: 81-203-1353-4.

3. “Data Structures & Algorithms in Java”byGoodrich ,Tomassia's ,WSE 6th edition 2014

Reference Books

1. “Data Structures and Algorithm Analysis in C++”, Mark Allen Weiss,2009, 3rd edition, Pearson Education

2. “Fundamentals of Algorithms”, G. Brassard and Bratley, Prentice. Hall 1996.

3. "Computer Algorithms: Introduction to design and Analysis", Sara Baase, Allen Van Gelder, , Addison Wesley, 2000.

SOCIAL NETWORKING

Course Code	Name of the course		L	T	P	Scheme of Examination						
IT824	SOCIAL NETWORKING	Hrs/week	3	-	-		Th	S	TW	P	O	TOTAL
		Credits	3	-	-	Duration (min)	3	-	-	-	-	-
						Marks	100	25	-	-	-	125

Course Objectives:

1. To understand the concept of social networking and its emerging trends
2. To understand the need for web mining in a social network
3. To understand the structure of social networking and how diffusion of data takes place
4. To get acquainted with the privacy issues of social networking

Course Outcomes:

1. Explain the idea of social networking and its emerging trends
2. Analyze and web mine a social network
3. Describe the structure and how diffusion of data takes place in a social network
4. Identify the privacy issues related to social networking

UNIT 1	
Introduction: Data Mining and web mining Web Community and Social Network Analysis: Characteristics of Web data, Web community, Social networking An overview on Social networking-Design , Issues , Emerging Trends and Security: Challenging aspects in social networking, Static and dynamic social network model, Factors that affect the design of social networks, Security prospective in social networks. Ontology and their role in the Semantic Web: Ontology-based knowledge Representation -Ontology languages for the Semantic Web	10hrs
UNIT 2	
Extraction and Mining Communities in Web Social Networks Extracting evolution of Web Community from a Series of Web Archive – Detecting communities in social networks – Definition of community – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms – Tools for detecting communities social network infrastructures and communities – Decentralized online social networks – Multi-Relational characterization of dynamic social network communities	10hrs
UNIT 3	
Visualization and Applications of Social Networks Graph theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing online social networks, Visualizing social networks with matrix-based representations – Matrix and Node-Link Diagrams – Hybrid representations – Applications – Cover networks – Community welfare – Collaboration networks – Co-Citation networks.	10hrs
UNIT 4	
Privacy and Anonymization in Social Networks: Privacy in social networks, Privacy in published social network data, Private information in published social network data,	

Background-Knowledge attacks, GASNA-Greedy Algorithm For Social Network Anonymization	09hrs
Text Books:	
1. Social Networking: Mining, Visualization, and Security by Mrutyunjaya Panda, Satchidanandan Dehuri, Gi-Nam Wang 2. Peter Mika, Social Networks and the Semantic Web, First Edition, Springer 2007. **Reference Books** 1. Borko Furht, Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010. 2. Social Network Analytics: Computational Research Methods and Techniques By Nilanjan Dey,Samarjeet Borah,Rosalina Babo,Amira S.Ashour 3. Web Mining and Social Networking :Techniques and Applications By GuandongXu ,Yanchun Zhang,Lin Li, First Edition, Springer, 2011. 4. Borko Furht, Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010.	