SRIT R23
COURSE STRUCTURE & SYLLABUS

M. Tech Regular Two Year Master's Degree Program
(Applied for the Batches admitted from 2023-2024)

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

[AUTONOMOUS]
Affiliated to JNTUA & Approved by AICTE
Accredited by NAAC with 'A' Grade & Accredited by NBA (CSE, ECE & EEE)
Rotarypuram Village, B K Samudram Mandal,
Ananthapuramu - 515701

COURSE STRUCTURE AND SYLLABI
SRIT-R23

Master of Technology
In
Computer Science

M. Tech (Regular- Full time)
(Effective for the students admitted into I Year from the Academic year **2023- 2024**)

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY
(Autonomous)
Affiliated to JNTUA & Approved by AICTE Accredited by NAAC with 'A' Grade & NBA (CSE, ECE & EEE)
Rotarypuram Village, B K Samudram Mandal,
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M. Tech Course Structure

Semester 1
(Computer Science)

I Semester: I M.Tech I Semester (5 Theory + 2 Labs + 1 AC)

Course Code	Course Name	Subject Area	Periods per week			Credits	Scheme of Examination (Max. Marks)		
			L	T	P		CIA	SEE	Total
23DCS101	Advanced Data Structures and Algorithms	PCC	3	0	0	3	40	60	100
23DCS102	Advanced Computer Networks	PCC	3	0	0	3	40	60	100
	Program Elective Course – I	PEC	3	0	0	3	40	60	100
	Program Elective Course – II	PEC	3	0	0	3	40	60	100
23DCS105	Advanced Data Structures and Algorithms Lab	PCC	0	0	4	2	40	60	100
23DCS106	Advanced Computer Networks Lab	PCC	0	0	4	2	40	60	100
23DRM101	Research Methodology and IPR	MCC	2	0	0	2	40	60	100
	Audit Course – I	AC	2	0	0	0	40	-	40
					Total	**18**	**320**	**420**	**740**

II Semester: I M.Tech II Semester (4 Theory + 1 Lab+1 TS)

Course Code	Course Name	Subject Area	Periods per week			Credits	Scheme of Examination (Max. Marks)		
			L	T	P		CIA	SEE	Total
23DCS201	Advanced Operating Systems	PCC	3	0	0	3	40	60	100
23DCS202	Advanced Databases	PCC	3	0	0	3	40	60	100
	Program Elective Course – III	PEC	3	0	0	3	40	60	100
	Program Elective Course – IV	PEC	3	0	0	3	40	60	100
23DCS205	Advanced Operating Systems Lab	PCC	0	0	4	2	40	60	100
23DCS206	Advanced Databases Lab	PCC	0	0	4	2	40	60	100
23DCS207	Technical Seminar	PR	0	0	4	2	100	-	100
	Audit Course – II	AC	2	0	0	0	40	-	40
					Total	**18**	**380**	**360**	**740**

III Semester: II M.Tech I Semester (2 Theory + 1 CCA)

Course Code	Course Name	Subject Area	Periods per week			Credits	Scheme of Examination (Max. Marks)		
			L	T	P		CIA	SEE	Total
	Program Elective Course – V	PEC	3	0	0	3	40	60	100
	Open Elective – I	OEC	3	0	0	3	40	60	100
23DCS302	Dissertation Phase – I	PR	0	0	20	10	100	-	100
23DCS303	Co-Curricular Activities		0	0	0	2	40	-	40
					Total	**18**	**220**	**120**	**340**

IV Semester: II M. Tech II Semester (1 DP)

Course Code	Course Name	Subject Area	Periods per week			Credits	Scheme of Examination (Max. Marks)		
			L	T	P		CIA	SEE	Total
23DCS401	Dissertation Phase – II	PR	0	0	32	16	-	100	100
					Total	16	-	100	100

Program Elective Course-I

Course Code	Course Name	Subject Area	Periods per week			Credits	Scheme of Examination (Max. Marks)		
			L	T	P		CIA	SEE	Total
23DCS103a	Machine Learning	PEC	3	0	0	3	40	60	100
23DCS103b	Advanced Computer Architecture	PEC	3	0	0	3	40	60	100
23DCS103c	Object Oriented Software Engineering	PEC	3	0	0	3	40	60	100

Program Elective Course-II

Course Code	Course Name	Subject Area	Periods per week			Credits	Scheme of Examination (Max. Marks)		
			L	T	P		CIA	SEE	Total
23DCS104a	Data Science	PEC	3	0	0	3	40	60	100
23DCS104b	Distributed Computing	PEC	3	0	0	3	40	60	100
23DCS104c	Information Security	PEC	3	0	0	3	40	60	100

Program Elective Course-III

Course Code	Course Name	Subject Area	Periods per week			Credits	Scheme of Examination (Max. Marks)		
			L	T	P		CIA	SEE	Total
23DCS203a	Deep Learning	PEC	3	0	0	3	40	60	100
23DCS203b	Computer Vision	PEC	3	0	0	3	40	60	100
23DCS203c	Service Oriented Architecture	PEC	3	0	0	3	40	60	100

Program Elective Course-IV

Course Code	Course Name	Subject Area	Periods per week			Credits	Scheme of Examination (Max. Marks)		
			L	T	P		CIA	SEE	Total
23DCS204a	Data Visualization Techniques	PEC	3	0	0	3	40	60	100
23DCS204b	Internet of Things	PEC	3	0	0	3	40	60	100
23DCS204c	Privacy Preserving Data Publishing	PEC	3	0	0	3	40	60	100

Program Elective Course-V

Course Code	Course Name	Subject Area	Periods per week			Credits	Scheme of Examination (Max. Marks)		
			L	T	P		CIA	SEE	Total
23DCS301a	Software Defined Networks	PEC	3	0	0	3	40	60	100
23DCS301b	Reinforcement Learning	PEC	3	0	0	3	40	60	100
23DCS301c	Data Analytics	PEC	3	0	0	3	40	60	100

Open Elective-I

Course Code	Course Name	Subject Area	Periods per week			Credits	Scheme of Examination (Max. Marks)		
			L	T	P		CIA	SEE	Total
23DOE301a	Optimization Techniques	OEC	3	0	0	3	40	60	100
23DOE301b	Industrial Safety	OEC	3	0	0	3	40	60	100
23DOE301c	Business Analytics	OEC	3	0	0	3	40	60	100

Audit Course-I

Course Code	Course Name	Subject Area	Periods per week			Credits	Scheme of Examination (Max. Marks)		
			L	T	P		CIA	SEE	Total
23DAC101a	English for Research Paper Writing	AC	2	0	0	0	40	-	40
23DAC101b	Disaster Management	AC	2	0	0	0	40	-	40
23DAC101c	Sanskrit for Technical Knowledge	AC	2	0	0	0	40	-	40

Audit Course-II

Course Code	Course Name	Subject Area	Periods per week			Credits	Scheme of Examination (Max. Marks)		
			L	T	P		CIA	SEE	Total
23DAC201a	Pedagogy Studies	AC	2	0	0	0	40	-	40
23DAC201b	Yoga for Stress Management	AC	2	0	0	0	40	-	40
23DAC201c	Personality Development through Life Enlightenment Skills	AC	2	0	0	0	40	-	40

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Advanced data structures and algorithms

(**Computer Science**)

I M.Tech - I Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS101	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Dictionaries

Definition, Dictionary Abstract Data Type, Implementation of Dictionaries, Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Unit II - Skip Lists

Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists, Trees: Binary Search Trees (BST), AVL Trees, Red Black Trees: Height of a Red Black Tree, Red Black Trees Bottom-Up Insertion, Top-Down Red Black Trees, Top-Down Deletion in Red Black Trees, Analysis of Operations.

Unit III - 2-3Trees

2-3Trees, Advantageof2-3 trees over Binary Search Trees, Search and Update Operations on 2-3Trees, Analysis of Operations, B-Trees: Advantage of B-trees over BSTs, Height of B-Tree, Search and Update Operations on 2-3Trees, Analysis of Operations, Splay Trees: Splaying, Search and Update Operations on Splay Trees, Amortized Analysis of Splaying.

Unit IV - Text Processing

Sting Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Sub Sequence Problem(LCS), Applying Dynamic Programming to The LCS Problem.

Unit V – Computational Geometry

One Dimensional Range Searching, Two-Dimensional Range Searching, constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad trees, k-D Trees.

Text books:	
1	Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, second Edition, Pearson, 2004.
2	T.H.Cormen, C.E.Leiserson, R.L.Rivest, Introduction to Algorithms, Third Edition PrenticeHall,2009
Reference Books:	
1	T.H.Cormen, C.E.Leiserson, R.L.Rivest, Introduction to Algorithms, Third Edition Prentice Hall,2009.
2	"Advanced Data Structures" by Peter Brass
3	"Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles" by Narasimha Karumanchi

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Explain the concept of hashing and its role in efficient data retrieval from dictionaries.
CO2	Understand the need for randomizing data structures and algorithms to achieve efficient and balanced performance.
CO3	Analyze the time complexity of search and update operations on 2-3 trees and understand their efficiency.
CO4	Describe standard trees and their applications in storing and searching for strings efficiently.
CO5	Construct and analyze the Priority Search Tree data structure, which is used for efficient range searching in multidimensional space.
CO6	Develop a comprehensive understanding of various data structures and algorithms commonly used in computer science.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Advanced computer networks

(**Computer Science**)

I M.Tech - I Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS102	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Network Architecture, Performance

Bandwidth and Latency, High Speed Networks, Network-Centric View, Error Detection, Reliable Transmission, Ethernet and Multiple Access Networks, Overlay Networks: Routing Overlays, Peer-to-Peer Networks and Content Distribution Networks, Client-Server Networks, Delay-Tolerant Networks.

Unit II – Switching

Circuit-Switched Networks, Datagram Networks, Virtual-Circuit Networks, Message-Switched Networks, Asynchronous Transfer Mode: Evolution, Benefits, Concepts, Exploring Broadband Integrated Services Digital Network, Layer and Adaptation Layer, IPv4: Address Space, Notations, Classful, Classless, Network Address Translation, Datagram.

Unit III – Fragmentation and Checksum IPv6 Addresses

Structure, Address Space, Packet Format and Extension Headers, ICMP, IGMP, ARP, RARP, Congestion Control and Resource Allocation: Problem, Issues, Queuing, TCP Congestion Control, Congestion-Avoidance Mechanisms and Quality of Service.

Unit IV – Internetworking

Intra-Domain and Inter-Domain Routings, Unicast Routing Protocols: RIP, OSPF and BGP, Multicast Routing Protocols: DVMRP, PIM-DM, PIM-SM, CBT, MSDP and MOSPF, Spanning Tree Algorithm, Optical Networking: SONET/SDH Standards, Traffic Engineering: Requirement, Traffic Sizing, Characteristics, Protocols, Time and Delay Considerations, Connectivity, Availability, Reliability and Maintainability and Throughput.

Unit V – Multimedia Over Internet

Transmission, IP Multicasting and VoIP, Domain Name System: Name Space, Domain Name Space, Distribution, Domains, Resolutions and Dynamic Domain Name System, SNMP, Security: IP Sec, SSL/TLS, PGP and Firewalls, Datacenter Design and Interconnection Networks.

Text books:

1	Larry L. Peterson and Bruce S. Davie, Computer Networks: A System Approach, Fifth Edition, Morgan Kaufmann, Elsevier, 2012.
2	Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, Fifth Edition, 2017.

Reference Books:

1	Satish Jain Advanced Computer Networking: Concepts and Applications
2	Chwan-Hwa (John) Wu, J. David Irwin, Introduction to Computer Networks and Cyber
3	Security, CRC press, Taylor & Francis Group,2014.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Analyze computer network architectures and estimate quality of service.
CO2	Design application-level protocols for emerging networks.
CO3	Analyze TCP and UDP traffic in data networks.
CO4	Design and analyze medium access methods, routing algorithms and IPv6 protocol for data networks.
CO5	Analyze Data Center Networks and Optical Networks.
CO6	Understand, Analyze, design, and manage computer networks while considering performance, reliability, security, and scalability aspects.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Machine learning

(**Computer Science**)

I M. Tech - I Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS103a	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Introduction to Machine Learning

Definitions, Datasets for Machine Learning, Different Paradigms of Machine Learning, Data Normalization, Hypothesis Evaluation, VC-Dimensions and Distribution, Bias-Variance Tradeoff, Regression.

Unit II – Bayes Decision Theory

Bayes decision rule, Minimum error rate classification, Normal density and discriminant functions. Parameter Estimation: Maximum Likelihood and Bayesian Parameter Estimation.

Unit III – Discriminative Methods

Distance-based methods, Linear Discriminant Functions, Decision Tree, Random Decision Forest and Boosting Feature Selection and Dimensionality Reduction: PCA, LDA, ICA, SFFS, SBFS.

Unit IV – Learning from un classified data

Clustering, Hierarchical Agglomerative Clustering. k-means partitioned clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with E Musing Labeled and unlabeled data.

Unit V – Kernel Machines

Kernel Tricks, SVMs (primal and dual forms), K-SVR, K-PCA (6 Lectures) Artificial Neural Networks: MLP, Back prop, and RBF-Net.

Text books:	
1	Shalev-Shwartz S, Ben-David S. (2014), Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press.
2	R.O.Duda, P.E.Hart, D. G.Stork (2000),Pattern Classification, Wiley-Blackwell, 2ndEdition.
Reference Books:	
1	Machine Learning Methods in the Environmental Sciences, Neural Networks, William WH sieh, Cambridge University Press.
2	Richardo Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & amp; SonsInc.,2001.
3	Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Understand the definitions and fundamental concepts related to machine learning, including datasets, different paradigms, and data normalization techniques.
CO2	Learn about parameter estimation methods, including maximum likelihood and Bayesian parameter estimation.
CO3	Gain knowledge of feature selection and dimensionality reduction techniques such as PCA, LDA, ICA, SFFS, and SBFS.
CO4	Understand semi-supervised learning techniques using labeled and unlabeled data in combination with the EM algorithm.
CO5	Explore kernel tricks and support vector machines (SVMs) in both primal and dual forms, as well as their extensions like K-SVR and K-PCA.
CO6	Apply various machine learning methods to solve real-world problems, perform data analysis, make optimal decisions based on probabilistic models, and effectively work with large datasets.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Advanced Computer Architecture

(**Computer Science**)

I M.Tech - I Semester								**SRIT R23**
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS103b	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

UNIT I- Fundamentals of Computer Design

Fundamentals of Computer design, Technology trends, Cost price and their trends, Measuring and reporting performance, Quantitative principles of computer design, Amdahl's law, Instruction set principles and examples- Introduction, classifying instruction set- Memory addressing- type and size of operands, Operations in the instruction set.

Unit II – Pipelines

Introduction, Basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, reducing pipeline branch penalties, Memory Hierarchy Design- Introduction, Review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

Unit III – Instruction Level Parallelism the Hardware Approach

Instruction Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- hardware based speculation

Unit IV – ILP Software

Approach Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues -Hardware verses Software.

Unit V – Multi Processors and Thread Level Parallelism

Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, distributed shared – memory architecture, Synchronization, Inter Connection and Networks

Text books:

1. John L. Hennessy, David A. Patterson – Computer Architecture: A Quantitative Approach, 3rd Edition, An Imprint of Elsevier.
2. Hwang, Kai, and Naresh Jotwani. Advanced computer architecture: parallelism, scalability, programmability. Vol. 199. New York: McGraw-Hill, 1993.

Reference Books:

1. John P. Shen and Miikko H. Lipasti – Modern Processor Design : Fundamentals of Super Scalar Processors.
2. Computer Architecture and Parallel Processing – Kai Hwang, Faye A.Brigs., MC Graw Hill..
3. Advanced Computer Architecture – A Design Space Approach – Dezso Sima, Terence Fountain, Peter Kacsuk , Pearson Ed.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Understand the basic concepts of computer architecture.
CO2	know the types of computers, and new trends and developments in computer architecture.
CO3	Understand pipelining, instruction set architectures, memory addressing.
CO4	Understand exploiting ILP using dynamic scheduling, multiple issue, and Speculation.
CO5	Understand the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges.
CO6	Understand multithreading by using ILP and supporting thread-level parallelism (TLP).

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Object Oriented Software Engineering

(**Computer Science**)

I M.Tech - I Semester								**SRIT R23**
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS103c	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Introduction to Software Engineering

Software Development process models – Agile Development – Project & Process-Project Management-Process & Project metrics - Object Oriented concepts, Principles & Methodologies.

Unit II – Software Requirements Specification

Software prototyping - Software project planning - Scope - Resources -Software Estimation - Empirical Estimation Models– Planning – Risk Management- Software Project Scheduling-Object Oriented Estimation & Scheduling.

Unit III –Modelling & Analysis

Behavioral Modelling-Structured Analysis - Object Oriented Analysis - Domain Analysis-Object Oriented Analysis process – Object Relationship Model- Object Behavior Model, Design modeling with UML.

Unit IV – Design Concepts & Principles

Design Process-Design Concepts-Modular Design-Design Effective Modularity-Introduction to Software Architecture –Data Design –Transform Mapping –Transaction Mapping-Object Oriented Design-System Design Process-Object Design Process-Design Patterns.

Unit V – Software Testing

Software Testing Methods-White Box, Basis Path-Control Structure - Black Box- Unit Testing - Integration testing - Validation & System Testing-Testing Tools–Software Maintenance & Reengineering.

Text books:	
1	Fairley R, "Software Engineering Concepts", second edition, Tata McGraw Hill, New Delhi, 2003.
2	Jalote P, "An Integrated Approach to Software Engineering", third edition, Narosa Publishers, New Delhi,2013
Reference Books:	
1	Machine Learning Methods in the Environmental Sciences, Neural Networks, William WH sieh, Cambridge University Press.
2	Richardo Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & amp; SonsInc.,2001.
3	Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Understand the various software development process models and their characteristics, including traditional models and Agile Development.
CO2	Develop skills in using software project management tools and software to aid in project planning, estimation, scheduling, and risk management.
CO3	Apply structured analysis techniques to analyze and model system requirements and processes.
CO4	Understand the principles and practices of object-oriented design and apply them to develop well-structured and reusable software components.
CO5	Develop skills in identifying, documenting, and fixing software defects and issues.
CO6	Develop a comprehensive understanding of software development processes.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

DATA SCIENCE

(**Computer Science**)

I M.Tech - I Semester								**SRIT R23**
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS104a	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Introduction to core concepts and technologies

Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

Unit II – Data collection and management

Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources.

Unit III – Data analysis

Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naïve Bayes.

Unit IV – Data visualization

Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

Unit V – Applications of Data Science

Technologies for visualization, Bokeh (Python) Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

Text books:	
1	Cathy O 'Neil and Rachel Schutt. Doing Data Science, Straight Talk from, The Frontline. O'Reilly.
2	Jure Leskovek, Anand Raja Raman and Jeffrey Ullman. Mining of Massive Datasets.v2.1, Cambridge University Press.
Reference Books:	
1	Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. MIT Press, 2013.
2	Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. O'Reilly,2013.
3	Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. Springer,2009.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Develop skills to collect, analyze, visualize, and interpret data, and apply data science methods in various domains.
CO2	Explore the tools and technologies commonly used in data science.
CO3	Acquire skills in exploring and examining data for quality, consistency, and accuracy.
CO4	Apply statistical techniques to solve real-world problems in various domains.
CO5	Understand solid foundation in data visualization principles, techniques, and best practices.
CO6	Apply data visualization techniques and tools in real-world data science projects.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Distributed Computing

(**Computer Science**)

I M.Tech - I Semester								**SRIT R23**
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS104b	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Introduction

Introduction - Message-passing systems versus shared memory systems - Primitives for distributed communication - Synchronous versus asynchronous executions - A model of distributed computations - A model of distributed executions - Models of communication networks - Models of communication networks - Models of process communications

Unit II – Distributed Algorithms

Global state and snapshot recording algorithms - System model and definitions - Snapshot algorithms for FIFO channels - Variations of the Chandy–Lamport algorithm - Snapshot algorithms for non-FIFO channels - Snapshots in a causal delivery system - Monitoring global state - Terminology and basic algorithms - Topology abstraction and overlays - Classifications and basic concepts - Complexity measures and metrics.

Unit III – Message ordering and group communication

Asynchronous execution with synchronous communication - Synchronous program order on an asynchronous system - Group communication - A nomenclature for multicast - Propagation trees for multicast - Classification of application-level multicast algorithms - Termination detection - Termination detection using distributed snapshots - Termination detection by weight throwing - A spanning-tree-based termination detection algorithm.

Unit IV – Distributed mutual exclusion

Distributed mutual exclusion algorithms - Lamport's algorithm - Ricart–Agrawala algorithm - Singhal's dynamic information-structure algorithm - Lodha and Kshemkalyani's fair mutual exclusion algorithm - Quorum-based mutual exclusion algorithms - Maekawa's algorithm - Agarwal–El Abbadi quorum-based algorithm.

Unit V – Deadlock detection in distributed systems

Models of deadlocks - Knapp's classification of distributed deadlock detection algorithms -Mitchell and Merritt's algorithm for the single resource model - Chandy–Misra–Haas algorithm for the AND model - Chandy–Misra– Haas algorithm for the OR model.

Text books:

1	Kshemkalyani, Ajay D., and Mukesh Singhal, "Distributed computing: principles, algorithms, and systems Cambridge University Press, 2011.
2	SunitaMahajan and Seema Shah, "Distributed Computing", Oxford University Press, Second Edition, 2011.

Reference Books:

1	Albert Y.Zomaya, "Parallel and Distributed Computing Hand book", Second edition, McGrawl Publications, 2005.
2	Francesco Pierfederici, "Distributed Computing with Python", First Edition, Packt Publishing, 2016.
3	Mahajan, Sunita, and Seema Shah, "Distributed Computing", Oxford University Press, Inc., 2013.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Understanding of Distributed System Models.
CO2	Develop proficiency in designing and analyzing distributed algorithms.
CO3	Understand message ordering and group communication in distributed systems.
CO4	Design and evaluate distributed mutual exclusion algorithms.
CO5	Understand models of deadlocks in distributed systems and various deadlock detection algorithms.
CO6	Apply distributed computing concepts and algorithms to real-world scenarios.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

INFORMATION SECURITY

(**Computer Science**)

I M.Tech - I Semester								**SRIT R23**
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS104c	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Security Attacks

Interruption, Interception, Modification and Fabrication Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

Unit II – Conventional Encryption Principles

Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

Unit III – Public key cryptography principles

Public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

Unit IV – Email privacy

Pretty Good Privacy (PGP) and S/MIME. IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Unit V – Web Security Requirements

Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Basic concepts of SNMP, SNM Pv1 Community facility and SNM Pv3. Intruders, Viruses and related threats.

Text books:	
1	Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2	Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, HalFlynnIdo Dubrawsky, Steve W. Manzuik and Ryan Permeh, Wiley Dream tech.
Reference Books:	
1	Network Security and Cryptography, Bernard Menezes, Cengage Learning.
2	Cryptography and Security, C. K. Shymala, N. Harini and Dr. T. R. Padmanabhan, Wiley-India.
3	Applied Cryptography, Bruce Schiener, 2ndedition, John Wiley & Sons.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Implement appropriate security measures to protect networked systems and information assets from threats and attacks.
CO2	Understand security services, mechanisms, and common attacks and vulnerabilities in computer networks and systems.
CO3	Implement cryptographic solutions to protect sensitive information and ensure data integrity in various contexts.
CO4	Develop a comprehensive understanding of public key cryptography algorithms.
CO5	Analyze security requirements, design and implement secure communication systems.
CO6	Design secure communication systems, implement protocols and mechanisms to protect against threats.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Advanced data structures and algorithms lab

(**Computer Science**)

I M. Tech – I Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
23DCS105	**PCC**	0	0	3	2	40	60	100

List of Experiments

S. No.	**Title of the Experiment**
1	To implement functions of Dictionary using Hashing (division method, Multiplication method, Universal hashing).
2	To perform various operations i.e., insertions and deletions on AVL trees.
3	To perform various operations i.e., insertions and deletions on 2-3 trees.
4	To implement operations on binary heap.
5	To implement operations on graphs.
6	To implement Depth First Search for a graph non-recursively.
7	To implement Breadth First Search for a graph non-recursively.
8	To implement Prim's algorithm to generate a min-cost spanning tree.
9	To implement Krushkal's algorithm to generate a min-cost spanning tree.
10	To implement Dijkstra's algorithm to find shortest path in the graph.

Reference Books/Lab Manuals:

1	Richard F.Gilberg, BehrouzA.Forouzan, "Data Structures A Pseudo code Approach with C", Second Edition, Cengage Learning2005.
2	Lipschutz Seymour, "Data Structures Schaum's Outlines Series", Tata McGraw Hill, 3rd Edition, 2014.
3	Horowitz Ellis, Satraj Sahni, Susan Anderson, Freed, "Fundamentals of Data Structures in C", W. H.Freeman Company, 2ndEdition, 2011.
4	M. A. Weiss, Data Structures and Algorithm Analysis, Addison-Wesley, 2nd Edition, 2013V

Course Outcomes: At the end of the course, the student should have acquire the ability to

CO1	Implement divide and conquer techniques to solve a given problem.
CO2	Implement hashing techniques like linear probing, quadratic probing, random probing and double hashing/rehashing.
CO3	Perform Stack operations to convert in fix expression in to postfix expression and evaluate the postfix expression.
CO4	Differentiate graph traversal techniques Like Depth First Search, Breadth First Search. Identify shortest path to other vertices using various algorithms.
CO5	Understand how advanced data structures and algorithms are applied to solve real-world problems in various domains
CO6	Analyze problems, devise efficient solutions, and critically evaluate their own algorithms and data structures.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Advanced Computer Networks lab

(**Computer Science**)

I M. Tech – I Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
23DCS106	**PCC**	0	0	3	2	40	60	100

List of Experiments

S. No.	Title of the Experiment
1	Implementation of client server programs for different network applications
2	Study and analysis of the network using Wire shark network protocol analyses
3	Implementation of topology generation for network simulation
4	Implementation of queuing management
5	Implementation of MAC-layer protocols
6	Implementation of routing protocols
7	Implementation of transport-layer protocols
8	Implementation of network security mechanisms

Reference Books/Lab Manuals:	
1	Computer Network Lab 2nd edition, by Chakchai So-In et al., 2017
2	Advanced Computer Networking by Prof. Satish Jain, BPB Publications
3	Practical Guide To Advanced Networking by Piyasat Nilkaew, Pearson India
4	Network Programmability and Automation: Skills for the Next-Generation Network Engineer by Jason Edelman, Matt Oswalt, Scott Lowe

Course Outcomes: At the end of the course, the student should have acquire the ability to	
CO1	Develop programs for client-server applications.
CO2	Perform packet sniffing and analyze packets in network.
CO3	Identify and use various networking components Understand different transmission media and design cables for establishing a network.
CO4	Implement network security algorithms.
CO5	Analyze performance of various communication protocols.
CO6	Implement error detecting and correcting codes.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Research Methodology and IPR

(Common to all Branches)

I M.Tech - I Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DRM101	**MCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	0	0	2	40	60	100

Unit I – Meaning of research problem

Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, scope, and objectives of research problem. Approaches of Investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

Unit II – Effective literature studies and approaches

Analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

Unit III – Nature of Intellectual Property

Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit IV – Patent Rights

Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit V – New Developments in IPR

Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

- Pedagogy/Course Delivery tools: ICT
- Links for online material:

Text books:	
1	Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2	Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
Reference Books:	
1	Ranjit Kumar, 2ndEdition, "Research Methodology: A Step by Step Guide for beginners"
2	Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
3	Mayall, "Industrial Design", McGraw Hill, 1992.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Develop the skills required to contribute to the body of knowledge in their discipline while understanding the importance of protecting intellectual property rights.
CO2	Analyze research related information.
CO3	Follow research ethics.
CO4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
CO5	Understanding that when IPR would take such important place in growth of individuals & nation, it is need less to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
CO6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Advanced Operating Systems

(**Computer Science**)

I M.Tech - II Semester								**SRIT R23**
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS201	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I –Basic Operating System Concepts

Overview of Unix File System - Files - Links - Types - I nodes –Access Rights - System Calls - Overview of Unix Kernels -Model - Implementation - Reentrant Kernels - AddressSpace-Synchronization-InterprocessCommunication-ProcessManagement-MemoryManagement-Device Drivers.

Unit II – Processes

Lightweight Processes, and Threads-Process Descriptor-State-Identifying a Process Relationships among Processes-Organization-Resource Limits-Creating Processes-System Calls-Kernel Threads –Destroying Processes-Termination-Removal.

Unit III – The Virtual File System (VFS)

Role - File Model -System Calls - Data Structures - Super Block, I node, File, dentry Objects - entry Cache - Files Associated with a Process – File system Types - Special Files systems –File system Type Registration–File system Handling-Name Spaces-Mounting–Un Mounting-Implementation of VFS System Calls.

Unit IV – Windows Operating system

versions, Concepts and tools, Windows internals, System Architecture, Requirements and design goals, Operating system model, Architecture overview. Key system components. System Mechanisms-Trap dispatching, object manager, Synchronization, System worker threads, Windows global flags, Local procedural calls, Kernel event tracing

Unit V – Android

what is android, basic building blocks – activities, services, broadcast receivers & content, ui components-views & notifications, components for communication -intents & intent filters, android api levels launching emulator editing emulator settings emulator shortcuts log cat usage, Applications of Android.

Text books:	
1	Daniel P. Bovet and Marco Cesati, "Understanding the Linux Kernel", 3rd Edition, O'Reilly Publications, 2005.
2	Harold Abelson, Gerald Jay Sussman and Julie Sussman, —Structure and Interpretation of Computer Programs, Second Edition, Universities Press,2013.
Reference Books:	
1	Mark E. Russinovi Chand David A. Solomon, Microsoft Windows Internals, 4th Edition, Microsoft Press, 2004.
2	Advanced Concepts In Operating Systems (McGraw-Hill Series in Computer Science) Hardcover – Import, 30 November 1993 by Mukesh Singhal, Niranjan Shivaratri
3	OS: Advanced Concepts, Maekawa, Oldehoeft. Addison-Wesley.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Understand Unix file system, Unix kernel architecture, and functionality.
CO2	Develop skills in concurrent programming using threads and gain insights into the internal mechanisms of process management in an operating system.
CO3	Understand of file system roles, file models, system calls, data structures and implement VFS (Virtual File System) system calls.
CO4	Understand system requirements and design goals of windows operating system.
CO5	Design and develop Android applications, testing and debugging, and gaining a broader perspective on the potential of Android in various domains.
CO6	Develop skills in analyzing and solving complex problems related to operating systems.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Advanced Databases
(**Computer Science**)

I M.Tech - II Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS202	**PCC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Database Analysis and Design Techniques

Basic Database Concepts, Database Design Methodologies. ER Modeling: Specialization, Generalization, Aggregation, Normalization Theory. Database Implementation using UML: Introduction to UML, Structure diagrams, behavioral diagrams, object oriented analysis, class diagram, Advanced Transaction Processing and Concurrency Control: Transaction Concepts, Concurrency Control: Locking Methods, Time stamping Methods, Optimistic Methods for Concurrency Control, Concurrency Control in Distributed Systems.

Unit II- Query Compiler

Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing, Heterogeneous Distributed Databases, Cloud-Based Databases, Directory Systems.

Unit III – Distributed Databases

Centralized DBMS and Distributed DBMS, functions and architecture of a DDBMS, Distributed Data Storage, Transparency issues in DDBMS, Query Processing DDBMS, Distributed transaction Management and Protocols, Distributed Concurrency Control and Deadlock Management.

Unit IV – Object Oriented Databases

Limitations of RDBMS, Need of Complex Datatype, Data Definition, ODBMS Fundamentals, issues in OODBMS, Object oriented database design. Comparison of ORDBMS and OODB.

Unit V – Emerging Database Models

Technologies and Applications Multimedia database -Emergence, difference from other data types, structure, deductive databases, GIS and spatial databases, Knowledge database, Information Visualization, Wireless Networks and databases, Personal database, Digital libraries, web databases, case studies.

Text books:

1	Advanced database management system by RiniChkrabarti and Shibhadra Dasgupta, Dreamtech.
2	Ramez Elmasri, Shamkant B. Navathe, Database systems- Models, Languages, Design and Application Programming.

Reference Books:

1	Thomas Cannolly and Carolyn Begg, " Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.
2	C.J.Date, A.Kannan and S.Swamynathan,"An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
3	V.S.Subramanian, "Principles of Multimedia Database Systems", Harcourt India Pvt Ltd., 2001.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Explain the concepts of databases.
CO2	Understand Distributed Database Process, Architecture, and Design Principles.
CO3	Apply Distributed Query Optimization Techniques and Algorithms.
CO4	Analyze and apply Concurrency Control and Reliability Techniques.
CO5	Analyze Need of Complex Data type like ORDBMS and OODBMS.
CO6	Identify Emerging Database Models.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Deep Learning

(**Computer Science**)

I M.Tech - II Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS203a	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Introduction

Introduction to machine learning-Linear models (SVMs and Perceptron's, logistic regression)-Intro to Neural Nets: What a shallow network Computes-Training a network: loss functions, back propagation and stochastic gradient descent-Neural networks as universal function approximates.

Unit II – Deep Networks

History of Deep Learning-A Probabilistic Theory of Deep Learning-Back propagation and regularization, batch normalization-VCDi mention and Neural Nets-Deep Vs Shallow Networks Convolutional Networks-Generative Adversarial Networks(GAN), Semi-Supervised Learning.

Unit III – Dimensionality Reduction

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Conv Net - Architectures – Alex Net, VGG, Inception, Res Net - Training a Conv Net: weights initialization, batch normalization, hyper parameter optimization.

Unit IV – Optimization and Generalization

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks-Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning-Computational & Artificial Neuroscience.

Unit V – Case Study and Applications

Image Net-Detection-Audio Wave Net-Natural Language Processing Word2Vec-Joint Detection Bio Informatics-Face Recognition-Scene Understanding-Gathering Image Captions.

Text books:	
1	Deep Learning", Ian Good fellow, Yoshua Bengio, Aaron Courville, MIT Press2016.
2	Deep Learning (Adaptive Computation and Machine Learning series) by Ian Goodfellow, Yoshua Bengio, Aaron Courville, Francis Bach
Reference Books:	
1	"Neural Networks and Deep Learning A Text Book", Charu C Aggarwal, Springer International Publishing AG, Part of Springer Nature 2018.
2	Deep Learning: A Practitioner's Approach, by Adam Gibson and Josh Patterson
3	Machine Intelligence: Demystifying Machine Learning, Neural Networks and Deep Learning by Suresh Samudrala.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Understand the main fundamentals that drive Deep Learning.
CO2	Understand of deep learning algorithms, their theoretical foundations, and their practical applications in various domains.
CO3	Develop a strong understanding of advanced techniques in deep learning, including dimensionality reduction, convolutional neural networks, and training optimization.
CO4	Acquire advanced knowledge and skills in optimization techniques for deep learning.
CO5	Implement deep learning algorithms and solve real-world problems.
CO6	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Computer Vision

(**Computer Science**)

I M.Tech - II Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS203b	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Overview

Computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis.

Unit II – Edge detection

Edge detection performance, Hough transform, corner detection

Unit III – Segmentation

Segmentation, Morpho logical filtering, Fourier transform.

Unit IV – Feature extraction

Shape, histogram, color, spectral, texture, using CVIP tools, Feature analysis, feature vectors, distance / similarity measures, data pre-processing.

Unit V – Pattern Analysis

Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi supervised

Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.

Text books:	
1	Computer Vision: Algorithms and Applications by Richard Szeliski.
2	Concise Computer Vision: An Introduction into Theory and Algorithms by Reinhard Klette
Reference Books:	
1	Deep Learning, by Good fellow, Bengio, and Courville.
2	Dictionary of Computer Vision and Image Processing, by Fisheret al.
3	Computer Vision: Principles, Algorithms, Applications, Learning by E. R. Davies

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Identify basic terminology, theories and models in the field of Computer Vision.
CO2	Analyze different methods of Computer Vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.
CO3	Use and apply appropriate image processing methods for image filtering, image restoration, image reconstruction, segmentation, classification and representation.
CO4	Assess which methods to use for solving a given problem, and analyze the accuracy of the methods.
CO5	Design of Computer Vision system for a specific problem.
CO6	Develop a strong foundation in computer vision, encompassing both theoretical understanding and practical skills.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Service Oriented Architecture

(**Computer Science**)

I M.Tech - II Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS203c	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Introducing SOA

Fundamental SOA, Common Characteristics of Contemporary SOA, Common Tangible Benefits of SOA, Common Pitfalls of Adopting SOA. Evolution of SOA: An SOA Timeline, The Continuing Evolution of SOA, The Roots of SOA.

Unit II – Web Services and Primitive SOA

The Web Services Frame Work, Services, Service Descriptions, Messaging. Web Services and Contemporary SOA (Part I-Activity management and Composition): Message Exchange Patterns, Service Activity, Coordination, Atomic Transactions, Orchestration, and Choreography. Web Services and Contemporary SOA (Part-II-Advanced Messaging, Metadata and Security): Addressing, Reliable Messaging, Correlation, Policies, Metadata exchange, Security.

Unit III – Principles of Service-Orientation

Service–Orientation and the Enterprise, Anatomy of SOA, Common Principles of Service–Orientation, Interrelation between Principles of Service- Orientation, Service Orientation and Object Orientation, Native Web Services Support for Principles of Service-Orientation.

Service Layers: Service-Orientation and Contemporary SOA, Service Layer abstraction, Application Service Layer, Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration Scenarios.

Unit IV – SOA Delivery Strategies

SOA Delivery Lifecycle Phases, The Top-Down Strategy, The Bottom-up Strategy, The Agile Strategy.

Service Oriented Design (Part I-Introduction): Introduction to Service-Oriented Design, WSDL Related XML Schema Language Basics, WS DL Language Basics, Service Interface Design Tools.

Service Oriented Design (Part II-SOA Composition Guidelines): SOA Composing Steps, Considerations for Choosing Service Layers, Considerations for Positioning Core SOA Standards, Considerations for Choosing SOA Extensions.

Unit V – Service Oriented Design (Part III- Service Design)

Service Design Overview, Entity- Centric Business Service Design, Application Service Design, Task-Centric Business Service Design, Service Design Guidelines.

Service Oriented Design (Part IV-Business Process Design): WS-BPEL Language Basics, WS-Coordination Overview, Service Oriented Business Process Design.

Text books:	
1	Service-Oriented Architecture-Concepts, Technology, and Design, Thomas Erl, Pearson Education, 2006.
2	Understanding SOA with Web Services, Eric New comer, Greg Lomow, Pearson Education, 2005.
Reference Books:	
1	Thomas Erl; Service Oriented Architecture Concepts Technology & amp; Design, Pearson Education Limited; 2015, ISBN-13:9788131714904.
2	Guido Schmutz, Peter Welkenbach, Daniel Liebhart; Service Oriented Architecture An Integration Blueprint; Shroff Publishers & Distributors;2010, ISBN-13:9789350231081.
3	Service Oriented Architecture analysis and Design for Services and Micro services 2nd Edition by Thomas Erl, Pearson India.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Comprehend the need for SOA and its systematic evolution.
CO2	Apply SOA technologies to enterprise domain.
CO3	Design and analyze various SOA patterns and techniques.
CO4	Compare and evaluate best strategies and practices of SOA.
CO5	Develop skills related to service design principles and service-oriented design concepts.
CO6	Gain practical skills in designing, implementing, and managing service-oriented systems to enable flexible, interoperable, and scalable solutions.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Data Visualization Techniques

(**Computer Science**)

I M.Tech - II Semester								**SRIT R23**
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS204a	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Information visualization

Effective data analysis – traits of meaningful data – visual perception –making abstract data visible – building blocks of information visualization – analytical interaction –analytical navigation–optimal quantitative escales–reference lines and regions–trellises and crosstab–multiple concurrent views – focus and context– details on demand – over-plotting reduction – analytical patterns–pattern examples.

Unit II – Distribution analysis

Describing distributions–distribution patterns–distribution displays–distribution analysis best practices–correlation analysis–describing correlations–correlation patterns –correlation displays–correlation analysis techniques and best practices–multivariate analysis–multivariate patterns–multivariate displays–multivariate analysis techniques and best practices.

Unit III – Information dash board

Introduction–dash board design issues and assessment of needs–Considerations for designing dash board-visual perception–Achieving eloquence.

Unit IV – Advantages of Graphics

Library of Graphs–Designing Bullet Graphs–Designing Spark lines–Dash board Display Media–Critical Design Practices–Putting it all together- Unveiling the dash board.

Unit V – Plotting Geospatial Data

Introduction to Geo plot lib, Design Principles of Geo plot lib, Geospatial Visualizations, Plotting Geospatial Data on a Map Web-Based Visualizations: Concepts of Bokeh, Interfaces-Plotting and Model Interfaces, Output, Bokeh Server, Presentation, Integrating– HTML Document and Bokeh Applications.

Text books:	
1	BenFry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
2	Mario Dobler,Tim Grobmann, "Data Visualization with Python", O' Reilly, First Edition, 2019.
Reference Books:	
1	Stephen Few, "Information dash board design: Displaying data for at-a-glance monitoring", second edition, Analytics Press, 2013.
2	Dictionary of Computer Vision and Image Processing, by Fisheret al.
3	Data Visualization: A Handbook for Data Driven Design Paperback – 9 July 2016 by Andy Kirk.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Explain principles of visual perception.
CO2	Apply core skills for visual analysis.
CO3	Apply visualization techniques for various data analysis tasks.
CO4	Design in formation dash board.
CO5	Understand of geospatial data visualization using Geo plot lib and Bokeh libraries.
CO6	Apply computer vision techniques to solve real-world problems.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Internet Of Things

(Common to all Branches)

I M.Tech - II Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS204b	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Overview of IoT

The Internet of Things: An Overview, The Flavor of the Internet of Things, the "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, who is Making the Internet of Things?
Design Principles for Connected Devices: Calm and Ambient Technology, Privacy, Web Thinking for Connected Devices, Affordances.
Prototyping: Sketching, Familiarity, Costs Vs Ease of Prototyping, Prototypes and Production, Open source Vs Close source, Tapping into the community.

Unit II – Embedded Devices

Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Mobile phones and tablets, Plug Computing: Always-on Internet of Things.

Unit III – Communication in the IoT

Internet Communications: An Overview, IP Addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols Prototyping Online Components: Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols Protocol

Unit IV – Business Models

A short history of business models, the business model canvas, which is the business model for, Models, Funding an Internet of Things startup, Lean Startups. Manufacturing: What are you producing, designing kits, Designing printed circuit boards.

Unit V – Manufacturing continued

Manufacturing printed circuit boards, Mass-producing the case and other fixtures, Certification, Costs, Scaling up software. Ethics: Characterizing the Internet of Things, Privacy, Control, Environment, Solutions.

Text books:	
1	Adrian McEwen, Hakim Cassimally-Designing the Internet of Things, Wiley Publications, 2012
2	Haider Raad Fundamentals of IoT and Wearable Technology Design, Wiley Publications 2020.
Reference Books:	
1	"The Internet of Things" by Samuel Greengard
2	Kashish Ara Shakil, Samiya Khan, Internet of Things (IoT) Concepts and Applications, Springer Publications 2020.
3	"Learning Internet of Things" by Peter Waher

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Choose the sensors and actuators for an IoT application.
CO2	Select protocols for a specific IoT application.
CO3	Utilize the cloud platform and APIs for IoT applications.
CO4	Experiment with embedded boards for creating IoT prototypes.
CO5	Design a solution for a given IoT application.
CO6	Establish a startup.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Privacy Preserving Data Publishing

(**Computer Science**)

I M.Tech - II Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS204c	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Fundamentals of defining privacy

Fundamentals of defining privacy and developing efficient algorithms for enforcing privacy, challenges in developing privacy preserving algorithms in real-world applications, privacy issues, privacy models,

Unit II – Anonymization operations

Information metrics, Anonymization methods for the transaction data, trajectory data, social networks data, and textual data, Collaborative Anonymization.

Unit III – Access control of outsourced data

Use of Fragmentation and Encryption to Protect Data Privacy, Security and Privacy in OLAP systems.

Unit IV – Extended Data publishing Scenarios

Anonymization for Data Mining, publishing social science data.

Unit V – Continuous user activity monitoring

Continuous user activity monitoring (like in search logs, location traces, energy monitoring), social networks, recommendation engines and targeted advertising.

Text books:	
1	Benjamin C. M. Fung, KeWang, AdaWai-CheeFu and Philip S. Yu, Introduction to Privacy Preserving Data Publishing: Concepts and Techniques, 1st Edition, Chapman & Hall/CRC, 2010.
2	Privacy-Preserving Data Publishing: An Overview – Import, 24 February 2010 by Raymond Chi-Wing Wong, Ada Wai-Chee Fu.
Reference Books:	
1	Bee-Chung Chen, Daniel Kifer, Ashwin Machana vajjhala, Kristen Le Fevre Privacy-Preserving Data Publishing, Now Publishers Inc., 2009.
2	Privacy-Preserving Data Publishing by Raymond Chi-Wing Wong, Ada Wai-Chee Fu
3	Introduction to Privacy-Preserving Data Publishing: Concepts and Techniques:– Import, 16 August 2010 by Benjamin C.M. Fung, Ke Wang, Ada Wai-Chee Fu, Philip S. Yu.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Understand the importance of privacy in data publishing and the challenges associated with protecting sensitive information.
CO2	Understand the challenges and considerations in developing privacy-preserving algorithms and effectively addressing privacy issues.
CO3	Evaluate the privacy and utility of anonymized datasets, comply with privacy regulations, and implement collaborative anonymization methods.
CO4	Implement techniques to enhance the security and privacy of data in various systems, with a specific focus on OLAP systems.
CO5	Develop an in-depth understanding of extended data publishing scenarios and anonymization techniques.
CO6	Design recommendation systems, and implementing targeted advertising strategies based on user data.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Advanced Operating Systems Lab

(**Computer Science**)

I M. Tech – II Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
23DCS205	**PCC**	0	0	4	2	40	60	100

List of Experiments

S. No.	Title of the Experiment
1	Write programs using the following system calls of UNIX operating system: 40fork, exec, get pid, exit, wait, close, stat, open dir, read dir.
2	Write programs using the I/O system calls of UNIX operating system (open, read, write, etc.)
3	Write C programs to simulate UNIX commands like ls, grep, etc.
4	Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.(2sessions)
5	Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.(2 sessions)
6	Developing Application using Inter Process communication (using shared memory, pipes or message queues)
7	Implement the Producer–Consumer problem using semaphores(using UNIX system calls).

Reference Books/Lab Manuals:	
1	Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI
2	Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
3	Advanced programming in the Unix environment, W.R.Stevens, Pearson education.
4	Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley

Course Outcomes: At the end of the course, the student should have acquire the ability to	
CO1	Revise any algorithm present in a system.
CO2	Design a new algorithm to replace an existing one.
CO3	Appropriately modify and use the data structures of the Linux kernel for a different software system.
CO4	Developing Application using Inter Process communication.
CO5	Simulate and implement operating system concepts such as scheduling, file management, and memory management.
CO6	Develop advanced practical skills in operating system design, implementation, and optimization.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Advanced Databases Lab

(**Computer Science**)

I M. Tech – II Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
23DCS206	**PCC**	0	0	4	2	40	60	100

List of Experiments

S. No.	Title of the Experiment
1	Implement basic SQL queries.
2	Implement Advanced SQL queries.
3	Implement Accessing Databases from Programs using JDBC.
4	Building Web Applications using PHP & MySQL.
5	Implement Indexing and Query Processing.
6	Implement Concurrency control.
7	Implement Big Data Analytics using Hadoop.

Reference Books/Lab Manuals:	
1	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 6th edition, Tata McGraw Hill, 2011.
2	Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 4th Edition, Pearson/Addision wesley, 2007.
3	Fundamentals of Database Systems by Ramez Elmasri, Shamkant Navathe, Pearson Education.

Course Outcomes: At the end of the course, the student should have acquire the ability to	
CO1	Understand the technology behind the IoT and associated technologies.
CO2	Use the IoT technologies in practical domains of society.
CO3	Gain knowledge about the state of the art methodologies in IoT application domains.
CO4	Conduct experiments on the HTTP-to-Co AP semantic mapping proxy in the IoT Toolkit.
CO5	Perform experiments on the application framework and embedded software agents in the IoT Toolkit.
CO6	Develop proficiency in utilizing various IoT tools and frameworks to build IoT solutions.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Software Defined Networks

(**Computer Science**)

II M.Tech - III Semester								**SRIT R23**
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS301a	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Evolving network requirements

The SDN Approach: Requirements, SDN Architecture, Characteristics of Software-Defined Networking, SDN and NFV-Related Standards: Standards-Developing Organizations, Industry Consortia, Open Development Initiatives.

Unit II – SDN data plane

Data plane Functions, Data plane protocols, Open flow logical network Device: Flow table Structure, Flow Table Pipeline, The Use of Multiple Tables, Group Table- Open Flow Protocol.

Unit III – SDN Control Plane Architecture

Control Plane Functions, South bound Interface, North bound Interface, Routing, ITU-T Model-Open Daylight-REST-Cooperation and Coordination Among Controllers.

Unit IV – SDN Application Plane Architecture

Northbound Interface, Network Applications, User Interface- Network Services Abstraction Layer: Abstractions in SDN, Frenetic-Traffic Engineering Measurement and Monitoring Security- Data Centre Networking-Mobility and Wireless.

Unit V – Background and Motivation for NFV

Virtual Machines- NFV Concepts: Simple Example of the Use of NFV, NFV Principles, High-Level NFV Frame work, NFV Benefits and Requirements-NFV Reference Architecture:

NFV Management and Orchestration.

Text books:	
1	Paul Goransson Chuck Black Timothy Culver: Software Defined Networks: A Comprehensive Approach, Morgan Kaufmann, 2016.
2	Ken Gray Thomas Nadeau: Network Function Virtualization, Morgan Kaufmann, 2016.
Reference Books:	
1	Larry Peterson, Carmelo Cascone, Bruce Davie: Software-Defined Networks: A Systems Approach, Systems Approach, 2021.
2	Software Defined Networking (SDN) by Doug Marschke Jeff Doyle Pete Moyer, Lulu.com
3	Software Defined Networks: A Comprehensive Approach Paperback – 25 October 2016 by Paul Goransson, Chuck Black, Timothy Culver.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Differentiate between traditional networks and software defined networks and understand the key benefits and use cases of SDN.
CO2	Interpret the SDN data plane devices and Open Flow Protocols.
CO3	Implement the operation of SDN control plane with different controllers.
CO4	Apply techniques that enable applications to control the underlying network using SDN.
CO5	Evaluate Network Functions Virtualization components and their roles in SDN.
CO6	Acquire knowledge of the key concepts, protocols, and architectures in SDN and explore the benefits and challenges associated with SDN deployment.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Reinforcement Learning

(**Computer Science**)

II M.Tech - III Semester								**SRIT R23**
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS301b	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Introduction

Introduction to Reinforcement Learning (RL) – Difference between RL and Supervised Learning, RL and Unsupervised Learning. Elements of RL, Markov property, Markov chains, Markov reward process (MRP).

Unit II – Evaluative Feedback

Multi-Arm Bandit Problem: An n-Armed Bandit Problem, Exploration vs Exploitation principles, Action value methods, Incremental Implementation, tracking a non-stationary problem, optimistic initial values, upper-confidence-bound action selection, Gradient Bandits. Introduction to and proof of Bellman equations for MRPs.

Unit III – Introduction to Markov decision process(MDP)

State and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations. Dynamic Programming (DP): Overview of dynamic programming for MDP, principle of optimality, Policy Evaluation, Policy Improvement, policy iteration, value iteration, asynchronous DP, Generalized Policy Iteration.

Unit IV – Monte Carlo Methods for Prediction and Control

Overview of Monte Carlo methods for model free RL, Monte Carlo Prediction, Monte Carlo estimation of action values, Monte Carlo Control, On policy and off policy learning, Importance sampling. Temporal Difference Methods: TD Prediction, Optimality of TD (0), TD Control methods -SARSA, Q-Learning and their variants.

Unit V – Eligibility traces

n-Step TD Prediction, Forward and Backward view of TD(λ), Equivalence of forward and backward view, Sarsa (λ), Watkins's Q(λ), Off policy eligibility traces using importance of sampling. Function Approximation Methods: Value prediction with function approximation, gradient descent methods, Linear methods, control with function approximation.

Text books:	
1	Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction", 2nd Edition, The MIT Press.
2	Csaba Szepesvari–Algorithms for Reinforcement Learning–Morgan & Claypool, 2010.
Reference Books:	
1	Reinforcement Learning By Richard S. (University Of Alberta) Sutton, Andrew G. (Co-Director Autonomous Learning Laboratory) Barto.
2	Reinforcement Learning: An Introduction (Adaptive Computation and Machine Learning series) Hardcover – Illustrated, 23 November 2018 by Richard S. Sutton, Andrew G. Barto, Francis Bach.

3	Reinforcement Learning An Introduction 1998 Edition by Richard S. Sutton, Andrew G. Barto, MIT Press Ltd

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Formulate Reinforcement Learning problems.
CO2	Explore the gradient bandit algorithm and its application in solving the bandit problem.
CO3	Apply various Tabular Solution Methods to Markov Reward Process Problems.
CO4	Gain proficiency in state and action value functions, Bellman equations, and the optimality of value functions and policies.
CO5	Understand the trade-offs between Monte Carlo methods and TD methods in terms of sample efficiency and bias-variance trade-offs.
CO6	Develop skills in evaluating and comparing different policies and value functions.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Data Analytics

(**Computer Science**)

II M.Tech - III Semester								**SRIT R23**
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DCS301c	**PEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100

Unit I – Introduction

What is Data Science? Big Data and Data Science hype and getting past the hype, Why now? Datafication, Current landscape of perspectives, Skill sets, Life cycle of Data Science, Different phases.

Unit II – Exploratory Data Analysis and the Data Science Process

Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: Real Direct (online real estate firm), Three Basic Machine Learning Algorithms: Linear Regression, k-Nearest Neighbours (k-NN), k-means.

Unit III – One More Machine Learning Algorithm and Usage in Applications

Motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web, Feature Generation and Feature Selection (Extracting Meaning from Data), Motivating application: user (customer) retention.

Unit IV – Feature Generation (brainstorming)

Role of domain expertise, and place for imagination, Feature Selection algorithms: Filters; Wrappers; Decision Trees; Random Forests, Recommendation Systems: Building a User-Facing Data Product: Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Exercise: build your own recommendation system.

Unit V – Data Visualization

Basic principles, ideas and tools for data visualization, Case study on industry projects,

Exercise: create your own visualization of a complex dataset, Data Science and Ethical Issues: Discussions on privacy, security, ethics, A look back at Data Science, Next-generation data scientists.

Text books:	
1	Cathy O' Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O' Reilly, 2014.
2	Jure Leskovek, Anand Raja Raman and Jerey Ullman. Mining of Massive Datasets, Cambridge University Press,2014.
Reference Books:	
1	Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. MIT Press, 2013.
2	Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. O' Reilly, 2013.
3	Trevor Hastie, Robert Tibshirani and Jerome Fried man. Elements of Statistical Learning, Second Edition. Springer,2009.
4	Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science. 2018.
5	Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental

	Concepts and Algorithms. Cambridge University Press, 2014.
6	Jiawei Han, Micheline Kamber and JianPei. Data Mining: Concepts and Techniques, Third Edition. Morgan Kaufmann, 2011.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Understand the ideas of statistical approaches to learning.
CO2	Understand the significance of exploratory data analysis (EDA) in data science and apply basic tools (plots, graphs, summary statistics) to perform EDA.
CO3	Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naïve Bayes) for predictive modeling. Explore the merits of Naïve Bayes technique.
CO4	Recognize the characteristics of machine learning techniques that are useful to solve real-world Problems.
CO5	Demonstrate the ability to create custom visualizations for complex datasets.
CO6	Gain hands-on experience in working with real-world datasets and using data visualization tools to communicate findings effectively.

AUDIT COURSES – I

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

ENGLISH FOR RESEARCH PAPER WRITING

I M.Tech - I Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DAC101a	**AC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	0	0	2	40	60	100

Unit I – Overview of a Research Paper

Planning and Preparation-Word Order-Useful Phrases-Breaking up Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy –Avoiding Ambiguity.

Unit II – Essential Components of a Research Paper

Abstracts-Building Hypothesis-Research Problem-Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cauterization.

Unit III – Introducing Review of the Literature

Methodology-Analysis of the Data-Findings-Discussion-Conclusions-Recommendations.

Unit IV – Key skills needed for writing a Title

Abstract and Introduction.

Unit V – Appropriate language to formulate Methodology

Incorporate Results, put forth Arguments and draw Conclusions.

Text books:

1	Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering &Technology PG Courses [Volume-I]
2	Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press

Reference Books:

1	Highman N (1998), Hand book of Writing for the Mathematical Sciences, SIAM. Highman's book
2	Adrian Wall work, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
3	Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg, London, 2011.

Course Outcomes: At the end of the course, the student should have acquired the ability to

CO1	Demonstrate writing meaningful sentences and coherent paragraphs.
CO2	Show conciseness, clarity and avoid redundancy in writing.
CO3	Summarize, evaluate literature, and write methodology, results and conclusion.
CO4	Describe how to develop title, write abstract and introduction.
CO5	Apply correct style of referencing and use punctuation appropriately.
CO6	Develop skills to write research paper writing for English.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY
Disaster Management

I M.Tech - I Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DAC101b	**AC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	0	0	2	40	60	100

Unit I – Introduction

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics.

Unit II – Repercussions of Disasters and Hazards

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

Unit III – Disaster Preparedness and Management

Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

Unit IV – Risk Assessment Disaster Risk

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

Unit V – Disaster Mitigation

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Text books:

1	R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies.
2	"New Royal Book Company. Sahni, Pardeep Et. Al.(Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall Of India, New Delhi.

Reference books:	
1	Goel S. L., Disaster Administration and Management Text and Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.
2	Disaster Management_18 by R Subramanian, Vikas Publishing House
3	Disaster Management Second Edition AICTE Recommended by S C Sharma, Khanna Publishers
Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Understand the need and significance of studying disaster management.
CO2	Understand the different types of disasters and causes for disasters.
CO3	Gain knowledge on the impacts Disasters on environment and society
CO4	Identify various methods of risk reduction measures and risk mitigation.
CO5	Apply knowledge about strategies of disaster mitigation and emerging trends.
CO6	Develop knowledge, skills, and strategies for effectively managing disasters and their impacts.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

SANSKRIT FOR TECHNICAL KNOWLEDGE

I M.Tech - I Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DAC101c	**AC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	0	0	2	40	60	100

Unit I
Alphabets in Sanskrit.
Unit II
Past / Present / Future Tense, Simple Sentences.
Unit III
Order, Introduction of roots.
Unit IV
Technical information about Sanskrit Literature.
Unit V
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics.

Text books:	
1	"Abhyas pustakam"–Dr. Vishwas, Sanskrit-Bharti Publication, New Delhi.
2	Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumb shastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication.

Reference books:	
1	"India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.
2	Technical Literature in Sanskrit by S. Venkitasubramonia Iyer.
3	Scientific Knowledge in Sanskrit Literature by Nirmal Trikha

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Understanding basic Sanskrit language.
CO2	Use of spoken Sanskrit will be learnt.
CO3	Understanding of these will develop logical understanding in the students.
CO4	Gain the knowledge of Technical information about Sanskrit Literature.
CO5	Develop better understanding of the language in technical concepts of engineering.
CO6	Use of Sanskrit officially will be known.

AUDIT COURSES – II

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Pedagogy Studies

I M.Tech - II Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DAC201a	**AC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	0	0	2	40	60	100

Unit I - Introduction and Methodology

Aims and rationale, Policy back ground, Conceptual frame work and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and searching.

Unit II – Thematic overview

Pedagogical practices are being used by teachers informal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit III - Evidence on the effectiveness of pedagogical practices

Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of body of the evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

Unit IV - Professional development

alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes.

Unit V – Research gaps and future directions

Research design**,** Contexts**,** Pedagogy**,** Teacher education**,** Curriculum and assessment**,** Dissemination and research impact.

Text books:

1	Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31(2):245-261.
2	Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies,36(3):361-379.

Reference books:	
1	Akyeampong K (2003) Teacher training in Ghana –does it count? Multi-site teacher education research project (MUSTER) country report1. London: DFID.
2	Akyeampong K, Lussier K, Pryor J, West brook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development,33 (3): 272–282.
3	Alexander R J (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell. Chavan M (2003) Read India: Amassscale, rapid, 'learning to read' campaign.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Understand the conceptual framework and terminology.
CO2	Use of Pedagogical practices are being used by developing countries.
CO3	Implement of effective utilization of pedagogical practices and approaches.
CO4	Apply optimum usage of pedagogical tools available.
CO5	Implement pedagogy study in research.
CO6	Develop knowledge, skills, and strategies related to effective pedagogy.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Stress Management for Yoga

I M.Tech - II Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DAC201b	**AC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	0	0	2	40	60	100

Unit I

Definitions of Eight parts of yoga. (Ashtanga).

Unit II

Yam and Niyam.

Unit III

Do's and Don'ts in life.

i) Ahinsa, satya, astheya, bramhacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishwar pranidhan

Unit IV

Asan and Pranayam.

Unit V

i) Various yog poses and their benefits for mind & body

ii) Regularization of breathing techniques and its Effects-Types of pranayam

Text books:

1	'Yogic Asanas for Group Training – Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur2. "Raja yoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.
2	Stress and Its Management by Yoga, January 2007 by K.N. Udupa, R.C. Prasad.

Reference books:

1	'Yoga & Stress Management by Acharya Yatendra
2	Stress and its management by K.N. Udupa
3	Yoga and Stress Management by Anju Luthra, Pramod Sharma , Anjum Padyal

Course Outcomes: At the end of the course, the student should have acquired the ability to

CO1	Develop healthy mind in a healthy body thus improving social health also Improve efficiency.
CO2	Develop body awareness. Learn how to use their bodies in a healthy way. Perform well in sports and academics.
CO3	Gain the knowledge of Do's and Don'ts in life.
CO4	Will balance, flexibility, and stamina, strengthen muscles and connective tissues enabling good posture.
CO5	Manage stress through breathing, awareness, meditation and healthy movement.
CO6	Build concentration, confidence and positive self-image.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

I M.Tech - II Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DAC201c	**AC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	0	0	2	40	60	100

Unit I

Neeti satakam-Holistic development of
personality Verses-19,20,21,22 (wisdom)
Verses-29,31,32 (pride & heroism)
Verses-26,28,63,65 (virtue)

Unit II

Neeti satakam-Holistic development of
personality Verses-52,53,59(don'ts)
Verses-71,73,75,78 (do's)

Unit III

Approach today work and duties.
Shrimad Bhagwat Gaeta:
Chapter2-Verses41,47,48,
Chapter3-Verses13,21,27,35,
Chapter6-Verses5,13,17,23,35,
Chapter18-Verses45,46,48.

Unit IV

Statements of basic knowledge.
Shrimad Bhagwad Geeta:
Chapter2-Verses 56,62,68
Chapter12-Verses13,14,15,16,17,18
Personality of Role model. Shrimad Bhagwad Geeta:

Unit V

Chapter2-Verses 17,
Chapter3-Verses36,37,42,
Chapter4-Verses18,38,39
Chapter18–Verses37,38,63

Text books:

1	"Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2	Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P. Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Reference books:	
1	Enlightenment: Personality Development & Management – Import, 28 October 2019 by Sagir Ahmed (Author).
2	Personality Development and Soft Skills: Preparing for Tomorrow by Dr Shikha Kapoor
3	Personality Development by Swamy Vivekananda.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
CO3	Study of Neeti shatakam will help in developing versatile personality of students.
CO4	Analyze and develop time management, team management, work ethics good manners and personal and professional etiquettes.
CO5	Lead the nation and mankind to peace and prosperity and practice emotional self-regulation.
CO6	Learn to develop coping mechanism to manage stress through yoga and meditation techniques and develop a versatile personality.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

SRIT R23

OPEN ELECTIVES

MASTER OF TECHNOLOGY
in
COMPUTER SCIENCE & ENGINEERING

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Optimizing Techniques

(Common to all Branches)

I M.Tech - III Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DOE301a	**OEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	0	0	2	40	60	100

Unit I – Liner Programming (L.P)

Revised Simplex Method, Duel simplex Method, Sensitivity Analysis DYNAMIC PROGRAMMING (D.P): Multi stage decision processes. Concepts of sub optimization, Recursive Relation-calculus method, tabular method, L Pasa case of D.P.

Unit II – Classical Optimization Techniques

Single variable optimization without constraints, Multi variable optimization without constraints, multi variable optimization with constraints–method of Lagrange multipliers, Kuhn-Tucker conditions. NUMERICAL METHODS FOR OPTIMIZATION: N elder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method.

Unit III – Modern Methods Of Optimization

GENETICALGORITHM(GA): Differences and similarities between conventional and evolutionary algorithms, working principle, Genetic Operators- reproduction, crossover, mutation
GENETICPROGRAMMING(GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, Random population generation. Fuzzy Systems: Fuzzy set Theory, Optimization of Fuzzy systems

Unit IV – Integer Programming

Graphical Representation, Gomory's Cutting Plane Method, Balas' Algorithm for Zero–One Programming, Branch-and-Bound Method.

Unit V – Applications of optimization in design and manufacturing systems

Formulation of model- optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

Text books:

1	Engineering Optimization (4th Edition) by S. S. Rao, New Age International.
2	Optimization for Engineering Design by Kalyanmoy Deb, PHI Publishers.

Reference books:

1	Genetical algorithms in Search, Optimization, and Machine learning–D.E.Goldberg, Addison-Wesley Publishers.
2	Operations Research by Hillarand Liberman, TMH Publishers.
3	Optimal design–Jasbir Arora, McGraw Hill (International) Publisher.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Explain the fundamental knowledge of Linear Programming and Dynamic Programming problems.
CO2	Use classical optimization techniques and numerical methods of optimization.
CO3	Describe the basics of different evolutionary algorithms.
CO4	Enumerate fundamentals of Integer programming technique and apply different techniques to solve various optimization problems arising from engineering areas.
CO5	Apply optimization techniques to enhance engineering design, manufacturing processes, and operational efficiency, contributing to improved performance and competitiveness in engineering domains.
CO6	Understanding of various optimization techniques and their applications in solving complex engineering and business problems.

SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

Industrial Safety

(Common to all Branches)

I M.Tech - III Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DOE301b	**OEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	0	0	2	40	60	100

Unit I – Introduction to Industrial safety

Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc., Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit II – Fundamentals of maintenance engineering

Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cos t& its relation with replacement economy, Service
Life of equipment.

Unit III - Wear and Corrosion and their prevention

Wear- types, causes, effects, wear reduction methods, lubricants-types and applications,
Lubrication methods, general sketch, working and applications,

i. Screw down grease cup,
ii. Pressure grease gun,
iii. Splash lubrication,
iv. Gravity lubrication,
v. Wick feed lubrication,
vi. Side feed lubrication,
vii. Ring lubrication,

Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit IV - Fault tracing

Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like,

I. Any one machine tool,
II. Pump,
III. Air compressor,
IV. Internal combustion engine,
V. Boiler,
VI. Electrical motors,

Types of faults in machine tools and their general causes.

Unit V - Periodic and preventive maintenance

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, over hauling of mechanical components, over hauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of:

I. Machine tools,

II. Pumps,
III. Air compressors,
IV. Diesel generating (DG) sets,
Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Text books:	
1	Maintenance Engineering Hand book, Higgins & Morrow, Da Information Services.
2	Maintenance Engineering, H. P. Garg, S. Chand and Company.

Reference books:	
1	Pump-hydraulic Compressors, Audels, McGraw Hill Publication.
2	Foundation Engineering Hand book, Winter korn, Hans, Chapman &Hall London.
3	Industrial Safety, Health and Environment Management Systems by Sunil S. Rao & Er. R.K. Jain, Sunil S. Rao.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Identify important legislations related to health, Safety and Environment.
CO2	identify and apply different types of maintenance strategies.
CO3	Create general sketches and explain the working principles and applications of these lubrication methods.
CO4	Understand the sequence of fault-finding activities and be able to apply it in practical scenarios.
CO5	Understand the complexities of repairs and their application in maintenance activities.
CO6	Develop the necessary knowledge and skills to create and maintain a safe working environment, ensuring compliance with relevant laws and promoting a culture of safety.

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Business Analytics

(Common to all Branches)

I M.Tech - III Semester								SRIT R23
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23DOE301c	**OEC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	0	0	2	40	60	100

Unit I – Introduction to business analysis
Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst. Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.
Unit II – Life Cycles
Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.
Unit III - Forming Requirements
Overview of Requirements, Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents. Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling.
Unit IV – Finalizing Requirements
Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools.
Unit V – Recent Trends in
Embedded and collaborative business intelligence, Visual data recovery, Data Story telling And Data Journalism.

Text books:	
1	Business Analysis by James Cadleetal.
2	Project Management: The Managerial Process by Erik Larson and, Clifford Gray.

Reference books:	
1	Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2	Business Analytics by James Evans, Persons Education.
3	Business Analytics– 27 January 2017 by R. Evans James.

Course Outcomes: At the end of the course, the student should have acquired the ability to	
CO1	Develop an understanding of the role of a business analyst, including their responsibilities and contributions to projects and organizational goals.
CO2	Understand the interrelationships between different life cycles and their impact on overall project success and product delivery.
CO3	Apply appropriate life cycle methodologies and effectively manage projects, ensuring the delivery of high-quality systems and products that meet stakeholder requirements and objectives.
CO4	Develop effective communication and presentation skills to convey requirements clearly and persuasively to diverse audiences.
CO5	Apply their knowledge and skills in data-driven decision-making, data communication, and potentially pursue careers in data journalism.
CO6	Gain a comprehensive understanding of different analytics techniques and methods, allowing them to extract insights from data and make informed business decisions.