

Proposed course structure and evaluation scheme for M.Tech Full-Time

SEMESTER –I

Sr. No.	Subject Category	Subject Code	Name of Subject	Periods		Evaluation Scheme				Subject Total	Credit
						SESSIONAL			ESE		
						L	T/P	CT			
1.	DC	RCSC101	Selected Topics of Computer Science	3	1/2	30	10	40	60	100	4
2.	DC	RCSC102	Advance Data Network	3	1/2	30	10	40	60	100	4
3.	DC	RCSC103	Advance Databases	3	1/2	30	10	40	60	100	4
4.	DE	RCSE101	Department Elective 1	3	1/2	30	10	40	60	100	4
Total										400	16

SEMESTER –II

Sr. No.	Subject Category	Subject Code	Name of Subject	Periods		Evaluation Scheme				Subject Total	Credit
						SESSIONAL			ESE		
						L	T/P	CT			
1.	DC	RCSC201	Advance Algorithm	3	1/2	30	10	40	60	100	4
2.	DC	RCSC202	Advance Modeling and Simulation	3	1/2	30	10	40	60	100	4
3.	DE	RCSE201	Department Elective 2	3	1/2	30	10	40	60	100	4
4.	DE	RCSE301	Department Elective 3	3	1/2	30	10	40	60	100	4
Total										400	16

Selected Topics of Computer Science

Course Code	: RCSC101
Course Category	: Department Core (DC)
L T/P	: 3 1/2
Credit	: 04
Course Outcome	: It is expected to understand the basics of computer Science.

UNIT 1:

Data Structure, Graphs and Algorithms: Searching, sorting, merging, insertion and deletion in array, stack, queue, tree, Hash table, Graph, shortest path in graph, all pair shortest path, Prim's algorithm, Dijkeshtra's algorithms, Krushcal's algorithm, Time and space complexity of the algorithms.

UNIT 2:

Concepts of Operating system: Concepts of single user and multiuser operating system, job scheduling algorithms, synchronization techniques, fragmentation, paging and segmentation, memory hierarchy, virtual memory concepts, Concepts of communication based operating systems, scheduling for communication channels e.g. Android

UNIT 3:

Automata Theory and compiler design: Finite automata, deterministic and non-deterministic finite automata, regular expression and regular grammar, CFG, left recursive and right recursive grammar, PDA, Turing machine, P and NP class. Phases,

UNIT 4:

Lexical analysis, Syntax and semantic analysis, Top down and bottom up Parsing, Loop optimizing and code optimizing technique.

UNIT 5:

Computer organization and architecture: Concepts of combinational and sequential circuits, arithmetic circuit design, logical circuit design, control logic design, comparator circuit design, I/O module, concepts of registers and counters, RAM and ROM design concepts, system interconnection architecture, SIMD, MIMD, Parallel processing, principle of scalable performance, vector processing, risk processor, pipelining.

Text Books:

1. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Addison Wesley.
2. Dhamdhare, "Operating Systems", Tata McGraw Hill.
3. A. K. Malviya and M. Datta, Theory of Computation and Application (Automata Theory and Formal Languages), , BPB Publications.
4. Hopcroft & Ullman, "Introduction to Automata Theory, Languages, and Computation", Narosa Publishing House.
5. Aho, Ullman and Sethi, "Compiler Design", Addison Wesley.
6. Kai Hwang, Advanced Computer Architecture, McGraw-Hill.
7. Hwang and Briggs, Computer Architecture and Parallel Processing, McGraw Hill
8. Hamacher V C, et al: Computer Organization – McGraw Hill

Advance Data Network

Course Code	: RCSC102
Course Category	: Department Core (DC)
L T/P	: 3 1/2
Credit	: 04
Course Outcome	: It is expected to understand the Advances of Data Network.

UNIT 1:

Introduction to Network Design: Overview of computer networks, seven layer architecture, TCP/IP suits of protocols, LANs, MANs and wireless LAN. Benefits of a hierarchal network design, design methodology, design considerations for the core, distribution and access layers, design considerations for the network enterprise edge, design considerations to support remote workers, design considerations for supporting enterprise wireless and/or data centre/server farms. Overview of Integrated services, differential services and MPLS, Mobility in networks, mobile IP, MANNETs, routing in MANETs.

UNIT 2:

Network Building concepts and Direct link Networks: Requirements, Networking architecture, Implementing Network software, Performance evaluation, Data Communication and Transmission Technologies, Building blocks, Encoding (NRZ, NRZI, Manchester, 4B/5B), Framing (BISYNS, PPP, DDCMP, HDLC, SONET), Error detection techniques, Reliable transmission techniques, Ethernet 802.3, Token rings (802.5, FDDI), Wireless (802.11), Network adaptors.

UNIT 3:

Packet Switching and Internetworking: Switching and forwarding, Bridges and LAN switches, Cell switching, Implementation and Performance. Simple Internetworking (IP), routing, global internet, multicast, multiprotocol label switching (MPLS).

UNIT 4:

End-to-End Protocol, Congestion control and Resource allocation: Demultiplexer (UDP), Reliable byte stream, RPC, Taxonomy of resource allocation, queuing disciplines, TCP congestion control, congestion avoidance mechanism (DECbit, RED etc), Quality of services.

UNIT 5:

Network Security and Firewalls: Cryptographic algorithms, Security mechanisms, authentication protocol, message integrity protocol, public key distribution, pretty good privacy, secure cells, TLS, SSH, HTTPS, IP security. Filter based firewalls, Proxy based firewalls, Limitations of firewalls.

Text Books:

1. Larry L. Peterson and Bruce S. Davie, Computer Networks- A Systems Approach.

2. Srinivasan Keshav, An Engineering Approach to Computer Networking, , Pearson Pub.
3. William Stallings, "Wireless Communications and networks" Pearson / Prentice Hall of India, 2nd Ed., 2007.
4. Dharma Prakash Agrawal & Qing-An Zeng, "Introduction to Wireless and Mobile Systems", Thomson India Edition, 2nd Ed., 2007.
5. Vijay. K. Garg, "Wireless Communication and Networking", Morgan Kaufmann Publishers, 2007.
6. Kaveth Pahlavan, Prashant Krishnamurthy, "Principles of Wireless Networks", Pearson Education Asia, 2002.

Advance Databases

Course Code : RCSC103
Course Category : Department Core (DC)
L T/P : 3 1/2
Credit : 04
Course Outcome : It is expected to understand the Advances of Database.

UNIT 1:

Database System Concepts and Architecture; Advance SQL: Transactional Control: Commit, Save point, Rollback, DCL Commands: Grant and Revoke Types of locks: Row level locks, Table level locks, Shared lock, Exclusive lock, Deadlock Synonym: Create synonym, Sequences: Create and alter sequences, Index: Unique and composite, Views: Create/Replace, Update and alter views

UNIT 2:

PL / SQL and Triggers Basics of PL / SQL Data types: Advantages Control Structures : Conditional, Iterative, Sequential Exceptions: Predefined Exceptions ,User defined Exceptions Cursors: Static (Implicit & Explicit), Dynamic, Procedures & Functions, Packages : Package specification, Package body, Advantages of package, Fundamentals of Database Triggers, Creating Triggers, Types of Triggers : Before, after for each row, for each Statement

UNIT 3:

Functional Dependency and Decomposition: Basics of Functional Dependency, Functional dependency diagram and examples, Full function dependency (FFD), Armstrong's Axioms for functional dependencies, Redundant functional dependencies, Closures of a set of functional dependencies, Lossy Decomposition, Lossless join decomposition, Dependency-Preserving Decomposition, Basics of Normalization: Normal Forms, First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF)

UNIT 4:

Transaction Processing: Introduction to transaction concepts, Concurrency, Methods for Concurrency control, Locking Methods, Timestamp methods, Optimistic methods. Deadlock and Concurrency Control; Object Oriented and Object Relational Databases:

UNIT 5:

Backup and Recovery Concepts, Emerging Database Technologies, Parallel and Distributed Databases

Text Books:

1. Ramez Elmasri, Shamkant Navathe: Fundamentals of Database Systems, Fifth Edition, Pearson Education, 2007.
2. Raghu Ramakrishnan, Johannes Gehrke : Database Management Systems, Tata McGraw-Hill.

3. Alexis Leon, Mathews Leon, "Database Management Systems
4. C.J. Date : An Introduction to Database Systems, Eighth Edition, Pearson Education.

Advance Algorithm

Course Code : RCSC201
Course Category : Department Core (DC)
L T/P : 3 1/2
Credit : 04
Course Outcome : It is expected to understand the Advances of Algorithm.

UNIT 1:

Algorithm Fundamentals: Basic Concept, Analysis of Algorithm, Growth of Functions, Master's Theorem.

UNIT 2:

Analysis of sorting Algorithms: Overview, Merge sort, Quick sort, Heap sort, radix sort.
Advance Data Structure: Red-Black Trees, B/B+ Trees.

UNIT 3:

Parallel Algorithm: Performance Measures of Parallel Algorithms, Parallel Merging/Sorting Algorithms on CREW/EREW, Parallel searching algorithms.

UNIT 4:

Advance Design and Analysis Techniques: Dynamic Programming, Greedy Algorithms, Branch and Bound, Back Tracking.

UNIT 5:

Graph Algorithm: DFS and BFS algorithm, Minimum spanning trees, Single source shortest paths, NP Hard and NP Complete Classes, Cook's Theorem, NP Hard and NP Complete Problem.

Text Books:

1. Coreman, Rivest, Lisserson, "Algorithm", PHI.
2. Basse, "Computer Algorithms: Introduction to Design & Analysis", Addison Wesley.
3. Horowitz, Sahani, and Rajasekaran "Fundamental of Computer Algorithms", Universities Press

Advance Modeling and Simulation

Course Code	: RCSC202
Course Category	: Department Core (DC)
L T/ P	: 3 1/2
Credit	: 04
Course Outcome	: It is expected to understand the advances of modeling and simulation.

UNIT 1:

Modeling and simulation. Application areas, definition and types of system, model and simulation, introduction to discrete-event and continuous simulation.

UNIT 2:

Simulation Methods: Discrete-event Simulation, Time advance Mechanisms, Components and organization of Discrete event simulation, Flowchart of next-event time advance approach, Continuous Simulation, Random Number generation methods.

UNIT 3:

Queuing Models: Single server queuing system, introduction to arrival and departure time, flowcharts for arrival and departure routine. Event graphs of queuing model. Determining the events and variables

UNIT 4:

Distribution Functions: Stochastic activities, Discrete probability functions, Cumulative distribution function, Continuous probability functions. Generation of random numbers following binomial distribution, poisson distribution, continuous distribution, normal distribution, exponential distribution, uniform distribution.

UNIT 5:

Programming in GPSS and C/C++: Basic Introduction to Special Simulation Languages:- GPSS and Implementation of Queuing Models using C/C++.

Text Books:

1. Averill M. Law and W. David Kelton “Simulation Modeling and Analysis”, Tata McGraw-Hill Publication.
2. Geoffery Gordon “System Simulation”, Prentice-Hall of India.
3. Jerry Banks, John S. Carson, Barry L. Nelson and David M. Nicol “Discrete-Event System Simulation”, Prentice-Hall of India.

Advance Artificial Intelligence

Course Code	: RCSE101
Course Category	: Department Elective (DE)
L T/P	: 3 1/2
Credit	: 04
Course Outcome	: It is expected to understand the Advances of Artificial Intelligence.

UNIT 1:

Introduction to AI. Agents and environments. Problem solving by search; uninformed search, informed ("heuristic") search, constrained satisfaction problems,

UNIT 2:

Adversarial search, Knowledge representation and reasoning; rule based representations

UNIT 3:

Logical formalisms, frames or object oriented systems,

UNIT 4:

network based approaches and mixed representations. Theorem-proving. Knowledge bases and expert systems.

UNIT 5:

Overview of LISP and PROLOG. Reasoning in uncertain environments. Planning communication and multiagent systems. Learning. Vision. Natural Language Processing.

Text Books:

1. Charniak and Mcdermott. Introduction to Artificial Intelligence, Addison-Wesley.
2. Ginsburg. Essentials of Artificial Intelligence, Morgan Kaufmann.
3. Winston. Artificial Intelligence, 3rd Edition, Addison Wesley.

Advance Software Engineering

Course Code	: RCSE102
Course Category	: Department Elective (DE)
L T/ P	: 3 1/2
Credit	: 04
Course Outcome	: It is expected to understand the Advances of Software Engineering.

UNIT 1:

Basic Concepts

The software problem, Software Engineering problem, The relationship between computer science and software engineering, The nature of software, Characteristics of software process, Software engineering ethics.

UNIT 2:

Agile Software Development

Agility, Agility and the cost of change, Agile process, Agility principles, Human factors, Extreme programming(XP), XP values, XP process, Industrial XP, Testing in XP, pair programming, scaling agile methods.

UNIT 3:

Software Metrics

What & Why ?, Software measurement, A framework for product metrics , Metrics for the requirement model, Metrics for the decision model, Metrics for testing, Metrics for maintenance, Web Engineering Project Metrics, Metrics Analysis.

UNIT 4:

Distributed and Aspect-oriented Software Engineering

Distributed system issues, client-server computing, Architectural pattern for distributed system, software as a service, the specification of concern, aspects, join points and point cuts, software engineering with aspects.

UNIT 5:

Quality management

software reliability, statistical testing, ISO 9000 Model, SEI-CMM, SPICE Six Sigma, Software maintenance, software reengineering, reverse engineering, the economics of reengineering risk management, software reuse the future of software engineering.

Text Books:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Shari Lawrence Pfleeger, Software engineering theory and practice, Pearson education asia
3. Ian Sommerville, Software Engineering, Addison Wesley
4. pankaj jalote, An Integraled Approach to software engineering; naros a publishing house

Object Oriented Software Engineering

Course Code	: RCSE103
Course Category	: Department Elective (DE)
L T/P	: 3 1/2
Credit	: 04
Course Outcome	: It is expected to understand the Advances of Object Oriented Software Engineering.

UNIT 1:

OO manifesto for OO Analysis. Object modeling and difference with data-oriented,

UNIT 2:

Process-oriented and behaviour modelling

UNIT 3:

Object modeling: classes, complex object classes, inheritance. Sub systems and systems in OO modeling. State transition diagrams,

UNIT 4:

Dynamic Modeling: Modeling an event. Event typology, event as trigger , Functional Modeling:

UNIT 5:

Review of Structured techniques, Cross model constraints and linkages. Conversion to OO implementation, UML notation

Text Books:

1. Rumbaugh et al, "Object Oriented Modeling and Design", Prentice Hall
2. Odell and Martin, "Object Oriented Analysis and Design", Prentice Hall

Distributed Computing

Course Code	: RCSE201
Course Category	: Department Elective (DE)
L T/P	: 3 1/2
Credit	: 04
Course Outcome	: It is expected to understand the Advances of Distributed Computing.

UNIT 1:

Foundation and Characterization of Distributed Systems, System Models, Shared Address Architecture and Message Passing Architecture,

UNIT 2:

Theoretical Foundation for Distributed System, Clock Synchronization, Distributed Synchronization and Distributed Mutual Exclusion,

UNIT 3:

Distributed Deadlock Detection, Agreement Protocols, Distributed Resource Management, Process and Threads, Distributed File System

UNIT 4:

Distributed Scheduling, Load Distribution, Fault Tolerance, Transactions and Concurrency Control in distributed transactions, Routing

UNIT 5:

Distributed Objects, Socket and Skeleton, Remote Procedure Call and Remote Method Invocation, CORBA RMI

Text Books:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna, Gehrke, "Database Management Systems", Mc Grawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
4. Tenanuanbaum, Steen, "Distributed Systems", PHI
5. W. Richard Stevens, "UNIX Network Programming, Vol 1 & 2", Pearson
6. Gerald Tel, "Distributed Algorithms", Cambridge University Press
7. Ceri, Palgatti, "Distributed Databases: Principles & Systems", McGraw-Hill
8. Barbosa, "Distributed Algorithms", MIT Press
9. Pradeep K. Sinha, "Distributed Operating Systems: Concepts and Design", PHI
10. Randy Chow, Theodore Johnson, "Distributed Operating Systems and Algorithm Analysis", Pearson

Cloud Computing

Course Code : RCSE202
Course Category : Department Elective (DE)
L T/P : 3 1/2
Credit : 04
Course Outcome : It is expected to understand the Advances of Cloud Computing.

UNIT 1:

Virtualized Data Center Architecture : Cloud infrastructures, Service provider interfaces
Saas, Paas, Iaas

UNIT 2:

VDC environments; concept, planning and design, business continuity and disaster recovery principles. Managing VDC and cloud environments and infrastructures

UNIT 3:

Information Storage Security & Design ,Storage Network Design

UNIT 4:

Cloud Optimized Storage: Global storage management locations, scalability, operational efficiency

UNIT 5:

Global storage distribution; terabytes to petabytes and greater. Policy based information management; metadata attitudes; file systems or object storage.

Text Books:

1. Greg Schulz 2011, Cloud and Virtual Data Storage Networking, Auerbach Publications [ISBN: 978-1439851739]
2. Marty Poniatowski, Foundations of Green IT [ISBN: 978-0137043750]
3. EMC, Information Storage and Management [ISBN: 978-0470294215]
4. Volker Herminghaus, Albrecht Scriba,, Storage Management in Data Centers [ISBN: 978-3540850229]
5. Klaus Schmidt, High Availability and Disaster Recovery [ISBN: 978-3540244608]

Cryptography and Steganography

Course Code	: RCSE301
Course Category	: Department Elective (DE)
L T/P	: 3 1/2
Credit	: 04
Course Outcome	: It is expected to understand the Advances of Cryptography and steganography.

UNIT 1:

Introduction to security attacks, services and mechanism, Symmetric Encryption techniques, DES, Strength of DES, Differential and Linear Cryptanalysis of DES, Advanced Encryption Standard, Stream Cipher and RC4, Block Cipher Principles, Block Cipher Modes of operation.

UNIT 2:

Public Key Cryptography: Public Key Cryptosystem, RSA System, Implementing RSA, Attacks on RSA, Elliptic Curve Cryptography, Key Management :Distribution of Public Keys, Public Key distribution of secret keys, Diffie-Hellman Key Exchange.

UNIT 3:

Number Theory: Euler's Totient Function, Fermat's & Euler's Theorem, Primality Testing, Group, Ring and Field, Modular Arithmetic. Hash Function and Authentication Application: Hash Functions, Security of Hash function, MD5, Secure Hash Algorithm, SHA-1, SHA-512, Whirlpool,

UNIT 4:

Digital Signature, Digital Signature Standard, Authentication Protocols, Kerberos and X.509. Steganography, Electronic Mail security, IP security, Web security.

UNIT 5:

Concept of Computer Forensics, System Security, Introduction to Steganography, Notation And Terminology, Practical steganographic methods, Steganalysis, Cachin's Definition of Steganographic Security, Evaluating and Testing Steganographic Systems, Applications of Steganography.

Text Books:

1. William Stallings, "Cryptography and Network Security", Fifth Edition, Pearson Education.
2. Behrouz A Forouzan, "Cryptography & Network Security", Special Edition, 2007, TMH
3. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich and Ton Kalker, "Digital Watermarking and Steganography", Second Edition Morgan Kaufmann.

Advance Software Testing

Course Code	: RCSE302
Course Category	: Department Elective (DE)
L T/P	: 3 1/2
Credit	: 04
Course Outcome	: It is expected to understand the Advances of Software Testing.

UNIT 1:

A perspective on testing : Humans, Errors, and Testing; Organization Structures for Testing Teams, Test cases; Identifying test cases; Types of Testing; Test planning, Management, Execution, and planning, Test Automation, Levels of Testing; Building a software testing strategy; The Saturation Effect.

UNIT 2:

Test Generation : Test generation from requirements- Boundary value analysis, Equivalence class partitioning, Cause-effect graphing, Test generation from predicates; Test generation from finite state models, Test generation from combinatorial designs, Path testing, Data flow testing, Retrospective on structural testing.

UNIT 3:

Test Selection, Minimization, and Prioritization for regression testing: Regression-test process, RTS-The problem, Selecting regression tests, Scalability of test selection algorithms, minimization, prioritization and tools for regression testing.

UNIT 4:

Test Adequacy assessment and enhancement: Test Adequacy Assessment using Control flow, Data flow and program mutation, Scalability of coverage measurement.

UNIT 5:

Object-Oriented Testing : Issues in Object Oriented Testing; Class testing, Integration testing, GUI testing, System testing, Mutation Testing.

Text Books:

1. Paul C. Jorgensen, Software Testing : A Craftsman's Approach, Second edition, CRC press.
2. Brian Marick, The Craft of Software Testing: Subsystem Testing Including Object-based and Object Oriented Testing, Pearson.
3. Renu Rajani, Pradeep Oak , Software Testing : Effective Methods, Tools and Techniques, Tata McGraw- Hill Publishing Company Limited, New-Delhi
4. Aditya P. Mathur, Foundations of Software Testing: Fundamental Algorithms and Techniques, Pearson.
5. Srinivasan Desikan and Gopalswamy Ramesh, Software Testing : Principles and Practices, Pearson

List of Electives

Elective	Elective Code	Elective Subject
Elective 1	RCSE101	Advance Artificial Intelligence
	RCSE102	Advance Software Engineering
	RCSE103	Object Oriented Software Engineering
	RCSE104	Advance Image Processing
	RCSE105	Complexity Theory
	RCSE106	Pattern Recognition
Elective 2	RCSE201	Distributed Computing
	RCSE202	Cloud Computing
	RCSE203	Parallel Processing
	RCSE204	Information Theory
	RCSE205	Knowledge base system
	RCSE206	Embedded System
Elective 3	RCSE301	Cryptography and Stegnography
	RCSE302	Advance Software Testing
	RCSE303	Big Data System
	RCSE304	Advance Theory of Computation
	RCSE305	Network Security and Cyber Law
	RCSE306	Natural Language Processing
Elective 4	RCSE401	Network Programming
	RCSE402	Forensic Science and Application
	RCSE403	Mobile Computing
	RCSE404	Software Quality Management
	RCSE405	Artificial Neural Network and Fuzzy Logic
	RCSE406	Wireless Ad-hoc Network
Elective 5	RCSE501	Software Reliability
	RCSE502	Advance Security Aspects
	RCSE503	Data Warehousing and Mining
	RCSE504	Real Time System
	RCSE505	Biometric System
	RCSE506	Fault Tolerance System and Reliability