COURSE SCHEME
EXAMINATION SCHEME
ABSORPTION SCHEME
&
SYLLABUS

Of

First, Second, Third & Fourth Semester
Choice Base Credit System (CBCS)
Of
Master of Technology (M.Tech)

In
Computer Science and Engineering (CSE)
Of
RASHTRASANT TUKDOJI MAHARAJ
NAGPUR UNIVERSITY, NAGPUR

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
Course and Examination Scheme of Master of Technology
Choice Base Credit System(CBCS)

I Semester M. Tech. (CSE)

Subject Code	Subject	Teaching Scheme			Examination Scheme									
		Hours per week		No. of Credits	Theory						Practical			
					Duration of Paper (Hrs.)	Max. Marks	Max. Marks	Total Marks	Min. Passing Marks		Max. Marks	Max. Marks	Total Marks	Min. Passing Marks
		L	P			University Assessment	College Assessment				University Assessment	College Assessment		
PGCSE101T	High Performance Computer Architecture	4	-	4	3	70	30	100	50		-	-	-	-
PGCSE102T	Advances in Operating System Design	4	-	4	3	70	30	100	50		-	-	-	-
PGCSE103T	Data Science	4	-	4	3	70	30	100	50		-	-	-	-
PGCSE104T	Elective –I (Discipline Specific)	4	-	4	3	70	30	100	50		-	-	-	-
PGOPEN105T	Elective –II (Open)	4	-	4	3	70	30	100	50		-	-	-	-
PGCSE106P	Laboratory –I (HPCA)	-	2	1	-	-	-	-	-		50	50	100	50
PGCSE107P	Laboratory –II (AOSD)	-	2	1	-	-	-	-	-		50	50	100	50
Total		20	4		-	350	150	500	-		100	100	200	-
Semester Total		24		22	700 Marks									

Elective –I (Discipline Specific)   PGCSE104/1T-**Software Architecture,** PGCSE104/2T-**AI and Expert System Design**
Elective –II (Open)   PGOPEN105/1T-**Advance Data Mining and Big Data Analytics,** PGOPEN105/2T-**Cyber Forensic and Computer Crimes**

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II Semester M. Tech. (CSE)

Subject Code	Subject	Teaching Scheme			Examination Scheme									
		Hours per week		No. of Credits	Theory					Practical				
		L	P		Duration of Paper (Hrs.)	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks
PGCSE201T	Advances in Algorithms	4	-	4	3	70	30	100	50	-	-	-	-
PGCSE202T	Advance Computer Network and Security	4	-	4	3	70	30	100	50	-	-	-	-
PGCSE203T	Advance Digital Image Processing	4	-	4	3	70	30	100	50	-	-	-	-
PGCSE204T	Elective –III (Discipline)	4	-	4	3	70	30	100	50	-	-	-	-
PGFD205T	Foundation Course -I	4	-	4	3	70	30	100	50	-	-	-	-
PGCSE206P	Laboratory –III (AA)	-	2	1	-	-	-	-	-	50	50	100	50
PGCSE207P	Laboratory –IV (ADIP)	-	2	1	-	-	-	-	-	50	50	100	50
Total		20	4		-	350	150	500	-	100	100	200	-
Semester Total		24		22	700 Marks								

Elective –III (Discipline Specific)   PGCSE204/1T-**Advance Multimedia System,** PGCSE204/2T-**Internet of Things**
Foundation Course –I   PGFD205T **-Research Methodology**

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III Semester M. Tech. (CSE)

Subject Code	Subject	Teaching Scheme			Examination Scheme									
		Hours per week		No. of Credits	Theory						Practical			
					Duration of Paper (Hrs.)	Max. Marks	Max. Marks	Total Marks	Min. Passing Marks		Max. Marks	Max. Marks	Total Marks	Min. Passing Marks
		L	P			University Assessment	College Assessment				University Assessment	College Assessment		
PGOPEN301T	Elective–IV (Open)	4	-	4	3	70	30	100	50		-	-	-	-
PGFD302T	Foundation Course -II	4	-	4	3	70	30	100	50		-	-	-	-
PGCSE303P	Project Seminar	-	-	8	-	-	-	-	-		-	200	200	100
Total		8	-	-		140	60	200	-		-	200	200	-
Semester Total		8		16	400 Marks									

Elective –IV (Open)   PGOPEN301/1T- **Security Analysis of Software,** PGOPEN301/2T- **Advance Databases**
Foundation Course –II   PGFD302T **-Project planning and Management**

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IV Semester M. Tech. (CSE)

Subject Code	Subject	Teaching Scheme		No. of Credits	Examination Scheme									
					Theory					Practical			
		Hours per week			Duration of Paper (Hrs.)	Max. Marks	Max. Marks	Total Marks	Min. Passing Marks	Max. Marks	Max. Marks	Total Marks	Min. Passing Marks
		L	P			University Assessment	College Assessment			University Assessment	College Assessment		
PGCSE401P	Project	-	-	16	-	-	-	-	-	400	-	400	200
Total		-	-		-	-	-	-	-	400	-	400	-
Semester Total		-		16	400 Marks								

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
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Course and Examination Scheme of Master of Technology
Choice Base Credit System (CBCS)

Absorption Scheme
Proposed Scheme of Absorption of Old course to New course of First to Fourth Semesters
I Semester M. Tech. (CSE)

Table-1

Subject Code (OLD)	Subject (OLD)		Subject Code (NEW)	Subject (NEW)	
PG-CSE1-01	High Performance Computer Architecture		PGCSE101T	High Performance Computer Architecture	
PG-CSE1-02	Advances in Operating System Design		PGCSE102T	Advances in Operating System Design	
PG-CSE1-03	Object Oriented Systems		---------	------------------	
PG-CSE1-04/1	Artificial Intelligence and Expert System Design		PGCSE104/2T	Elective –I (Discipline Specific) AI and Expert System Design	
PG-CSE1-04/2	Data Warehousing & Mining		---------	------------------	
PG-CSE1-05/1	Neural Network & Fuzzy System		---------	------------------	
PG-CSE1-05/2	Real Time Systems		---------	------------------	
PG-CSE1-05/3	Mobile Computing		---------	------------------	
PG-CSE1-06	Computer System Lab-1		---------	------------------	
PG-CSE1-07	Seminar-1		---------	------------------	

Table-2

Subject Code (NEW)	Subject (NEW)		Subject Code (OLD)	Subject (OLD)	Remark
PGCSE101T	High Performance Computer Architecture		PG-CSE1-01	High Performance Computer Architecture	PG-CSE1-01Not Clear Have to appear New PGCSE101T
PGCSE102T	Advances in Operating System Design		PG-CSE1-02	Advances in Operating System Design	PG-CSE1-02 Not Clear Have to appear New PGCSE102T
PGCSE103T	Data Science		---------	------------------	Have to appear PGCSE103T
PGCSE104T	Elective –I (Discipline Specific)		---------	------------------	If you Have Clear old PG-CSE1-04/1 Then don't appear PGCSE104T Otherwise Have to appear New PGCSE104T Elective –I (Discipline Specific)
PGOPEN105	Elective –II (Open)		---------	------------------	Have to appear
PGCSE106P	Laboratory –I (HPCA)		---------	------------------	Have to appear
PGCSE107P	Laboratory –II (AOSD)		---------	------------------	Have to appear

Proposed Scheme of Absorption of Old course to New course of First to Fourth Semesters

II Semester M. Tech. (CSE)

Table-1

Subject Code (OLD)	Subject (OLD)		Subject Code (NEW)	Subject (NEW)	
PG-CSE2-01	Advances in Algorithm		PGCSE201T	Advances in Algorithm	
PG-CSE2-02	TCP / IP and Internet		---------	------------------	
PG-CSE2-03	Advanced Digital Image Processing		PGCSE203T	Advance Digital Image Processing	
PG-CSE2-04/1	Distributed Systems		---------	------------------	
PG-CSE2-04/2	Software Engineering		---------	------------------	
PG-CSE2-04/3	Pattern Recognition		---------	------------------	
PG-CSE2-05/1	Embedded Systems		---------	------------------	
PG-CSE2-05/2	Cryptography and Network Security		---------	------------------	
PG-CSE2-05/3	Multimedia Systems		PGCSE204/1T	Elective –III (Discipline) Advance Multimedia System	
PG-CSE1-06	Seminar-II		---------	------------------	
PG-CSE1-07	Comprehensive Viva-Voce		---------	------------------	

Table-2

Subject Code (NEW)	Subject (NEW)		Subject Code (OLD)	Subject (OLD)	Remark
PGCSE201T	Advances in Algorithm		PG-CSE2-01	Advances in Algorithm	PG-CS2-01Not Clear Have to appear New PGCSE201T
PGCSE202T	Advance Computer Network and Security		---------	------------------	Have to appear PGCSE202T
PGCSE203T	Advance Digital Image Processing		PG-CSE2-03	Advanced Digital Image Processing	PG-CS2-03Not Clear Have to appear New PGCSE203T
PGCSE204T	Elective –III (Discipline)		---------	------------------	If you Have Clear old PG-CSE2-05/3 Then don't appear PGCSE204T Otherwise Have to appear New PGCSE204T
PGFD205T	Foundation Courses –I		---------	------------------	Have to appear Foundation Courses –I
PGCSE206P	Laboratory –III (AA)		---------	------------------	Have to appear
PGCSE207P	Laboratory –IV (ADIP)		---------	------------------	Have to appear

III & IV Semester M. Tech. (CSE)

Table-1

Subject Code (OLD)	Subject (OLD)		Subject Code (NEW)	Subject (NEW)	
PG-CSE 34	Project		PGCSE303P	Project Seminar	
			PGCSE401P	Project	

Table-2

III Semester M. Tech. (CSE)

Subject Code (NEW)	Subject (NEW)		Subject Code (OLD)	Subject (OLD)	Remark
PGOPEN301T	Elective–IV (Open)		---------	------------------	Have to appear
PGFD302T	Foundation Course -II		---------	------------------	Have to appear
PGCSE303P	Project Seminar		---------	------------------	Have to appear

IV Semester M. Tech. (CSE)

Subject Code (NEW)	Subject (NEW)		Subject Code (OLD)	Subject (OLD)	Remark
PGCSE401P	Project		---------	------------------	Have to appear

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Course and Examination Scheme of Master of Technology
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M. Tech. (CSE) - I Semester

Course Code	Course	Teaching Scheme		
		Hours Per Week		Credits
		L	P	
PGCSE101T	High Performance Computer Architecture	4	-	4

Unit-I
Theory of Parallelism: Parallel Computer Models, The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI Models, Architectural Development Tracks, Principles of Scalable Performance: Performance Metrics and Measures, Speedup and Performance Laws.

Unit-II
Pipelining, Basic concepts, instruction and arithmetic pipelines, and hazards in a pipeline: structural, data and control hazards, overview of hazard resolution technique, Dynamic instruction scheduling, branch prediction techniques, Exception handling, Pipeline optimization techniques, Compiler techniques for improving performance.

Unit-III
Instruction Level Parallelism: Concepts and Challenges, Basic Compiler Techniques for Exposing ILP, Reducing Branch Costs with Prediction , Overcoming Data Hazards with Dynamic Scheduling ,Dynamic Scheduling: Algorithm, Data level and Thread Level Parallelism.

Unit –IV
Memory Hierarchies: Basic concept of hierarchical memory organization, Hierarchical memory technology, main memory, Inclusion, Coherence and locality properties, Cache memory design and implementation, Techniques for reducing cache misses, Virtual memory organization, mapping and management techniques, memory replacement policies, RAID.

Unit-V
Parallel and Scalable Architecture: Multiprocessors and Multicomputer: Multiprocessor System Interconnect, Cache Coherence and Synchronization Mechanism, Multivector and SIMD Computers: Vector Processing Principles, Multivector-Multiprocessor, Compound Vector Processing.

Text Books
1. John. Hennessy & David A . Patterson, "Computer Architecture A quantitative approach", 5th Edition, Morgan Kaufmann Publications.
2. Kai Hwang and A. Briggs , "Computer Architecture and parallel Processing " , International Edition McGraw-Hill.

Reference Books:
1. Kai Hwang and Naresh Jotwani, "Advanced Computer Architecture: Parallelism, Scalability and Programmability" 2nd Edition, TMH Publications

2. David A. Kular and Jasvinder Pal Singh," Parallel Computer Architecture", Morgan Kaufmann Publications.

Course Code	Course	Teaching Scheme		
		Hours Per Week		**Credits**
		L	**P**	
PGCSE102T	**Advances in Operating System Design**	4	-	4

Unit-I
Distributed Operating System: Architectures, Issues in Distributed operating systems, Limitations of Distributed Systems, Lamport's logical clock, Global states, Chandy-Lampert's global state recording algorithm, Basic concepts of Distributed Mutual Exclusion ,Lamport's Algorithm, Ricart-Agrawala Algorithm; Basic concepts of Distributed deadlock detection, Distributed File system, Architecture, Design issues, SUN Network File system Basic concepts of Distributed shared memory, Basic concepts of Distributed Scheduling, Load balancing, Load sharing.

Unit-II
Distributed Resource Management: Distributed File systems, Architecture, Mechanisms, Design Issues, Distributed Shared Memory, Architecture, Algorithm, Protocols - Design Issues. Distributed Scheduling, Issues, Components, Algorithms.

Unit-III
Failure Recovery and Fault Tolerance: Basic Concepts-Classification of Failures, Basic Approaches to Recovery; Recovery in Concurrent System; Synchronous and Asynchronous Checkpointing and Recovery; Check pointing in Distributed Database Systems; Fault Tolerance; Issues - Two-phase and Non-blocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols

Unit-IV
Multiprocessor System: Definition, Classification, Multiprocessor Interconnections, Types, Multiprocessor OS functions & requirements; Design & Implementation Issue; Introduction to parallel programming; Multiprocessor Synchronization.

Unit-V
Real Time Operating Systems: Fundamentals of real time operating systems, real time multitasking, embedded application, preemptive task scheduling, inter-task communication and synchronization.

Text Books

1. Mukesh Singhal, Niranjan G.Shivaratri, "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", TMH, 2001

Reference Books:

1. Andrew S.Tanenbaum, "Modern operating system", PHI, 2003
2. Pradeep K.Sinha, "Distributed operating system-Concepts and design", PHI, 2003.
3. Andrew S.Tanenbaum, "Distributed operating system", Pearson education, 2003.
4. Operating Systems Concepts &design-Milan Milenkovic, TMH
5. Abraham Silberschatz, Peter B. Galvin, G. Gagne, "Operating System Concepts", Sixth Addison Wesley Publishing Co., 2003.

Course Code	Course	Teaching Scheme		
		Hours Per Week		**Credits**
		L	**P**	
PGCSE103T	**Data Science**	4	-	4

Unit I :

Introduction : Data science articulated, history and context, Ethical Issues, technology landscape Parallel databases, parallel query processing, Data engineering, MapReduce, Hadoop, Key-value stores and NoSQL; tradeoffs of SQL and NoSQL.

Unit II :

Statistical Inference: Populations and samples, Statistical modeling, probability distributions, Fitting a model, Intro to R
Machine Learning: Supervised Learning: Regression, polynomial regression, local regression, k-nearest neighbors,
Unsupervised Learning: Kernel density estimation, k-means, Naive Bayes, Data and Data Scraping, Classification, Ranking, Logistic regression

Unit III :

Introduction to Big Data Analytics :Big Data Platforms, Big Data Storage and Processing, Big Data Analytics Algorithms (Recommendation, Clustering, and Classification),Spark and Data Analytics, Linked Big Data -- I (Graph DB & Graph Analytics, Big Data Applications (TBA))

Unit IV :

Feature Generation and Feature Selection (Extracting Meaning From Data)- Motivating application: user (customer) retention, - Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms (Filters; Wrappers; Decision Trees; Random Forests) Social network analysis, Observational causal modeling, Sampling, data leakage, data incest

Unit V :

Graph Analytics: structure, traversals, analytics, Page Rank, community detection, recursive queries, semantic web Fundamentals of data visualization, Basic principles, ideas and tools for data visualization

Text Books :

1. "Doing Data Science, Straight Talk From The Frontline" : Cathy O'Neil and Rachel

Schutt. .O'Reilly. 2014.

2. "Mining of Massive Datasets" ,: Anand Rajaraman and Jeff Ullman

Reference Books :

1. "Data Mining and Analysis: Fundamental Concepts and Algorithms.",:Mohammed J. Zaki and Wagner Miera Jr. Cambridge University Press. 2014.

2. "Data Mining: Concepts and Techniques",: Jiawei Han, Micheline Kamber and Jian Pei. Third Edition. ISBN 0123814790. 2011.

Course Code	Course	Teaching Scheme		
		Hours Per Week		**Credits**
	Elective –I (Discipline Specific)	**L**	**P**	
PGCSE104/1T	**Software Architecture**	4	-	4

UNIT I: Introduction and Architectural Drivers

Introduction – What is software architecture? – Standard Definitions – Architectural structures – Influence of software architecture on organization-both business and technical – Architecture Business Cycle- Introduction – Functional requirements – Technical constraints – Quality Attributes.

UNIT II: Quality Attribute Workshop

Quality Attribute Workshop – Documenting Quality Attributes – Six part scenarios – Case studies.

UNIT III: Architectural Views

Introduction – Standard Definitions for views – Structures and views – Representing views-available notations – Standard views – 4+1 view of RUP, Siemens 4 views, SEI's perspectives and views – Case studies

UNIT IV: Architectural Styles

Introduction – Data flow styles – Call-return styles – Shared Information styles – Event styles – Case studies for each style.

UNIT V: Documenting the Architecture

Good practices – Documenting the Views using UML – Merits and Demerits of using visual languages – Need for formal languages – Architectural Description Languages – ACME – Case studies. Special topics: SOA and Web services – Cloud Computing – Adaptive structures

Text Books:

1. Len Bass, Paul Clements, and Rick Kazman, "Software Architectures Principles and Practices", 2nd Edition, Addison-Wesley, 2003.
2. Anthony J Lattanze, "Architecting Software Intensive System. A Practitioner's Guide", Auerbach Publications, 2010.

Reference Books:

1. Paul Clements, Felix Bachmann, Len Bass, David Garlan, James● Ivers, Reed Little, Paulo Merson, Robert Nord, and Judith Stafford, "Documenting Software Architectures. Views and Beyond", 2nd Edition, Addison-Wesley, 2010.
2. Paul Clements, Rick Kazman, and Mark Klein, "Evaluating software● architectures: Methods and case studies. Addison-Wesley, 2001.

3. Rajkumar Buyya, James Broberg, and Andrzej Goscinski, "Cloud Computing. Principles and Paradigms", John Wiley• & Sons, 2011

4. Mark Hansen, "SOA Using Java Web Services", Prentice Hall, 2007•

Course Code	Course	Teaching Scheme		
		Hours Per Week		**Credits**
	Elective –I (Discipline Specific)	**L**	**P**	
PGCSE104/2T	**AI and Expert System Design**	4	-	4

Unit-I

Overview of history and goals of AI: Tentative definitions. Turing's test, knowledge Vs. Symbolic Level, Relations with other disciplines from Philosophy, to Linguistic to Engineering, Review of AL successes and failures. State Spaces, Production System and Search: State Space representation of problems, Problem solving search, Constraints, Definition and examples of Production Systems, Heuristic search techniques, Two person games.

Unit-II

Knowledge representation Issues: Procedural Knowledge Representation Vs. Declarations Knowledge + reasoning, Facts, General Assertions, Meta knowledge, The Frame Problem. Using First-Order logic for Knowledge Representation: Propositional Logic, Semantics and Deduction, first Order Logic: Semantic and Deduction. Unification. Resolution-based theorem proving. Using theorem proving to answer questions about the truth of sentences or to identify individuals that satisfy complex constraints, Logic Programming. Weak Slot-and-Filler Structures: Semantic Nets and Frames, Scripts for representing prototypical combination of events and actions.

Unit-III

Introduction to Expert Systems: Definition why build an expert system, application areas of expert system and how are expert systems used. Characteristics of Expert Systems, Structure of expert system, characteristics and phases and people involved in building an expert systems, Inference Techniques, Types of reasoning deductive, inductive, abductive, analogical, common-sence and non-monotonic, types of inference forward and backward chaining, search techniques, depth-first search, breadth-first search and best-first search.

Unit-IV

Rule-Based Expert Systems: Evolution, architecture of rule-based expert system, examples of rule-based systems, backward chaining and forward chaining rule based systems and task on designing backward and forward chaining rule based system. Approach to Inexact Reasoning, Probability theory, Bayesian theory: example, variation and Prospector: an expert system application that employed Bayesion approach , Certainty theory: overview uncertain evidence, uncertain rules, uncertain inferencing certainty factor and certainty factor, example program.

Unit-V

History of artificial neural networks, Neural information processing, hybrid intelligence, basic concept of neural network, biological neural system, single layer perceptrons, multilayer perceptrons, supervised and unsupervised learning, neural network learning

Text Books:
3. Peteer J.F.Lucas and Linda C. Van Der Gaag, "Principles of Expert Systems", Addision Wesley Publication.
4. Elaine Rich , Kevin Knight& Shivashankar B Nair, "Artificial Intelligence", Mc Graw Hill Publication.
5. Limin Fu, "Neural Networks in Computer Intelligence", TMH publications.

Elective –II (Open)

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M. Tech. (CSE) II Semester

Course Code	Course	Teaching Scheme		
		Hours Per Week		**Credits**
PGCSE201T	**Advances in Algorithms**	**L**	**P**	
		4	-	4

UNIT- I : **Algorithm Analysis**: Asymptotic Notation, Amortization, **Basic Data Structure:** Stacks and Queues, Vectors, Lists and Sequences, Trees, Priority Queues, Heaps, Dictionaries and Hash Tables **Search Trees and Skip Lists:** Ordered Dictionaries and binary Search Trees, AVL trees, Bounded-Depth Search Trees. Exposure to some advanced data structures- Fibonacci heaps, augmented data structures, interval trees, dynamic trees.

UNIT-II : **Fundamental Techniques:** The Greedy Method, Divide and Conquer, Dynamic Programming **Graphs:** The Graph abstract data Type, Data Structures for Graphs, Graph Traversal, Directed Graphs. Graph algorithms: all-pairs shortest paths.

UNIT-III
Weighted Graphs: Single Source Shortest Paths, All pairs Shortest Paths, biconnected components in undirected graphs, strongly connected components in directed graphs, and other problems, Minimum Spanning Trees Network **Flow and Matching:** Flows and Cuts, Maximum Flow, Maximum Bipartite Matching, Minimum Cost Flow

UNIT-IV
Text processing: Strings and Pattern Matching algorithms, Tries, Text Compression, Text Similarity testing. **Number Theory and Cryptography:** Fundamental Algorithms involving numbers, Cryptographic Computations, Information Security Algorithms and Protocols.

Unit-V
Exposure to following topics: Approximation algorithms, Algebraic and number theoretic algorithms, Computational Geometry. Linear programming, Parallel/distributed algorithms, Randomized algorithms.

Reference Books
1. M.T.Goodrich, R.Tomassia, "Algorithm design – Foundations, Analysis, and Internet Algorithms", John Wiley, 2002
2. E Horrowitz, S salmi, S Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, University Press, 2007
3. Aho, A V Hopcraft Ullman JD, "The Design and analysis of computer Algorithms", Pearson Education, 2007
4. Hari Mohan Pandy, " Design analysis amd Algorithms", University Science Press, 2009
5. Cormen, Lieserson, Rivest, "Introduction to Algorithms", 2nd Edition, PHI, 2003

Course Code	Course	Teaching Scheme		
		Hours Per Week		**Credits**
		L	**P**	
PGCSE202T	**Advances Computer Network and Security**	4	-	4

UNIT I:

TCP/IP architecture, IP v4 packet & addressing, Classfull & classless addressing, CIDR, Transition from IPv4 to IPv6, IPv6 packet & addressing, Load balancing in OSPF, EIGRP, HSRP, GLBP.

UNIT II:

Optical Network, SONET, SONET Layers, SONET Frames, STS Multiplexing, Frame Relay, WWW, Wimax, GSM, UMTS, ATM, IP over ATM, VoIP, Real Time Transport Protocol: Scenario, Terminology, packet format.

UNIT III:

Mobile IP, Mobile TCP, Dynamic DNS, Network Virtual Terminal, Remote Login: TELNET, SSH, NAT & PAT. Packages & Transition State: ARP, IP, ICMP, IGMP, UDP, TCP

UNIT IV:

Symmetric Cipher model, Security Protocol: IPSec, SSL & TLS, Security in GSM & 3G, Differential & Linear cryptography, Euclidean Algorithm, Polynomial Arithmetic, Fermat's & Euler's Theorem, Elliptic Curve Cryptography & Arithmetic.

UNIT V

Hash & MAC: Whirlpool, HMAC, CMAC, MD5, Digital Signature, X.500 & X.509v3, VPN, Trusted System, SAFER K & SK- 64/128, RADIUS & TACACS Server.

Text Books:

1. Modern Operating Systems – A. S. Tanenbaum, Pearson Education

2. Data Communication & Networking – Behrouz Forouzan, Tata McGraw Hill

3. Cryptography & Network Security – William Stallings

Reference Books:

1. Communication Network, Leon-Gracia, & Widjija, 2001, TMH.
2. Cisco Routing & Switching Review Guide, Todd Lammle, Sybex

Course Code	Course	Teaching Scheme		
		Hours Per Week		Credits
		L	P	
PGCSE203T	**Advance Digital Image Processing**	4	-	4

Unit-I
Digital Image Fundamentals: Simple image model, Fundamentals Steps in Image Processing, Elements of visual perception, image sensing and acquisition, Image Sampling and Quantization, Basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations, Introduction to 2D Fourier Transform and Liner Algebra. Fundamental operations of image processing using image processing tool.

Unit II
Intensity Transformations and Filtering: Spatial intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing filters, sharpening filters, fuzzy techniques for intensity transformations and spatial filtering. Frequency domain filtering-sampling and Fourier transform of sampled functions, Discrete Fourier transform, properties of DFT, smoothing and sharpening in frequency domain.

Unit III
Color Image Processing and Wavelets: Color models, intensity slicing, color transformations, fundamentals of wavelets- image pyramids, subband coding, Harr transform, multi-resolution expansion- series scaling and wavelet functions, 1D wavelet transform-wavelet series expansion, discrete wavelet transform, continuous wavelet transform, fast wavelet transform, 2D wavelet transform, wavelet packets .

Unit-IV
Image Compression and Morphological Processing: Image Compression fundamentals- coding redundancy, spatial and temporal redundancy, image compression models, image formats and compression standards, compression methods-Huffman coding, Golomb coding, Arithmetic coding, LZW, Run Length coding, wavelet coding, digital image watermarking, morphological operations- dilation, erosion, duality, opening, closing, hit/miss transformation, boundary extraction, hole filling, extraction of connected components, thinning, thickening, skeletons, pruning.

Unit V
Image Segmentation and Object Recognition: fundamentals, detection of isolated point, line and edge detection, edge linking and boundary detection, global thresholding basics, multiple thresholds, variable thresholding, multivariable thresholding, region growing, region splitting and merging,   morphological watersheds- dam construction, watershed segmentation algorithm, markers, segmentation using motion- spatial techniques, frequency domain techniques. Patterns and patterns classes, matching, optimal statistical classifier, neural network, matching shape numbers, string matching.

 Recommended Books :
 1. Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", 2nd edition,
Pearson Education.
 2. A. K. Jain, "Fundamental of Digital Image Processing", PHI.
 3. William Pratt, "Digital Image Processing", 4th Edition, Wiley India Edition.

Course Code	Course	Teaching Scheme		
	Elective –III (Discipline)	**Hours Per Week**		**Credits**
		L	**P**	
PGCSE204/1T	**Advance Multimedia System**	4	-	4

Unit I :
Introduction to Multimedia Systems design, Elements, Systems architecture & technologies ,
Objects for multimedia systems , Multimedia data interface standards, Multimedia Databases,
Data Compression need, lossy and lossless compression, binary image compression Schemes,
color, grey and still video image compression , Full motion video compression , audio
compression.

Unit II :
Data and file format standards RTF, TIFF,RIFF, MIDI , JPEG ,AVI, MPEG Standards, video and
image display systems, image scanners , Digital voice and audio, Digital camera, video images
and animation, Full motion video

Unit III :
Telecommunications considerations for Multimedia, Specialized processors , ISDN, LAN and
WAN for Enterprise Multimedia Applications, Distributed Object Model, Multimedia
communication protocols (UDP , RTP , RTCP , TELNET) ,Multimedia Applications and Design
issues, Virtual Reality , Design, Components of Multimedia Systems,, Application Work flow &
Distributed Application Design Issues

Unit IV :
 Multimedia Authoring and User Interface, Design Considerations, Hypermedia Applications,
Information Access, Object display, Hypermedia Messaging, Integrated document
Management

Unit V :
Distributed Multimedia Systems, Components, Client-server Operation, Object Server, Network
Performance Issues, Distributed Multimedia databases, Managing distributed
Objects , System Design: Design issues,requirements, feasibility, Performance Analysis, Design
for performance , Multimedia Systems Design , Extensibility and example.

BOOKS RECOMMENDED:

1. Prabhat K Andleigh and Kiran Thakrar "Multimedia Systems Design" (PHI Publications).
2. Fred Halsall," Multimedia Communications by (Pearson Publications).
3. Ze-Nian Li, Mark S.Drew,"Fundamentals of Multimedia" (Pearson Publications).
4. John K.Koegel Buford, "Multimedia Systems" (Pearson Education)

REFERENCE BOOKS:
1. Game Engineering Design & Implementation - Alan Thorn, Pub : Jones & Bartlet (VIVA Pub.)
2. Fundamentals of Game Development : Chandler & Chandler, Pub : Jones & Bartlet (VIVA
Pub.)

Course Code	Course	Teaching Scheme		
		Hours Per Week		**Credits**
	Elective –III (Discipline)	**L**	**P**	
PGCSE204/2T		4	-	4
	Internet of Things			

Unit I **IoT Web Technology**

The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardisation, Recommendations on Research Topics.

Unit II **IoT Applications for Value Creations**

Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

Unit III **Internet of Things Privacy, Security and Governance**

Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

Unit IV **Architectural Approach for IoT Empowerment**

Introduction, Defining a Common Architectural Ground, IoT Standardisation, M2M Service Layer Standardisation, OGC Sensor Web for IoT, IEEE, IETF and ITU-T standardization activities, Interoperability Challenges, Physical vs Virtual, Solve the Basic First, Data Interoperability, Semantic Interoperability, Organizational Interoperability, Eternal Interoperability, Importance of Standardisation, Plan for validation and testing, Important Economic Dimension, Research Roadmap for IoT Testing Methodologies. Semantic as an Interoperability Enabler and related work.

Unit V **Identity Management Models in IoT**

Introduction, Vulnerabilities of IoT, Security requirements, Challenges for a secure Internet of Things, identity management, Identity portrayal, Different identity management model: Local identity, Network identity, Federated identity, Global web identity, Identity management in Internet of Things, User-centric identity management, Device-centric identity management, Hybrid identity management.

Text Books

1. Dr. Ovidiu Vermesan, Dr. Peter Friess, Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers, 2013, ISBN: 978-87-92982-96-4 (E-Book), ISBN: 978-87-92982-73-5 (Print)

2. Dr. Parikshit Mahalle, Poonam Railkar, Identity Management for Internet of Thing, River Publishers, 2015, ISBN: 978-87-93102-91-0 (EBook), ISBN:978-87-93102-90-3(Hard Copy)

Reference Book

1. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493- 9357-1

Foundation Course –I

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
Course and Examination Scheme of Master of Technology
Choice Base Credit System(CBCS)

M. Tech. (CSE): Semester III

Elective–IV (Open)

Foundation Course –II

Course Code	Course	Teaching Scheme		
		Hours Per Week		Credits
		L	P	
PGFD302T	**Project planning and Management**	4	-	4