SHIVAJI UNIVERSITY
M.Tech (Computer Science and Engineering)
Introduced from June, 2006

ADMISSION TO M. TECH. PROGRAMMES

A. Eligibility Criteria

1) The qualifying criteria for the M.Tech. course is as below.

1. Computer Science and Engineering

B.E. / B.Tech. (CSE/CT/CE/CS/IT/ Electronics/ Electrical)
M.Sc. (CS/ IT)
AMIE / IETE

2. Environmental Science and Technology

B. E. / B. Tech. (Cvil/ Chemical/ Environmental)
AMIE / IETE
M. Sc. (Environmental Science)

3. Energy Technology

B. E. / B. Tech. (Mechanical/ Automobile/ Production/ Chemical/ Electrical)
AMIE / IETE
M.Sc. (Electronics)

4. Electronics

B.E. / B. Tech. (ETC/ Electronics / Industrial Electronics)
AMIE / IETE
M. Sc. (Electronics)

B. Selection Basis :

Valid GATE Score.

Vacant seats, if any shall be filled up from the merit list prepared by conducting written test and interview by the University.

SHIVAJI UNIVERSITY

M.TECH PROGRAMMES

A. Computer Science and Engineering
B. Environmental Science and Technology
C. Energy Technology
D. Electronics.

1. Programme Duration : Two Years : Four Semesters

2. Intake : 18 per Programme

3. Programme structure and syllabus

First Year -

a. Theory Subjects :
   6 Compulsory Subjects
   4 Elective Subjects

b. Practicals for compulsory Subjects
c. Seminars - 2
d. Industrial Training – 8 weeks at the end of the First Year. (Summer)

Second Year –
a. Dissertation

4. Scheme of Marking

a.	Theory Subjects	-	1000
b.	Practicals	-	300
c.	Seminars	-	100
d.	Industrial Training	-	100
e.	Dissertation	-	500
	Total		**2000**

5. Eligibility : As per AICTE norms.

SHIVAJI UNIVERSITY, KOLHAPUR

M.Tech (Computer Science and Engineering)
Course Structure and Scheme of Evaluation
Semester I

Course code	Name of the subject	Teaching Scheme		Examination Scheme		Total Marks
		Lectures	Practicals	Theory	Term Work	
Mtech101	Theory of Computer science	4	2	100	50	150
Mtech102	Advance Operating system	4	2	100	50	150
Mtech103	Design and analysis of Algorithms	4	2	100	50	150
Mtech104(1)	Elective –I	4	-	100	-	100
Mtech104(2)	Elective –II	4	-	100	-	100
Mtech104(3)	Seminar	----------	2	---------	50	50
Total		20	08	500	200	700

Total hrs. 28, Total Marks 700

Elective-I 1) Computer Vision And Image Processing, 2) Artificial Neural Networks, 3) Real time O.S.
Elective-II 1) Multimedia Communications, 2) Embedded Systems, 3) Data Mining, 4) Geographical Information System

Semester II

Course code	Name of the subject	Teaching Scheme		Examination Scheme		Total Marks
		Lectures	Practicals	Theory	Term Work	
Mtech201	Computer Network Administration	4	2	100	50	150
Mtech202	Advanced Computer Architecture	4	2	100	50	150
Mtech203	Advance in Database Design	4	2	100	50	150
Mtech204(1)	Elective –III	4	-	100	-	100
Mtech204(2)	Elective – IV	4	-	100	-	100
S 26	Seminar	----------	2	---------	50	50
Total		20	08	500	200	700

Total hrs. 28, Total Marks 700
Elective III : 1) Web Technology, 2) Component Technology, 3) Quantum Computing, 4) Bio Informatics
Elective IV : 1) Advance Software Engineering, 2) Computer Modeling and Simulation, 3) Natural language Processing
4) Grid Computing

Semester-III

Course code	Name of the subject	Evaluation		Total Marks
		Term Work	Orals	
T31	* Industrial Training	100	--	100
S32	Dissertation Phase-I	100	100	200
Total		200	100	300

* 8 Weeks at the end of First Year (summer)

Semester-IV

Course code	Name of the subject	Evaluation		Total Marks
		Term Work	Orals	
D42	Dissertation Phase-II	100	200	300

Total Marks For Four Semesters: -

Semester	I	II	III	IV	**Total**
Marks	700	700	300	300	**2000**

M.Tech. (Computer Science and Engineering) Syllabus

Mtech - 101 Theory of Computer Science

Section – I

1) Introduction: Mathematical notions and terminology of sets, sequences and tuples, functions and relations, graphs, strings and languages. Boolean logic properties and representation. Definition. Theorems and types of proofs formal proofs, deductive, reduction to definition, proof by construction, contradiction, induction, counter-examples.
2) Regular languages: Finite automata, DFA, NFA. Equivalence of DFA and NFA. An application, Regular expressions and languages , applications.
3) Context-free languages: CFGs, Applications, Ambiguity removal, Pushdown automata and Equivalence with CFGs.
4) Turing machine: Turing machines, variants of TMs, programming techniques for TMs, TMs and computers.

Section – II

5) Decidability: Decidable languages, decidable problems concerning Context-free languages. The halting problem – Diagonalization method, halting problem is undecidable.
6) Reducibility: Undecidable problems from language theory. Regular expressions, Turing machines, Reduction, A simple undecidable problem (PCP), mapping reducibility and other undecidable problems.
7) Computability: Primitive recursive functions, More examples, The recursion theorem.
8) Computational complexity: Tractable and Interactable problems, Growth rates of functions, Time complexity of TM of TM, Tractable decision problems, Theory of Optimization.

Books:

1) Introduction to Theory of Computation
   - Michael Sipser (Thomson Brools Cole)
2) Introduction to Automata Theory, Languages and Computation
- J. E. Hoperoft, Rajeev Motawani and J.D. Ullman(Pearson Education Asia) 2nd Edition.

References:

1) Discrete Mathematical structures with applications to computer science
   - J. P. Thembloy and R. Manohar.
2) Theory of Computer Science – E. V. Krishnamoorthy

Mtech 102 Advanced Operating System

1) Distributed computing systems fundamentals: Introduction to Distributed computing systems, Models, Popularity. Distributed computing system. Design issues of Distributed operating system. Distributed computing environment.
2) Message Passing: Features of a good Message Passing System. Issues in IPC by Message Passing Synchronization, Bullering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure handling, Group Communication.

3) Remote Procedure Calls: RPC Model, Implementing RPC Mechanism. Stub Generation. RPC Messages, Marshaling Arguments and Results. Server Management, Parameter-Passing semantics, call semantics, Communication protocols for RPCs, Client-Server Building, Exception handling, Security RPC in Heterogeneous Environments, Lightweight RPC.
4) Distributed Shared Memory: General Architecture of DSM systems. Design and implementation Issues of DSM, Granularity, Structure of Shared Memory Space. Consistency models, Replacement strategy, Thrashing.
   Synchronization: Clock Synchronization. Event Ordering, Mutual Exclusion, Deadlock, Election Algorithms.
5) Resource Management: Features of global scheduling algorithm. Task assignment approach, Load-Balancing and Load approach.
6) Process Management: Introduction, Process Migration, Treads.
7) Distributed File Systems: Features of good DFS, File models, File Accesing models. File-Sharing Semantics, File-Caching scemes, File Replication, Fault Tolerance, Atomatic Transactions, Design Principles, Case study: DCE Distributed File Service.
8) Security: Potential Attacks to Computer systems, Cryptography, Authantication, Access Control, Design Principles, Case study : DCE Security service.
9) Case Study: Case study of Chorus.

Text book:

1. Distributed Operating Systems concepts and design-P.K.Sinha(PHI).
2. Modern Operating System-Singhal

Reference Books:

1. Distributed Systems concepts and design-G.Coulouris,J.Dollimore & T. Kindberg
2. Modern Operating System-A.S. Tanenbaum(PHI).

Mtech 103 Design And Analysis Of Algorithms

Section-I

1) Introduction: Algorithm definition and specification ,Performance analysis randomized algorithms,Divide and Conquer method ,Binary search,Merge sort Quick sort and Convex hull.
2) Greedy method and Dynamic Programming : General methods ,Job sequencing with deadlines ,Minimum cost spanning trees,Optimal merge patterns,All pairs shortest paths,Optimal binary search trees,Reliablity design ,Travelling salesman problem and flow shop scheduling.
3) Lower bound Theory: Comparision trees ,Oracles and adversary arguments,lower bounds through reductions.

Section-II

4) NP-Hard and NP- complete problems: Basic concepts, cook's theorem. NP –hard graph problems,NP-hard scheduling problems.NP-Hard code generations problems.
5) PARAM Algorithms: Introduction, computational model, Fundamental techniques and algorithms, Merging ,lower bounds.
6) Mesh Algorithms: computational model packet routing fundamental algorithms, merging, computing the convex hull.
7) Hypercube Algorithms: Computational model ,PPR routing fundamental algorithms ,merging, computing the convex hull.

Books:

1. Fundamentals of computer algorithms –Ellis horowitz,,sartaj sahani and Sanguthewar Rajasekaran
2. Design and analysis of algorithms- Aho Hoperraft &Ullman
3. Introduction to algorithms- Thomas H. cormen,charles S.Leiserson
4. Randomized algorithms-Rajeev Motwan and Prabhakar Raghwan

Mtech104(1) -COMPUTER VISION AND IMAGE PROCESSING

UNIT – I

Digital Image Fundamentals: - Digital image Representation – Functional Units of an Image processing system. Visual perception – Image Model _ Image sampling and and Quantization – grayscale resolution – pixel relationship – image geometry. Image Transforms – Unitary Transform, Discrete Fourier Transform, Cosine Transform, Sine Transform, Hadamard Transform, Slant and KL Transform.

UNIT – II

Image Enhancement – Histogram processing – Spatial operations – Image smoothing –Image Sharpening – Color Image Processing methods- Color Image Models

UNIT –III

Image restoration and compression Degradation Model – Discrete Formulation – Circulant matrices – Constrained and Unconstrained restoration geometric transformations fundamentals – Compression Models – Error Free Compression – Lossy Compression – International Image Compression Standards.

UNIT – IV

Image Analysis and Computer Vision: Spatial feature Extraction – Transform feature –Edge detection-Boundary Representation-Region Representation-Moment Representation-Structure-Shape Features-Texture-Scene Matching and Detection-Image Segmentation-Classification techniques-Morphology-Interpolation.

UNIT –V

Sensing 3D shape: how the 3rd dimension changes the problem. Stereo 3D description, 3Dmodel, matching, TINA. Direct 3D sensing-structured light, range finders, range image segmentation.
Emerging IT applications: Recognition of characters, Fingerprints and faces-Image databases.

Reference Books

1.Fundamentals of Digital Image Processing-A.K.Jain
2.Image Processing and machine vision-Milan Sonka,Vaclav Hlavae
3.Pattern Recognition Principles-J.T. Tou and R.C.Gonzalez
4.Syntactic Pattern Recognition and applications.-King Sun Fun
5.Computer vision-Fairhurst(PHI).

Mtech 104(2) Artificial Neural Networks

1. Introduction: Inspiration from Neuroscience,History,Issues.
2. Hopfield model: Associative memory problem ,model,stochastic networks .capacity of stochastic n/w.
3. Optimization problems: Weighed matching problem,Travelling salesman problem,Graph bipartioning,optimization problems in image processing.
4. Simple perceptions: feed forward n/w,Threshould units ,linear units,nonlinear units stochastic units ,capacity of simple perception.
5. Multi-layer n/w:Back propagation ,examples and applications performance of multilayer feed forward n/w Kohoanen self organizing n/w cognitron & neocognutron.
6. Recurrent n/w:Boltzmann n/w,Recurrent Back propogation ,Learning time sequence,Reinforcement learning.
7. Learning:Supervised ,Unsupervised(Hebbian competitive),adaptive resonance theory,Travelling salesman problem.
8. applicationOf artificial Neural Network.

Reference Books

1. Introduction to the theory of neural Computation-Hertz Krogh,Palmer
2. Artificial Neural Networks-B.Yegnanarayana(PHI)
3. Genetic Algorithms-David E.Goldberg(Adddison Wesely)

Mtech 104(3)Real Time Operating Systems

Unit 1 Basic Real Time Concepts : Terminology ,Real time design issues,Example Real-time systems, Brief history, Language issues : Language features, Commonly used programming languages,Software life cycle : Phases of the software life cycle ,non temporal transition in the software life cycle , spiral model .

Unit2 Real time specification and design techniques: Natural languages , Mathematical specification , flow chart, structure chart ,pseudo code,programming designing languages,finite state automata , data flow diagrams, petrinets,warnier-orr notations ,state charts,Sunity in using graphical techniques

Unit 3 Real time kernels : Polled loop system,phase state driven code , co routine interrupt driven systems,foreground/background systems,full feature real time operating system

Unit 4 Inter-Task Communicatin and Synchronizatin : Buffering Data, Mailboxes, Critical Regions, Semaphores, Event flags and signals, Deadlock.

Unit 5 Real time Memory Management : Process Stack Management, Dynamic Allocation, Static Schemes.

Unit 6 System performance Analysis and optimization : Response Time calculation, Interrupt Latency, Time- Loading and its Measurement, Scheduling is NP-Complete,Reducing Response Times and Time-loading, Analysis of memory Requirements, Reducing Memory loading I/O performance.

Unit 7 Queueing Models : Probabilty functions,discrete, Basic Buffer size calculation, Classical Queueing theory, Little's law, Erlang's Formula.

Unit 8 Reliability, Testing and Fault tolerance: Faults,Failures,Bugs and effects,Reliability,testing fault tolerance.

Unit 9 Multiprocessing System : Classification of architecture, Distributed systems Non-Von Neuman Architecutres.

Unit 10 Hardware, Software Integration : Goals of real time system integration tools, Methodology, The software Heisenberg Uncertainity Principle.

Unit 11 Real time Applications: Real time systems as complex system,first Real time application, Real time databases Real time Image processing , Real time Unix Building Real time Applications with real time programming languages.
Books:

1. Real Time Systems Design and Analysis : An Engineer's Handbook
   Phillp A. Laplante(2nd Edition PHI)

Reference Books:

1>Real Tiem system Design – Levi Shem Tov and Ashok K. Agrawala
(New York McGraw Hill)

2>Proceedings of IEEE Special Issue on Real Time Systems (Jan 1994)

3>Real Time Systems and their Programming Language Burns,Alan and Andy Wellings
(New York , Addison Wesley)

4> The desing of Real time Applications : M.Blackman (New York John Wiley & Sons).

5> Real time systems : C.M.Krishna, K.G. Shin (TMGh)

Mtech 104(4) Digital Security

Section – I

1)Security Protocols
Key exchange , Authentication,Multiple key Public key cryptography,Secret splitting and secrete sharing , Threshhold cryptography, Time stamping Services,Zero knowledge Proofs, Blins Signatures.

2)Key Management
Symmetric key length , Public-key key length ,One Way Hash Functions-MD5,SHA-1, Attacks against one way hash functions , Public-key key management.
3)Stream and Block Ciphers
DES,IDEA,BLOWFISH,RC5,A5,PKZIP,Public – key algorithms-
ELGAMAL,ECC,DSA,ESIGN

SECTION-II

4)INTERNET SECURITY PROTOCOLS
ppp-General examples of PPP operations, PPPphase diagram,Transport layer security,extensible authentication protocol.

5)Dial-inoperations with PAP,CHAP,RADIUS,DIAMETER
key aspects of PAP,CHAP messages ,RADIUS configuration ,DIAMETER

6)IPSec Architecture
basics of IPsec, the security association,placements of IPSec, IPsec databases, examples of IPSec sending and receiving operations, services of IPsec protocols,ICV,AH and ESP.

7)The internet key distribution, certification and management
PKI,ISAKMP,DOI,IKE,the protection suite,ISAKMP negotiation phases ,IKE basics, perfect forward secreModels to establish authenticated key exchange,examples of Ike message exchanges, security operations in mobile networks.

Text books:
William Stallings- Cryptography and network security principles and practices. Pearson Education(LPE)
Bruce Schneier – applied cryptograpy-protocols , algorithms and source code 2nd edition, John Weilley

Reference Books-

1) Menezes, A.J., P.C. Van Oorschot,and S.A. Vanstone, " handbook of applied Cryptography"

MTech 201: Computer Network Administration

1) Advanced Socket
   1.1) IPV4 and IPV6 iteroperability inetd superserver.

2) Advanced I/O functions, unix domain protocols, Nonblocking I/O, ioctl operations
3) Routing Sockets. Data link socket address structure, Reading and writing, sysctd operations, get-ifi-info function, Interface name & index functions.
4) Key management Sockets: Reading and writing, Dumping the security association database (SADB), Creating a static security association(SA), Dynamically maintaining SAs
5) Broadcasting : Broadcast addresses, Unicast verses Broadcast, dg-cli function using broadcasting, Race function,
6) Multicasting: Multicasting addresses, Multicasting verses Broadcasting on a LAN, Multicasting ona WAN, Source-specified multicast, Multicast socket options, mcast_join and related functions, dg_cli function using multicasting, Receiving IP multicast infrastructure session announcemnents, sending and receiving, Simple network time protocol
7) Advanced UDP sockets : Receiving flags, destination IP addresses, interface index, Datagram truncation, UDP verses TCP,. Adding reliability to UDP application , Binding interface addresses, Concurrent UDP services, IPV6 packet information, IPV6 path MTU control

8) Advanced SCTP sockets : Auto closing, Partial delievery, Notification, Unordered data, Binding a subset of addresses, Determining peer and local addresses, Association of ID and IP addresses, Peeling off and association, controlling timing SCTP verses TCP
9) Out_of_Band data : TCP Out_of_Band data, socket:mark function
10) Raw sockets: Raw sockets creation, Raw socket output, Raw socket input, ping program, traceroute program, ICMP message daemon

References :

1) UNIX network programming (3rd Edition)
Stevens, fenner, rudoff Pearson education
2) TCP/IP illustrated (V2)
Write, Stevens Pearson education

- Internetworking with TCP/IP (V2)
Comer, Stevens Pearson education

Mtech202 -ADVANCED COMPUTER ARCHITECTURE

UNIT –I

Computational Models: the concept of computational model – basic computational models- the concept of computer architecture - interpretation to the concept of computer architectures at different levels of abstraction. Introduction to parallel Processing: basic concepts – program, process and threads in languages – concepts of parallel concurrency and parallel execution –types and levels of parallelism – classification of parallel architectures – basics parallel techniques –pipelining and replication – an overview of parallel processing applications.

UNIT- II

Instruction –level Parallel processors: evolution and overview of ILP – dependencies between instructions – data , control and resource dependencies- instruction scheduling – preserving sequential consistency – Pipelined Processors – basic concepts – design space of pipelines – case study: pipelined instruction processing in the Pentium processor and PowerPC 604, VLIW Architectures – case study: the Trace 200 family.

UNIT III

Memory organization: basic naming, allocation and accessing techniques – name mapping implementations – name translation before program execution – name translation by an executing program – operating system controlled address translations – segmentation, paging and paged segments – the processor-memory interface – memory management units, cache memory, memory interleaving, memory bandwidth and granularity – memory organizations for array processors – contentions in shared memory architectures – memory structure of SPARC, ALPHA AXP AND MC680*0 architectures. Characteristics of I/O subsystems – interrupt mechanisms and special hardware – I/O Processors and channels.

Mtech 203- ADVANCES IN DATABASE DESIGN

UNIT I

Entity –Relationship model – Relational Model – Relational constraints- Relational algebra – Tuple and Domain Relational calculus –SQL- QUEL-QBE-Design Algorithms-Dependencies – Normal forms-ER and EER to Relational mapping-MS-access and Oracle

UNIT II

Query processing and optimization-Transactions-Properties of Transactions-Concurrency Control –Recovery -Security and Authorization –Storage-Indexing and Hashing-ISAM –B-Trees -Kd Trees-X Trees –Dynamic Hashing

UNIT III

Distributed Databases-Principles –Design-Queries Translation of queries optimization Access Strategies –Management of Distributed Transactions actions-concurrency Control-Reliability

UNIT IV

Object Oriented Concepts-Data Object Models-Object Based Databases –Object Oriented Databases-Object Oriented Databases Relational Databases-Object Definition Languages-Object Query Languages-SQL3-Concurreency in OODBs-Storage and Access –Data Access Interface Technologies-ADO-RDO-CORBA

UNIT V

Other Database Models-Multimedia Databases-Parallel Databases Data Mining - Data Warehousing –Spatial Databases Concepts –Temporal Databases Concepts-Active Databases.

REFERENCE BOOKS :

1) Fred R. McFadden, Jeffery A. Hoffer, Mary B. Prescott, " Modern Database Management" , Fifth Edition , Edition Wesley, 2000
2) Elmasri, Navathe, "Fundamentals Of Database Systems ", Third Edition,Addison Wesley, 2000
3) Abraham Silberchartz, Henry F. Korth, S. Sudarshan, " Database System Concepts" , Third Edition, McGraw-Hill, 1996
4) Jefry D. Ullman , Jenifer Widom ," A First Course in Database Systems", Pearson Education Asia, 2001
5) Stefano Ceri, Giuseppe Pelagatti, " Distributed Databases Principles & Systems", McGraw-Hill International Editions, 1985
6) Rajesh Narang, "Object Oriented Interfaces & Databases", Prentice Hall Of India, 2002

Mtech204(4) Geographical Information systems

2. Introduction to GIS, Spatial Data, Spatial Data Modeling.
3. Attribute Data Management.
4. Data Input and Editing.
5. Data Analysis.
6. Analytical Modeling in GIS.
7. Output: From New Maps to Enhanced decisions.

8. Development of Computer methods for handling spatial data.
9. Data quality issues.
10. Human and Organisational issues.
11. GIS project design and management, future of GIS.

Books –

1. An Introduction to Geographical Information Systems – Lan Heywood. Sarah Corneius and Steve Carver. (Pearson Education).

Note: Syllabi of the remaining paper will be prepared in due course.

SAWANT S. P. BIRJE SR/ Jr. Clerk

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