

**SGGS INSTITUTE OF ENGINEERING AND TECHNOLOGY
VISHNUPURI- NANDED**

DEPARTMENT OF INFORMATION TECHNOLOGY

SYLLABI STRUCTURE OF M. Tech (Information Technology)(First year)

Code	Name of the course	Total credits	Lectures /week L-T-P	Practicals/ week
IT-501	Applied Algorithms	04	03-01-00	--
IT-502	Software Engineering Methodologies	04	03-01-00	--
IT-503	Net- Centric Computing	04	03-01-00	--
IT-504	Elective-I	04	03-01-00	--
IT-505	Laboratory Practice-I	03	00-00-06	06
IT-506	Seminar-I	01	00-00-02	02
Total for Part-I		20	12-04-08	08
IT-507	Advance trends in data Base Management	04	03-01-00	--
IT-508	Management Trends in Information Technology	04	03-01-00	--
IT-509	Information & Wireless Network Security	04	03-01-00	--
IT-510	Elective-II	04	03-01-00	--
IT-511	Laboratory Practice-II	03	00-00-06	06
IT-512	Seminar-II	01	00-00-02	02
Total for Part-II		20	12-04-08	08
Total for Part-I and Part-II		40	24-08-16	16

**SGGS INSTITUTE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF INFORMATION TECHNOLOGY

SYLLABI STRUCTURE OF M. Tech (Information Technology)(SECOND YEAR)

Code	Name of the course	Total credits	Lectures /week L-T-P	Practicals/ week
IT-513	Elective-III	04	03-01-00	--
IT-514	Elective-IV	04	03-01-00	--
IT-515	Laboratory Practice-III	04	00-00-08	08
IT-516	Seminar-III	02	00-00-04	04
IT-517	Project -I	06	00-00-06	06
	Total for Part-I	20	06-02-18	18
IT-518	Project-II (Dissertation)	20	00-00-20	20
	Total for Part-II	20	00-00-20	20
	Total for Part-I and Part-II	40	06-02-38	38

IT- 504 : Elective-I

1. Real Time and Embedded Systems
2. High Performance Computer Networks
3. Mobile Computing and M Commerce
4. Real Time and Embedded Systems

IT-501 : Applied Algorithms

(Lectures: 3 Hrs/week Tutorials- 01 Hrs/Week

Total Credits : 04)

1. Introduction to Problem Solving : Review of algorithmic strategies; proof Techniques such as implication, converse, inverse, contra positive, negation and contradiction. Structure of formal proofs, direct proofs, proof by counterexample, proof by contra position, proof by contradiction, mathematical induction, strong induction, recursive mathematical definitions, well orderings.
2. Analysis Of Algorithms: : Asymptotic analysis: upper and average complexity bounds. Identifying differences among best, average and worst Case Behaviors. Big O, little O, omega and theta notations, Standard complexity classes. Empirical measurements of performance. Time and space trade offs in algorithms. Analyzing recursive algorithms using recurrence relations.
3. Fundamental Computing Algorithms::Numerical algorithms. Sequential and binary search algorithms. Quadratic sorting algorithms and $O(n \log n)$ sorting algorithms. Algorithms on graphs and their complexities.
4. Advanced data structures: self-adjustment, persistence and multi-dimensional trees. Randomized algorithms: Use of probabilistic inequalities in analysis.
5. Geometric algorithms;Point location, Convex hulls and Voronoi diagrams. Arrangements applications using examples.
6. Graph algorithms : Matching and Flows. Approximation algorithms.Use of Linear programming and primal dual, local search heuristics.
7. Parallel Algorithms : Parallel algorithms; Basic techniques for sorting, searching merging, list ranking in PRAMs, and interconnection networks. Parallel computers and models, performance measures. Parallel Complexity: The NC Class, Basic Lower and Upper Bounds. Algorithms for Parallel Computers: Pointer Jumping, CRCW algorithms and EREW algorithms.

Reference Books:

1. Lakshmivarahan S., Dhall S., "Analysis and Design of Parallel Algorithms", McGrawHill
2. Cormen, Leiserson, Rivest, "Algorithms", PHI
3. S. Baase, S and A. Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", 3rd edition. Addison Wesley, 2000
4. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms", Addison Wesley
5. Horowitz, Sahni, "Fundamentals of Computer Algorithm", Galgotia.
6. Knuth, "Art of Programming", Addison Wesley
7. C Papadimitriou and K Steiglitz, "Combinatorial Optimization", PHI Bressard, "Fundamentals of Algorithms", PHI

IT-502 : Software Engineering Methodologies

1. Software Process Models: Software Process Framework, Process Patterns, Personal and Team Process Models, Process Models: Waterfall Model, Incremental Models, Evolutionary Models, Iterative Development, The Unified Process, Agile process, Process Assessment, CMMI, Impact of Processes and Outcomes, Process Selection and applicability
2. Requirements Engineering::Requirements Engineering Tasks, Requirement Elicitation Techniques,Software Requirements: Functional, Non-Functional, Domain, Requirements Characteristics and Characterization, Requirement qualities, Requirement Specification, Requirement Traceability, System Analysis Model Generation, Requirement Prioritize
3. UML 2.0 Concepts:: Programming In Small Versus Programming In Large, UML 2.0 History/ New Features MDA/ MOF/ XMI/ CORBA, Introduction to UML Meta model , Extensibility Mechanisms and its usage, Introduction to OCL ,Specification techniques of diagrams in UML
4. Behavioral Model::Use Cases, Use Case Diagram Components, Use Case Diagram , Actor Generalization, Include and Extend, Template for Use Case Narrative , Using Use Cases Data Dictionary: Finding the Objects, Responsibilities, Collaborators, and Attributes , CRC Cards
5. Dynamic Behavior:Sequence diagrams, object lifelines and message types, Refining sequence diagrams, Implementing memory in objects using state machines, States,events and actions, Nested machines and concurrency, Modeling methods with activity diagrams, Activity Diagrams: Decisions and Merges, Synchronization, Drilling Down, Iteration, Partitions, Parameters and Pins, Expansion Regions, Swim lanes, concurrency and synchronization, Communication Diagram, Timing Diagrams
6. Design Engineering : Design quality, Design Concepts, The Design Model, Introduction to Pattern-Based Software Design, Architecture styles: Main program with sub program style, Abstract data type style, Repository, Layered. Architectural Design: Software Architecture, Data Design and Architectural Design, User Interface Design: Rules, User Interface Analysis and Steps in Interface Design, Design Evaluation
7. Object Oriented Design : Design of Objects, Design and Factoring , Design of Software Objects ,Features and Methods, Cohesion of Objects , Coupling between Objects, Coupling and Visibility, Inheritance, Establishing The Object Model, defining classes and associations, Analysis model vs. design model classes, Categorizing classes: entity, boundary and control, Modeling associations and collections, Achieving re usability, Reuse through delegation , Identifying and using service packages
8. Principles of Testing :Testing Concepts: Purpose of Software Testing, Testing aspects: Requirements,Test Scenarios, Test cases, Test scripts/procedures, Strategies for Software Testing, Testing Activities, Mistakes, Faults & Failures, Testing, Debugging & Root Cause Analysis, Software Items, Component & Units, Verification &Validation, Test Bed, Traceability and Testability, Attributes

of Testable Requirements, Test Matrix, Benefits of Formal Test Documentation
White-Box Testing: Test Adequacy Criteria, Static Testing, Structural Testing,
Code Complexity Testing, Mutation Testing Black-Box Testing: Test Case
Design Criteria, Requirement Based Testing, Positive and Negative Testing,
Boundary Value Analysis, Equivalence Partitioning, State Based Testing,
Compatibility Testing, User Documentation Testing, Domain Testing

9. Project Planning and Estimation : Project Activities, Structures and Frameworks, Developing Realistic Estimates Integrating the Schedule and Critical Path, Introduction to Complex Projects, Assessing Project Viability, Managing Stakeholders, Introduction to Function Points, Empirical Estimation, COCOMO II model, Software Measurement Framework, Ishikawa's Seven tools, Process Assessment and patterns, CMMI, IPPD, Product and Process attributes

Reference Books:

1. Ian Sommerville, Software Engineering, 7th Edition, Addison-Wesley, 2004, ISBN 81- 7758-530-4
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison- Wesley, ISBN – 0321267974.
3. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design. ", 2nd Edition, Addison- Wesley, ISBN – 0321321278.
4. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049.
5. Desikan, Ramesh, ' Software Testing: principles and Practices", Pearson Education, ISBN 81-7758-121-X.
6. Burnstein, "Practical Software Testing", Springer International Edition, ISBN 81-8128-089-X
7. William E. Perry, " Effective Methods for Software Testing", John Wiley and Sons, ISBN 9971-51-345-5
8. Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education, ISBN 81-297-0175-8

IT-503 : Net-Centric Computing

(Lectures: 3 Hrs/week Tutorials- 01 Hrs/Week

Total Credits : 04)

1. Network Technology :Introduction, Media Issues, Data Link Protocols, The OSI Model, Networking topologies, Types of Networks, protocols capabilities,

- NetBIOS, IPX,TCP/IP,CSMA/CD, token passing, frame relay, networking devices,Repeaters, Bridges, Routers, switches, gateways, Network design issues, Data in support of Network Design, Network design tools, protocols and architecture.
2. Network Performance, Modeling and Estimation :Issues related with optimizing network performance, probability, stochastic processes, modeling and performance evaluation. Queuing theory, queuing models, estimating model parameters, throughput utilization, modeling network as graph external and internal representation, complexity issues, network traffic controls.
 3. Network Administration :Function and responsibilities, network issues:-planning, implementation, fault diagnosis and recovery.
 4. Network Design :Problem definition, multipoint line layout heuristics, CMST algorithms, ESAU-William’s algorithm, Sharma’s algorithm, unified algorithm, Bin packing algorithm, Terminal assignments and concentrator location.
 5. High Speed Networks :Need, characteristics, challenges, applications, frame relay, ATM, ISDN, High speed LANs: Ethernet, fiber channel, DQDB, SMDS, B_ISDN, STM, DSL, and DWDM, Architecture Transport, Switching and Routing in optical domain, optical network management, Internetworking.
 6. Network security : Basic cryptographic techniques, security in OSI architecture, internet and networked computing, Kerberos, firewalls, proxy, etc. Security applications in commerce and banking.
 7. IP Telephony : VOIP system architecture, protocol hierarchy, structure of a voice endpoint, Protocols for the transport of voice media over IP networks, Providing IP quality of service for voice, signaling protocols for VOIP,PSTN gateways, VOIP applications.
 8. Storage Networks :Introduction, challenges, SCSI protocols and architecture: RAID, Backup and mirroring, Fiber channel attached storage. Network attached storage including NFS, CIFS, and DAFS, Management of network storage architectures. New storage protocols, architectures and enabling technologies.
 9. Compression :Overview of Information Theory, Lossless Compression: Run-Length Encoding, Facsimile compression, String Matching algorithms. Lossy compression: DCT, Wavelet compression.

Reference Books :

- 1) Stallings. W.-“High Speed Networks and Internets:Performance and Quality of service”,Prentice Hall 2002
- 2) Kershenbaum A.-“Telecommunications Network Design Algorithms” TataMcGraw Hill.
- 3) Ramaswami R. ,Shivrajan K-“Optical Networks”,Morgan Kaufmann.
- 4) Douskalis B.-“IP Telephony:The Integration of Robust VOIP service”,Perason Education Asia .
- 5) Douglas E.Comer-“Computer NetWorks and Internet”,Pearson Education Asia.
- 6) Stallings W.-“High Speed Networks :TCP/IP and ATM Design principles”,Prentice Hall,1998.
- 7) Andrew Tanenbaum- “computer Network”,PHI.

IT-504 : Elective-I

(Lectures: 3 Hrs/week Tutorials- 01 Hrs/Week

Total Credits : 04)

1. IT- 504 (a) :Real Time and Embedded Systems

1. Embedded Architecture :Embedded Computers, Characteristics of Embedded Computing Applications, Challenges in Embedded Computing system design, Embedded system design process- Requirements, Specification, Architectural Design, Designing Hardware and Software Components, System Integration, Formalism for System Design-Structural Description, Behavioral Description, Design Example: Model Train Controller
2. Embedded Processor And Computing Platform :ARM processor-processor and memory organization, Data operations, Flow of Control, SHARC processor- Memory organization, Data operations,Flow of Control, parallelism with instructions, CPU Bus configuration, ARM Bus, SHARC Bus, Memory devices, Input/output devices, Component interfacing, designing with microprocessor development and debugging, Design Example : Alarm Clock.
3. Networks : Distributed Embedded Architecture- Hardware and Software Architectures, Networks for embedded systems- I2C, CAN Bus, SHARC link ports, ethernet, Myrinet, Internet, Network-Based design-Communication Analysis, system performance Analysis, Hardware platform design, Allocation and scheduling, Design Example: Elevator Controller.
4. Real-Time Characteristics : Clock driven Approach, weighted round robin Approach, Priority driven Approach, Dynamic Versus Static systems, effective release times and deadlines, Optimality of the Earliest deadline first (EDF) algorithm, challenges in validating timing constraints in priority driven systems, Off-line Versus On- line scheduling.
5. System Design Techniques :Design Methodologies, Requirement Analysis, Specification, System Analysis and Architecture Design, Quality Assurance, Design Example:Telephone PBX- System Architecture, Ink jet printer- Hardware Design and Software Design, Personal Digital Assistants, Set-top Boxes.

Reference Books :

1. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2001.
2. Jane.W.S. Liu Real-Time systems, Pearson Education Asia, 2000
3. C. M. Krishna and K. G. Shin , Real-Time Systems, ,McGraw-Hill, 1997 Frank Vahid and Tony Givargi, Embedded System Design: A Unified Hardware/Software Introduction, John Wiley & Sons, 2000.Networking)

2. IT- 504 (b): High Performance Computer Networks

Network Performance analysis :

Objectives and requirements for Quality of Service (QoS) in high performance networks. Architecture of high performance networks (HPN), design issues, protocols for HPN, VHF backbone networks, virtual interface architectures, virtual interface for networking, High-speed switching and routing - INTERNET and PSTN IP switching techniques, SRP protocols, SRP authentication, and key exchange, comparison of TCP/IP, FTP, TELNET, queuing systems, network modeling as a graph

Gigabit Ethernet : Architecture, standards, interface, applications, network design

High speed networks :

A. Frame relay: Frame relay protocols and services, frame relay congestion control

B. ATM: Architecture, protocol, switching, traffic and congestion control, flow control, error detection and control, traffic management, ATM service categories, ATM in LAN environment, classical IP over ATM

C. ISDN: ISDN overview, interfaces and functions, physical layer, Network layer, ISDN services

D. B-ISDN: Driving forces and need, B-ISDN standards and services, B-ISDN Functional Architecture, B-ISDN Transmission structure, B-ISDN protocol architecture

ADSL and DSL Technologies :Background and technological capabilities, Standards and associations, Architecture, Conceptual overview of VDSL, Deployment Case study, Market status and future

Fiber Optics Communication: GPON (Gigabit capable Passive Optical Network), SONET/SDH and comparison with other available standards, SAN (Storage Area Networks) and Fiber Channel, DWDM, and CWDM

Wireless Networks:

Overview of GSM & CDMA, 3G mobile technologies, UMTS, EDGE, WiFi, WiMax

Reference Books :

1. Jochetl Schiller: Mobile Communication: Addison Wesley.
2. Tanenbaum: Computer Networks: PHI
3. M Shwartz: Telecommunication Network Protocol Modeling And Analysis:

Addison Wesley

4. Gallangar: Data Networks: Prentice Hall

5. Fred Halsall: Data Communication Computer Networks, And Open Systems:

Addison Wesley

6. Kershanbaum : Telecommunication Network Design Algorithms: MGH

7. William Stallings: ISDN And BISDN

8. William Stallings: High Speed Networks

9. Computer Networks And Internet: Comer

10. Johnson: Fast Ethernet

3. IT-504(c) Mobile Computing and M Commerce:

Introduction:Generations of mobile computing, Spectrum allocation, Standard Bodies, Playersin the Wireless Space, three tier architecture of mobile computing, MobileComputing through Internet, Basic cellular system, concept of frequency reuse channels, hand-off mechanism, cell splitting

1. GSM & GPRS :

GSM features and Architecture , Network Aspects in GSM ,GSM Frequency Allocation, Mobility management, hand-off mechanisms, cell splitting, Security issues used in GSM, GPRS features and architecture, network operations, data services in GPRS, applications and limitations, SMS and MMS services architecture and operation details

2. Emerging Telecommunication Technologies :

Introduction, bluetooth, EDGE, UMTS, Wireless Broadband (WiMAX), Mobile IP, Java Card, WLAN, Ad-hoc Networks, Sensor Networks, Spread Spectrum technology, CDMA, Third generation networks and applications, WAP: Model, architecture & protocol stack

3. Security Issues in Mobile Computing :

Introduction, Information security, Security techniques and Algorithms, security Protocols, Public Key Infrastructure, Trust, Security Models, Security Frameworks for Mobile Environment

4. M-Commerce :

Introduction to m-commerce :Emerging applications, different players in m-commerce, m-commerce life cycle Mobile financial services, mobile entertainment services, and proactive service management

5. Management of mobile commerce services :

Content development and distribution to hand-held devices, content caching, pricing of mobile commerce services

6. The emerging issues in mobile commerce : The role of emerging wireless LANs and 3G/4G wireless networks, personalized content management, implementation challenges in m-commerce, futuristic m-commerce services

Text Book:

1. Mobile Computing (Technology, Applications and Service Creation)
Asoke. K Talukder and Roopa R. Yavagal.TATA McGRAW HILL
2. Mobile Communication : Jachan Schiller, Adison-Wesley.
3. Wireless and Mobile Network Architecture : Yi-Bing Lin, Wiley
4. Mobile Commerce: Technology, Theory and Applications by Brian
Mennecke and Troy J. Strader, Idea Group Publishing

Reference Books :

1. Mobile Commerce and Applications, Upkar Varshney, A tutorial at IEEE
International Conference on Wireless Communications (WCNC)
2. Mobile Commerce: Frameworks, Applications and Networking Support,
3. ACM/Kluwer Journal on Mobile Networks and Applications (MONET), June
2002 (Upkar Varshney and Ron Vetter)
4. Location-based Mobile Commerce Services, ACM Transactions on Internet
Technology, August 2003, (Upkar Varshney)
5. Mobile Commerce: An Emerging Frontier, IEEE Computer, Oct
2000 (Varshney and others)
6. Group-oriented Mobile Services, ACM/Kluwer Journal on Mobile Networks
and Applications (MONET), 2004 (Upkar Varshney)

4. IT-504 (d) : User Interface Design

1. Introduction to Human-Computer Interaction as an emerging field : Disciplines
contributing to HCI, Human Information Processing Psychology of everyday
things, Importance of human factors in design – cultural , emotional ,
technological, business,Need Satisfaction curve of technology,Levels of human
computer interaction
2. Foundations of User Interface Design (U.I.D) :Goals of UID, Goal directed
Design, User Interface Models, Understanding and Conceptualizing Interface,
Psychology of users designing for collaboration and communication, Process of
Interaction Design, Standards & Guidelines, Usability Testing, GIU.
3. UCD Models , UCD methodology : User centered design life cycle - cooperative ,
participative , contextual Understanding users , user experience levels , human
information processing - i/o channels ISO 13407,Human memory , user study
techniques , user models,User research - Personas, , scenarios , story boarding
Focus Groups , Card Sorting , Questionnaires , Interviews , On-site
observation,Role Playing, Walkthroughs,
4. User research : O,interviews,questionnaires,social interaction & emotional design,

5. Interaction Design :Goals of interaction design , Interaction design strategies Task analysis & design , GOMS model , navigation design , screen design Defining interactivity , types of interactions , interaction models Interaction models , styles, Advancements in interaction devices Ergonomics principles in interaction design
6. Design - Types participatory : Scenario/task based , usage centered , user centered, User interface models, Interface metaphors and conceptual models User support systems – online help, documentation Accessibility of User Interfaces Heuristics , Principles , patterns in interaction design HCI frameworks, Architectural patterns for user interface Designing for effectiveness , comprehension , satisfaction
7. Evaluation criteria for UI testing : Usability Testing , Suitability Testing , Accessibility Testing Testing methods - Think Aloud , Video taping , Customer Satisfaction questionnaires Advantages & disadvantages of user centered design Case studies in UCD
8. Usable Web - Web Site Usability : Web User Interfaces , Rich web experience design Navigations , Links , Searching , Comparisons , Readability , Collaborative systems, groupware & coordination technology
9. Object Oriented User Interfaces (OOUI) :Identifying needs and establishing requirement , Object Oriented User Interface, Migrating GUI to Object Oriented User Interfaces.
10. Advanced UI – Techniques and Technology : User Interface design, Toolkit, Help Advise, Wizard Testing and Modeling Testing, PC –Internet user Interface.

Reference Books :

1. Elements of User Interface Design - Theo Mandel, John Wiley & Sons
2. Interaction Design – Preece, Roger, Sharp, John Wiley & Sons
3. Essentials of User Interface Design – Alan Cooper – Wiley India.
4. Object Modeling & User Interface Design - Mark Hamelen ,
5. Human Computer Interaction by Alan Dix

IT-505 : Laboratory Practice – I

(Practicals : 06 Hours a week

Total Credits : 03)

Experiments/Assignments based on Subjects IT-501, IT-502, IT-503 and IT-504 and/or small project. The lab in charge should frame minimum of five assignments/ Experiments in each of the subjects mention above .

IT-506 : Seminar

(Practicals : 02 Hours a week

Total Credits : 01)

The students will deliver a talk on their experience during the semester referring to at least two research papers and will deliver a seminar on topic of current interest in Information Technology, Computer Science and Engineering field. The student is expected to review and study at least four research papers from IEEE transactions based on the theory subjects