B.TECH. II Semester-4	L	T	P	C
CS 401: Software Engineering	3	0	2	4

Unit - 1	8 Hours
Introduction to Software and Software Engineering: The Evolving Role of Software, Software: A Crisis on the Horizon and Software Myths, Software Engineering: A Layered Technology, Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Agile Process Model. *Agile Development*: Agility and Agile Process model, Extreme Programming, Other process models of Agile Development and Tools.	
Unit - 2	**14 Hours**
Requirement Analysis and Software Design: Understanding the Requirement, Requirement Modelling, Requirement Specification (SRS). *Managing Software Project*: Software Metrics (Process, Product and Project Metrics), Software Project Estimations, Software Project Planning (MS Project Tool), Project Scheduling & Tracking, Risk Analysis & Management, Design Concepts and Design Principal, Architectural Design, Component Level Design, User Interface Design.	
Unit - 3	**10 Hours**
Software Coding and Testing: Coding Standard and coding Guidelines, Code Review, Software Documentation, Testing Strategies, Testing Techniques and Test Case, Test Suites Design, Testing Conventional Applications, Testing Object Oriented Applications, Testing Tools	
Unit - 4	**10 Hours**
Quality Assurance and Maintenance: Quality Concepts and Software Quality Assurance, Software Reviews (Formal Technical Reviews), Software Reliability, The Quality Standards: ISO 9000, CMM, Six Sigma for SE, SQA Plan, Types of Software Maintenance, Re-Engineering, Reverse Engineering, Forward Engineering, The SCM Process, Version Control and Change Control	
Total Contact Time: 42 Hours	

Recommended Books

1. Roger Pressman, "Software Engineering: A Practitioner's Approach", 7th Edition, McGraw-Hill, 2010.
2. Rajib Mall, Fundamentals of software Engineering, Prentice Hall of India.
3. Ian Sommerville, "Software Engineering", 9th Edition, Addison-Wesley, 2016.
4. Jeffery A. Hoffer, Joey F. George, & Joseph S. Valacich, Third Edition, Modern Systems Analysis and Design, Pearson Education, 2003
5. Pankaj Jalote, "A Concise Introduction to Software Engineering", Springer, 2008.
6. William E. Lewis, “Software Testing and Continuous Quality Improvement”, Third Edition, Auerbach Publications, 2008

B.TECH. II Semester-4	L	T	P	C
CS 402: Computer Networks	3	0	2	4

Unit - 1	9 Hours
Introduction: Overview of network and data communication, Data Communications, Computer Networking, Protocols and Standards, types of Network, Network Topology, Protocol hierarchies, and design issues of layers, Interfaces and services. Reference Model: The OSI reference model, TCP/IP reference model, network standards and protocols. *Physical Layer*: Data and transmission techniques, Multiplexing, Transmission media, Asynchronous Communication, Wireless transmission, ISDN, ATM, Cellular Radio, Switching techniques issues.	
Unit - 2	**14 Hours**
Data Link Layer: Layer design issues, services provided to network layers, Framing, Error control and Flow control, Data link control and protocols – Simplex protocol, Sliding window protocol. *Medium Access Layer*: Channel Allocations, Multiple Access protocols- ALOHA, CSMA, CSMA/CD protocols, Collision free protocols, Limited contention protocols, LAN architectures, IEEE 802 and OSI, Ethernet(CSMA/CD), Bus, Token Ring, DQDB, FDDI, Bridges and recent developments.	
Unit - 3	**8 Hours**
Network Layer: Network Layer design issue, Routing algorithms and protocols, Congestion Control Algorithms, Internetworking, Addressing, N/W Layer Protocols and recent developments.	
Unit - 4	**11 Hours**
Transport Layer: Transport services, Design issues, transport layer protocols, Congestion Control, QOS and its improvement. *Application Layer*: Client Server Model, DNS, SMTP, FTP, HTTP, WWW and recent development	
Total Contact Time: 42 Hours	

Recommended Books

1. Tanenbaum, “Computer Network”, 4th Edition, PHI,1996.
2. William Stalling: “Data and Computer Communication”, 8th Edition, Prentice Hall, 2006.
3. Douglas E. Comer:” Internetworking with TCP/IP Volume – I”, 3rd Edition, PHI, 1991.
4. W. Richard Stevens: “TCP/IP Illustrated Volume-I”, Addison Wesley, 1994.
5. B. Forouzan , ” Data Communication And Networking “, 5th Edition, TMH, 1997.
6. James F. Kurose and Keith Ross, Computer Networking: a Top Down Approach, 8th edition Published by Pearson, 8th Edition

B.TECH. II Semester-4	L	T	P	C
CS 403: System Software	3	0	2	4

Unit - 1	12 Hours
Introduction: Introduction System software, Utility Software, systems programming. *Assembler*: Introduction, Cross Assembler, Micro Assembler, Meta Assembler, Single pass Assembler, Two Pass Assembler, Design of Operation code table, Symbol table, Literal table. *Macro Processor*: Introduction of Macros, Macro processor design, Forward reference, Backward reference, positional parameters, keyword parameters, conditional assembly, Macro calls within Macros, Implementation of macros within Assembler. Designing Macro name table, Macro Definition table, Kew word parameter table, Actual parameter table, Expansion time variable storage. *Compiler Structure*: Analysis-synthesis model of compilation, various phases of a compiler, tool based approach to compiler construction.	
Unit - 2	**14 Hours**
Lexical and Syntax Analysis: Interface with input, parser and symbol table, token, lexeme and patterns, difficulties in lexical analysis, error reporting, and implementation. Regular definition, Transition diagrams. Context free grammars, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, Bottom up parsing, operator precedence parsing, LR parsers.	
Unit - 3	**6 Hours**
Intermediate Code Generation: Intermediate representations, Code generation & instruction selection issues, basic blocks & flow graphs, register allocation, optimization of basic blocks, loops, global dataflow analysis.	
Unit - 4	**10 Hours**
Run Time Environment: Absolute loader, Relocation - Relocating loader, Dynamic loader, Bootstrap loader, Linking-loader, Program relocatibility, Design of Absolute Loader, Design of direct-linking editor, other Loader scheme e.g. (Binders, Linking Loaders, Overlays, Dynamic Binders.	
Total Contact Time: 42 Hours	

Recommended Books

1. A. V. Aho, R. Sethi and J D.Ullman, “Compilers-Principles, Techniques and Tools”, 2nd Edition, Pearson,2006.
2. Leland L. Beck, ”System Software -An Introduction to System Programming”, 3rd Edition, Addision Wesley, reprint2003.
3. Kenneth C. Louden,” Compiler Construction-Principles and Practice”, 1st Edition, Thomson, 1997.
4. D. M. Dhamdhere, “System Programming and Operating System”, 2nd Edition, TMH, 1993.
5. Houlb, “Compiler Design in C”, PHI, EEE, 1995.

B.TECH. II Semester-4	L	T	P	C
CS 404: Object Oriented Technology	3	0	2	4

Unit - 1	10 Hours
Introduction: Introduction to system analysis and design, Structured system analysis and design, Object oriented analysis and design, Object oriented methodologies, Iterative development and Unified Process *Modelling requirement*: Requirement Capture, Requirement Analysis, Refining the Requirement Models, Object Interaction *Structural Modeling*: Object Oriented Fundamentals, Basic structural Modeling, UML Model, Class, Diagrams, Object Diagrams, Packages and Interfaces, Case Studies.	
Unit - 2	**12 Hours**
Behavioral and Architectural Modeling: Use Case Diagrams, Interaction Diagrams, State Chart Diagrams, Collaborations, Design Patterns, Component Diagrams, Deployment Diagrams, Case Studies	
Unit - 3	**10 Hours**
Object Oriented Testing Methodologies: Implications of Inheritance on Testing, State Based Testing, Adequacy and Coverage, Scenario Based Testing, Testing Workflow, Case Studies , Object Oriented Metrics	
Unit - 4	**10 Hours**
Components: Abuses of inheritance, danger of polymorphism, mix-in classes, rings of operations, class cohesion and support of states and behavior, components and objects, design of a component, lightweight and heavyweight components, advantages and disadvantages of using components.	
Total Contact Time: 42 Hours	

Recommended Books

1. M.Page-Jones,"Fundamentals of Object Oriented Design in UML", Pearson Education,2002.
2. G. Booch, J. Rumbaugh and I. Jacobsons, "The Unified Modeling Language User Guide", Addison Wesley,2002.
3. A. Bahrami, "Object Oriented System Development", McGraw Hill,2003.
4. J. Baugh, I. Jacobson and G. Booch, "The Unified Modeling Language Reference Manual", Addison Wesley,1999.
5. C. Man C, "Applying UML & Patterns: An Introduction to Object-Oriented Analysis &Design", Addison Wesley,2002.
6. G. Booch, M. Engle and B. Young, "Object-Oriented Analysis and Design with Applications", 3rd Edition, 2007.

B.TECH. II Semester-4	L	T	P	C
CS 405: Design and Analysis of Algorithms	3	0	0	3

Unit - 1	12 Hours
Introduction: Introduction to algorithms, analysis and design techniques. Analysis Techniques: Mathematical, Empirical and Asymptotic analysis. Review of the notations in asymptotic analysis. Recurrence Relations and Solving Recurrences - Proof Techniques –Illustrations *Divide and Conquer Approach*: Sorting & order statistics: Divide and Conquer technique – Various Comparison based Sorts – Analysis of the Worst-case and the Best-cases – Randomized Sorting Algorithms – Lower Bound on Sorting - Noncomparison based sorts – Applications – Medians and Order Statistics	
Unit - 2	**8 Hours**
Greedy Design Techniques: Basic Greedy Control Abstraction – Motivation – The Thirsty Baby Problem – Formalization – Activity Selection and its variants – Huffman Coding – Horn Formulas - The Tape Storage Problem - The Container Loading Problem – The Knapsack Problem – Graph Algorithms – Minimum Spanning Trees – Single Source Shortest Paths – Maximum Bipartite Cover Problem – Applications	
Unit - 3	**10 Hours**
Dynamic Programming: Motivation – The Coin Changing problem – The Longest Common Subsequence – The 0/1 Knapscak problem – Memoization – All-pairs Shortest Path Problems - The Dynamic Programming Control Abstraction *Backtracking*: Backtracking - Branch & Bound - N-Queens problem - 15-puzzle problem.	
Unit - 4	**12 Hours**
Number Theoretic Algorithms: Number Theoretic notions – the GCD – Modular Arithmetic – The Chinese Remainder Theorem – Generators – Cyclic Groups – Galois Fields – Applications in Cryptography - The Primality Testing. *NP-Complete Problems*: Polynomial time – verification – NP-completeness – Search Problems – The reductions – Dealing with NP - completeness – Approximation Algorithms – Local Search Heuristics.	
Total Contact Time: 42 Hours	

Recommended Books

1. Cormen, Leiserson, Rivest, Stein, “Introduction to Algorithms”, 3rd Edition, MIT Press, 2009.
2. Donald E. Knuth, “The Art of Computer Programming, Vol I & III”, 3rd Edition, Pearson Education, 1997.
3. Sara Baase, Allen van Gelder, “Computer Algorithms: Introduction To Design & Analysis”, 3rd Edition, Pearson Education, 2000.
4. Sartaj Sahni, “Data Structures, Algorithms and Applications in C++”, 2nd Edition, Universities Press/Orient Longman, 2005.
5. J. Kleinberg, E. Tardos, “Algorithm Design”, 1st Edition, Pearson Education, Reprint 2006.

B.TECH. II Semester-4	L	T	P	C
EC 407: Analog & Digital Communication	3	0	0	3

Unit - 1	14 Hours

Introduction to Electronic Communication

Fourier Representation of Signals and Systems: The Fourier Transform, Properties of the Fourier Transform, The Inverse Relationship Between Time and Frequency, Dirac Delta Function, Fourier Transform of Periodic Signals. Transmission of Signals through Linear Systems: Convolution Revisited, Ideal Low-Pass Filters, Correlation and Spectral Density: Energy Signals, Power Spectral Density, Numerical Computation of the Fourier Transform, Theme Example: Twisted Pairs for Telephony

Unit - 2	14 Hours

Amplitude Modulation: AM concepts, Modulation Index and Percentage of Modulation, Sidebands and the Frequency Domain, AM Power, Single-Sideband Modulation

Amplitude Modulator & Demodulator Circuits: Basic Principles, Amplitude Modulators, Amplitude Demodulators, Balanced Modulators, SSB Circuits

Fundamentals of Frequency Modulation: Basic Principles of Frequency Modulation, Principles of Phase Modulation, Modulation Index and Sidebands, Noise Suppression Effects of FM (Noise and Phase Shift, Preemphasis), FM versus AM

FM Circuits: Frequency Modulators, Phase Modulators, Frequency Demodulators

Digital Communication Techniques: Digital Transmission of Data, Data Conversion (Basic Principles, Oversampling and Undersampling), Pulse Modulation (Comparing Pulse-Modulation Methods, Pulse-Code Modulation: Concept, Companding, Codecs & Vocoders)

Unit - 3	14 Hours

Radio Transmitters: Transmitter Fundamentals (Transmitter Configurations), Carrier Generators, Impedance-Matching Networks

Communication Receivers: Basic Principles of Signal Reproduction, Superheterodyne Receivers, Frequency Conversion (Mixing Principles, Mixer and Converter Circuits, Local Oscillators and Frequency Synthesizers), Intermediate Frequency and Images, Noise, Typical Receiver Circuits (RF Input Amplifiers, IF Amplifiers, Automatic Gain Control Circuits, Squelch Circuits, SSB andContinuous-Wave Reception), Receivers and Transceivers

Multiplexing and Demultiplexing: Basic Principles, Frequency-Division Multiplexing, Time-Division Multiplexing (PAM Multiplexers, Demultiplexer Circuits), Pulse-Code Modulation (PCM Multiplexers, PCM Demultiplexers, Benefits of PCM, Digital Carrier Systems, T-Carrier Systems, T-2, T-3, and T-4 Systems), Duplexing

Digital Data Transmission: Principles of Digital Transmission(Serial Transmission, Asynchronous Transmission, Synchronous Transmission, Encoding Methods), Transmission Efficiency, Modern Concepts and Methods(Modulation for Data Communication, Spectral Efficiency and Noise, Wideband Modulation)

Total Contact Time: 42 Hours

Recommended Books

Text-Book

1. Simon Haykin, and Michael Moher, "Introduction to Analog and Digital Communication", John Wiley & Sons, 2nd Edition.
2. Louis E. Frenzel, “Principles of Electronic Communication Systems, 4th Edition, TMH.

Reference Books
3. Lathi B. P., and Ding Zhi, “Modern Digital & Analog Communication Systems”, Oxford University Press, 4th Edition, 2010.
4. Proakis J., and Salehi M., “Fundamental of Communication Systems”, PHI/Pearson Education-LPE, 2nd Edition, 2006.