**M.Tech. Degree Course**

**In**

**CYBER SECURITY**

**Scheme and Syllabi**

**M.Tech. Cyber Security**

**Scheme**

**Semester: 1**

|  |  |  |  |  |  |  |  |
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| **Exam Slot** | **Course No:** | **Name** | **L-T-P** | **Internal Marks** | **End Semester Exam** | | **Credits** |
| **Marks** | **Duration (Hrs)** |
| A | 08CS 6211 | Mathematical Foundations of Computer Science | 3-0-0 | 40 | 60 | 3 | 3 |
| B | 08CS 6221 | Internetworking – Protocols and Security | 3-0-0 | 40 | 60 | 3 | 3 |
| C | 08CS 6231 | Advanced Cryptography | 4-0-0 | 40 | 60 | 3 | 4 |
| D | 08CS 6241 | Advanced Computer Architecture | 3-0-0 | 40 | 60 | 3 | 3 |
| E | 08CS 6251 | Elective I | 3-0-0 | 40 | 60 | 3 | 3 |
|  | 08GN 6101 | Research Methodology | 0-2-0 | 100 | 0 | 0 | 2 |
|  | 08CS 6271 | Seminar I |  | 100 | 0 | 0 | 2 |
|  | 08CS 6281 | Advanced Networking Lab | 0-0-2 | 100 | 0 | 0 | 2 |
| **Credits** | | | | | | | **22** |

**Elective I**

08CS 6251(A): High Speed Networks

08CS 6251(B) :Advanced Distributed Computing

08CS 6251(C) : Computational Intelligence

**Semester 2**

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| **Exam Slot** | **Course No:** | **Name** | **L-T-P** | **Internal Marks** | **End Semester Exam** | | **Credits** |
| **Marks** | **Duration (Hrs)** |
| A | 08CS 6212 | Mobile and Wireless Network Security | 4-0-0 | 40 | 60 | 3 | 3 |
| B | 08CS 6222 | Secure Coding | 3-0-0 | 40 | 60 | 3 | 3 |
| C | 08CS 6232 | Digital Forensics | 3-0-0 | 40 | 60 | 3 | 3 |
| D | 08CS 6242 | Elective II | 3-0-0 | 40 | 60 | 3 | 3 |
| E | 08CS 6252 | Elective III | 3-0-0 | 40 | 60 | 3 | 3 |
|  | 08CS 6262 | Mini Project | 0-0-4 | 100 | 0 | 0 | 2 |
|  | 08CS 6272 | Cyber Security Lab | 0-0-2 | 100 | 0 | 0 | 2 |
| **Credits** | | | | | | | **19** |

**Elective II**

08CS 6242(A):Data Compression

08CS 6242(B):Interactive Programming with PHYTHON

08CS 6242(C): Computer and Information Security Management

**Elective III**

08CS 6252(A): Computer Law and Ethics

08CS 6252(B): Bio-Informatics

08CS 6252(C): Soft Computing

**Semester 3**

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| **Exam Slot** | **Course No:** | **Name** | **L-T-P** | **Internal Marks** | **End Semester Exam** | | **Credits** |
| **Marks** | **Duration (Hrs)** |
| A | 08CS 7213 | Elective IV | 3-0-0 | 40 | 60 | 3 | 3 |
| B | 08CS 7223 | Elective V | 3-0-0 | 40 | 60 | 3 | 3 |
|  | 08CS 7233 | Seminar II | 0-0-2 | 100 | 0 | 0 | 2 |
|  | 08CS 7243 | Project (Phase 1) | 0-0-12 | 50 | 0 | 0 | 6 |
| **Credits** | | | | | | | **14** |

**Elective IV**

08CS 7213(A) :Digital Watermarking

08CS 7213(B): Mathematical Models of Internet

08CS 7213(C): Database Security

**Elective V**

08CS 7223(A) :Cloud and Utility Computing

08CS 7223(B) : Crypto Complexity

08CS 7223(C) : Security Policies and Assurance

**Semester 4**

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| **Exam Slot** | **Course No:** | **Name** | **L-T-P** | **Internal Marks** | **End Semester Exam** | | **Credits** |
| **Marks** | **Duration (Hrs)** |
|  | 08CS 7214 | Project (Phase 2) | 0-0-21 | 70 | 30 | 0 | 12 |
| **Credits** | | | | | | | **12** |

**Total Credits: 22+19+14+12 = 67**

**COURSE NO: 08CS 6211 COURSE TITLE: MATHEMATICAL FOUNDATIONS OF COMPUTERSCIENCE**

**CREDITS: 3-0-0**

**Pre-requisites: Nil**

**Course Objectives:**

* To familiarize the students with the fundamental theorems, group and subgroups properties.
* To gain knowledge about fundamental principles of counting and graphs.
* Will help the students in their master research project work.

**Syllabus**

Divisibility, gcd, prime numbers, fundamental theorem of arithmetic, Congruences, Fermat's theorem, Groups and subgroups, homomorphism theorems.

**Course Outcome:**

**After the completion of the Course, the students,**

* Will have clear knowledge about the fundamental principle of counting and graphs.
* Understand the fundamental theorems groups and subgroup properties.

**References**

1. Niven, H.S .Zuckerman and Montgomery, an Introduction to the Theory of Numbers,3/e, John Wiley and Sons ,NewYork, 1992.
2. R. P. Grimaldi, Discrete and Combinatorial Mathematics: An AppliedIntroduction,3/e,Addison-Wesley,NewDelhi,1994.
3. B.KolmanandR.C.Busby,DiscreteMathematicalStructuresforComputerScience,PHI,New Delhi,1994.
4. J.ClarkandD.A.Holton,AFirstLookatGraphTheory,AlliedPublishers(WorldScientific),New Delhi,1991.
5. C.L.Liu,ElementsofDiscreteMathematics,McGrawHill,2/e,Singapore,1985.

**COURSE PLAN**

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| **COURSE NO: 08 CS6 211 COURSE TITLE: MATHEMATICALFOUNDATIONSOFCOMPUTERSCIENCE (L-T-P: 3-0-0) CREDITS:3** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Divisibility, gcd, prime numbers, fundamental theorem of arithmetic, Congruences, Fermat's theorem ,Euler function, Primality testing, solution of congruences, Chinese remainder theorem, Wilson’s theorem. | **7** | **15** |
| **MODULE: 2**  Groups and subgroups, homomorphism theorems, cosets and normal subgroups. | **7** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Lagrange’s theorem, rings, finite fields, polynomial arithmetic, quadratic residues, reciprocity, discrete logarithms, elliptic curve arithmetic. | **7** | **15** |
| **MODULE: 4**  Fundamental principles of counting, pigeonhole principle, countable and uncountable sets, principle of inclusion and exclusion, derangements, equivalence relations and partitions, partial order, lattices and Boolean algebra, generating functions, recurrence relations, solution of recurrences. | **7** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Graphs, Euler tours, planar graphs, Hamiltonian graphs, Euler's formula, applications of Kuratowski's theorem, graph coloring, | **6** | **20** |
| **MODULE: 6**  Chromatic polynomials, trees, weighted trees, shortest path algorithms, spanning trees, the max-flow min-cut theorem. | **5** | **20** |

**COURSE NO: 08CS 6221COURSE TITLE:INTERNETWORKING: PROTOCOLS AND SECURITY(L-T-P:3-0-0) CREDITS:3**

**Prerequisite: Computer Networks**

**Course Objectives:**

* To provide the students with the concepts of network services and architectures.
* Also to gain basic knowledge about network management security issues.

**Syllabus**

Networkservicesandapplications:DNS,HTTP,SMTP,peer-to-peersystems,Network transport architecture, Routing and forwarding, Network measurement, Security.

**Course Outcome:**

**After the completion of the Course, the students,**

* Would completely understand the various networking protocols.
* Understand the concept of various network services and architecture.
* Will have the ability to understand the fundamentals of several networking attacks.

**References**

1. James F Kuroseand Keith W. Ross ,"Computer Networking- A top Down Approach",FifthEdition,Addison-Wesley,2010.
2. L.Peterson and B.Davie, "Computer Networks: A Systems Approach", Fifth Edition, Elsevier Inc., 2011.
3. W.Richard Stevens,"TCP/IPIllustrated,Volume1: The Protocols", Addison- Wesley, 1994.

**COURSE PLAN**

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| **COURSE NO: 08CS 6221 COURSE TITLE:INTERNETWORKING: PROTOCOLS AND SECURITY (L-T-P: 3-0-0) CREDITS:3** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Networkservicesandapplications:DNS,HTTP,SMTP,peer-to-peersystems. | **8** | **15** |
| **MODULE: 2**  Network transport architecture, TCP, UDP, ICMP, TCP ,Congestion control | **5** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Routingandforwarding,intra-domainandinter-domainroutingalgorithms, Link layers and local area networks. | **7** | **15** |
| **MODULE: 4**  Ethernet, Wi-Fi, and mobility ,Multimedia communications and quality of service. | **6** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Network measurement ,inference ,and management, Network experimentation and performance analysis. | **6** | **20** |
| **MODULE: 6**  Security: ARP attacks and ARP poisoning, DNS attacks, SYN flood attacks and its mitigation, UDP ping-pong and fraggle attacks, TCP port scanning and reflection attacks. | **7** | **20** |

**COURSE NO: 08CS 6231 COURSE TITLE: ADVANCED CRYPTOGRAPHY**

**(L-T-P: 4-0-0) CREDITS: 4**

**Pre-requisites: Nil**

**Course Objectives:**

* To provide the students with the concepts of cryptography algorithms and schemes to handle the security issues.
* Also to gain basic knowledge about web security and message authentication.

**Syllabus**

Review of number theory and algebra, computational complexity,probabilityand informationtheory,primalitytesting,Cryptographyandcryptanalysis,Publickeyencryption,Messageauthentication.

**Course Outcome:**

**After the completion of the Course, the students,**

* Gain an idea related to Different kinds of Encryption and Decryption.
* Detailed Knowledge related to Different types of Cryptosystems.
* Values and Necessities of a digital Signature.

**References**

1. W.Mao,ModernCryptography:Theory&Practice,PearsonEducation,2004.
2. C. Kaufman, R. Perlman and M. Speciner, Network Security: PrivateCommunicationinapublicWorld,2/e, PrenticeHall,2002.
3. W. Stallings ,Cryptography and Network SecurityPrinciplesandpractice,3/e, PearsonEducationAsia,2003.
4. H. Delfsand H. Knebl, Introduction to Cryptography: Principles and Applications,Springer-Verlag,2002

**COURSE PLAN**

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| **COURSE NO: 08CS 6231 COURSE TITLE:ADVANCED CRYPTOGRAPHY**  **(L-T-P: 4-0-0) CREDITS: 4** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Review of number theory and algebra, computational complexity ,probability and information theory, primality testing. | **13** | **15** |
| **MODULE: 2**  Cryptography and cryptanalysis, symmetric key encryption ,DES ,Triple DES,AES, RC4,modesofoperation. | **13** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Public key encryption, RSA cryptosystem, Diffie-Hellman, elliptic curve cryptography. | **7** | **15** |
| **MODULE: 4**  Rabin, ElGamal, Goldwasser-Micali, Blum-Gold wasser cryptosystems. | **6** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Message authentication, digital signature algorithms. | **7** | **20** |
| **MODULE: 6**  Security handshake pitfalls, Strong password protocols. | **6** | **20** |

**COURSE NO: 08CS 6241 COURSE TITLE: ADVANCED COMPUTER ARCHITECTURE**

**(L-T-P: 3-0-0) CREDITS: 3**

**Prerequisite: Computer Organization and Design**

**Course Objectives:**

* To familiarize the students with the concepts of processor architecture ,support for parallelism and multiprocessors systems.

**Syllabus**

Performance evaluation, pipeline hazards, issues in pipelined processor implementation, Instruction level parallelism, Instruction and data cache organizations, Inter connection networks, New programming paradigms

**Course Outcome:**

**After the completion of the Course, the students,**

* Able to gain complete knowledge about the concepts of computer architecture and the various processors used in the recent past.
* Would have a clear knowledge of VLIV, RISCand CISC.
* Will have the ability to solve the problems related to efficiency, performance and various methods.

**References**

1. HennessyJ.L.,D.Patterson,ComputerArchitecture–AquantitativeApproach, MorganKoffman(3/e),2003
2. John Paul Shen,Mikko Lipasti. Modern Processor Design– Fundamentals of SuperscalarProcessors.McGrawHillInternationalEdition,2005.
3. DezsoSima ,Terence Fountain ,Peter Kacsuk .Advanced Computer Architecture–ADesignSpaceApproach,AddisonWesley,2000.
4. Fayez Gebali ,Algorithms and Parallel Computing John wiley and sons, Inc. Publication 2011

**COURSE PLAN**

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| **COURSE NO: 08CS 6241COURSE TITLE: ADVANCEDCOMPUTER ARCHITECTURE**  **(L-T-P: 3-0-0) CREDITS: 3** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Performance evaluation, processor architecture, pipelining, pipeline hazards, issues in pipelined process or implementation. | **10** | **15** |
| **MODULE: 2**  Instruction level parallelism, hardware and compiler support for branch prediction ,out-of-order Instruction issue, speculative execution and other techniques for high-performance | **10** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Instruction and data cache organizations ,multi-level caches, parallel memory systems, Support for virtual memory. | **5** | **15** |
| **MODULE: 4**  Inter-connection networks, shared memory system, memory models, cache coherence. | **5** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Multiple processor systems, Parallel algorithms architecture, Multicore processing. | **5** | **20** |
| **MODULE: 6**  New programming paradigms- Hadoop, map reduce. | **4** | **20** |

**COURSE NO:08CS 6251(A):COURSE TITLE:HIGH SPEED NETWORKS**

**(L-T-P: 3-0-0) Credits: 3**

**Prerequisite: Nil**

**Course Objectives:**

* To familiarize the students with the concepts of high speed networks like frame relays ,ATMs etc.
* Gives details about congestion control in high speed networks, discusses integrated and differentiated services etc.

**Syllabus**

Frame Relay Networks, Asynchronous transfer mode ,ATM Protocol Architecture, ATM logical Connection, ATM Cell, ATM Service Categories, TCP Flow control.

**Course Outcome:**

**After the completion of the Course, the students,**

* Describe and interpret the basics of high speed networking technologies.
* Optimize and troubleshoot high speed networks.
* Demonstrate the knowledge of network planning and optimization.

**References**

1. WilliamStallings,―HIGHSPEEDNETWORKSANDINTERNET‖,PearsonEducation, SecondEdition,2002.
2. Warland& Pravin Varaiya,―HIGH PERFORMANCE COMMUNICATION NETWORKS‖,JeanHarcourtAsiaPvt.Ltd.,IIEdition,2001.
3. Irvan Pepelnjk, Jim Guichard and Jeff Apcar,―MPLS and VPN architecture ‖,Cisco Press,Volume1and2,2003.

**COURSE PLAN**

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| **COURSE NO:08CS 6251(A):COURSE TITLE:HIGH SPEED NETWORKS**  **(L-T-P: 3-0-0) CREDITS: 3** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Frame Relay Networks–Asynchronous transfer mode –ATM Protocol Architecture, ATM logical Connection, ATM Cell–ATM Service Categories–AAL. High Speed LAN’s: Fast Ethernet, Gigabit Ethernet, Fibre Channel–Wireless LAN’s. | **8** | **15** |
| **MODULE: 2**  Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks –Frame Relay Congestion Control. | **7** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  TCPFlowcontrol–TCPCongestionControl–Retransmission–TimerManagement–ExponentialRTObackoff –KARN’s Algorithm– Window management– Performance of TCP over ATM. Traffic and Congestion controlin ATM– Requirements–Attributes. | **8** | **15** |
| **MODULE: 4**  Traffic Management Framework, Traffic Control–ABR traffic Management–ABR rate control, RM cell formats, ABR Capacity allocations– GFR traffic management. | **8** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Integrated Services Architecture–Approach, Components, Services-Queuing Discipline ,FQ,PS,BRFQ, GPS, WFQ–Random Early Detection, Differentiated Services. | **8** | **20** |
| **MODULE: 6**  RSVP–Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms–Multiprotocol Label Switching–Operations, Label Stacking, Protocol details –RTP–Protocol Architecture, Data Transfer Protocol, RTCP. | **9** | **20** |

**COURSE NO: 08CS 6251(B):COURSE TITLE:ADVANCED DISTRIBUTED COMPUTING**

**(L-T-P: 3-0-0) CREDITS: 3**

**Prerequisite: Distributed Systems**

**Course Objectives:**

* To familiarize the concepts of distributed systems and models.
* To Study the issues concerning Remote procedure call and distributed file systems.
* An introduction to issues concerning distributed transaction process in detail.

**Syllabus**

Characterization of Distributed Systems, System Models, Networking and Internetworking, Inter Process communication, Distributed Objects and Remote Invocation, RPC, Processes and threads.

**Course Outcome:**

**After the completion of the Course, the students,**

* Common scenarios & protocols in distributed system.
* Implementation issues and its feasible solutions.
* Implementation of various distributed algorithms.
* Concept of grid computing.

**References**

1. Coulouris G., Dollimore J. &Kindberg T., "Distributed Systems Concepts And Design", 3/e, Addison Wesley 2004
2. Tanenbaum S, Maarten V.S., Distributed Systems Principles and Paradigms, Pearson Education 2004
3. Chow R. & Johnson T., "Distributed Operating Systems and Algorithms", Addison Wesley 2003
4. Tanenbaum S., "Distributed Operating Systems", Pearson Education 2005
5. Frederic Magoules , Jie Pan , Kiat An Tan , Abhinit Kumar ,” Introduction to Grid Computing”, Chapman & Hall/CRC press 2009.

**COURSE PLAN**

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| **COURSE NO: 08CS 6251(B):TITLE:ADVANCED DISTRIBUTED COMPUTING(L-T-P: 3-0-0) CREDITS: 3** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Characterization of Distributed Systems, System Models, Networking and Internetworking. | **7** | **15** |
| **MODULE: 2**  Inter Process communication, Distributed Objects and Remote Invocation, RPC, Processes and threads. | **6** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Name Services and Domain Name System, Directory and Discovery Systems, Distributed File systems. | **6** | **15** |
| **MODULE: 4**  Transactions and Concurrency Control, Distributed Transactions, Distributed Deadlocks, Transaction Recovery, Fault-tolerant Services, Distributed Shared Memory. | **7** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Synchronizing physical clocks, logical time and logical clocks, Distributed Mutual Exclusion, Elections. | **6** | **20** |
| **MODULE: 6**  Grid Computing – motivation, comparison, Grid Architecture, GRID standards – OGSA, OGSI, WSRF Data management, Grid Scheduling and Information Services, Grid Workflow , Fault Tolerance in Grids , Security in Grid Computing. | **7** | **20** |

**COURSE NO: 08CS 6251(C):COURSE TITLE :COMPUTATIONAL INTELLIGENCE**

**(L-T-P: 3-0-0) CREDITS: 3**

**Prerequisite: Nil**

**Course Objectives:**

* To provide the students with the concepts of Artificial Intelligence and representation of knowledge.
* To familiarize fundamental models of machine learning and expert systems.
* Discuss various Languages and Programming Techniques for Artificial Intelligence.

**Syllabus:**

Artificial Intelligence: History and Applications, Production Systems, Structures and Strategies for state space search- Data driven and goal driven search.Depth First and Breadth First Search, Knowledge representation - Propositional calculus, Predicate Calculus, Theorem proving by Resolution, Answer Extraction.

**Course Outcome:**

**After the completion of the Course, the students,**

* The students can able to understand the basic concepts of Artificial Intelligence, Knowledge representations, Machine Learning in terms Genetic algorithm.
* They can also able understand the basic functionalities of artificial Intelligence tools.

**References**

1. GEORGE.F.LUGER, Artificial Intelligence- Structures and Strategies for Complex Problem Solving, 4/e, 2002, Pearson Education.
2. E. RICH, K.KNIGHT, Artificial Intelligence, 2/e, Tata McGraw Hill WINSTON. P. H, LISP, Addison Wesley
3. IVAN BRATKO, Prolog Programming for Artificial Intelligence, 3/e, Addison Wesley, 2000
4. Online documentation for Octave.

**COURSE PLAN**

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| **COURSE NO: 08CS 6251(C):COURSE TITLE:COMPUTATIONAL INTELLIGENCE**  **( L-T-P: 3-0-0) CREDITS: 3** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Artificial Intelligence: History and Applications, Production Systems, Structures and Strategies for state space search- Data driven and goal driven search. | **7** | **15** |
| **MODULE: 2**  Depth First and Breadth First Search, DFS with Iterative Deepening, Heuristic Search- Best First Search, A\* Algorithm, AO\* Algorithm, Constraint Satisfaction, Using heuristics in games- Minimax Search, Alpha Beta Procedure. | **6** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE :3**  Knowledge representation - Propositional calculus, Predicate Calculus, Theorem proving by Resolution, Answer Extraction | **5** | **15** |
| **MODULE: 4**  AI Representational Schemes- Semantic Nets, ConceptualDependency, Scripts, Frames, Introduction to Agent based problem solving. | **6** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE :5**  Machine Learning- Symbol based and Connectionist, Social and Emergent models of learning, The Genetic Algorithm- Genetic Programming, Overview of Expert System Technology- Rule based Expert Systems, Introduction to Natural Language Processing. | **9** | **20** |
| **MODULE: 6**  Languages and Programming Techniques for AI- Introduction to PROLOG and LISP. Search strategies and Logic Programming in LISP, Production System examples in PROLOG[Programming in Octave/Matlab]. | **9** | **20** |

**Course No: 08GN 6101,Course Title: Research Methodology**

**(L-T-P: 0-2-0) CREDITS: 2**

**Course No: 08CS 6271 Course Title:Seminar**

**Credits: 2**

**Course Objectives:**

* To assess the debating capability of the student to present a technical topic.
* Also to impart training to a student to face audience and present his/her ideas.
* Creating self-esteem and courage that are essential for an engineer*.*

Each student is expected to present a seminar on a topic of current relevance in Cyber/Information Security or Forensics for about 45 minutes. They are expected to refer current research and review papers from standard journals like ACM,IEEE, JPDCetc.–at least three cross references must be used-the seminar report must not be the reproduction of the original paper. A committee consisting of at least three faculty members shall assess the presentation of the seminar and award marks to the students based on merits of topic of presentation. Each student shall submit two copies of a write up of the seminar topic. One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library .Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

**Course No: 08CS 6281 Course Title:Advanced Networking Lab**

**Credits:1**

1. Introduction to NS2 and TCL
2. Simulate a simple network with 2 nodes using NS2
3. Simulate a network with 4 nodes using NS2
4. Simulate any one multicast routing protocol using NS2
5. Implement broadcasting in wired network
6. Implement a simple wireless network
7. Implement link state routing using NS2
8. Implementation of TCP cubic in NS2
9. Familiarization of cyber forensic tool
10. Familiarization of security auditing tools

**SEMESTER II**

**COURSE NO: 08CS6212 COURSE TITLE: MOBILE AND WIRELESS NETWORK SECURITY**

**(L-T-P: 3-0-0) CREDITS: 3**

**Pre-requisite: Nil**

**Course Objectives:**

* To teach the transmission fundamentals and Wireless System Operations and Standards.
* To discuss the issues concerning various threats to wireless networks, encryption and decryption.
* To provide students with the concepts of security mechanisms for Blue-tooth, WLAN, WIMAX, satellite network etc.

**Syllabus**

Transmission Fundamentals. Satellite Networks, Threats to Wireless networks, Risks.

**Course Outcome:**

**After the completion of the Course, the students,**

* Gain detailed idea related to Antenna, wave propagation.
* They are able to gain Ideas related to threats to Wireless networks, ESM, ECM and ECCM.
* Different kinds of Encryption and decryption mechanisms in GSM are discussed in detail.
* How to provide Access point based security using different mechanisms is discussed in detail.

**References**

1. KavehPahlavan and Preshant Krishnamurthy, Principles Wireless Networks, Prentice Hall, 2006.
2. Cyrus Peikari and Seth Fogie, °Maximum Wireless Security Sams, 2002.
3. Hideki /mai, Mohammad Ghulam Rahman and Kazukuni Koba "Wireless Communications Security, Universal Persor Communications of Adech House, 2006.
4. Stallings William, "Wireless Communications and Network: Second Edition, Pearson Education Ltd, 2009.
5. Jon Edney and William A. Arbaugh, " Real 802.11 Security: Wi Protected Access and 802.11i", Addison-Wesley Professional

**COURSE PLAN**

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| **COURSE NO: 08CS6212**  **COURSE TITLE: MOBILE AND WIRELESS NETWORK SECURITY** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Transmission Fundamentals, Antennas and Wave Propagation Cellular Wireless networks, Third Generation Systems, 4G, Signal Encoding Techniques, Spread Spectrum, Coding and Error Control, Multiple Access in Wireless Systems. | **13** | **15** |
| **MODULE: 2**  Satellite Networks, Wireless System Operations and Standards. Wi-Max and Ultra Wide Band technologies, Mobile IP and Wireless Access: Protocol. Wireless LAN Technology, Wi-Fi and IEEE 802.11 Wireless LAN Standard, Blue-tooth and IEEE 802.15 standard. | **13** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Threats to Wireless networks, ESM, ECM and ECCM, Proliferation of device and technologies, Practical aspects, Wireless availability, Privacy Challenges. | **7** | **15** |
| **MODULE: 4**  Risks: Denial of Service, Insertion Attacks, interception and monitoring wireless traffic, Misconfiguration. Wireless Attack: Surveillance, War Driving, Client-to-Client Hacking, Rogue Access Points, Jamming and Denial of Service. | **6** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Authentication, Encryption, Decryption in GSM, Securing the WLAN, WEP Introduction, RC Encryption, Data Analysis, IV Collision, Key Extraction, WEP Cracking WPA/ WPA2, AES. | **7** | **20** |
| **MODULE: 6**  Access Point-Based Security Measures Thin Party Security Methods, Funk's Steel-Belted Radius, VVLAN Protection Enhancements, Blue-tooth Security Implementation, Security in WI MAX, UWB security, Satellite network security. | **6** | **20** |

**COURSE NO: 08CS6222 COURSE TITLE: SECURE CODING**

**(L-T-P: 3-0-0)CREDITS: 3**

**Course Objectives:**

* To provide the students with the concepts of secure programming, threat modelling, attacks, resource management and secure testing methodologies.

**Syllabus**

A brief overview of Application Security and Secure Programming concepts. Secure Coding in Java and Web Applications, Resource leaks and resource lifetime management.

**Course Outcome:**

**After the completion of the Course, the students,**

* Would have provided a detailed description of different threats that could affect a piece of code.
* Ability to understand the various injection attacks mechanisms.
* Would have a clear knowledge about the various secured software testing techniques.

**References**

1. Robert C. Seaford, 'Secure Coding in C and C++', Addison-Wesley Professional, 2005.
2. James A. Whittaker and Herbert H. Thompson, "How to Break Software Security", Addison Wesley, 2003
3. John C. Mitchell and Krzysztof Apt, "Concepts in Programming Languages", Cambridge University Press, 2001.

**COURSE PLAN**

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| **COURSE NO: 08CS6222**  **COURSE TITLE:SECURE CODING** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  A brief overview of Application Security and Secure Programming concepts. Secure Coding in C and C++, Stack overflow, Strings, Integers, Arrays, File I/O, Race conditions, Signal handling, Recommended Practice. | **10** | **15** |
| **MODULE: 2**  Secure Coding in Java and Web Applications-Web as a primary vector for Cyber-attacks, Anatomy of attacks, data breach case studies, Threat modelling, Cross Site Scripting (XSS) vulnerabilities, Injection flaws (SQL, process, path etc.), Buffer overflows. | **9** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Resource leaks and resource lifetime management, Threat modeling and Security design review. | **4** | **15** |
| **MODULE: 4**  Software Assurance and Testing-Software Assurance overview, Testing threat categories, Assessing Risk. | **5** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| Secure Testing Methodologies - Attacking Dependencies, Attacking through the User Interface, Attacking Design, Attacking Implementation. | **5** | **20** |
| Software engineering practices for development of high assurance code, Model Checking, Static Analysis techniques for analysing software. | **6** | **20** |

**COURSE NO: 08CS6232 COURSE TITLE: DIGITAL FORENSICS**

**(L-T-P: 3-0-0) CREDITS: 3**

**Prerequisite: Computer Organization**

**Course Objectives:**

* To provide the students with the concepts security audit mechanisms for various file systems, database and networks.
* An introduction to applications of digital forensic analysis in mobile and smart phones and vehicular systems are also given.

**Syllabus**

Framework for digital forensic evidence collection and processing Auditing and security architecture, Forensic Analysis of Database.

**Course Outcome:**

**After the completion of the Course, the students,**

* Able to get the fundamental concepts of security audit mechanisms for various file systems.
* Understand the fundamentals of forensic analysis of database systems.
* Would have clear knowledge about the fundamentals of host forensics for Microsoft and Linux OS.

**References**

1. K. J. Jones, R. Beftlich and C. W. Rose, Real Digital Forensics', Addison- Wesley, 2006.
2. D. P Bovet and M. Cesati, "Understanding the Linux Kernel", Third Edition, O'Reiry, 2006.
3. B. Carrier, "File System Forensic Analysis", Addison- Wesley, 2005.
4. M. Russinovich, D. A. Soiomon and A. lonescu, "Windows InternalsTM, Fifth Edition, Microsoft Press, 2008.
5. Chang-Tsun Li, "Multimedia Forensics and Security", Information Science Reference, Hershey, New York, 2008.
6. Online Documentation of MySQL,MariaDB and PostgreSQL.

**COURSE PLAN**

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| **COURSE NO: 08CS6232**  **COURSE TITLE:DIGITAL FORENSICS** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Framework for digital forensic evidence collection and processing. Fundamentals of host forensics for Microsoft windows, including kernel architecture, device driver architecture, registry. | **5** | **15** |
| **MODULE: 2**  Auditing and security architecture, file system handling, reconstruction of files and directory structures on the FAT and NTFS file system families. | **5** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Fundamentals of host forensics for UNIX derivatives use the Linux operating system, including kernel and device drives architecture, security and audit mechanisms, file system and pseudo file systems, and the reconstruction of file and directory structures using UFS and Ext2/3fs as exemplars. | **9** | **15** |
| **MODULE: 4**  Forensic Analysis of Database Systems [MySQL/Maria DB/Postgre SQL], Database Tampering, Forensic analysis of Database Components, table storage, transaction log, indexes, Forensic recovery for table storage. | **5** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| Fundamentals of network forensics from data capturing and collection to network file systems and supplementary protocols and selection application layer protocols and techniques used for identifying and reverse- engineering protocols used on networks | **6** | **20** |
| Application to malware detection, anti-forensic and propagation techniques, Application to stenographic and steganalysis, Application to non-standard storage mechanisms like mobile and smart phones and vehicular systems and network based search and storage mechanism. | **9** | **20** |

**COURSE NO: 08CS6242(A) COURSE TITLE:DATA COMPRESSION**

**(L-T-P:3-0-0)CREDITS: 3**

**Prerequisite: Nil**

**Course Objective:**

* To familiarize the students with the different data compression techniques for image Compression, audio compression, video compression etc.
* Also gives a comparison of different compression algorithms and their implementation.

**Syllabus**

Dictionary Methods ,Image Compression, Wavelet Methods, Video compression.

**Course Outcome:**

* Able to gain knowledge about the different data compression techniques like image compression, audio compression, video compression.
* A comparative study on different compression algorithms used.

**References**

1. David Solomon, *Data compression: the complete reference*, 2nd edition, Springerverlag ,New York. 2000.
2. Stephen Welstead, *Fractal and wavelet Image Compression techniques*, PHI, NewDelhi-1, 1999.
3. Khalid Sayood, *Introduction to data compression*, Morgan Kaufmann Publishers, 2003 reprint

**COURSE PLAN**

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| **COURSE NO: 08CS6242(A)**  **COURSE TITLE:DATA COMPRESSION** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Introduction, Basic Techniques, Dictionary Methods. | **8** | **15** |
| **MODULE: 2**  Image Compression, Transform based techniques. | **5** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Wavelet Methods, adaptive techniques | **5** | **15** |
| **MODULE: 4**  Video compression, Audio Compression, Fractal techniques. | **6** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Comparison of compression algorithms. | **7** | **20** |
| **MODULE: 6**  Implementation of compression algorithms. | **8** | **20** |

**COURSE NO: 08CS6242(B) COURSE TITLE:INTERACTIVE PROGRAMMING WITH PYTHON**

**(L-T-P:3-0-0) CREDITS: 3**

**Prerequisite: Web Systems and Network Security**

**Course Objectives:**

* To familiarize the students with the concept of Interactive programming with python.

**Syllabus**

Introduction to Interpreted Languages and Python - Multithreading and Concurrency, Web Servers and Client scripting.

**Course Outcome:**

**After the completion of the Course, the students,**

* Detailed Study on different Programming Constructs in Python.
* How to perform the Web Browser Emulation is discussed with proper effective examples.
* Implementation of Immunity Debuggers and Libs are discussed along with Scraping Web Application.

**References**

1. Mike Dawson,‖More Python programming for Absolute Beginner‖, Cengage Learning PTR; 3rd edition,2010, ISBN-10: 1435455002, ISBN-13: 978-14354550092.
2. Mark Lutz,‖ Python Pocket reference‖, O'Reilly Media; 4th edition ,2009,ISBN-10: 0596158084, ISBN-13: 978-0596158088

**COURSE PLAN**

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| **COURSE NO: 08CS6242(B)**  **COURSE TITLE: INTERACTIVE PROGRAMMING WITH PYTHON** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Introduction to Interpreted Languages and Python - Data Types and variables - Operators and Expressions - Program Structure and Control - Functions and Functional Programming - Classes, Objects and other OOPS concepts . I/O in Python - File and Directory Access. | **7** | **15** |
| **MODULE: 2**  Multithreading and Concurrency - Inter Process Communication (IPC) - Permissions and Controls , Raw Socket basics -Socket Libraries and Functionality. | **6** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Programming Servers and Clients - Programming Wired and Wireless Sniffers - Programming arbitrary packet injectors - PCAP file parsing and analysis. | **7** | **15** |
| **MODULE: 4**  Web Servers and Client scripting - Web Application Fuzzers - Scraping Web Applications – HTML and XML file analysis. | **7** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Web Browser Emulation - Attacking Web Services - Application Proxies and Data Mangling - Automation of attacks such as SQL Injection, XSS etc. | **6** | **20** |
| **MODULE: 6**  Exploit Development techniques - Immunity Debuggers and Libs - Writing plugins in Python - Binary data analysis - Exploit analysis Automation. | **6** | **20** |

**COURSE NO: 08CS6242(C) COURSE TITLE: COMPUTER AND INFORMATION SECURITY MANAGEMENT**

**(L-T-P:3-0-0) CREDITS: 3**

**Prerequisite: Knowledge of TCP/IP, Cryptography and Network Security is preferred**

**Course Objectives:**

* To learn how to manage computer and information security aspects.
* Provides methods to develop new framework for information security, overview of security risk assessment and management and security planning in an organization.

**Syllabus**

The big picture-Learning from experience-Risk assessment-Measuring ROI on security-Overview of SSE CMM

**Course Outcome:**

**After the completion of the Course, the students,**

* Gain knowledge on Effective on Risk Assessment Techniques.
* How to create a path for the security of the software.
* Different mechanisms to establish configuration management.
* Implementation of Information security management in Health care industry is discussed in detail.

**References:**

1. Donn Parkers, ― Fighting Computer Crime: A New Framework for Protecting Information‖, John Wiley& Sons, 2003
2. Micki Krause, Harold F.Tripton, ― Information Security Management Handbook‖, Auerbach Publications, 2012.

**COURSE PLAN**

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| **COURSE NO: 08CS6242(C)**  **COURSE TITLE: COMPUTER AND INFORMATION SECURITY MANAGEMENT** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  The big picture-Learning from experience-Weaknesses in Information Security-The extent of crime in cyberspace- The cyberspace crimoid syndrome-Policies and technologies- A new framework for information security. | **6** | **15** |
| **MODULE: 2**  Risk assessment-Richard Baskerville’s risk assessment methodology- Generations of risk assessment techniques- Quantitative approach to risk assessment-Problems with Quantitative approach – NIST ALE- Baseline approach. | **5** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Measuring ROI on security- Security patch management- Purposes of Information Security management- The building blocks of information security- Human side of information security-Security management- Securing new information technology. | **9** | **15** |
| **MODULE: 4**  Overview of SSE CMM- SSE CMM relationship to other initiatives- Capability levels. | **5** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Security Engineering- Security Engineering process overview- Basic process areas- Configuration management- Base practices- Establish configuration management .Security Engineering- Security Engineering process overview- Basic process areas- Configuration management- Base practices- Establish configuration management . | **6** | **20** |
| **MODULE: 6**  Maintaining information security during downsizing- Business case for Information Security- Information Security Management in healthcare industry- Protecting high tech trade secrets- Outsourcing Security. | **8** | **20** |

**COURSE NO: 08CS6252(A) COURSE TITLE:COMPUTER LAW AND ETHICS**

**(L-T-P:3-0-0) CREDITS: 3**

**CourseObjectives:**

* To provide the students with the concepts of Intellectual property rights, issues in equipment contracts.
* Discusses the ethical issues in computer security, cyber laws in India and IT Act 2000.

**Syllabus**

Intellectual property rights, Computer contracts**,** Computer crime, computer fraud, hacking

**Course Outcome:**

**After the completion of the Course, the students,**

* can able to identify the ethical issues surrounding computers and it causes.
* can able enhance their analytical skills to solve the problems.

**References**

1. D. Bainbridge, *Introduction to Computer Law*, 5/e, Pearson Education, 2004.
2. P. Duggal, *Cyber law: the Indian Perspective*, 2005.
3. C. P. Fleeger and S. L. Fleeger, *Security in Computing*, 3/e, Pearson Education, 2003

**COURSE PLAN**

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| **COURSE NO: 08CS6252(A)**  **COURSE TITLE: COMPUTER LAW AND ETHICS** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Intellectual property rights, computer software copyrights, copyright in databases and electronic publishing. | **6** | **15** |
| **MODULE: 2**  Law of confidence, patent laws, trademarks, product designs, international law. | **5** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Computer contracts, liability for defective hardware and software, software contracts, web and hardware contracts, electronic contracts and torts, liabilities. | **8** | **15** |
| **MODULE: 4**  Computer crime, computer fraud, hacking, unauthorized modification of information, piracy, computer pornography and harassment. | **7** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Cyber laws in India, IT Act 2000, data subjects’ rights. | **7** | **20** |
| **MODULE: 6**  Ethical issues in computer security, case studies. | **6** | **20** |

**COURSE NO: 08CS6252(B) COURSE TITLE: BIO-INFORMATICS**

**(L-T-P:3-0-0) CREDITS: 3**

**Course Objectives:**

* Gives students an introduction to the area of Bio-informatics and various concepts related to bio- informatics such as search engines, data mining, pattern matching etc.

**Syllabus**

The Central Dogma – The search process-Statistical concepts-Data Mining.

**Course Outcome:**

* The students can able to understand the basic terminology of bioinformatics, types of biological databases, data storage and retrieval and sequence alignments.

**References**

1. Bryan Bergeron, ―Bio Informatics Computing‖, Second Edition, Pearson Education,2003.
2. D. E. Krane and M. L. Raymer, Fundamental Concepts of Bioinformatics, Pearson Education, 2003.
3. T. K. Attwood and D. J. Parry-Smith, Introduction to Bioinformatics, Pearson Education, 2003.
4. J. H. Zar, Biostatistical Analysis, 4/e, Pearson Education, 1999.

**COURSE PLAN**

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| **COURSE NO: 08CS6252(B)**  **COURSE TITLE:BIO-INFORMATICS** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  The Central Dogma – The Killer Application – Parallel Universes – Watson’s Definition– Top Down Versus Bottom up – Information Flow – Convergence – Databases – Data Management – Data Life Cycle – Database Technology – Interfaces – Implementation –Networks – Geographical Scope – Communication Models – Transmissions Technology– Protocols – Bandwidth – Topology – Hardware – Contents – Security – Ownership –Implementation – Management. | **7** | **15** |
| **MODULE: 2**  Statistical concepts – Microarrays – Imperfect Data – Randomness – Variability –Approximation – Interface Noise – Assumptions – Sampling and Distributions –Hypothesis Testing – Quantifying Randomness – Data Analysis – Tool selection-statistics of Alignment – Clustering and Classification. | **7** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Statistical concepts – Microarrays – Imperfect Data – Randomness – Variability –Approximation – Interface Noise – Assumptions – Sampling and Distributions –Hypothesis Testing – Quantifying Randomness – Data Analysis – Tool selection-statistics of Alignment – Clustering and Classification . | **6** | **15** |
| **MODULE: 4**  Data Mining – Methods – Selection and Sampling – Pre processing and Cleaning – Transformation and Reduction – Data Mining Methods – Evaluation – Visualization – Designing new queries – Pattern Recognition and Discovery – Machine Learning – Text Mining – Tools. | **6** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Pair wise sequence alignment – Local versus global alignment –Multiple sequence alignment – Computational methods – Dot Matrix analysis – Substitution matrices –Dynamic Programming – Word methods – Bayesian methods – Multiple sequence alignment – Dynamic Programming – Progressive strategies – Iterative strategies – Tools– Nucleotide Pattern Matching – Polypeptide pattern matching – Utilities – Sequence Databases. | **6** | **20** |
| **MODULE: 6**  Drug Discovery – components – process – Perspectives – Numeric considerations – Algorithms – Hardware – Issues – Protein structure – Ab Initio Methods– Heuristic methods – Systems Biology – Tools – Collaboration and Communications –standards - Issues – Security – Intellectual property. | **7** | **20** |

**COURSE NO: 08CS6252(C) COURSE TITLE :SOFT COMPUTING**

**(L-T-P:3-0-0) CREDITS: 3**

**Course Objectives:**

* To provide the students with the concepts of soft computing techniques such as neural networks, fuzzy systems, genetic algorithms etc.

**Syllabus**

Evolution of Computing -.Supervised Learning Neural Networks-Fuzzy Sets.

**Course Outcome:**

* Able to understand the basic concepts of fuzzy neural network and genetic algorithm.
* Students can the improve the performance of any system integrated with soft computing.
* Ability to hybrid soft computing mechanisms.

**References:**

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, ―Neuro-Fuzzy and Soft Computing‖, Prentice-Hall of India, 2003.
2. James A. Freeman and David M. Skapura, ―Neural Networks Algorithms, Applications, and Programming Techniques‖, Pearson Edn., 2003.
3. George J. Klir and Bo Yuan, ―Fuzzy Sets and Fuzzy Logic-Theory and Applications‖, Prentice Hall, 1995.
4. Amit Konar, ―Artificial Intelligence and Soft Computing‖, First Edition, CRC Press, 2000.
5. Simon Haykin, ―Neural Networks: A Comprehensive Foundation‖, Second Edition Prentice Hall, 1999.
6. Mitchell Melanie, ―An Introduction to Genetic Algorithm‖, Prentice Hall,1998.
7. David E. Goldberg, ―Genetic Algorithms in Search, Optimization and Machine Learning‖, Addison Wesley, 1997.

**COURSE PLAN**

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| **COURSE NO: 08CS6252(C)**  **COURSE TITLE:SOFT COMPUTING** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Adaptive Networks – Feed forward Networks. | **9** | **15** |
| **MODULE: 2**  Supervised Learning Neural Networks – Radia Basis Function Networks - Reinforcement Learning –Unsupervised Learning Neural Networks – Adaptive Resonance architectures | **5** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations - Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Logic – Fuzzy Expert Systems – Fuzzy Decision Making. | **5** | **15** |
| **MODULE: 4**  Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling –  Classification and Regression Trees. | **5** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Data Clustering Algorithms – Rule base Structure Identification – Neuro-Fuzzy Control. | **5** | **20** |
| **MODULE: 6**  Machine Learning Techniques – Machine Learning Using Neural Nets – Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition. Support Vector Machines for Learning – Linear Learning Machines – Support Vector Classification – Support Vector Regression -Applications. | **10** | **20** |

**COURSE NO: 08CS6262 COURSE TITLE: MINI PROJECT**

**CREDITS: 2**

**Course Objectives:**

* To estimate the ability of the student in transforming the theoretical knowledge studied so far into a working model of a computer / information system.
* Enabling the students to gain experience in organisation and implementation of a small project and thus acquire the necessary confidence to carry out main project in the final year.

**COURSE NO: 08CS6272COURSE TITLE:CYBER SECURITY LABORATORY**

**CREDITS: 1**

1. Implementation of Substitution and Transposition ciphers

2. Implementation of Data Encryption Standard

3. Implementation of International Data Encryption Algorithm

4. Implementation of Advanced Encryption Standard

5. Implementation of RSA Algorithm

6. Implementation of Diffie-Hellman Key Exchange

7. Implementation of Message Authentication Codes

8. Implementation of Hash functions

9. Implementation of Digital Signature Standard

10. Hiding of confidential information within Image

11. Implementation in FOSS based security mechanisms’

**SEMESTER 3**

**COURSE NO: 08CS 7213(A) COURSE TITLE:DIGITAL WATERMARKING**

**(L-T-P : 3-0-0) CREDITS: 3**

**Pre-requisites: Nil**

**Course Objectives:**

* To provide the students with the concepts of modelling of watermarking, message coding.
* Also to gain knowledge in Watermark security and cryptography.

**Syllabus**

Watermarking host signals: Image, Video, Audio. Multimedia compression and decompression, Lossless compression, Modeling watermark detection by correlation.

**Course Outcome:**

* The students can able to understand the different authentication methodology.
* They can also understand about the copyright protection of their materials.

**References**

1. Cox I., M. Miller, J. Bloom, J. Fridrich and T Kalker, "Digital Watermarking and Steganography", Second Edition, Morgan Kaufmann Publishers, 2008.

**COURSE PLAN**

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| **COURSE NO: 08CS 7213(A) COURSE TITLE: DIGITAL WATERMARKING**  **( L-T-P: 3-0-0) CREDITS: 3** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks%** |
| **MODULE: 1**  Watermarking host signals: Image, Video, Audio. Multimedia compression and decompression, Lossless compression. | **6** | **15** |
| **MODULE: 2**  Models of watermarking, Communication-based models of watermarking. Geometric models of watermarking, Modeling watermark detection by correlation. | **7** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Basic message coding, Mapping message into message vectors, Error correction coding, detecting multi-symbol watermarks, Watermarking with side information. | **7** | **15** |
| **MODULE: 4**  Informed embedding, Informed coding, structured dirty-paper codes, Analyzing errors, Message errors, ROC curves, The effect of whitening on error rates, Analysis of normalized correlation, Using perceptual models. | **8** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Evaluating perceptual impact of watermarks, General forms of a perceptual model, Perceptual adaptive watermarking, Robust watermarking. | **6** | **20** |
| **MODULE: 6**  Watermark security, Watermark security and cryptography, Content authentication, Exact authentication, Selective authentication, Localization, Restoration. | **5** | **20** |

**COURSE NO: 08CS 7213(B) : COURSE TITLE:MATHEMATICAL MODELS OF INTERNET**

**(L-T-P: 3-0-0) CREDITS: 3**

**Pre-requisites: Nil**

**Course Objectives:**

* To provide the students with the concepts of modeling the queuing systems and moving networks.
* Also to know the applications of various models used in internet based applications.

**Syllabus**

Definition and characteristics of mathematical models, Modeling the network - queuing systems, modeling the QoS for improvement.

**Course Outcome:**

* Able to gain complete knowledge about queuing systems.
* Understand the various internet based applications models.

**References**

1. Harold Tipton, Micki Krause, *Information Security Management Handbook*, 5thEdition, Auerbach / CRC Press 2004
2. Seymour Bosworth, M E Kabay .*Computer Security Handbook*, 4th Edition. John Wiley, 2002.
3. Theo Dimitrakos, Fabio Martinelli, (Editors). *Formal Aspects in Security and Trust:* Proceedings of IFIP Workshop on Formal Aspects in Security and Trust (FAST) 2004
4. Ali E Abdallah, Peter Ryan, Steve Schneider (Editors). *Formal Aspects of Security:* Proceedings of First International Conference, FASec 2002. LNCS 2629, Springer2003
5. Markus Schumacher. *Security Engineering with patterns: origins, theoretical model, Andnew applications.* LNCS 2754, Springer

**COURSE PLAN**

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| **COURSE NO: 08CS 7213(B) COURSE TITLE: MATHEMATICAL MODELS OF INTERNET (L-T-P: 3-0-0) CREDITS:3** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE : 1**  Definition and characteristics of mathematical models. | **10** | **15** |
| **MODULE : 2**  Modeling the network - queuing systems, modeling the QoS for improvement. | **5** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE : 3**  Mathematical models of fairness and stability**.** | **5** | **15** |
| **MODULE : 4**  Modeling a self-managed internet. Moving away from the end to end concept. | **9** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE : 5**  Modeling required in an untrustworthy world. | **5** | **20** |
| **MODULE : 6**  Modeling of an internet based application. | **5** | **20** |

**COURSE NO: 08CS 7213(C) COURSE TITLE: DATABASE SECURITY**

**(L-T-P: 3-0-0) CREDITS: 3**

**Pre-requisites: Nil**

**Course Objectives:**

* To provide the students with the concepts of modeling database, authentication and access control mechanisms.
* Also to know the various issues concerning private database management.

**Syllabus**

Introduction to databases: database modeling, conceptual database design, overview of SQL and relational algebra, Access control mechanisms in general computing systems: Lampson's access controi matrix. Mandatory access control

**Course Outcome:**

* Students can able to understand the risk analysis of large database.
* They also understand how to setup privilege, Audit, Back-up and Restore the databases.

**References**

1. Ron Ben Natan, "Implementing Database Security and Auditing", Elsevier, 2005.
2. Hassan A. Afyouni, "Database Security and Auditing: Protecting Data Integrity and Accessibility", Course Technology, 2005.
3. Michael Gertz and Sushi! Jajodia, "Handbook of Database Security—Applications and Trends", Springer, 2008.

**COURSE PLAN**

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| **COURSE NO: 08CS 7213(C) COURSE TITLE: DATABASE SECURITY**  **(L-T-P: 3-0-0) CREDITS: 3** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Introduction to databases: database modeling, conceptual database design, overview of SQL and relational algebra | **10** | **15** |
| **MODULE: 2**  Access control mechanisms in general computing systems: Lampson's access controi matrix. Mandatory access control | **9** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Authentication mechanisms in databases, DAC in databases: Griffiths and Wade. | **5** | **15** |
| **MODULE: 4**  MAC mechanisms in databases: SeaView. RBAC in databases, SQL Injection, Auditing in databases, Statistical inferencing in databases, | **5** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Private information retrieval viewed as a database access problem. | **5** | **20** |
| **MODULE:6**  Privacy in data publishing, Virtual Private Databases, Security of outsourced databases. | **5** | **20** |

**COURSE NO: 08CS 7223(A) COURSE TITLE:CLOUD AND UTILITY COMPUTING**

**(L-T-P: 3-0-0) CREDITS: 3**

**Pre-requisites: Nil**

**Course Objectives:**

* To provide the students with concept of on-demand network access to a shared pool of configurable computing.

**Syllabus**

Introduction to Cloud Computing- The Evolution of Cloud Computing – Hardware

Evolution – Internet Software ,Interoperability Standards for Data Center Management, Software Utility Application Architecture

**Course Outcome:**

* Students can able to compare the operation, implementation and performance of cloud computing systems, and the relative merits and suitability of each for complex data-intensive applications.
* They can able to nexplain and characterise different cloud computing models, namely, infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS)
* They will identify security implications in cloud computing

**References**

1. John W. Rittinghouse and ames F. Ransome, ―Cloud Computing Implementation, Management and Security‖, CRC Press, Taylor & Francis Group, Boca Raton London New York. 2010 [Unit -11 and Unit II]
2. Alfredo Mendoza, ―Utility Computing Technologies, Standards, and Strategies‖, Artech House INC, 2007. [Unit -11I to Unit V]
3. Guy Bunker and Darren Thomson, ―Delivering Utility Computing‖, John Wiley & Sons Ltd, 2006.

**COURSE PLAN**

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| **COURSE NO: 08CS 7223(A) COURSE TITLE: CLOUD AND UTILITY COMPUTING (L-T-P: 3-0-0) CREDITS: 3** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Introduction to Cloud Computing- The Evolution of Cloud Computing – Hardware Evolution – Internet Software Evolution – Server Virtualization - Web Services Deliver from the Cloud – Communication-as-a-Service – Infrastructure-as-a-Service – Monitoring-as-a-Service – Platform-as-a-Service – Software-as-a-Service – Building Cloud Network. | **5** | **15** |
| **MODULE: 2**  Federation in the Cloud - Presence in the Cloud - Privacy and its Relation to Cloud-Based Information Systems – Security in the Cloud - Common Standards in the Cloud – End-User Access to the Cloud Computing | **5** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Introduction - Advancing towards a Utility Model – Evolving IT infrastructure – Evolving Software Applications – Continuum of Utilities- Standards and Working Groups – Standards Bodies and Working Groups – Service Oriented Architecture – Business Process Execution Language. | **5** | **15** |
| **MODULE: 4**  Interoperability Standards for Data Center Management - Utility Computing Technology – Virtualization – Hyper Threading – Blade Servers - Automated Provisioning - Policy Based Automation – Application Management – Evaluating Utility Management Technology - Virtual Test and development Environment - Data Center Challenges and Solutions - Automating the Data Center . | **5** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Software Utility Application Architecture - Characteristics of an SaaS - Software Utility Applications - Cost Versus Value - Software Application Services Framework – Common Enablers – Conceptual view to Reality – Business Profits - Implementing Database Systems for Multitenant Architecture. | **10** | **20** |
| **MODULE: 6**  Other Design Considerations - Design of a Web Services Metering Interface – Application Monitoring Implementation - A Design for an Update and Notification Policy - Transforming to Software as a Service - Application Transformation Program – Business Model Scenarios - Virtual Services for Organizations - The Future. | **9** | **20** |

**COURSE NO: 08CS 7223(B) COURSE TITLE:CRYPTO COMPLEXITY**

**(L-T-P: 3-0-0) CREDITS: 3**

**Pre-requisites: Nil**

**Course Objective:**

* To provide the students with the concepts of cryptology and complexity theory.
* Also to know the different protocols like diffiehellman, elgamaletc and randomized algorithms and complexity classes.

**Syllabus**

Review of Relevant Mathematics, Complexity Theory, Foundations of Cryptology,

Hierarchies based on NP.,Randomized algorithms and Complexity classes.

**Course Outcome:**

* Student gain knowledge on various factoring methods.
* RSA Cryptosystem is discussed in detail.
* Various advantages of performing Primality Tests in the field of advanced cryptology is given.

**References:**

1. Jorg Roth, *Complexity Theory and Cryptology – An introduction to crypto complexity*, Springer, 2005.
2. 2.H. Anton, *Elementary Linear algebra*, John Wiley and Sons, New York, eighth edition,2000.
3. G. Brassard. *A note on the complexity of cryptography*, IEEE Transactions on Information Theory, 25(2):232-233, 1979

**COURSE PLAN**

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| **COURSE NO: 08CS 7223(B) COURSE TITLE: CRYPTO COMPLEXITY**  **(L-T-P: 3-0-0) CREDITS: 3** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **MODULE: 1**  Review of Relevant Mathematics, Complexity Theory, Foundations of Cryptology, Hierarchies based on NP. | **9** | **15** |
| **MODULE: 2**  Randomized algorithms and Complexity classes. | **5** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE:3**  Probabilistic Polynomial time classes, Quantifiers, Graph Isomorphism and lowness. | **5** | **15** |
| **MODULE: 4**  RSA Cryptosystem, Primality and factoring, Primality Tests. | **5** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Factoring Methods, Security of RSA. | **5** | **20** |
| **MODULE: 6**  Diffie Hellman’s, ElGamal’s and other protocols, Arthur Merlin Games and Zero Knowledge. | **10** | **20** |

**COURSE NO: 08CS 7223(C) COURSE TITLE:SECURITY POLICIES AND ASSURANCE**

**(L-T-P: 3-0-0) CREDITS: 3**

**Course Objectives:**

* To impart knowledge to students to know the standards of security policies, guidelines and procedures.

**Syllabus**

Security policies, Integrity policies, Assurance and trust ,Waterfall model.

**Course Outcome:**

* The students can be understand the policy related to Information assurance which includes protection of the integrity, availability, authenticity and security.

**References:**

1. M. Bishop, *Computer Security: Art and Science*, Pearson Education, 2003.
2. W. Mao, *Modern Cryptography: Theory & Practice*, Pearson Education, 2004.
3. C. P. Fleeger and S. L. Fleeger, *Security in Computing*, 3/e, Pearson Education, 2003.

**COURSE PLAN**

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| **COURSE NO: 08CS 7223(C) COURSE TITLE: SECURITY POLICIES AND ASSURANCE (L-T-P: 3-0-0) CREDITS: 3** | | |
| **MODULES** | **Contact Hours** | **Sem.Exam**  **Marks;%** |
| **Module:1**  Security policies, policy languages, confidentiality policies, Bell-Lapadula model, controversies over the model. | **9** | **15** |
| **Module:2**  Integrity policies, Biba model, Lipner’s model, Clark-Wilson models, Chinese wall model. | **5** | **15** |
| **FIRST INTERNAL TEST** |  |  |
| **MODULE: 3**  Clinical information systems security policy, non-interference and policy composition. | **5** | **15** |
| **MODULE: 4**  Assurance and trust, building secure and trusted systems. | **5** | **15** |
| **SECOND INTERNAL TEST** |  |  |
| **MODULE: 5**  Waterfall model, other models of development. | **5** | **20** |
| **MODULE: 6**  Assurance in requirements definition and analysis, assurance during system and software design, assurance during implementation and integration. | **10** | **20** |

**COURSE NO: 08CS 7233 COURSE TITLE:SEMINAR II**

**(L-T-P: 2) CREDITS: 2**

**Course Objectives:**

* To assess the debating capability of the student to present a technical topic.
* Also to impart training to a student to face audience and present his/her ideas and thus creating self-esteem and courage that are essential for an engineer.

Each student is expected to present a seminar on a topic of current relevance in Cyber/Information Security or Forensics for about 45 minutes. They are expected to refer current research and review papers from standard journals like ACM,IEEE, JPDC,IEE etc.– at least three cross references must be used-the seminar report must not be the reproduction of the original paper. A committee consisting of atleast three faculty members shall assess the presentation of the seminar and award marks to the students based on merits of topic of presentation. Each student shall submit two copies of a write-up of the seminar topic .One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library .Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

**COURSE NO: 08CS 7243 COURSE TITLE: PROJECT (PHASE 1)**

**(L-T-P: 0-0-12) CREDIT:6**

**Course Objectives:**

* To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes.
* The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

The project work should be a project related to cyber security or allied topics.

The project work is allotted individually on different topics. The students shall be encouraged to do their project work in the parent institute itself. If found essential, they may be permitted to do their project out side the parent institute subject to the conditions in clause 10 of M.Tech regulations. Department will constitute an Evaluation Committee to review the project work. The Evaluation committee consists of at least three faculty members of which internal guide and another expert in the specified area of the project shall be two essential members. The student is required to undertake the masters research project phase-I during the third semester and the same is continued in the 4th semester.(Phase-II). Phase-I consists of preliminary thesis work, two reviews of the work and the submission of preliminary report. First review would highlight the topic, objectives, methodology and expected results. Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4th semester.

**COURSE NO: 08CS 7214 COURSE TITLE:PROJECT (PHASE 2)**

**(L-T-P:0-0-21) CREDITS: 12**

**Course Objectives:**

* To improve the professional competency and research aptitude by touching the areas which other wise not covered by theory or laboratory classes.
* The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

Masters Research project phase-II is a continuation of project phase-I started in the third semester. Before the end of the fourth semester, there will be two reviews, one at middle of the fourth semester and other towards the end. In the first review, progress of the project work done is to be assessed. In the second review, the complete assessment (quality, quantum and authenticity) of the Thesis is to be evaluated. Both the reviews should be conducted by guide and Evaluation committee. This would be a pre-qualifying exercise for the students forgetting approval for the submission of the thesis. At least one technical paper is to be prepared for possible publication in journal or conferences. The technical paper is to be submitted along with the thesis. The final evaluation of the project will be external evaluation.