Department of Computer Science & Cyber Security

SARDAR PATEL UNIVERSITY OF POLICE, SECURITY AND CRIMINAL JUSTICE, Jodhpur

About the Department

The Department of Computer Science & Cyber Security was established in 2013. The department offers 2-years MS programme in Cyber Security.

About the Programme

Cyber security is an emerging area in the field of Computer Science & Engineering. M.S in Cyber Security is aimed at producing the much needed highly skilled manpower in the area of Information Security. It offers many areas for specialization including: securing network(s) and allied infrastructure, securing applications, security testing, information testing, information systems auditing, penetration testing, forensic investigation and digital forensics science etc. Keeping all the facts in view this program is designed to create professionals trained in both cyber forensics and cyber security with best of technical talent.

The objectives of the course are:
.
- To develop a human resource specialized in cyber crime investigation, which can be assistance to our law enforcement agencies.
- To prepare trained manpower needed for academics, R & D of ICT and related industries and research organizations.
- The approach shall be both multi-disciplinary and inter-disciplinary.

Scheme and Detailed Syllabus

M.S. Cyber Security

Subject Code	Subject Name	Credits
I Semester		
MSCS-11	Fundamental of Mathematics	4
MSCS-12	Advance Concepts of Information Technology	4
MSCS-13	Cyber Crime and IT Law	4
MSCS-14	Elective I	4
MSCS-15	Language and Communication Skills (Audit Course)	-
II Semester		
MSCS-21	Mobile And Wirelesss Security	4
MSCS-22	TCP/IP and Network Security	4
MSCS-23	Cryptography and Data Security	4
MSCS-24	Elective II	4
MSCS-25	Behavioural Science (Audit Course)	-
III Semester		
MSCS-31	Cyber Forensics, Audit and Investigation	4
MSCS-32	Web Application Security	4
MSCS-33	Database Security	4
MSCS-34	Elective III	4
MSCS-35	Research Methodology (Audit Course)	-
IV Semester		
MSCS-41	Dissertation	20

List of Electives (Program /Open Elective)

Semester	Subject Code	Subjects
I	MSCS-15	- Intellectual Property Right in Digital Environment - Disaster Management w.r.t. Cyber Security - Social Networking w.r.t. Cyber Security
II	MSCS-25	- Banking Technology Management - Cyber Security Models
III	MSCS-35	- Case Study - Network finger printing & Access control. - Internet Architecture & 4GLs

List of Practical Labs

Semester	Subject Code	Practical Lab	Credits
I	MSCS-L11	Python Lab	2
	MSCS-L12	Unix Administration Lab	2
II	MSCS-L21	Network Security & Malware Analysis Lab	2
	MSCS-L22	TCP/IP Lab	2
III	MSCS-L31	Cyber Forensic Lab	2
	MSCS-L32	Ethical Hacking Lab	2

Note: MS in Cyber Security consists of 3 audit courses. These courses do not weigh any credits but are must to pass for promoting to next semester. The percentage of a student would be calculated using credit courses only.

Semester I

Subject Code	Subject Name	(L)	(P)	Credits
MSCS-11	Fundamental of Mathematics	3	-	4
MSCS-12	Advance Concepts of Information Technology	3	-	4
MSCS-13	Cyber Crime and IT Law	3	-	4
MSCS-14	Elective I	3	-	4
MSCS-15	Language and Communication Skills (Audit Course)	3	-	-
MSCS-L11	Python Lab	-	4	2
MSCS-L12	Unix Administration Lab	-	4	2
Total Credits				20

List of Electives:

- Intellectual Property Right in Digital Environment
- Disaster Management w.r.t. Cyber Security
- Social Networking w.r.t. Cyber Security

Paper Title: **Fundamental of Mathematics (MSCS-11)**

Course Credits: 4   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit	Topic
I	Algebraic structures (definitions, examples and basic properties): Groups, Abelian and cyclic groups, subgroups, cosets, Lagrange's theorem, rings, subrings, ideals and quotient rings, integral domains, fields, reducible and irreducible polynomials, finite fields, construction of finite fields of small orders.
II	Vector spaces, subspaces, bases and dimensions, linear transformations, invertible linear transformations, matrix representations, inner product spaces, Gram-Schmidt orthogonalization process, eigenvalues and eigenvectors of matrices and linear operators, matrix-diagonalization, rank, singular values and singular value decomposition of matrices.
III	Divisibility, greatest common divisors, Euclidean algorithm, modular Arithmetic, prime numbers, congruences, quadratic residues, residue classes, Fermat's little theorem, Euler's totient function, Euler's theorem, Chinese remainder theorem.
IV	Basic concepts of codes: encoding and decoding processes, encoding functions, generation of codes using parity checks, Hamming distance, minimum distance, group codes, decoding functions, linear codes, Hadamard and Goppa codes.
V	Basic concepts of Probability: Random experiments, sample spaces, axiom's of probability, conditional probability, Baye's theorem, random variables, discrete and continuous random variables, probability mass and density functions, central limit theorem, introduction to random processes, Markov Chains.

Books recommended:
- D. S. Malik, J. Mordeson, M. K. Sen, Fundamentals of abstract algebra, Tata McGraw Hill, 1997

- P. K. Saikia, Linear algebra, Pearson Education, 2009.

- I. Niven, H.S. Zuckerman and H. L. Montgomery, An introduction to the theory of numbers, John Wiley and Sons, 2004.

- D P Bersekas and J N Tsitsiklis, Introduction to probability, Athena Scientific, 2008

Paper Title: **Advance Concepts of Information Technology (MSCS-12)**

Course Credits: 4   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit	Topics
I	Operating system overview, Process states, description, and control, Threads, multicore, multithreading
II	Overview of different Operating systems Windows 8, Linux versions, Solaris, iOS, Android. Working on different platforms
III	Security overview in different operating systems. File system in different operating systems
IV	Introduction to Real-Time Systems, Distributed operating systems, Embedded Systems, Reading: operating-system.org's "VxWorks", Reading: operating-system.org's "QNX"
V	-Software and hardware differences between basic machine operating system and Palm OS.Case Study

Books recommended:

- V. Rajaraman, Fundamentals of Computers
- PROGRAMMING IN C – E BALAGURUSAMY
- E. Balaguruswamy, "Objected Oriented Programming with C++", TMH
- Herbert Schidlt , The complete reference Java , Seventh Edition , TataMcGraw Hill
- R. S. Pressman, "Software Engineering – A practitioner's approach", McGraw Hill Int. Ed.
- H.F. Korth and Silberschatz: Database Systems Concepts, McGraw Hill
- Tananbaum A.S., "Computer Networks", PHI.
- Stalling W, "Data & Computer Communications", PHI
- B. Forouzan, "Data Communication and Networking", Tata McGraw Hill
- Silbershatz and Galvin, " Operating Sys`tem Concepts", Addison Wesley

Paper Title: **Cyber Crime And IT Law (MSCS-13)**

Course Credits: 4   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit No.	**Topics**
Unit I	Cyber Security Issues & Challenges: Cyber Espionage, Cyber Warfare, Cyber Terrorism Cyber Crime , Attacker Techniques & Motivations, Botnet, Denial of Service Attacks, SPAM, Malware. Information Security - General trends, Security Assurance
Unit II	Information Security and Risk Analysis & Management: Information Security: Asset, Threat, Vulnerability, Countermeasure, Expected Loss, Impact. Risk Management: Risk Assessment, Risk Mitigation, Risk Evaluation and Discussion. Risk Analysis Terminology
Unit III	Cyber Crime, Categorization of Cyber Crime
Unit IV	Cyber Crime Prevention
Unit V	Information Technology Act, Amendments in Information Technology Act, International Cyber Laws.

Books recommended:

- Cyber Security, Cyber Crime and Cyber Forensics: Applications and Perspectives, Raghu Santanam, M. Sethumadhavan, Information Science Reference
- Cyber Crime: How to Protect Yourself from Computer Criminals, Laura E. Quarantiello
- Cyber Security Essentials, James Graham, Ryan Olson, Rick Howard, CRC Press
- Cybercrime: Security and Surveillance in the Information Age, Douglas Thomas; Brian Loader
- Computer Crime: A Crime-Fighters Handbook by David Icove
- Crime in the Digital Age: Controlling Telecommunications and Cyberspace Illegalities, Peter N. Grabosky
- Cyberlaw – The Indian Perspective By Pavan Duggal, Saakshar Law Publications.

Paper Title: **Intellectual Property Right in Digital Environment (MSCS-14)**

Course Credits: 4   Elective   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit	Topics
I	Introduction to Copyrights, Protected works, Ownership, Rights conferred by Copyright, Limitations, and Assignment of Copyrights Branding, Trademarks, Meaning, Functions, Features, Registration of trademark, Licensing, and Infringement of Trademark, Service Mark, Registered marks
II	Introduction to Patents, Conditions of Patentability, Rights of Patentee, Procedure of obtaining Patent, Exceptions Industrial Design, Meaning of design, Registration of Design, Rights granted to Proprietor of Design, Infringement of Design
III	IPRs in Digital / Technology Environment, Patent of Computer Programs, Computer software's and Copyright Law, Software Licenses, Computer database and Law, Domain Names, Disputes, Web related Issues, Semiconductor Layout and Design
IV	International and National Framework for Protection of IP and Agreements under WIPO, Primary legislations regulating IP in India
V	Valuation and Management of IP Assets, Concept of Monopoly and Perfect Competition, Valuation Methods, IP Management strategies, Concept of Audit, and Taxation

Books recommended:

- Law Relating to Intellectual Property Rights by VK Ahuja
- Law Relating to Intellectual Property by Dr. B.L. Wadhera
- Intellectual Property Rights in the WTO and Developing Countries by Jayashree Watal
- Intellectual Property: Valuation, Exploitation, and Infringement Damages by Russell L. Parr , Gordon V. Smith
- Intellectual Property Law in India by P.S. Narayana

Paper Title: **Language & Communication Skills (MSCS-15)**

Course Credits: NA   *Audit Course*   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit	Topics
I	Communication Introduction & Theory
II	Oral Communication skills
III	Written Communication
IV	Phonetics and English Grammar
V	Comprehension and Text (Stories/Essays/Poems)

Books recommended:

- Bhaskar W.W.S. and Prabhu N.S. – English through reading, book I & II, Macmillan 1975.
- Leech, Geoffrey and savtvik, Jan – Communicative Grammar of English, Longman, Delhi 2001.
- Thomson and Martinet – Practical English, OUP 1970
- J.D. O'Connor, Better English Pronunciation, Cambridge University Press, 2010.
- How to build a better vocabulary – Maxwell, Nurnbey, Morris, Roesmblom.
- Allan and Barbara Pearse – The Definitive Book of Body Language.
- Michael MC Carthy, Felicity O Dell – English Vocabulary in use.
- Hancock Mark – English Pronunciation is use intermediate

Semester II

Subject Code	Subject Name	(L)	(P)	Credits
MSCS-21	Mobile And Wirelesss Security	3	-	4
MSCS-22	TCP/IP and Network Security	3	-	4
MSCS-23	Cryptoraphy and Data Security	3	-	4
MSCS-24	Elective II	3	-	4
MSCS-25	Behavioural Science (Audit Course)	3	-	-
MSCS-L21	Network Security & Malware Analysis Lab	-	4	2
MSCS-L22	TCP/IP Lab	-	4	2
Total Credits				20

List of Electives:

- Banking Technology Management

- Cyber Security Models

Paper Title: **Mobile And Wireless Security (MSCS-21)**

Course Credits: 4   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit	Topics
I	Mobile Networks: Cellular Wireless Networks. GSM: Architecture, Protocols, Connection Establishment, Frequency Allocation, Routing, Mobility Management and GPRS.
II	Mobile Network Security: Mobile IP, DHCP, AdHoc, Proactive and Reactive Routing Protocols, Multicast Routing. Mobile routing protocols: DSR, AODV, Reactive routing, Location aided routing.
III	Wireless Networks: Issues and challenges of Wireless networks: Location management, Resource management, Routing. Wireless Media Access Techniques : ALOHA , CSMA , Wireless LAN , MAN ,IEEE 802.11 (a,b,e,f,g,h,i), Bluetooth, Wi-Fi, WiMAX Wireless routing protocols : Mobile IP, IPv4, IPv6.
IV	Wireless Network Security: Network Packet analysis: Packet analysis and Packet sniffing in Hub and Switched environment, Analysis of packet for security i.e. Sync Scan. Technique of hacking wireless network and its countermeasures.
V	E-Commerce & M-Commerce : An overview of E- Commerce- Operating System Services, Developer Services, Data Services, Application Services, Store Services, Client Services. Electronic Payment Systems: Overview of Electronic Payment Systems, Cybercash. Smart Card , Electronic Banking, Electronic Fund Transfers, Session Management. M-commerce trust, security, and payment: Trust in M-commerce, Encryption, Authentication, confidentiality, integrity, and non-repudiation.

Books Recommended:

- Stalling W., " Network Security Essentials", Pearson
- Practical Packet Analysis: Using Wireshark to Solve Real-Word Network problems by Chris Sanders
- Jochen Schiller, "Mobile Communications", PHI.
- Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, Principles of Mobile Computing, Springer, New York, 2003
- Frank Adelstein, Sandeep KS Gupta, Golden Richard, Fundamentals of Mobile andPervasive Computing,McGraw-Hill

Paper Title: **TCP/IP and Network Security (MSCS-22)**

Course Credits: 4   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit	Topics
I	TCP/IP: Working of DNS, HTTP, FTP and SMTP/POP. Configuration of DNS, Web, FTP and MailServer. Working of TCP, UDP, IP , ARP,ICMP. Security at Application Layer: PGP and S/MIMIE, E-mail security, PEM, Secure binding of multimedia streams
II	Security Problem in TCP/IP Protocol Suite: Identification of Security issues in ethernet, ARP, IP, TCP, Application and Routing protocols. Secure network infrastructure services: DNS, NTP, SNMP, SSL Architecture, SSL/TLS Basic Protocol, SSL Message Formats, Session Resumption.
III	Security at Network Layer Routing algorithm vulnerabilities: route and sequence number spoofing, instability and resonance effects. Information hiding: DMZ networks, route aggregation and segregation ICMP redirect hazard: denial of service.
IV	Firewalls: Network partitioning, firewall platforms, partitioning models and methods. Secure SNMP, Secure routing interoperability: virtual networks. Transparent and opaque network services. Source masking and hidden channels. IDS, Honeypots, Honey nets
V	Security Models: Military and civil security, vulnerability and threat models, End-end Security, link encryption, compartments Privacy. Authentication. Denial of service. Nonrepudiation. Issues in multi-level secure systems. Internet security models: IPv4/IPv6 encapsulation header

Books recommended:

- S. Tannenbaum.Computer Networks, 2nd Edition, Prentice-Hall, 1988.
- D. E. Comer. Internetworking with TCP-IP: Principles, Protocols and Architecture, Vol I, 2nd Edition, Prentice Hall, 1991.
- Tananbaum A.S., "Computer Networks", PHI.
- Stalling W, "Data & Computer Communications", PHI
- B. Forouzan, "Data Communication and Networking", Tata McGraw Hill
- Michael A. Miller, "Data & Network Communication", Vikas Publication
- TCP/IP Protocol Suite (McGraw-Hill Forouzan Networking) by Behrouz Forouzan

Paper Title: **Cryptography and Data Security(MSCS-23)**

Course Credits: 4

Continuous Evaluation: 30 Marks

Course Duration: 40 Hours

End Sem Evaluation: 70 Marks

Unit	Topics
I	OSI security architecture, security attacks, Encryption Theory, Classical techniques, Block Cipher, DES, AES, Block cipher operations
II	Introduction to Cryptoanalysis, Discrete Log Problem (DLP), Primality Testing. Fermat's and Euler's theorem, Chinese Remainder Theorem, RSA algorithm, Diffie Hellman Key Exchange, ElGamal cryptosystem.
III	Cryptographic Hash functions: Hash functions and data integrity, Security of Hash functions, Message Authentication Codes, MACs based on Hash functions. Signature Schemes: Security requirements for Signature Schemes, ElGamal Signature Schemes, Digital Signature Standard
IV	Symmetric Key Distribution using Symmetric and Assymetric encryption, Distribution of Public Keys, X.509 Certificates, Public Key Infrastructure, Remote User Authentication, Kerberos
V	SSL, TLS, HTTPS, SSH, Wireless LAN security, Wireless transport layer security, WAP end-to-end security, PGP, S/MIME, IP Security overview and policy, Encapsulating security payloads, Combining security associations, Internet Key Exchange

Books recommended:

- K. M. Martin, Everyday Cryptography, Oxford University Press (2012).
- Highly recommended:
- N. Ferguson, B. Schneier and T. Kohno, Cryptography Engineering, Wiley (2010)

Paper Title: **Banking Technology Management(MSCS-24)**

Course Credits: 4   *Elective*   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit	Topics
I	Branch Operation and Core Banking: Introduction and Evolution of Bank Management, Technological Impact in Banking Operations, Total Branch Computerization, Concept of Opportunities, Centralized Banking, Concept, Opportunities, Challenges & Implementation.
II	Delivery Channels: Overview of delivery channels, Automated Teller Machine (ATM), Phone Banking, Call centers, Internet Banking, Mobile Banking, Payment Gateways, Card technologies, MICR electronic clearing.
III	Back office Operations: Bank back office management, Inter branch reconciliation, Treasury Management, Forex Operations ,Risk Management, Data centre Management,Net work Management, Knowledge Management (MIS/DSS/EIS, Customer Relationships Management(CRM)
IV	Interbank Payment System: Interface with Payment system Network, Structured Financial Messaging system – Electronic Fund transfer, RTGSS, Negotiated Dealing Systems & Securities Settlement Systems, Electronic Money, and E Cheques.
V	Contemporary Issues in Banking Techniques: Analysis of Rangarajan Committee Reports, E Banking, Budgeting, Banking Software's, Case study: Analysis of Recent Core Banking Software.

Books Recommended:
- Jessica Keyes, "Financial Services Information Systems", Auerbach publication; 2nd Edition, 2000.
- Kaptan S S and Choubey N S., "E-Indian Banking in Electronic Era", Sarup & Sons, New Delhi, 2003.
- Vasudeva, "E – Banking", Common Wealth Publishers, New Delhi, 2005.
- Turban Rainer Potter, "Information Technology", John Wiley & Sons Inc., 2005.

Paper Title: **Behavioral Sciences(MSCS-25)**

Course Credits: NA   *Audit Course*   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit	Topics
I	Social and Emotional Intelligence
II	Cognitive Science: Perception, Language, Memory, Reasoning, Emotion
III	Motivation: Types of theories and models, Intrinsic and Extrinsic Motivation, Psychological theories and models
IV	Social Neuro Science: Nervous System, Biological Mechanisms
V	Ethics

Books Recommended:
- Psychology by Baron. Pearson
- Emotional Intelligence by Daniel Goleman. Bloomsbury Publishing
- "Atkinson and Hilgard's Psychology: An Introduction" by Geoffrey Loftus, Willem and Barbara. Cengage
- "Psychology: The science of mind and behaviour" by Michael W Passer, Ronald. McGraw-Hill
- Fundamentals of Cognitive Psychology by Henry and Reed. Tata McGraw-Hill
- Biopsychology by John P J Pinel. Allyn & Bacon Publications

Semester III

Subject Code	Subject Name	(L)	(P)	Credits
MSCS-31	Cyber Forensics, Audit And Investigation	3	-	4
MSCS-32	Web Application Security	3	-	4
MSCS-33	Database Security	3	-	4
MSCS-34	Elective III	3	-	4
MSCS-35	Research Methodology (*Audit Course*)	3	-	-
MSCS-L31	Cyber Forensic Lab	-	4	2
MSCS-L32	Ethical Hacking Lab	-	4	2
Total Credits				20

List of Electives:

- Case Study
- Network finger printing & Access control.
- Internet Architecture & 4GLs

Paper Title: **Cyber Forensic, Audit And Investigation(MSCS-31)**

Course Credits: 4   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit	Topics
I	File systems, Microsoft file structure, Examining NTFS disks, Microsoft BitLocker, Third-Party Disk Encryption Tools, Windows Registry, Startup Tasks, Virtual Machines, Macintosh file structure and boot process, UNIX and Linux disk structures and boot processes. Other Disk structures (CD, SCSI, IDE and SATA devices)
II	Commercial Forensic Tools (Encase, FTK), Advanced Features of forensic tools (search, encryption and decryption, data carving), windows registry, memory analysis, advanced file system analysis (deleted and hidden data, metadata, temporary file, unknown\executable file analysis), applied decryption.
III	Graphic files: recognition, lossless and lossy data compression, locating and recovering graphic files, Identifying unknown file formats.
IV	Virtual Machines, Network Forensics, Network tools, E-mail Investigation, E-mail forensics tools, Mobile Device Forensic.
V	Computer Investigation,Evidence acquisition, Processing crime and Incidence scene, Preserving, Analysis, Digital forensic investigation procedures, Report writing, Ethics

Books Recommended:
- Computer Evidence - Collection and Preservation.Brown, C.L.T. Course Technology CENGAGE Learning.
- Guide to Computer Forensics And Investigations Nelson, Bill ; Phillips, Amelia; Enfinger, Frank; Steuat, Christopher Thomson Course Technology.
- Scene of the Cybercrime. Shinder, Debra Littlejohn and Tittel, Syngress
- Computer Forensics – Computer Crime Scene Investigation.Vacca, John R. Charles River Media
- Bunting, Steve and William Wei. EnCase Computer Forensics: The Official EnCE: EnCase Certifed Examiner Study Guide. Sybex, 2006
- Prosise, Chris, Kevin Mandia, and Matt Pepe. Incident Response: Computer Forensics. McGraw-Hill,
- Casey, Eoghan, ed. Handbook of Computer Crime Investigation, Forensic Tools and Technology, Academic press
- Carrier, Brian. File System Forensic Analysis. Addison-Wesley Professiona

<p style="text-align:center">Paper Title: **Web Application Security(MSCS-32)**</p>

Course Credits: 4   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit	Topics
I	Web Fundamentals – HTML, HTTP, Client-side scripting, Server-side scripting; Web server architecture - Windows & Linux, IIS and LAMP servers, Network topologies and DMZ,
II	Web applications: Introduction to web applications, Web application hacking, Overview of browsers, extensions, and platforms
III	Attacks, detection evasion techniques, and countermeasures for the most popular web platforms, including IIS, Apache, PHP, and ASP.NET Attacks and countermeasures for common web authentication mechanisms, including password-based, multifactor (e.g., CAPTCHA), and online authentication services like Windows Live ID.
IV	Advanced session analysis, hijacking, and fixation techniques, cross-site scripting, SQL injection, classic categories of malicious input, Overlong input (like buffer overflows), canonicalization attacks (like the infamous dot-dot-slash), and meta characters (including angle brackets, quotes, single quote, double dashes, percent, asterisk, underscore, newline, ampersand, pipe, and semicolon), beginner-to-advanced SQL injection tools and techniques, stealth-encoding techniques and input validation/ output-encoding countermeasures.
V	Web services vulnerabilities discovery and exploited through techniques including WSDL disclosure, input injection, external entity injection, and XPath injection. Web application management attacks against remote server management, web content management/authoring, admin misconfigurations, and developer-driven mistakes. Web browser exploits

Books recommended:

- Hacking Exposed Web Applications, 3rd edition, JOEL SCAMBRAY, VINCENT LIU, CALEB SIMA
- The Web Application Hacker's Handbook Discovering and Exploiting Security Flaws By Dafydd Stuttard, Marcus Pinto
- Rich Bowen, Ken Coar, "Apache Cookbook", O'Reilly
- Open Web Application Security Project. A Guide to Building Secure Web Applications and Web Services. http://www.owasp.org/index.php/Category:OWASP_Guide_Project

Paper Title: **Database Security(MSCS-33)**

Course Credits: 4   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit	Topics
I	Introduction (Databases and Information Systems, An example usage context, Database system concepts and architecture), Overview of Information Security, Database design using the relational model :- Functional dependencies : Keys in a relational model, Concept of functional dependencies, Normal forms based on primary keys, BCNF Further Dependencies : Multi-values dependencies and fourth normal form, Join dependencies and fifth normal form, Inclusion dependencies, Other dependencies and normal forms
II	Database security lifecycle, data risk assessment, Analyze data threats, risks and vulnerabilities, Understand the need for a database security architecture, database security architecture, Implement a feedback mechanisms, Understand how to adjust policies and practices based on feedback mechanisms using different security models.
III	Database Vulnerabilities, Threats and Physical Security: distinction between data and database security from network and perimeter security, external and internal database threats, flaws in perimeter security, risks of not securing an organization's data, typical database security hierarchy, analysis general security landscape, evaluation of security fundamentals, Understand the importance for staying current with database releases, fixes and security patches , Managing USB ports and USB enabled devices, Understand the implications of the physical placement of database files and their copies
IV	Access control of relational databases, Temporal role-based access control in database management, Access control models for XML databases. Managing and Querying Encrypted Data, Security in Data Warehouses and OLAP Systems
V	Secure Semantic Web Services, Geospatial Database Security, Damage Quarantine and Recovery in Data Processing Systems, Privacy-enhanced Location-based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment

Books recommended:

- Handbook of Database Security: Applications and Trends by Michael Gertz and Sushil Jajodia
- Database Security and Auditing, Hassan A. Afyouni, India Edition, CENGAGE Learning, 2009.
- Database Security, *Castano,* Second edition, Pearson Education
- Database security by alfred basta, melissa zgola, CENGAGE learning

Paper Title: **Research Methodology(MSCS-35)**

Course Credits: NA   *Audit Course*   Continuous Evaluation: 30 Marks

Course Duration: 40 Hours   End Sem Evaluation: 70 Marks

Unit	Topics
I	Introduction to Computer Science Research: What is Research?, Types of Research, Why Research, Significance & Status of Research in Computer Science. Steps in Research: Having grounding in Computer Science, Major Journals & Publication in Computer Science, Major Research areas of Computer Science, Identification, selection & Formulation of research problem, Hypothesis formulation, Developing a research proposal, Planning your research, The wider community, Resources and Tools, How engineering research differs from scientific research.
II	Basic of Computer Science Research, Introduction to formal models and Computability: Turing Machine & Computability, Undecidability, Diagonalization and Self-reference, reductions, Introduction to basic techniques for designing algorithms: Divide and conquer, Dynamic programming, Analysis of Algorithms
III	Research Data: What is data, Mathematical statistics and computer science views on data analysis, Methods for finding associations: regression and pattern recognition, Method for aggregation and visualisation: principal components and clustering, Hypothesis testing.
IV	Literature Survey: Finding out about your research area, Literature search strategy, Writing critical reviews, Identifying venues for publishing your research.
V	Writing papers and the review process: preparing and presenting your paper. The conference review process, Making use of the referees' reports. The journal review process, Group exercise in reviewing research papers. Thesis Writing: Planning the thesis, Writing the thesis, Thesis structure, Writing up schedule, The oral examination and Viva Voice

Books recommended:

- Research Methods By Francis C. Dane, Brooks/ Cole Publishing Company, California.
- Basic of Qualitative Research (3rd Edition) By Juliet Corbin & Anselm Strauss, Sage Publications (2008)
- The Nature of Research: Inquiry in Academic Context By Angela Brew, Routledge Falmer (2001)
- Research Methods By Ram Ahuja, Rawat Publications (2001)

Semester IV

Subject Code	Subject Name	(L)	(P)	Credits
MSCS-41	Dissertation	-	-	20
Total Credits				20

<div align="center">Paper Title: **Dissertation(MSCS-41)**</div>

Course Credits: 20   Continuous Evaluation: 30 Marks

                                                      End Semester Evaluation: 70 Marks

This is the dissertation wherein every student shall be expected to contribute to domain knowledge incrementally. It is expected that the work should be focused in a particular area for concept, design, implementation and analysis (prior approval by the department). For this first part of 20 credits, periodic internal assessment shall be done by the department. At the end of semester, students would be required to submit dissertation report. The continuous evaluation would be based on periodic checkpoint presentations by the students. The end semester evaluation would be based on dissertation report and open seminar with an external examiner.