

Vikram University, Ujjain

Board of studies in Computer science (Faculty of Engineering Science)

SYLLABUS of

PG Diploma in Cyber Security

Exclusively for University Teaching Department (ICS, VUU)

ONE YEAR PG Diploma in Cyber Security

PROGRAMME of UTD (ICS, VUU)

(Effective from Academic Session 2020-21)

[Modified as according to the provision of “Ordinance”]

Programme Objectives:

- To create awareness of Cyber security issues and challenges in IT environment.
- To impart basic knowledge and skills to protect one's personal IT assets.
- To learn the techniques needed for providing protection and security to our personal data and information resources.
- To experiment and learn the skills to provide protection and security to organizational data and information to build a secured IT infrastructure in the companies.
- To develop high level of professional ethics in providing security in the cyber world.
- To develop awareness in taking precautions in protecting them from cyber crimes and fraudulent activities.

COURSE STRUCTURE

PG Diploma in Cyber Security

First Semester

S N	Course code	Title	End term sem Exam	Internal	Max Marks
1	PGCS-101	Fundamental of Information Technology	70	30	100
2	PGCS-102	PC-Packages	70	30	100
3	PGCS-103	Programming and Problem solving in C	70	30	100
4	PGCS- 104	Digital Computer Orgnization	70	30	100
5	PGCS-105	Modern Technologies of Computer Science	70	30	100
		Total			500

COURSE STRUCTURE

PG Diploma in Cyber Security

Second Semester

S N	Course code	Title	End term sem Exam	Internal	Max Marks
1	PGCS-201	Data Communication and Computer Network	70	30	100
2	PGCS-202	Network Security	70	30	100
3	PGCS-203	Information Security	70	30	100
4	PGCS- 204	Cyber Security and Cyber Law	70	30	100
5	PGCS-205	Legal Aspects of Cyber Security	70	30	100
		Total			500

PGCS-101: Fundamental of Information Technology

UNIT-1

Computer Fundamental: Characteristics of Computers, History of Computer, Evolution of Computers, Computer Generations and Types of Computer. **Components of a Computer:** Registers, instruction Set, Bus Architecture. **Computer Hardware:** Input Devices, Output Devices. **Storage Devices:** Primary Storage capacity, Memory Types, Memory Measuring Units, Secondary Storage. Software & Software Types, Computer Languages, Compiler, Interpreter.

UNIT-2

Introduction of Programming: Procedure Oriented Programming, Object oriented programming, Concepts used in OOP, Benefits of OOP, Main advantages and disadvantage of OOP, Applications of OOP, OOP vs. POP.

UNIT-3

Operating System Overview: Computer System Startup, Computer System Structure, computer system components, operating System classifications, operating System Services, Major Functions of operating system, Process Management, CPU Scheduling, Scheduling Criteria. **Memory and File Management:** Memory Management Requirements, Swapping, Memory Management Techniques.

UNIT-4

Introduction to DBMS: File System, Traditional File Oriented Approach, DBMS Advantages and Disadvantage, Role of DBMS, Three views of data, DBMS Architecture. Data Models, Data Independence, Major components of DBMS, Data Dictionary, Types of Users, DBMS applications, Keys in Databases, Database Languages.

UNIT-5

Introduction to computer Networks: computer Network Definition, Importance of Networking, Types of Networks, Network Topology, Advantages and Disadvantage of computer Networks, Applications of computer networks, Reference Model, Internet, introduction to Internet Technology, Electronic Mail, World Wide Web.

Reference Books:

1. Operating Systems Concepts, A. Silberschaz, P.Galvin, G.Gagne, John Wiley & Sons
2. Object Oriented Programming in C++, Robert Lafore, Galgotia Publication.
3. Data base management systems vol. 1., Date C.J.
4. Fundamental of Computer Science & IT, Singh Umesh Kumar, Jain S., Maheshwari A., SSDN publications New Delhi,
5. Data Communications and Networks, Godbole A, Tata Mccraw-Hill Publications.

PGCS- 102: PC-Packages

UNIT-1

MS windows: Introduction to MS windows; Features of windows; working with windows; My computer & Recycle bin; Desktop, Icons and windows Explorer; Screen description & working styles of windows; Dialog Boxes & Toolbar; working with files & Folders, Simple operations like copy, delete, moving of files and folders from one drive to another; Accessories and. windows settings using control panel-setting common devices using control panel, modem, printers, audio, network, fonts, creating users, internet settings, Start button & program lists ;Installing and uninstalling new Hardware & software program on your computer.

UNIT-2

MS word Basics - Introduction to MS office; introduction to MS- word; Features & area of use, working with MS- word; Menus & commands; Toolbars & Buttons; shortcut Menus, wizards & Templates, creating a New Document; Different page views and Layouts; Applying various Text Enhancements; working with - Styles, Text .Attributes; paragraph and Page. Formatting; Text Editing using various features; Bullets, Numbering, Auto formatting, Printing & various print options.

UNIT-3

Advanced Features of MS- word- Spell check, Thesaurus, Find & Replace; Headers & Footers: Inserting- Page Number, Pictures, Files, Auto texts, Symbols etc.; working with columns, Creation and working with Tables including conversion to and from text; Margins and Space management in Documents.

UNIT- 4

MS Excel: Introduction and area of use; working with MS Excel: concept of workbook and worksheet; Using Wizards; Various Data Types; Using different features with Data, Cell and Texts; Inserting, Removing & Resizing of Columns & Rows; Working with Data & Ranges; Different views of Worksheet; Column Freezing, Labels, Hiding, Splitting etc.; Using different features of Data and Text; Use of Formulas, Calculation & Functions; Cell formatting including Borders and Shading; Working with Different Chart Types; Printing of Workbook & Worksheets with Various options.

UNIT-5

MS PowerPoint: Introduction and area of use; Working with MS PowerPoint; Creating a New Presentation; Working with Presentation; Using Wizards; Slides & its Different Views; Inserting, Deleting and Copying of Slides; Working with Notes, Handouts; Columns and Lists; Adding Graphics, Sounds and Movies to a slide; Working with PowerPoint Objects; Designing and Presentation of a Slide Show; Printing presentations; Notes, Handouts with print options.

Reference Books:

1. Windows XP Complete Reference. BPB publications
2. MS Office XP complete BPB Publication.

PGCS-103: Programming and Problem Solving in C

UNIT-1

Problem identification analysis, design, coding, testing & debugging, implementation, modification & maintenance, algorithms & flowcharts, Characteristics of a good program - accuracy, simplicity, robustness, portability, minimum resource & time requirement, modularization; documentation, naming variables; Top down design; Bottom-up design.

UNIT-2

History of C, Structure of a C program, Data types, Constant & Variable, Operators & expressions, **Control Constructs** - if-else, for, while, do-while, Case statement, Arrays, Type modifiers & Storage classes, Ternary operator, Type conversion & type casting.

UNIT-3

Functions, Arguments, return value, Parameter passing - call by value, call by reference, return statement, Scope, visibility and life time rules for various types of variable, static variable, calling a function, Recursion - basics, comparison with iteration, tail recursion, when to avoid recursion examples.

UNIT-4

Special constructs - break, continue, exit , goto & labels; pointers - & and * operators, pointer expression, pointer arithmetic, String, Pointer to function, Function to parameter, structure - basic, declaration, membership operator, pointer to structure, referential operator, self-referential structures, structure within structure, array in structure, array of structures, Union - basic, declaration: Enumerated data type, Command line arguments.

UNIT-5

File handling and related functions: printf & family, c preprocessor- basics, # Include, # define, # undef, conditional compilation directive like #if, #else, #endif, #ifdef and #ifndef, Variable argument list functions.

Reference Books:

1. Kernighan & Ritchie: The C programming language, PHI
2. Cooper Mullish: The Spirit of C, Jaico publishing-House Delhi
3. Kanetkar Y: Let us C 4, Kanetkar Y: Pointers in C.

PGCS- 104: Digital computer Organization

UNIT-1:

Digital components: Functional units of a computer, logic gates, Minimization of Boolean Expressions, Flip-Flips, Decoders, Encoders, Multiplexers, Counters, and Registers.

UNIT-2:

Data Representation: Number systems, Representations of signed and unsigned numbers, alphanumeric codes, Addition of binary numbers, subtraction, 2's complement, and Floating point number representation.

UNIT-3:

Register Transfer Language & Micro-operations: Concepts of the Bus, Timings in Register transfer, Languages used for data transfer in registers, Data movement from/to memory.

UNIT-4:

Arithmetic circuits, Half adder, full adder, N-bit adder, Logical micro operation, arithmetic logic unit. Instruction sets for basic computer: Addressing modes, Instruction cycles, Control signal generation.

UNIT-5:

Central Processing Unit: General register organization, Memory stacks, Instruction types, Interrupts, Instruction pipelining, Arithmetic pipelining. .

Reference books:

1. P. N. Basu, Computer Organization and Architecture, Vikas Publication, 2nd Edition.
2. H. Patterson, Computer Architecture: A Quantitative approach, Elsevier, 5th Edition.
3. W. Stalling, Computer Organization and architecture, Pearson Education Asia, 5th Edition.
4. Donald Leach & Albert Malvino, Digital Principles & Applications, McGraw Hill, 7th Edition.

PGCS-105: Modern Technologies of Computer Science

UNIT-1:

Introduction to Computer Security: The Challenges of Computer Security, The OSI Security Architecture. Security Attacks (Passive Attacks, Active Attacks). Security Services (Authentication, Access Control, Data Confidentiality, Data Integrity, Nonrepudiation, Availability Service).

UNIT-2:

Introduction to Artificial Intelligence: What is AI ? The Importance of AI. AI and related fields. Introduction to Natural Language Processing.,Application of AI.. Basic Problem solving methods: Production systems-state space search, control strategies, Breadth first search, Depth first search, Heuristic search.

UNIT-3:

Introduction to Machine Learning :Learning Problems - Perspectives and Issues - Concept Learning - Version Spaces and Candidate Eliminations - Inductive bias - Decision Tree learning - Representation Algorithm- Heuristic Space Search.

UNIT-4:

Introduction to IoT: Definition, Characteristics, Conceptual framework, Architectural view. Technology involved - Server-end technology, Hardware and Software components, Development tools & Open source framework, APIs & Device interfacing components, Platforms & Integration tools, Sources of IoT, Advantages and Disadvantages of IoT.

UNIT-5:

Introduction to Data Mining: Definitions, KDD v/s Data Mining, DBMS v/s Data Mining , DM techniques, Mining problems, Issues and Challenges in DM, DM Application areas.

Reference Books:

1. Charles P. Pleege, "Security in Computing", Pearson Education Asia, 5th Edition, 2001.
2. William Stallings, "Network Security Essentials: Applications and standards", Person Education Asia, 2000
3. Dan W. Patterson: Introduction to Artificial Intelligence and Expert System, Prentice Hall.
4. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Thing", Wiley
5. 2. Rajkamal, "Internet of Things: Architecture and Design Principles", McGraw Hill Educ
6. Data Mining Techniques ; ArunK.Pujari ; University Press.

PGCS-201: Data Communication & Computer Network

UNIT-1

Introduction: Theoretical Model for Communication, analog and digital signals Bandwidth, Noise, Channel Capacity, Data-rate, Concepts of Circuit Switching, Message switching and Packet switching with their timing diagrams, comparison of switching techniques, ISDN.

UNIT-2

Evolution of Computer Networks Layered: Network architecture, OSI Layers Model, transmission media topology, error detection & Correction techniques, Parity checks, CRC, Asynchronous and synchronous transmission, TDM, FDM.

UNIT-3

Data Link Layer: Different Types of line discipline, simplex, half duplex and full duplex. **Flow control:** stop and wait protocol, sliding Window Protocol with their efficiency, ARQ techniques & their performances HDLC.

UNIT-4

LAN: Static & Dynamic channel allocation, Media access control for LAN & WAN; **ALOHA:** pure, slotted ALOHA, CSMA, CSMA/CD, **IEEE 802 standards for LAN & MAN:** 802.3, 802.4, 802.5, 802.6 and 802.2 & their **comparison Fast LANs:** fast Ethernet, FDDI.

UNIT- 5

Routing: Definition, Elements of routing techniques, Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Routing Strategies, Congestion Control encryption & description techniques, Internet working, Internet and Intranet.

Reference Books:

1. Computer Networks Tanenbaum A. S. PHI.
2. LANs- Keizer
3. Computer Networks - Stalling w., PHI.

PGCS-202: Network Security

UNIT-1

A Definition of Computer Security, The Challenges of Computer Security, The OSI Security Architecture. Security Attacks (Passive Attacks, Active Attacks). Security Services (Authentication, Access Control, Data Confidentiality, Data Integrity, Nonrepudiation, Availability Service).

UNIT-2

Symmetric Encryption Principle (Cryptography, Cryptanalysis) Symmetric Block Encryption Algorithms (Data Encryption Standard, Triple DES, Advanced Encryption Standard). Stream Ciphers and RC4 (Stream Cipher Structure, The RC4 Algorithm). Cipher Block Modes of Operation (Electronic Codebook Mode, Cipher Block Chaining Mode, Cipher Feedback Mode, Counter Mode).

UNIT-3

Public-Key Cryptography Principles (Public-Key Encryption Structure, Applications for Public-Key Cryptosystems, Requirements for Public-Key Cryptography). Public-Key Cryptography Algorithms (The RSA Public-Key Encryption Algorithm, Diffie-Hellman Key Exchange, Other Public-Key Cryptography Algorithms). Digital Signatures.

UNIT-4

Approaches to Message Authentication: Secure Hash Functions (Hash Function Requirements, Security of Hash Functions, Simple Hash Functions, The SHA Secure Hash Function). Message Authentication Codes (HMAC, MACs Based on Block Ciphers).

UNIT-5

Security Threats and Vulnerability: Types of attacks on Confidentiality, Integrity and Availability. Vulnerability and Threats, Malware: Viruses, Worms, Trojan horses, Security Counter Measures; Intrusion Detection Systems, Antivirus Software

Reference Books:

1. W. Stallings, Cryptography and Network Security Principles and practice, 3/e, Pearson Education Asia, 2003. 2. Charlie Kaufman, Radia Perlman and Mike Speciner, “Network Security: Private Communication in a public world”, Prentice Hall India, 2nd Edition, 2002.
2. Charles P. Pleege, “Security in Computing”, Pearson Education Asia, 5th Edition, 2001.
3. William Stallings, “Network Security Essentials: Applications and standards”, Person Education Asia, 2000.
4. W. Mao, Modern Cryptography: Theory & Practice, Pearson Education, 2004

PGCS-203: Information Security

UNIT-1

System Security: Desktop Security, Programming Bugs and Malicious code, Database Security, Operating System Security, OS Security Vulnerabilities.

UNIT-2

Security Management: Disaster Recovery, Digital Signature, Ethical Hacking, Penetration Testing, Computer Forensics

UNIT-3

Network Security: Network Security Model, Network Security Threats, Firewalls: Overview, Types, Features, User Management, Intrusion Detection System, Intrusion Prevention System, Public Key Infrastructure, Digital Signature Schemes

UNIT-4

Internet and Web Application Security: Email security: PGP and SMIME, Web Security: Web authentication, Injection Flaws, SQL Injection, Web Browser Security, E-Commerce Security

UNIT-5

Wireless Network Security: Wireless Network Components, Security issues in Wireless Networks, Securing a Wireless Network, Mobile Security

Reference Books:

1. Charlie Kaufman, Radia Perlman, Mike Speciner, "Network Security", Prentice Hall, 2nd edition, 2002, ISBN-10: 0130460192, ISBN-13: 978-0130460196.
2. Charles Pfleeger, "Security in Computing", Prentice Hall, 4 th Edition, 2006, ISBN-10: 0132390779, ISBN-13: 978-0132390774.
3. Ulysess Black, "Internet Security Protocols: Protecting IP Traffic", Prentice Hall PTR; 1st edition, 2000, ISBN-10: 0130142492, ISBN-13: 978-0130142498.
4. Amir Ranjbar 2007, CCNP ONT Official Exam Certification Guide, Cisco Press [ISBN: 978-1- 58720-176-3].

PGCS–204 Cyber Security and Cyber Law

UNIT-1

Cyber World: An Overview: The internet and online resources, Security of information, Digital signature.

UNIT-2

An Overview of Cyber Law: Introduction about the cyber space, Regulation of cyber space – introducing cyber law, UNCITRAL Model Law on Electronics Commerce 1996.

UNIT-3

An Overview of Cyber Crimes: Defining Crime, Crime in context of Internet –Actus Rea/Mens Rea, Types of crime in Internet, Computing damage in Internet crime.

UNIT-4

An Overview of Indian Penal Law & Cyber Crimes: Fraud, Hacking, Mischief, Trespass, Defamation, Stalking, Spam.

UNIT-5

An Overview of Human Rights Issues in Internet: Freedom of Expression in Internet, Issues of Censorship, Hate speech, Sedition, Libel, Subversion, Privacy Issues, International Positions on Free Speech in Internet.

Reference Books:

1. Vivek Sood, Cyber law Simplified, Tata Mcgraw-Hill Publishing (2001).
2. Chris Reed and John Angel, Cyber law (2007)
3. Sudhir Naib, The Information Technology Act, 2005: A Handbook, OUP, New York, (2011)
4. S. R. Bhansali, Information Technology Act, 2000, University Book House Pvt. Ltd.

PGCS–205 Legal Aspects of Cyber Security

UNIT-1

An Overview of Electronic Contracts: The Indian Law of Contract, Construction of Electronic Contracts, Issues of Security Issues of Privacy Technical Issues in Cyber Contracts.

UNIT-2

Types of Electronic Contracts: Employment Contracts Consultant Agreements Contractor Agreements Sales, Re-Seller and Distributor Agreements Non-Disclosure Agreements, Software Development & Licensing Agreements Shrink Wrap Contract, Source Code Escrow Agreements.

UNIT-3

An Overview of E-Commerce & Taxation E-Commerce - Salient Features: On-line contracts, Mail Box rule, Privity of Contracts, Jurisdiction issues in E-Commerce, Electronic Data Interchange.

UNIT-4

Security and Evidence in E-Commerce: Dual Key Encryption, Digital Signatures, Security issues in E-Commerce, Evidence related issues, UNCITRAL model law of E-Commerce, Indian Legal Position on E- Commerce, IT Act 2000/Indian Evidence Act/ Draft law on E-Commerce.

UNIT-5

An Overview of Copy Right in Information Technology: Understanding the technology of Software, Software - Copyrights vs. Patents debate, Authorship and Assignment Issues, Commissioned Work and Work for Hire, Idea/Expression dichotomy, Copyright in Internet.

Legal Issues in Internet and Software Copyright: Jurisdiction Issues and Copyright, Infringement, Remedies of Infringement, Multimedia and Copyright issues, Software Piracy.

Reference Books:

1. The Information Technology Act,2000.
2. Information Technology Law and practices by Vakulsharma.
3. Computers, Internet and New Technology Laws (A comprehensive reference work with a special focus on developments in India)" By: Karnika Seth.
4. Cyber Law & Crimes By: BarkhaBhasin, Rama Mohan Ukkalam.