**Vikram University, Ujjain**

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

**SYLLABUS of**

**PG Diploma in Modern Technologies of Computer Science**

**Exclusively for University Teaching Department (ICS, VUU)**

**ONE YEAR PG Diploma in Modern Technologies of Computer Science**

**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 Modern Technologies of Computer Science 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.

# Vikram University, Ujjain –PG Diploma in Modern Technologies of Computer Science w.e.f. 2020-2021

## COURSE STRUCTURE

**PG Diploma in Modern Technologies of Computer Science**

**First Semester**

| S N | Course code | Title | End term sem Exam | Internal | Max Marks |
|---|---|---|---|---|---|
| | | | | | |
| 1 | PGMT-101 | Fundamental of Information Technology | 60 | 40 | 100 |
| 2 | PGMT-102 | PC-Packages | 60 | 40 | 100 |
| 3 | PGMT-103 | Programming and Problem solving in C | 60 | 40 | 100 |
| 4 | PGMT- 104 | Digital Computer Orgnization | 60 | 40 | 100 |
| 5 | PGMT-105 | Modern Technologies of Computer Science | 60 | 40 | 100 |
| | | Total | | | 500 |

## COURSE STRUCTURE

**PG Diploma in Modern Technologies of Computer Science**

**Second Semester**

| S N | Course code | Title | End term sem Exam | Internal | Max Marks |
|---|---|---|---|---|---|
| | | | | | |
| 1 | PGMT-201 | Network Security | 60 | 40 | 100 |
| 2 | PGMT-202 | Artificial Intelligence | 60 | 40 | 100 |
| 3 | PGMT-203 | Machine Learning | 60 | 40 | 100 |
| 4 | PGMT- 204 | Internet of Things | 60 | 40 | 100 |
| 5 | PGMT-205 | Data Mining | 60 | 40 | 100 |
| | | Total | | | 500 |

**PGMT-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. Silbrschaz, 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.

**PGMT- 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.

**PGMT-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: pdntf &  family, c preprocessor- basics, # Include, # define, # undef, conditional compilation directive like #if, #else, #endif, #ifdefand #ifndef, Variable argument list functions.

**Reference Books:**

l. Keminghan& Richie: The C progamming tanguage, pHI

2. Cooper Mullish: The Spirit ofC, Jaico publishing-Housg Delhi

3. Kanetkar Y: Let us C 4, Kanetkar Y: Pointers in C.

**PGMT- 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.

**PGMT-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. Pleeger, "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.

**PGMT-201: 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. Pleeger, "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

**PGMT-202: Artificial Intelligence**

**Unit-1**

Basic Problem solving methods: Production systems-state space search, control strategies. Heuristic search, forward and backward reasoning, Hill climbing techniques Breadth first search, Depth first search, Best search.

**Unit-2**

Knowledge Representation: Predicate logic, Resolution question Answering, Nonmonotonic Reasoning, statistical and probabilistic reasoning, Semantic Nets. Conceptual Dependency, frames and scripts.

**Unit-3**

AI languages: Important characteristics of Al languages PROLOG, LISP.

**Unit-4**

Introduction to Expert Systems: Structure of an Expert system interaction with an expert, Design of an Expert system.

**Unit-5**

Neural Network: Basic Structure of a neuron, Perception Feed forward, Back propagation, Hopfield Network.

**Reference Books:**

1.Rich E and Knight K Artificial Intelligence, 'TMH New Delhi,

2. Nelsson N.J. Principles of Artificial Intelligence, Springer Verlag, Berlin.

3. Barr A, Fergenbaub EA. and Cohen PR, Artificial Intelligence. Addisonwesley Reading (Mars) 1989.

4.Waterman D.A. A guide to Expertsystem, Adision - Wesley, Reading (Mars) 1986,

5.Artificial Intelligence Hand book, Vol. 1-2, ISA. Research Triangle Park 1989,

**PGMT–203 Machine Learning**

**UNIT-1**

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

**UNIT-2**

Neural Network Representation - Problems - Perceptrons – Multilayer  Networks and Back Propagation Algorithms - Advanced Topics - Genetic Algorithms - Hypothesis Space Search Genetic Programming - Models of Evalution and Learning.

**UNIT-3**

Bayes Theorem - Concept Learning - Maximum Likelihood – Minimum Description Length Principle - Bayes Optimal Classifier - Gibbs Algorithm - Naïve Bayes Classifier – Bayesian Belief Network - EM Algorithm - Probability Learning - Sample Complexity - Finite and Infinite Hypothesis Spaces - Mistake Bound Model.

**UNIT-4**

K- Nearest Neighbour Learning - Locally weighted Regression - Radial Bases Functions - Case Based Learning.

**UNIT-5**

Learning Sets of Rules - Sequential Covering Algorithm - Learning Rule Set - First Order Rules - Sets of First Order Rules - Induction on Inverted Deduction - Inverting Resolution -Analytical Learning - Perfect Domain Theories - Explanation Base Learning – FOCL Algorithm- Reinforcement Learning - Task - Q-Learning - Temporal Difference Learning

**Reference Books:**

1. Machine Learning - Tom M. Mitchell, - MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis

**PGMT– 204 Internet of Things**

**UNIT-1:**

Introduction: Definition, Characteristics of IOT, IOT Conceptual framework, IOT Architectural view, Physical design of IOT, Logical design of IOT, Application of IOT.

**UNIT-2:**

Machine-to-machine (M2M), SDN (software defined networking) and NFV(network function virtualization) for IOT, data storage in IOT, IOT Cloud Based Services.

**UNIT-3:**

Design Principles for Web Connectivity: Web Communication Protocols for connected devices, Message Communication Protocols for connected devices, SOAP, REST, HTTP Restful and Web Sockets. Internet Connectivity Principles: Internet Connectivity, Internet based communication, IP addressing in IOT, Media Access control.

**UNIT-4:**

Sensor Technology , Participatory Sensing, Industrial IOT and Automotive IOT , Actuator, Sensor data Communication Protocols ,Radio Frequency Identification Technology, Wireless Sensor Network Technology.

**UNIT-5:**

IOT Design methodology: Specification -Requirement, process, model, service, functional & operational view.IOT Privacy and security solutions, Raspberry Pi & arduino devices. IOT Case studies: smart city streetlights control & monitoring.

**Reference Book:**

1. Rajkamal,"Internet of Things", Tata McGraw Hill publication

2. Vijay Madisetti and Arshdeep Bahga, "Internet of things(A-Hand-on-Approach)" 1st Edition ,Universal Press

3. Hakima Chaouchi "The Internet of Things: Connecting Objects", Wiley publication.

4. Charless Bell "MySQL for the Internet of things", Apress publications.

**PGMT– 205 Data Mining and Data Warehousing**

**UNIT-1**

Introduction : 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. Association Rules & Clustering Techniques: Introduction, Various association algorithms like A Priori, Partition, Pincer search etc., Generalized association rules.

**UNIT-2**

Clustering paradigms; Partitioning algorithms like K-Medioid, CLARA, CLARANS; Hierarchical clustering, DBSCAN, BIRCH, CURE; categorical clustering algorithms, STIRR, ROCK, CACTUS. Other DM techniques & Web Mining: Application of Neural Network, AI, Fuzzy logic and Genetic algorithm, Decision tree in DM. Web Mining, Web content mining, Web structure Mining, Web Usage Mining.

**UNIT-3**

Temporal and spatial DM: Temporal association rules, Sequence Mining, GSP, SPADE, SPIRIT, and WUM algorithms, Episode Discovery, Event prediction, Time series analysis. Spatial Mining, Spatial Mining tasks, Spatial clustering, Spatial Trends.

**UNIT-4**

Data Mining of Image and Video: A case study. Image and Video representation techniques, feature extraction, motion analysis, content based image and video retrieval, clustering and association paradigm, knowledge discovery.

**UNIT-5**

The vicious cycle of Data mining, data mining methodology, measuring the effectiveness of data mining data mining techniques. Market baskets analysis, memory based reasoning, automatic cluster detection, link analysis, artificial neural networks, generic algorithms, data mining and corporate data warehouse, OLA

**Reference Books:**

1. Data Mining Techniques ; ArunK.Pujari ; University Press.
2. Data Mining; Adriaans&Zantinge; Pearson education.
3. Mastering Data Mining; Berry Linoff; Wiley.