SU/BOS/Science/497   **Date: 10/07/2023**

To,

The Principal, All Concerned Affiliated Colleges/Institutions Shivaji University, Kolhapur	The Head/Co-ordinator/Director All Concerned Department (Science) Shivaji University, Kolhapur.

Subject: Regarding syllabi of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.

Sir/Madam,

     With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.

M.Sc.Part-II (Sem. III & IV) as per NEP-2020			
1.	Microbiology (HM)	8.	Food Science & Nutrition
2.	Pharmaceutical Microbiology (HM)	9.	Food Science & Technology
3.	Microbiology	10.	Biochemistry
4.	Computer Science	11.	Biotechnology
5.	Computer Science (Online Mode)	12.	Medical Information Management
6.	Data Science	13.	Environmental Science
7.	Information Technology (Entire)	14.	Physics

     This syllabus, nature of question and equivalence shall be implemented from the academic year 2023-2024 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website **www.unishivaji.ac.in**)

     The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2023 & March/April 2024. These chances are available for repeater students, if any.

     You are, therefore, requested to bring this to the notice of all students and teachers concerned.

     Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

Shivaji University, Kolhapur

Accredited By NAAC with 'A++' grade with CGPA 3.52

Syllabus for

Master of Science (M.Sc.)

In

Computer Science

(Online Mode)

(Under Science Faculty)

Part-II

(Subject to modifications to be made time to time)

Syllabus to be implemented from 2023-2024

M.Sc. Part II - Semester III

Course Code	Title of the Course	Credits	Teaching Scheme (h/w)		Evaluation Scheme (Marks)		
			L	P	CIE	SEE	Total
CC -301	Computer Networks	4	**Contact sessions will be conducted as per UGC norms for Delivery of Courses in online mode		20	80	100
CC-302	Advanced Java Programming	4			20	80	100
CC-303	Web Programming	4			20	80	100
CE-304	Elective-I: CE-304.1: Image Processing CE-304.2 Cloud Computing	4			20	80	100
CCPR-305	Advanced Java Programming Lab	4			100	--	100
CCPR-306	Web Programming Lab	4			100	--	100
Total		24			280	320	600

M.Sc. Part II - Semester IV

Course Code	Title of the Course	Credits	Teaching Scheme (h/w)		Evaluation Scheme (Marks)		
			L	P	CIE	SEE	Total
CC -401	Artificial Intelligence	4	**Contact sessions will be conducted as per UGC norms for Delivery of Courses in online mode		20	80	100
CC-402	Advanced Web Technology	4			20	80	100
CC-403	Machine Learning Using Python	4			20	80	100
CE-404	Elective-II: CE-404.1: Advanced Computer Architectures CE-404.2: Network Security	4			20	80	100
CCPR-405	Advanced Web Technology Lab	4			100	--	100
CCPR-406	Machine Learning Lab	4			100	--	100
Total		24			280	320	600

Total Marks for M. Sc.-II : 1400	
Total Credits for M. Sc.-II (Semester III & IV): **48**	
CC-Core Course	
CE–Core Elective	
CIE – Continuous Internal Examination	
SEE – Semester End Examination	
CCPR – Core Course Practical.	**Total Credits for M.Sc. Course : 88**
	Total Marks for M.Sc. Course : 2200

** UGC norms for Delivery of Courses in online mode

M.Sc.-II Semester-III (Computer Science) (Online Mode)

CC-301: Computer Networks

Course outcomes:

1. Understand the basic concepts of data communication including the key aspects of networking and their interrelationship
2. Understand various protocols such as HTTP, SMTP, POP3, IMAP, FTP, DNS, DHCP and the basic structure of IPv4, IPv6 Address and concept of sub netting with numerical
3. Understand routing concept and working of routing protocols such as, Random access protocols, sliding window protocols MIME, SMTP,FTP
4. Understand various protocols like UDP,TCP

UNIT-I

Introduction and Physical Layer: Network - goals and applications, Network Types, Protocol Protocols and Protocol Hierarchies, Network Models -OSI Reference Model -Functionality of each layer , TCP/IP Reference Model - Introduction to IP, TCP, and UDP, TCP/IP Protocol Suite - Comparison of OSI and TCP/IP model Physical Layer- Basic Concepts: Bit rate, bit length, base band transmission, Transmission Impairments – attenuation, distortion and noise, Data Rate Limits – Nyquist's bit rate formula for noiseless channel and Shannon's law - Problems on above concepts. Transmission Modes-Parallel Transmission,-Serial Transmission – Asynchronous and Synchronous Transmission Media-Guided Media – Twisted Pair, Coaxial Cable, Fiber Optic Cable, Unguided Media – Radio waves, microwaves, Infrared Switching -Circuit Switching, Message Switching and Packet Switching

UNIT-II

Data Link Layer: Framing: Character Count, Byte Stuffing, Bit Stuffing and Physical Layer Coding Violations Error Control -Hamming Code and CRC Flow Control -Stop and Wait ARQ for noisy channel Sliding Window Protocols -1-bit sliding window protocols,Go back N, Selective Repeat. The Medium Access Sub layer Random Access Protocols: ALOHA – pure and slotted,CSMA – 1-persistent, p-persistent and nonpersistent,CSMA/CD ,CSMA/CA Controlled Access -Reservation, Polling and Token Passing Channelization -FDMA, TDMA and CDMA VLANS -Membership, Configuration and Advantages

UNIT-III

Network Layer: Design Issues, Store-and-forward packet switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection Oriented Service, Comparison of Virtual Circuit and Datagram Logical Addressing - IPV4

Addresses – Address Space, Notations, Classful Addressing, Classless Addressing, Network Address Translation(NAT) - IPV6 Addresses – Addressing Structure, Address Space IPV4 Protocol - Datagram Format, Fragmentation, Checksum, Options IPV6 Protocol - Advantages, Packet Format, Extension Headers

UNIT-IV

Transport Layer: Process-to-Process delivery, UDP, and TCP. Concepts of congestion control: data traffic, congestion and congestion control, congestion Control in TCP. Application Layer: Web and HTTP, Domain Name System (DNS) and DNS servers, Electronic Mail: Architecture and services, Message Formats, MIME, message transfer, SMTP, Mail Gateways, Relays, Configuring Mail Servers, File Transfer Protocol

Reference Books:
 1. Computer Networks, Andrew Tanenbaum, Pearson Education
 2. Data Communication and Networking ,Behrouz Forouzan, TATA McGraw Hill.
 3. Data Communication and Networks ,James Irvin, David HarleWiley
4. Computer Networks protocols, Standards and Interface, Black C.,Prentice Hall of India
5. Computer Communication Networks, William Stalling, Prentice Hall of India
6. Delight of Computer Network ,Singh K. K. ,Schitech
7. Computer Networks ,Sharma C. R., Jaico
8. Computer Networks and Internets ,Comer D. E. ,Pearson ,5 th Edition

M.Sc.-II Semester-III (Computer Science) (Online Mode)

CC-302: Advanced Java Programming

Course Outcomes:

1. The student will be able to develop distributed business applications, develop web pages using advanced server-side programming through servlets and Java server pages.
2. Develop Java client/server applications.
3. Develop distributed applications using RMI
4. Develop component-based Java software using JavaBeans
5. Develop server side programs in the form of servlet

UNIT -1

Overview of Java programming, Java Servlets: Servlet basics, servlet life cycle, Generic and HTTP servlets, The Servlet API, javax.servlet,session and cookies, web deployment descriptor, web.xml. Remote Method Invocation–Introduction, architecture, defining remote objects, creating stubs and skeleton, object serialization, RMI activation, registering remote objects, Parameter passing in remote methods (marshalling and unmarshalling).

UNIT-II

Java Database Connectivity. JDBC overview, Architecture, Types of JDBC Drivers, DriverManager class, database connection statements, Resultset, transaction, Metadata and Aggregate functions , callable statements, Connection to various back ends. Java Server Pages (JSP): Introduction to JSP tags and directive, Request String, User Sessions, Cookies, Session objects.

UNIT-III

Java Beans: Basics of designing JavaBeans, Java Bean design patterns, creating and usingproperties, using events to communicate with other components. Enterprise Java Bean: Preparing a Class to be a JavaBean, Creating a JavaBean, JavaBean Properties,Types of beans, Stateful Session bean, Stateless Session bean, Entity bean

UNIT –IV

Hibernate framework application, Introduction Working on Hibernate framework, Introduction

Hibernate framework, its advantage and disadvantage, Struts framework Architecture and details, Struts frameworks Components.

References:-

1. The complete Reference Java- 5th edition – Herbert Schildt- Tata McGraw Hill
2. Developing Java Servlets James Goodwill, Techmedia Pub.
3. Java 2EE – Ivan Bayross (PHI)
4. Java 2 Black Book –(DreamTech)
5. JDBC, Servlet and JSP, Black Book, Santosh Kumar K. Dremtech publication
6. Valesky, "Enterprise Java Beans", Addison Wesley.
7. Inside Java 2 Virtual Machine by Venners Bill, Mcgraw Hill Education

CC-303: Web Programming

Course Outcomes:

1. Students will be able to develop application using HTML
2. Students will be able to Understand .NET architecture.
3. To familiarize the student with the development of web-based application using ASP.NET.
4. To inculcate skills pertaining to data access technology geared to facilitate the development of Connected and Disconnected systems using ADO.NET platform.
5. Student will able to utilize AJAX toolkit
6. Utilize the concepts of JavaScript

UNIT -I

Overview of HTML, Structure of HTML document. Formatting text with HTML, adding local and remote links, adding graphics, creating lists in HTML, creating tables in HTML, Dividing the window with frames, Building interactivity with forms, Formatting site with cascading style sheets. Image maps – creating client-side and server-side image maps. Various HTML Editors.

Introduction: .NET framework and its architecture, CLR, JIT, CTS, Metadata, .NET Revolution.

UNIT- II

ASP.NET: Page Life Cycle, ASP.NET server-side Controls, Data Controls, Server-side

ADO.NET: ADO.NET Architecture, ADO.NET namespaces, Working with ADO.NET, Data controls, GridView Control, DetailsView Control, FormView Control, Connected architecture, Disconnected Architecture, Three-layer Architecture, Working with Master pages.

UNIT- III

State management: Server side & Client-side state management, Caching in ASP.NET: Page caching, data caching, fragment caching AJAX: Introduction to AJAX, Various extenders of AJAX

Validation Controls: RequiredFieldValidator, CompareValidator, RangeValidator, RegularExpressionValidator, CustomValidator, ValidationSummary.

Language Integrated Queries (LINQ), Web services.

UNIT- IV

Microsoft SQL Server: Database designing, Tables, Views, Stored Procedures, taking backup of database, creating script of database

Java Script: JavaScript Overview, Data types, variables, scope of variables, casting, data type conversion rules, Expressions and operators. Arrays. Built-in functions, and Built-in objects- String, Date, Math. Three types of dialog boxes-alert, prompt, confirm. Custom Functions.

References:

1. Head first HTML and CSS by Elisabeth Robson and Eric Freeman
2. ASP.NET: The Complete Reference, by Matthew MacDonald
3. A Beginners Guide, ASP.NET 3.5 by William B. Senders
4. C# in Depth by Jon Skeet
5. Microsoft Visual C# Step by Step by Sharp John
6. Let Us C# by Yashavant P Kanetkar
7. Javascript: The Complete Reference by Thomas Powell & Fritz Schneider
8. JavaScript Pocket Reference, 3rd Edition By David Flanagan
9. Professional JavaScript for Web Developers, 4th Edition by Matt Frisbie

M.Sc.-II Semester-III (Computer Science) (Online Mode)

CE-304.1: Image processing

Course Outcomes:
1. Exploration of the limitations of the computational methods on digital images.
2. Expected to implement the spatial and frequency domain image transforms on enhancement and restoration of images.
3. Elaborate understanding on image enhancement techniques.
4. Expected to define the need for compression and evaluate the basic compression algorithms.

UNIT - I
Digital Image Fundamentals & Image Transforms: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels. Image Transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT - II
Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering. Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT - III
Image Restoration: Degradation Model, Algebraic Approach to Restoration, InverseFiltering, Least Mean Square Filters, Constrained Least Squares Restoration, InteractiveRestoration.

UNIT – IV
Image Segmentation: Detection of Discontinuities, Edge Linking And Boundary Detection, thresholding, Region Oriented Segmentation. Morphological Image Processing: Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing.

References:

1. Rafael C.Gonzalez & Richard E.Woods – Digital Image Processing – Pearson Education-2/e – 2004.
2. Anil.K.Jain – Fundamentals of Digital Image Processing- Pearson Education-2003.
3. B.Chanda & D.Dutta Majumder – Digital Image Processing and Analysis – Prentice Hall of India – 2002
4. William K. Pratt – Digital Image Processing – John Wiley & Sons-2/e, 2004
5. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008

6. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools - Scotte Umbaugh, 2nd Ed, CRC Press, 2011
7. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Edition, MC GRAW HILL EDUCATION, 2010.
8. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
9. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2008,2nd Edition.

M.Sc.-II Semester-III (Computer Science) (Online Mode)

CE-304.2: Cloud Computing

Course Learning Outcome:
On completion of the course, students will be able to-
1. Acquire knowledge of cloud computing and its usage.
2. Understand components and operations of cloud computing system.
3. Enhance the skills for data management, storage and operations in cloud computing system.
4. Study recent trends in cloud computing.

UNIT – I
Introduction to cloud computing: Evolution of cloud computing, key characteristics of cloud computing, need of cloud computing, Components of cloud computing, cloud computing architecture, client server architecture, grid computing environment, types of cloud, major players in cloud computing, benefits and challenges of cloud computing.

UNIT – II
Virtualization, Virtualization architecture and its needs, benefits and challenges, types of virtualization, virtualization of CPU, Memory and I/O devices, server virtualization, virtualization design requirements, virtualization structure, open source virtualization technology, draw backs of virtualization. Hypervisor, load balancing, Google cloud, VMware, Amazone EC2.

UNIT – III
Cloud computing services & security, Cloud services-IaaS, SaaS, PaaS, DaaS, MaaS, CaaS, DBaas, cloud models- public, private, hybrid and community clouds. Open cloud implementation and administration (Eucalyptus), cloud development techniques, cloud based storage, cloud backup, Cloud security - disaster recovery, data integration, data transformation, data migration, challenges with data security.

UNIT – IV
Recent trends in cloud computing, Cloud standards, service oriented architecture (SOA) for cloud application, mobile computing its application, architecture and working. MangoDB, MapReduce implementations for the Cloud.

REFERENCE BOOKS:
1. Kailash Jauaswal, Jagannath Kallakurchi, Donald J. Houde, Dr. Deven Shah, "Cloud Computing", Black Book, Dreamtech , 2014
2. Barrie Sosinsky, "Cloud Computing Bible, " Wiley India Pvt. Ltd. 2012
3. Prasant Kumar Pattnaik et.al., Fundamentals of Cloud Computing, Vikas Publication House Pvt. Ltd.,first Edition 2015

M.Sc.-II Semester-III (Computer Science) (Online Mode)

CCPR-305: Advanced Java Programming Lab

Lab assignments based on Advanced Java Programming course.

M.Sc.-II Semester-III (Computer Science) (Online Mode)

CCPR-306: Web Programming Lab

Lab assignments based on Web Programming course.

M.Sc.-II Semester-IV (Computer Science) (Online Mode)

CC-401: Artificial Intelligence

Course Outcome
1. Apply problem solving by intelligent search approach.
2. Represent knowledge using AI knowledge representation techniques.
3. Design Machine Learning solution to real life problems.
4. Derive solutions for problems with uncertainty using Fuzzy theory.
5. Define a NLP problem and find a suitable solution to it.
6. To develop a good understanding of all aspects of Natural Language Processing (NLP) and Genetic algorithm

UNIT-I

Introduction of AI and Problem Solving: Artificial Intelligence, AI Problems, AI Techniques, The Level of the Model, Criteria For Success. Defining the Problem as a State Space Search, Problem Characteristics , Search and Game Playing: Breadth first search, depth first search, hill climbing, heuristic search, Best first search, A* algorithm, AO* algorithm, Minmax & game trees, refining Minmax, Alpha – Beta pruning, constraint satisfaction

UNIT-II

Knowledge Representation: Introduction, Propositional Logic, Syntax and Semantics, Interpretations, Properties, Predicate Calculus, WFF, Free and Bound Variables, Normal Forms, Inference Techniques, Resolution, Unification, Frames, Frame Representation Language, Conceptual Dependency, Script, Semantic Net, Forward and Backward Reasoning

UNIT-III

Neural Networks: Introduction, Basic Concepts of Neural Networks, Model of an Artificial Neuron, Activation Functions, Feedforward Network, Recurrent Network, Learning Methods, deep learning and deep neural network. Fuzzy Set Theory, Fuzzy Membership, Fuzzy Operations, Fuzzy Logic Systems.

UNIT-IV

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis. Genetic Algorithm: Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis of Selection Operations, the Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm

Reference Book

1. Elaine Rich and Kelvin Knight, Artificial Intelligence, Tata McGraw Hill, 2002.
2. Nils J Nilson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publishers , Inc., San Francisco, California, 2000.
3. R. Akerkar, Introduction to Artificial Intelligence, Prentice-Hall of India, 2005
4. Winston P.H, "Artificial Intelligence", Addision Wesley (1993)
5. B. Yegnanarayana, Artificial Neural Networks, Prentice-Hall of India, 2006
6. Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications, S. Rajasekaran, G. A. VijayalakshmiPai, Prentice-Hall of India, 2003
7. Artificial Intelligence: A Modern Approach, 2nd edition, by Russell and Norvig, Prentice Hal

CC-402: Advanced Web Technology

Course Outcomes:

1. Students will be able to develop application using MVC
2. Students will be able to understand Entity Framework
3. Students will be able to understand the use bootstrap
4. Students will be able to understand the use Angular JS
5. Students will be able to understand the use Node JS

UNIT-I

Introduction to MVC: Benefits of using ASP.NET MVC, Role of Model, View, and Controller, ASP.NET MVC Works, Naming conventions, Creating views, Defining controllers, Defining data model, creating strongly-typed views, Creating strongly-typed views. Razor View Engine: Razor Basics, Razor design goals, Implementation of Razor view, Razor syntax, Accessing Model Data in Razor views.

UNIT -II

Using Entity Framework: Crud Operations, Crud Operation Using BO Class, Crud Operations Using Generic BO Class, Authentication and Authorization: Windows Authentication, Forms Authentication, Role Based Authentication, Working with URLs and Routing: Understanding the Routing Mechanism, Adding a Route Entry, Using Parameters, Using Defaults, Using Constraints.

UNIT -III

Introduction to Bootstrap: History of Bootstrap, Advantages of Bootstrap Framework, Responsive webpage, Bootstrap Grid, Container, Offset Column, Reordering Columns, Bootstrap Typography, Bootstrap Tables, Bootstrap Form Layout, Bootstrap Components, Glyphicons Component.

UNIT -IV

Introduction to AngularJS: Expressions, Modules, Directives, Directive, Data Binding, Controllers, Scope, Filters, Services, AngularJS AJAX, Tables, Select Boxes Introduction to Node JS: Advantages of Node JS, Setup Development Environment, Functions, Buffer, Module, Modules Types, Node Package Manager, Creating Web Server, File System, Debugging Node JS Application, Events.

References:

1. Professional ASP.NET MVC 5, by Jon Galloway, Brad Wilson, K. Scott Allen, David Matson
2. ASP.NET MVC 4 and the Web API: Building a REST Service from Start to Finish by Jamie Kurtz
3. Mastering Bootstrap 4 by Benjamin Jakobus and Jason Marah
4. AngularJS by Brad Green and ShyamSeshadri
5. Learning AngularJS: A Guide to AngularJS Development by Ken Williamson
6. Node.js 8 the Right Way: Practical, Server-Side JavaScript That Scales by Jim R. Wilson Get Programming with Node.js by Jonathan Wexler

M.Sc.-II Semester-IV (Computer Science) (Online Mode)

CC-403: Machine Learning using Python

Course Outcome
1. Provide an introduction to the basic principles, techniques, and applications of Machine Learning.
2. Ability to select and implement machine learning techniques that are suitable for the applications under consideration
3. Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies.
4. Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques
5. Use different machine learning techniques to design machine learning applications for real world problems.

UNIT-I
Introduction to Machine learning, Essential concepts in Machine learning. Machine learning basics: Key terminology, Key tasks of machine learning, choosing the right algorithm, Steps in developing a machine learning application.

UNIT-II
Supervised Learning: The k-Nearest Neighbours classification algorithm, Parsing and importing data from a text file, Creating plots with Matplotlib, Normalizing numeric values. Decision tree, Tree construction, plotting trees in Python, Testing and storing the classifier

UNIT-III
Regression in machine learning, Linear Regression, drawing the best-fit line, Types of Linear Regression.
 Naïve Bayesian decision theory, Conditional probability, classifying with conditional probabilities, Document classification with naïve Bayes, classifying text with python,

UNIT-IV
Unsupervised learning: Working of Unsupervised Learning, Types of Unsupervised Learning Algorithms, Clustering, Grouping unlabelled data using K-Means clustering, K-means algorithm.

References:
1. Machine Learning and Artificial Intelligence, Ameet V. Joshi, Springer, Cham
2. Machine Learning in Action,Peter Harrington, April 2012 , Manning publications.
3. Artificial Intelligence and Machine Learning Fundamentals by Zsolt Nagy
4. Data Mining Concepts and Techniques, Jiawei Han and Micheline Kambe

M.Sc.-II Semester-IV (Computer Science) (Online Mode)

CE-404.1: Advanced Computer Architecture

Course Outcomes:

1. Ability to address the design challenges in building a computer system.
2. Discuss memory organization and mapping techniques.
3. Describe architectural features of advanced processors.
4. Development of software to solve computationally intensive problems.

UNIT - I
Introduction: Paradigms of Computing: Synchronous – Vector/Array – SIMD – Systolic Asynchronous – MIMD, reduction Paradigm – Hardware taxonomy: Flynn's classification – Software taxonomy: Kung's taxonomy – SPMD.

UNIT - II
Memory Organizations: Bus – Cache – Shared Memory – Backplane Bus Systems – Cache Memory Organizations – Shared Memory Organizations – Sequential and Weak Consistency Models. Pipelining and Superscalar Techniques – Linear Pipeline Processors– Nonlinear Pipeline Processors

UNIT - III
Pipeline and Superscalar Techniques: Pipelining and Superscalar Techniques – Linear Pipeline Processors– Nonlinear Pipeline Processors– Instruction Pipeline Design– Arithmetic Pipeline Design–Superscalar and Super Pipeline Design. Parallel Computer Models: Evolution of Computer Architecture– Multiprocessors &Multi-computers– Vector Supercomputers & SIMD supercomputers– VLSI models– Dataflow machines.

UNIT - IV
Parallel Computer Models: Parallel Computer Architectures: Design Issues–Communication Models, Interconnection Networks–Performance. SIMD Computers: Array Processors & Vector Processors. Shared Memory Multiprocessors: UMA–NUMA &COMA Multiprocessors. Message-Passing Multi-computers.

Reference Books
1. H. El-Rewini& M. Abd-El-Barr, Advanced Computer Architecture and Parallel Processing, J. Wiley, 2005.
2. M. R. Bhujade, Parallel Computing, New Age Intr. Publishers, 1998.
3. S. Tanenbaum, Structured Computer Organization, Prentice Hall, 2007.
4. W. Stallings, Computer Organization & Architecture, Prentice Hall, 2006.
5. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, Tata McGraw- Hill, 2003.

M.Sc.-II Semester-IV (Computer Science) (Online Mode)

CE-404.2: Network Security

Course Outcomes:

1. Identify information security goals, classical encryption techniques and acquirefundamental knowledge on the concepts of network security.
2. Apply different verification techniques to achieve authentication and create secureapplications
3. Apply network security basics, analyze different attacks on networks
4. Get introduced to different attacks on the network etc.
5. Apply the knowledge of cryptographic utilities and authentication mechanisms todesign secure applications
6. Understand different IDS and working of firewalls

UNIT-I

Basics of Cryptography: Introduction to cryptography, conventional and public-key cryptography, hash functions, authentication, and digital signatures. (Key Management and Distribution: Symmetric Key Distribution, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure. Block Encryption, DES rounds, S-Boxes ,AES,DES,RSA etc.

UNIT-II

 Authentication: User Authentication: Remote User-Authentication Principles, Remote User-Authentication Using Symmetric Encryption, Kerberos Systems, Remote User Authentication Using Asymmetric Encryption. Cryptographic Authentication: passwords as keys, protocols, KDC's Certification Revocation,

Unit-III

Network Security: IANA, Allotment of IP Address, IPv4 and IPv6, IP Address – Basic, Detecting, Ping and Ping Sweep, Ping   Sweeping tools, Nmap - common commands, Trace Router, Detecting Victim's OS, Detecting Firewall, Countermeasures

Unit-IV

Firewalls and IDS : Firewalls and Intrusion Detection Systems: Intrusion Detection Password Management, Firewall Characteristics Types of Firewalls, Types of attacks, Malicious Software: Viruses, Worms, System Corruption, Attack Agents, Information Theft, Keyloggers, Phishing, Spyware Payload Stealthing, Backdoors, Rootkits, Distributed Denial of Service Attacks.

Reference Books

1. Network Security: Private Communications in a Public World, M. Speciner, R. Perlman, C. Kaufman, Prentice Hall, 2002.
2. Network Security, Firewalls And VPNs, J. Michael Stewart, Jones & Bartlett Learning, 2013, ISBN-10: 1284031675, ISBN-13: 978-1284031676.
3. AtulKahate, Cryptography and Network Security, McGraw Hill.
4. Joseph MiggaKizza, Guide to Computer Network Security, Springer InternationalPublishing AG 2017
5. Cryptography and Network Security; McGraw Hill; Behrouz A Forouzan.

M.Sc.-II Semester-IV (Computer Science) (Online Mode)

CCPR-405: Advanced Web Technology Lab

Lab assignments based on Advanced Web Technology course.

M.Sc.-II Semester-IV (Computer Science) (Online Mode)

CCPR-406: Machine Learning Lab

Lab assignments based on Machine Learning Using Python course.