BIOMETRICS
(Professional Elective-III)

Subject Code: UGIT7T0120	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites:

1. Knowledge on Biometric authentication process
2. Awareness on different biometric devices

Course Objectives:

1. Understand the Biometric technology including the definition, terminologies used, parameters and basic features.
2. Learn the principle, process, hardware used and issues for the different biometric methods like finger, facial, iris, voice, hand, signature, keystroke, AFIS and retina.
3. Know the different biometric applications.
4. Know the difference between physiological and behavioral biometrics.

SYLLABUS:

UNIT I: (6 Hrs)

Introduction – Why Biometrics? - Benefits of biometrics versus Traditional Authentication methods, Benefits of biometrics in identification Systems

Key Biometric Terms and Processes - Definitions, Verification and identification, Logical versus Physical Access, how biometric matching works, **Accuracy in biometric systems**– False match rate, False non-match rate, Failure to enroll rate, Derived metrics. **[T1]**

UNIT II: (8 Hrs)

Finger scan – Components, how finger scan technology works, competing finger Scan technologies, Finger scan Deployments, Finger scan Strengths, Finger scan weaknesses. **[T1]**

Facial Scan – Components, how facial scan technology works, competing facial Scan technologies, Facial scan Deployments, Facial scan Strengths, Facial scan weaknesses. **[T1]**

UNIT III: **(8 Hrs)**

Iris Scan - Components, how it works, Deployments, Iris scan Strengths, Iris scan weaknesses. **[T1]**

Voice Scan - Components, how it works, Deployments, Voice scan Strengths, Voice scan weaknesses. **[T1]**

UNIT IV: **(8 Hrs)**

Other physiological biometrics – Hand Scan, Retina Scan, Automatic Fingerprint Identification Systems (AFIS)

Other Leading Behavioral Biometrics – Signature scan, keystroke scan. **[T1]**

UNIT V: **(8 Hrs)**

Categorizing Biometrics Applications – Defining the Seven Biometric Applications, Introduction to IBG's Biometric Solution Matrix

Assessing the Privacy Risks of Biometrics – Bio Privacy Technology Risk Ratings

Biometric standards – Why Standards? Application Programming Interfaces. **[T1]**

UNIT VI: **(8 Hrs)**

Recommended Biometric for Network Security – Finger Biometrics, Face Biometrics, Voice Biometrics, Iris Biometrics, the Choice of a Biometric for Network Access

An Introduction to Statistical Measures of Biometrics – FAR, FRR, FTE, EER, and What Measure is Most Important?

The Biometric Transaction – Securing and Trusting a Biometric Transaction, Trusted Biometric Devices, and non-trusted biometric devices, Matching Location. **[T2]**

Course Outcomes:

Upon the completion of the course, the students will be able to:

CO 1: Identify various biometric techniques and standards. **[L3]**

CO 2: categorizes biometric applications and technologies to real time Problems. **[L4]**

CO3: Describe various biometric mechanisms. **[L2]**

CO4: Determine security mechanisms in Biometrics. **[L5]**

Mapping of COs to POs:

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1. "Biometrics–Identity Verification in a Networked World", Samir Nanavati, Michael Thieme, Raj Nanavati, A Wiley Tech Brief.
2. "Biometrics for Network Security" Paul Reid, Pearson Education.

REFERENCE BOOKS:

1. "Biometrics- The Ultimate Reference", John D. Woodward, Jr. Wiley Dreamtech
2. Woodward, J.D. and Orlans, Nicholos M., Biometrics, McGraw Hill
3. " Implementing Biometric Security", John Chirillo, Scott Blaul, Wiley

ONLINE COURSES / REFERENCES:

1. "Biometrics-An introductory course about understanding the different types and uses of biometrics" Created by Art of Service – Udemy course
2. "Biometrics"- offered by IIT Kanpur – NPTEL Course
3. "Usable Security" offered by University of MaryLand – Coursera course
4. https://blog.mantratec.com/category/biometric-technology
5. https://www.bayometric.com/biometric-blog/
6. https://www.aware.com/blog/

IMAGE PROCESSING

(PROFESSIONAL ELECTIVE–III)

Subject Code: UGCS7T0320	**L**	**T**	**P**	**C**
IV Year/ I Semester	**3**	**0**	**0**	**3**

Prerequisites: Basic knowledge in Mathematics and Computer Graphics.

Course Objectives: The course objective is to provide introduction to basic concepts and methodologies to digital image processing, and to develop a foundation that can be used as the basis for further study and research in this field.

Syllabus:

UNIT I: INTRODUCTION (8 hrs)

Introduction to Digital Image Processing, Fundamental steps in image processing systems, Image acquisition, Sampling and quantization, Basic relationship between pixels, Mathematical tools used in image processing, Camera model of Image, Need for image transform and spatial frequencies in image processing, 2-D DFT, DCT, DST transforms.

UNIT II: IMAGE ENHANCEMENT (8 hrs)

Some basic intensity transformation functions, Histogram processing, Fundamentals of spatial filtering –smoothing spatial filters and sharpening spatial filters, combining spatial enhancement methods, Transformation and spatial filtering, Image smoothing using frequency domain filters Selective filtering and implementation.

UNIT III: IMAGE RESTORATION & RE-CONSTRUCTION (9 hrs)

Image degradation/restoration model, Noise models, Restoration in the presence of noise, linear Position invariant degradation, Estimation of degradation function and inverse filtering, Wiener filtering, Constrain least square filtering.

UNIT IV: COLOR IMAGE PROCESSING (9 hrs)

Color fundamentals, Color models, Pseudo color Image Processing, Basics of full color image processing, Color transformations, Smoothing and sharpening.

UNIT V: IMAGE COMPRESSION AND WATER MARKING (8 hrs)

Lossless Compression: Variable length coding, Dictionary-based coding, LZW compression, Lossy Compression, Image Compression standards, JPEG, JPEG 2000, Digital Water Marking, Frequency Domain Water Marking, Security Attacks.

UNIT VI: SEGMENTATION & MORPHOLOGICAL PROCESSING (7 hrs)

Erosion and Dilation, Opening and closing, Hit or miss transformation, some basic Morphological algorithms, Gray-Scale Morphology, Point, line and edge detection, Thresholding, Region oriented segmentation, Segmentation using morphological watersheds, Use of motion in segmentation.

Course Outcomes:

Upon completion of this course, the students will be able to:

CO 1: Understand the fundamentals steps in image processing.
CO 2: Analyze different filters and transformations for the enhancement of an image.
CO 3: Apply image processing techniques for restoration, reconstruction and compression of images.
CO 4: Compare various color models to perform color image processing.
CO 5: Understand the concepts of segmentation and distinguish basic morphological algorithms.

Mapping of COs to POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	2	-	-	-	-	-	-	-	-	-
CO3	3	-	2	2	2	-	-	-	2	2	-	2	2	3
CO4	2	2	-	-	3	-	-	-	2	2	-	2	2	3
CO5	2	2	2	-	2	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1. Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, 2011, Pearson Education.
2. Anil K jain, Fundementals of Digital Image Processing, 2012, Prentice Hall of India.

REFERENCE BOOKS:

1. S.Jayaraman, S,Esakkirajan, T.Veerakumar, Digital Image Processing, 2009, McGraw Hill Publisher.
2. B.Canda and D DuttaMjumder, Digital Image Processing and analysis, 2011/12, Prentice Hall of india.

INFORMATION SECURITY INCIDENT RESPONSE & MANAGEMENT
(Professional Elective-3)

Subject Code: UGIT7T0220	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites: Familiarity with Computer Networks.

Course Objectives:
The Students will learn the Vulnerability Assessment with phases, the configuration network devices, router, banner, firewall, VPN, identification of unauthorized devices, strategy for incident management and data backup policies, and malicious codes and its handling incidents.

SYLLABUS:

UNIT I: (10 hrs)

Information Security Assessments: Vulnerability Assessment, Classification, Types of Vulnerability Assessment, Vulnerability Assessment Phases, Vulnerability Analysis Stages, Characteristics of a Good Vulnerability Assessment Solutions &Considerations, Vulnerability Assessment Reports – Tools and choosing a right Tool, Information Security Risk Assessment, Risk Treatment, Residual Risk, Risk Acceptance, Risk Management Feedback Loops. **[T1]**

UNIT II: (7 hrs)

Configuration Reviews: Introduction to Configuration Management, Configuration Management Requirements-Plan-Control, Development of configuration Control Policies, Testing Configuration Management.

Managing Information Security Services: Configuring Network Devices, Identifying Unauthorized Devices, Testing the Traffic Filtering Devices, Configuring Router, Configuring Modes – Router/Global/Interface/Line/Privilege EXEC/ROM/User EXEC, Configuring a banner/Firewall/Bastion Host/VPN server.**[T1]**

UNIT III: (7 hrs)

Troubleshooting Network Devices and Services: Introduction & Methodology of Troubleshooting, Troubleshooting of Network Communication-Connectivity-Network Devices-Network Slowdowns-Systems-Modems.

Information Security Incident Management &Data Backup: Information Security Incident Management Overview-Handling-Response, Incident Response Roles and Responsibilities, Incident Response Process. Data Back introduction, Types of Data Backup and its techniques, Developing an Effective Data Backup Strategy and Plan, Security Policy for Back Procedures. **[T3]**

UNIT IV: **(8 hrs)**

Log Correlation: Computer Security Logs, Configuring& Analyzing Windows Logs, Log Management-Functions & Challenges, Centralized Logging and Architecture, Time Synchronization – NTP/NIST. **[T3]**

UNIT V: **(8 hrs)**

Handling Network Security Incidents: Network Reconnaissance Incidents, Network Scanning Security Incidents, Network Attacks and Security Incidents, Detecting DoS Attack, DoS Response Strategies, Preventing/stopping a DoS Incident etc. **[T3]**

UNIT VI: **(8 hrs)**

Handling Malicious Code Incidents: Incident Handling Preparation, Incident Prevention, Detection of Malicious Code, Containment Strategy, Evidence Gathering and Handling, Eradication and Recovery, Recommendations etc.**[T3]**

Course Outcomes:

Upon the completion of the course, the students will be able to:

CO 1: Demonstrate critical thinking and systematically apply Risk Management concepts to address strategic organizational IS/IT/Information security issues. [L2]

CO 2: Critically reflect on and evaluate the challenges and impact of a multitude of factors to IS/IT/Information Security management. [L5]

CO 3: Evaluate the mechanisms of data backups and Identify different types security logs. [L5]

CO 4: Analyze network security incidents from attacks and their presentation. [l4]

CO 5: Identify & removal of malicious code and recommendation for recovering the system. [L3]

Mapping of COs to POs:

CO/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	2	3	-	-	-	-	-	-	-	-	-
CO4	-	-	3	3	3	-	-	-	-	-	-	-	-	-
CO5	-	-	3	3	3	-	-	-	-	-	-	-	-	-

TEXTBOOKS:

1. Assessing Information Security (strategies, tactics, logic and framework) by A Vladimirov, K. Gavrilenko, and A.Michajlowski
2. "The Art of Computer Virus Research and Defense" by Peter Szor.
3. Managing Information Security Risks, The Octave Approach by Christopher Alberts and Audrey Dorofee

REFERENCES:

1. https://www.sans.org/reading-room/whitepapers/threats/implementing-vulnerability-management-process-34180
2. http://csrc.nist.gov/publications/nistpubs/800-40-Ver2/SP800-40v2.pdf
3. https://www.sans.org/reading-room/whitepapers/incident/security-incident-handling-small-organizations-32979

ONLINE COURSES AND REFERENCES:

1. Cybersecurity Roles, Processes & Operating System Security (Offered by IBM)
2. Introduction to Cybersecurity Tools & Cyber Attacks (Offered by IBM)

NETWORK PROTOCOLS
(Professional Elective - 3)

Subject Code: UGIT7T0320	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites:

1. Data Communications.
2. Computer Networks.

Course Objective:

The student will know,

1. The importance of TCP/IP protocol suite.
2. How the protocols relate toone another?
3. The functionality of each protocol, syntax, and semantics of various PDUs.

SYLLABUS:

UNIT I: **(8 Hrs)**

Internetworking Concept and Architectural Model: Introduction, Application-Level Interconnection, Network-Level Interconnection, Properties of the Internet, Internet Architecture, Interconnection through IP Routers. **[T1]**

Classful Internet Addresses: Introduction, Universal Identifiers, The Original Classful Addressing Scheme, Addresses Specify Network Connections, Network and Directed Broadcast Addresses, Limited Broadcast, Subnet and Supernet Extensions, IP Multicast Addresses, Loopback Address, IPV4 packet format. **[T2]**

IPV6 addressing scheme: Introduction, Address Space Allocation, Global Unicast Addresses, IPV6 packet format, Comparison between IPv4 and IPv6 Headers. **[T2]**

UNIT II: **(8 Hrs)**

Address Mapping-Static Mapping, Dynamic Mapping, The ARP Protocol-Packet Format, Encapsulation, Operation, RARP, DHCP-operation, packet format, BOOTP. **[T1 &T2]**

UNIT III: **(6 Hrs)**

IP protocol error handling: The Internet Control Message Protocol- Error Reporting vs. Error Correction, ICMP Message Format. **[T2]**

UNIT IV: **(8 Hrs)**

Transport layer protocols: TCP-services, protocols-stop & wait, Go back-N, Selective repeat, TCP format. UDP- Introduction, services, format, applications. **[T2]**

UNIT V: **(8 Hrs)**

Application Layer protocols: DNS-need, name space, DNS in Internet, Resolution, Telnet, R-Login, HTTP protocol. **[T2]**

UNIT VI: **(7 Hrs)**

Client-Server Paradigm-Socket Interfaces, Communication Using UDP, Communication Using TCP, Predefined Client-Server Applications, Peer-To-Peer Paradigm. **[T2]**

Course Outcomes:

Upon the completion of the course, the students will be able to:

- **CO 1:** Apply various layered techniques for designing sub-nets and super-nets and observe packet flow on basis of routing protocols. [L3]
- **CO 2:** Analyze the services and features of various protocol layers in data networks. [L4]
- **CO 3:** Evaluate data communication link considering elementary concepts of layered protocols. [L5]
- **CO 4:** Distinguish Various underlying protocols and its Applications in Application layer. [L4]

Mapping of COs to POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2		3												
CO3				3										
CO4		3												

TEXTBOOKS:

1. Internetworking with TCP/IP Vol-1, Principles, Protocols, and Architecture, Douglas e. Comer, Prentice Hall
2. TCP/IP Protocol Suite: by Behrouz A. Forouzan, McGraw Hill, 4th edition

REFERENCES:

1. Computer Networking: A Top-Down Approach, 6th edition, by James F. Kurose and Keith W. Ross.
2. TCP/IP Illustrated, Vol. 1: The Protocols, by W. Richard Stevens.

ONLINE COURSES AND REFERENCES:

1. Introduction to TCP/IP: Coursera link: https://www.coursera.org/learn/tcpip#syllabus

BLOCKCHAIN TECHNOLOGIES
(Professional Elective-IV)

Subject Code: UGIT7T0420	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

Prerequisite:
The prerequisites to learn about blockchain technology are important to identify whether you are ready for blockchain concepts.

Course objective:
To give students the understanding of emerging abstract models for Blockchain Technology and to familiarize them with the functional/operational aspects of cryptocurrency eco-system

SYLLABUS

UNIT I: Basics of Blockchain:
Introduction, Concept of Blockchain, History, Definition of Blockchain, Fundamentals of Blockchain, Characteristics of Blockchain, Consensus in Trust-Building Exercise, Public, Private, and Hybrid Blockchains, Distributed Ledger Technologies, DLT Decentralized Applications and Databases, Architecture of Blockchain, Transactions, Chaining Blocks, Value Proposition of Blockchain Technology.

UNIT II: Architecture of Blockchain:
Architecture of Blockchain, Transactions, Chaining Blocks, Value Proposition of Blockchain Technology.
Consensus: Introduction, Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods.

UNIT III: Blockchain Components:
Introduction, Ethereum, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Ethereum Key Pairs, Ethereum Addresses, Ethereum Wallets, Ethereum Transactions, Ethereum Languages, Ethereum Development Tools.

UNIT IV: Smart Contracts:
Introduction, Smart Contracts, Absolute and Immutable, Contractual Confidentiality, Law Implementation and Settlement, Characteristics, Internet of Things,
Bitcoin: Introduction, Working of Bitcoin, Merkle Trees, Bitcoin Block Structure, Bitcoin Address, Bitcoin Transactions, Bitcoin Network, Bitcoin Wallets, Bitcoin Payments, Bitcoin Clients, Bitcoin Supply

UNIT V: Blockchain and Allied Technologies: Blockchain and Cloud Computing, Characteristics of Blockchain Cloud, Blockchain and Artificial Intelligence, Blockchain and IoT, Blockchain and Machine Learning, Blockchain and Robotic Process Automation

Unit VI: Introduction to Augmented Reality: What Is Augmented Reality - Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality Augmented Reality Concepts- How Does Augmented Reality Work? Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.

Course Outcomes:

After the completion of this course, students will be able to

CO1: Apply and explore the working of Blockchain technology Architecture and components. (Apply)

CO2: Analyze the working of Smart Contracts. (Analyze)

CO3: Analyze and evaluate Crypto currency. (Evaluate)

CO4: Apply the learning of solidity and de-centralized apps on Ethereum. (Apply)

Mapping of COs to POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	3	-	-	2	-	-	-	-	-	-	2	-
CO2	-	3	2	-	-	3	-	-	-	-	-	-	3	-
CO3	3	3	-	-	-	3	-	-	-	-	-	-	3	-
CO4	-	3	2	-	-	-	-	-	-	-	-	-	3	-

Text Book:

1. Blockchain Technology: Concepts and Applications.Kumar Saurabh, Ashutosh Saxena,Wiley.
2. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016), ISBN-10: 9332578494 .
3. Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018, ISBN 978- 1484236178 2

Reference Books:

1. Blockchain Technology, Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, Universities Press
2. Blockchain Basics: A Non-Technical Introduction in 25 Steps by Daniel Drescher, Apress.
3. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016.

HUMAN COMPUTER INTERACTION
(PROFESSIONAL ELECTIVE-IV)

Subject Code: UGCS7T0720	**L**	**T**	**P**	**C**
IV Year/ I Semester	**3**	**0**	**0**	**3**

Prerequisites: Basic concepts of system analysis and design and exposure to various user interface designs related to web and mobile.

Course Objectives:

Upon successful completion of this course, students should be able to:

- Design clear, easy-to-understand and use interfaces and screens for graphical and Web systems.
- Describe and apply core theories, models and methodologies from the field of HCI.

Syllabus:

UNIT I: (10 hrs)

The User Interface – An Introduction and Overview: Importance of User Interface, Defining the User Interface, importance of Good Design, Benefits of Good Design, A brief history of the Human-Computer Interface**.**

Characteristics of Graphical and Web User Interfaces: The Graphical User Interface, popularity of Graphics, the concept of direct manipulation, Graphical systems: Advantages and Disadvantages, Characteristics of the Graphical User Interface, The Web User Interface, The Popularity of the Web, Characteristics of a Web Interface, Principles of user interface Design.

UNIT II: (8 hrs)

The User Interface Design process: Obstacles and Pitfalls in the Development Path, Usability, The Design Team, Understanding How People Interact with Computers, Important Human Characteristics in Design, Human Considerations in Design, Human Interaction Speeds.

Understand the Business Function: Business Definition and Requirements Analysis, Determining Basic Business Functions, Design Standards or Style Guides, System Training and Documentation Needs.

UNIT III: **(8 hrs)**

Develop System Menus and Navigation Schemes: Structures of Menus, Functions of Menus, Content of Menus, Formatting of Menus, Phrasing the Menu, Selecting Menu Choices, Navigating Menus, Kinds of Graphical Menus.

UNIT IV: **(8 hrs)**

Select the Proper Kinds of Windows: Window Characteristics, Components of a Window, Window Presentation Styles, Types of Windows, Window Management, Organizing Window Functions, Window Operations, Web Systems.

UNIT V: **(9 hrs)**

Select the Proper Device-Based Controls: Characteristics of Device-Based Controls, Selecting the Proper Device-Based Controls.

Choose the Proper Screen-Based Controls: Operable Controls, Text Entry/Read-Only Controls, Selection Controls, Combination Entry/Selection Controls, Other Operable Controls, Custom Controls, Presentation Controls, Selecting the Proper Controls.

UNIT VI: **(9 hrs)**

Components: Words, Sentences, Messages and Text, Text for Web Pages.

Create Meaningful Graphics, Icons and Images: Icons, Multimedia.

Choose the Proper Colors: Color, Color Uses, Possible Problems with Color, Color and Human Vision, Choosing Colors, Choosing Colors for Textual Graphic Screens, Choosing Colors for Statistical Graphics Screens, Choosing Colors for Web Pages, Colors to Avoid.

Course Outcomes:

Upon completion of this course, the students will be able to:

- **CO 1:** Interpret the basic principles of user interface & GUI design concepts.
- **CO 2:** Apply interactive design principles in real-time application development with client and system requirements.
- **CO 3:** Classify various interface design components by using modern tools.

Mapping of COs to POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	3	-	3	3	-	-	3	3	3	3	-	-
CO3	3	-	3	-	3	3	-	-	-	-	-	3	-	-

TEXT BOOKS:

1. Wilbert O Galitz, "The Essential Guide To User Interface Design", Wiley DreamaTech.
2. Ben Shneidermann, "Designing The User Interface", 3rd Edition, Pearson EducationAsia.

REFERENCE BOOKS:

1. Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell Bealg, "Human Computer Interaction",Pearson.
2. Prece, Rogers, Sharps, "Interaction Design", WileyDreamtech.
3. Soren Lauesen, "User Interface Design", PearsonEducation.

SECURE SOFTWARE ENGINEERING
(Professional Elective-IV)

Subject Code: UGIT7T0520 **L T P C**
IV Year / I Semester **3 0 0 3**

Prerequisites:
Concepts related to software Engineering, Object Oriented Development.

Course Objectives:
1. This course highlights the problems faced by the project team in the industry
2. It helps the people involved in the project to plan schedule and manage the project
3. It gives successful and improvements for effective and efficient projects.

SYLLABUS:

UNIT I: **(8 Hrs)**

INTRODUCTION: Problem, Process, and Product, Problems of software practitioners, approach through software reliability engineering, experience with SRE, SRE process, defining the product, Testing acquired software, reliability concepts, software and hardware reliability. Implementing Operational Profiles, Developing, identifying, crating, reviewing the operation, concurrence rate, occurrence probabilities, applying operation profiles

UNIT II: **(8Hrs)**

RELIABILITY: Engineering "Just Right" Reliability - Defining "failure" for the product, choosing a common measure for all associated systems. Setting system failure intensity objectives, determining user needs for reliability and availability. Overall reliability and availability objectives, common failure intensity objective. Engineering software reliability strategies. Preparing for Test, Preparing test cases.

UNIT III: **(7Hrs)**

TEST STRATEGY: Executing Test, Planning and allocating test time for the current release. Invoking test identifying failures, Analyzing test output for deviations. Determining which deviations are failures, establishing when failures occurred.

UNIT IV: **(7Hrs)**

GUIDE TO RELIABILITY ENGINEERING: Guiding Test, Tracking reliability growth, Estimating failure intensity. Using failure intensity patterns to guide test, Certifying reliability. Deploying SRE, Core material, persuading your boss, your coworkers, and stakeholders. Executing the deployment, using a consultant.

UNIT V: (8Hrs)

SECURITY WITH UML: Using UML for Security, UML diagrams for security requirement, security business process physical security, security critical interaction, security state. Analyzing Model, Notation, formal semantics security analysis, important security opportunities. Model based security engineering with UML.

UNIT VI: (7Hrs)

APPLICATIONS: Secure channel, Developing Secure Java program, more case studies. Tool support for UML, Extending UML CASE TOOLS with analysis tools, automated tools for UML. Formal Foundations, UML machines Rely guarantee specifications, reasoning about security properties.

Course Outcomes:

After completion of the course the students will

CO1: Understand the contents of a software requirements document. [L1]

CO2: Identify the difference between software, hardware reliability and different test plan to manage S/W failures. [L3]

CO3: Analyze how security assurance can be incorporated into the software development life cycle with UML. [L4]

CO4: Develop different applications with CASE Tools. [L6]

Mapping of COs to PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1. John Musa D, "Software Reliability Engineering", 2nd Edition, Tata McGraw-Hill, 2005 (Units I, II, III and IV)
2. Jan Jurjens, "Secure Systems Development with UML", Springer; 2004 (Unit V and VI)

SEMANTIC WEB AND SOCIAL NETWORKS

(PROFESSIONAL ELECTIVE-V)

Subject Code: UGCS7T1120	**L**	**T**	**P**	**C**
IV Year/ I Semester	**3**	**0**	**0**	**3**

Prerequisites: Familiarity with the concepts of databases and web.

Course Objectives:

The objective of this course is to provide insights to students about the context based semantic integration of multiple web resources and expose semantically enriched social data to the public domain. This course also focuses on various concepts such as knowledge representation, management, extraction, aggregating information across heterogeneous sources and analysis related o semantic web and social networks.

Syllabus:

UNIT I: (9 hrs)

Web Intelligence: Thinking and Intelligent Web Applications, The Information Age, The World Wide Web, Limitations of Today's Web, The Next Generation Web, Web Architecture and Business Logic, The Semantic Web, Berners-Lee, Competing Web Standards, Semantic Web Road Map, Semantic Web Services, Logic on the semantic Web, Semantic Web Capabilities and Limitations.

UNIT II: (8 hrs)

Knowledge Representation on the Semantic Web: Ontologies and their role in the semantic web, Ontology Languages for the Semantic Web – Resource Description Framework(RDF), Ontology Web Language(OWL).

UNIT III: (8 hrs)

Ontology Engineering: Ontology Engineering, Constructing Ontologies, Ontology Example, Ontology Methods, Ontology Libraries, Ontology Matching, Ontology Mapping, Ontology Mapping Tools, Logic and Inference, Monotonic and Nonmonotonic Rules, Descriptive Logic, Inference Engines.

UNIT IV: (9 hrs)

Semantic Web Applications, Services and Technology: Semantic Web applications and services, Semantic Search, e-learning, Semantic Bio-informatics, XML Based Web Services, Next Generation Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods.

UNIT V: (8 hrs)

Social Network Analysis: What is network analysis? Development of Social Network Analysis, Key concepts and measures in network analysis. Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks.

UNIT VI: (8 hrs)

Developing Social Semantic Applications: Building Semantic Web applications with social network features, Flink- the social networks of the Semantic Web community, Open academia: distributed, semantic-based publication management.

Course Outcomes:

Upon completion of this course, the students will be able to:

CO 1: Interpret the need of transformation of WWW and basic concepts of semantic web technology.
CO 2: Build knowledge base for semantic web using ontology engineering.
CO 3: Develop semantic web applications by using semantic technology and services for various domains.
CO 4: Illustrate social network analysis and develop social semantic applications.

Mapping of COs to POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	3	-	-	-	-	-	-	-	-	3	-
CO2	-	-	3	-	-	3	-	-	-	-	-	-	3	-
CO3	-	-	3	-	-	3	-	-	-	-	-	-	3	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-	3	-

TEXT BOOKS:

1. Berners Lee, Godel, and Turing, "Thinking on the Web", Wiley.
2. Peter Mika, Social Networks and the Semantic Web, Springer.

REFERENCE BOOKS:

1. J.Davies,RudiStuder, and Paul Warren, Semantic Web Technologies,Trends and Research in Ontology Based Systems, John Wiley & Sons.
2. Liyang Lu Chapman and Hall, Semantic Web and Semantic Web Services, CRC Publishers. (Taylor & Francis Group)
3. HeinerStuckenschmidt and Frank Van Harmelen, Information Sharing on the semantic Web, Springer Publications.

E-COMMERCE & DIGITAL MARKETING
(PROFESSIONAL ELECTIVE-V)

Subject Code: UGIT7T0620	**L**	**T**	**P**	**C**
IV Year/ I Semester	**3**	**0**	**0**	**3**

Prerequisites:

1. Knowledge on traditional commerce and business processes
2. Basics of internet and online related transactions

Course Objectives:

The students will learn the following:

1. Basic concepts of e-business and e-commerce, including presentation and discussion of the strategies and technologies involved
2. Concepts and challenges of e-business, including a balanced coverage of both the technical and the management (operational, tactical and strategic) aspects of successful e-business
3. Concepts of business strategies, and technologies involved in the design and deployment of business and Digital Marketing on the internet and World Wide Web.

SYLLABUS:

UNIT I: **(7 hrs)**

Electronic Commerce: Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications, Consumer Oriented Electronic commerce, Mercantile Process models

UNIT II: **(8 hrs)**

Electronic Payment Systems: Smart Cards, Credit Cards, Risks in Electronic Payment systems.

UNIT III: **(9 hrs)**

Inter Organizational Commerce: EDI, EDI Implementation, Value added networks, Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT IV: Corporate Digital Library: **(9 hrs)**

Document Library, digital Document types, corporate Data Warehouses, Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing

UNIT V: **(8hrs)**

Introduction to Digital Marketing: Origin of Digital Marketing, traditional Vs Digital Marketing, internet users, Digital Marketing strategy, Digital marketing Advertisement in India

UNIT VI: **(8 hrs)**

Digital Marketing Strategies: Social median marketing, Facebook Marketing-Introduction, Anatomy of an ad campaign, adverts.

Course Outcomes:

Upon the successful completion of the course, the student will:

CO 1: comprehend the increasing significance of E- Commerce and its applications in Business and Various Sectors
CO 2: To identify various Payment, Security, Privacy and Legal Issues.
CO 3: To develop skills of students in relation with application of IT in E-Commerce.
CO 4: To explore the students to the latest trends in marketing.
CO 5: Analyze the confluence of Digital marketing and operations in real- time delivery

Mapping of CO's to PO's:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		3				3	.							
CO2											3			
CO3			3		3									
CO4										3				
CO5					3									

Textbooks:

1. "Frontiers of electronic commerce",RaviKalakata, Andrew B.Whinston, Pearson education.
2. Digital Marketing, Seema Gupta, McGraw HILL Education.

References:

1. E-Commerce fundamentals and applications by Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, - John Wiley.
2. E-Commerce by S.Jaiswal – Galgotia.
3. E-Commerce by EfrainTurbon, Jae Lee, David King, H.Michael Chang.
4. Electronic Commerce by Gary P.Schneider – Thomson

INFORMATION RETRIEVAL SYSTEMS

(PROFESSIONAL ELECTIVE-V)

Subject Code: UGIT7T0720	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**-**	**-**	**3**

Prerequisites: Basics of Database Management Systems, Data structures.

Course Objectives

To give knowledge on Information Retrieval System data structures, algorithms for effective information retrieval.

UNIT I: (10 hrs)

Introduction to Information Storage and Retrieval System: Introduction, Domain Analysis of IR systems and other types of Information Systems, IR System Evaluation.

Introduction to Data Structures and Algorithms related to information Retrieval: Basic Concepts, Data Structures, Algorithms.

UNIT II: (8 hrs)

Inverted Files: Introduction, Structures used in Inverted Files, Building Inverted File using a sorted array, Modifications to Basic Techniques.

UNIT III: (8 hrs)

Signature Files: Introduction, Concepts of Signature Files, Compression, Vertical Partitioning, Horizontal Partitioning

UNIT IV: (8 hrs)

New Indices for Text: PAT Trees and PAT Arrays**: Introduction**, PAT Tree structure, algorithms on the PAT Trees, Building PAT trees as PATRICA trees, PAT representation as arrays.

UNIT V: (8 hrs)

Stemming Algorithms: Introduction, Types of Stemming Algorithms, Experimental Evaluations of Stemming to Compress Inverted Files.

UNIT VI: (8 hrs)

Thesaurus Construction: Introduction, Features of Thesauri, Thesaurus construction, Thesaurus construction from Texts, Merging existing Thesauri**.**

Course Outcomes

After completing this course satisfactorily, a student will:

- **CO 1:** Understand the importance of Information Retrieval System and its data structures
- **CO 2:** Familiarize the representation of Information retrieval system in various formats like inverted files and signature files.
- **CO 3:** Understand PAT trees and PAT arrays for representation of information
- **CO 4:** Understand stemming algorithms to compress the data in text preprocessing
- **CO 5:** Analyze the thesaurus construction from the given text

Mapping of COs & POs

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	3	3	3	3	-	-	-	-	-	-	-	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3
CO3	3	3	3	3	-	-	-	-	-	-	-	3
CO4	3	3	3	3	-	-	-	-	-	-	-	3
CO5	3	3	3	3	-	-	-	-	-	-	-	3

TEXT BOOKS:

1. Frakes, W.B., Ricardo Baeza - Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Modern Information Retrieval by Yates Pearson Education.
3. Information Storage & Retrieval by Robert Korfhage - John Wiley & Sons.

REFERENCE BOOKS:

1. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.
2. Information Retrieval Algorithms and Heuristics, 2ed, Springer.

NATURAL LANGUAGE PROCESSING

(PROFESSIONAL ELECTIVE-V)

Subject Code: UGCS7T0520	**L**	**T**	**P**	**C**
IV Year/ I Semester	**3**	**0**	**0**	**3**

Prerequisites: Familiarity withCompiler Design.

Course Objectives: The main objective of the course is to learn how to develop practical computer systems capable of performing intelligent tasks on natural language analyze, understand and generate written text.

Syllabus:

UNIT I: (8 hrs)

Introduction: What is Natural Language Processing, NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity. The role of machine learning. Brief history of the field.

UNIT II: (8 hrs)

N-gram Language Models: The role of language models, Simple N-gram models. Estimating parameters and smoothing. Evaluating language models.

Part of Speech Tagging and Sequence Labeling: Lexical syntax. Hidden Markov Models. Maximum Entropy Models. Conditional Random Fields.

UNIT III: (8 hrs)

Syntactic Parsing: Grammar formalisms and tree banks. Efficient parsing for context-free grammars (CFGs). Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs.

UNIT IV: (10 hrs)

Semantic Analysis: Lexical semantics and word-sense disambiguation. Compositional semantics. Semantic Role Labeling and Semantic Parsing.

UNIT V: (8 hrs)

Information Extraction (IE) and Machine Translation (MT): Named entity recognition and relation extraction. IE using sequence labeling. Basic issues in MT. Statistical translation, word alignment, phrase-based translation, and synchronous grammars. Dialogues: Turns and utterances, grounding, dialogue acts and structures.

UNIT VI: **(8 hrs)**

Natural Language Generation: Introduction to language generation, architecture, discourse planning (text schemata, rhetorical relations).

Course Outcomes:

Upon completion of this course, the students will be able to:

- **CO 1:** Relate the basics of NLP and study the role of machine learning in processing NLP.
- **CO 2:** Analyze various Language Models and process part of speech tagging for static NLP.
- **CO 3:** Discover how to analyze the words and extract meaning from the text.
- **CO 4:** Identify various ways to draw inferences from text and language translation.
- **CO 5:** Summarize the mechanisms to generate natural language.

Mapping of COs to POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	3	-	2	-	-	-	-	-	3	-	-
CO3	-	3	3	-	-	2	-	-	-	-	-	3	-	-
CO4	-	3	3	-	-	2	-	-	-	-	-	3	-	3
CO5	-	2	2	2	-	-	-	-	-	-	-	3	-	3

TEXT BOOKS:

1. D. Jurafsky, J. H. Martin, Speech and Language Processing- An introduction to Language Processing, Computational Linguistics, and Speech Recognition, Pearson Education.
2. Manning and Schutze, Foundations of Statistical Natural Language Processing, MIT Press.

REFERENCE BOOKS:

1. Allen, James Benjamin/Cummings, Natural Language Understanding, Benjamin-Cummings Publishing Co, 2ed.
2. Bharathi, A., Vineet Chaitanya and Rajeev Sangal, Natural Language Processing- A Pananian Perspective, Prentice Hll India, Eastern Economy Edition.

REAL-TIME SYSTEMS

(PROFESSIONAL ELECTIVE-V)

Subject Code: UGIT7T0820	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

Pre-Requisites:
Basic programming skills and operating systems concepts

Course Objectives:

Students will learn the following:

1. Real-time scheduling and schedulability analysis {a,b,c}
2. Formal specification and verification of timing constraints and properties {a,b,c,d}
3. Design methods for real-time systems {a,b,c}
4. Development and implementation of new techniques to advance the state-of-the-art real-time systems research {c,d,e,f}

SYLLABUS:

UNIT I: (6 hrs)

Introduction to real-time systems : Historical background, RTS Definition, Classification of Real-time Systems, Time constraints, Classification of Programs.

UNIT II: (8 hrs)

Concepts of computer control : Introduction, Sequence Control, Loop control, Supervisory control, Centralized computer control, Distributed system, Human-computer interface, Benefits of computer control systems.

UNIT III: (8 hrs)

Computer hardware requirements for RTS: Introduction, General purpose computer, Single chip microcontroller, Specialized processors, Process-related Interfaces, Data transfer techniques, Communications, Standard Interface.

UNIT IV: (8 hrs)

Languages for real-time applications: Introduction, Syntax layout and readability, Declaration and Initialization of Variables and Constants, Modularity and Variables, Compilation, Data types, Control Structure, Exception Handling, Low-level

facilities, Co routines, Interrupts and Device handling, Concurrency, Real-time support, Overview of real-time languages.

UNIT V: **(8 hrs)**

Operating systems: Introduction, Real-time multi-tasking OS, Scheduling strategies, Priority Structures, Task management, Scheduler and real-time clock interrupt handles, Memory Management, Code sharing, Resource control, Task co-operation and communication, Mutual exclusion, Data transfer, Liveness, Minimum OS kernel, Examples.

UNIT VI: **(7 hrs)**

Design of RTOS – general introduction: Introduction, Specification documentation, Preliminary design, Single-program approach, Foreground/background, Multi-tasking approach, Mutual exclusion, Monitors. **Development methodologies:** Introduction, Yourdon Methodology, Requirement definition for Drying Oven, Ward and Mellor Method, Hately and Pirbhai Method.

Course Outcomes:

Upon the completion of the course, the students will be able to:

- **CO 1:** Understand the working of real time Operating Systems with real time database.
- **CO 2:** Develop new real time distributed applications.
- **CO 3:** Design and development of applications related to real time communication.
- **CO 4:** Implement real time embedded systems using the concepts of RTOS.

Mapping of COs & POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	3	-	-	-	-	-	-	-	-	-
CO2	2	-	3	-	3	-	-	-	-	-	-	-	-	-
CO3	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	3	-	-	-	-	-	-	-	-	-

Text Books:

1. Jane W. Liu, "Real-Time Systems" Pearson Education, 2001.

References:

1. Rajib Mall, "Real-Time Systems: Theory and Practice," 1stEdition,Pearson, 2008.
2. Krishna and Shin, "Real-TIme Systems," Tata McGraw Hill. 1999.
3. Alan C. Shaw, Real-Time Systems and Software, Wiley, 2001.
4. Philip Laplante, Real-TIme Systems Design and Analysis, 2nd Edition, Prentice Hall of India, 2012.

AUGMENTED REALITY AND VIRTUAL REALITY

(JOB ORIENTED ELECTIVE-III)

Subject Code: UGCS7T1320	**L**	**T**	**P**	**C**
IV Year/ I Semester	**2**	**0**	**2**	**3**

Prerequisites: The students should have basic knowledge on programming and computer graphics.

Course Objectives:

To introduce the basic concepts of Augmented Reality and Virtual Reality and to gain knowledge on various devices required for interaction and applications.

Syllabus:

UNIT I: (8 hrs)

Introduction: Virtual Reality, Augmented Reality, Mixed Reality, Augmented Virtuality,

Extended Reality, History, VR Features, VR Controllers, Current issues with VR, AR Mobile devices, AR headsets, AR glasses, AR Controllers, Current issues with AR.

UNIT II: (8 hrs)

Consuming Content in VR: High-end devices, Mid-tier devices, Low-end devices, Near-Future Hardware.

Consuming Content in AR: Microsoft HoloLens, Meta 2, Magic Leap, Mira Prism, Apple ARKit, Google ARCore, Near-Future Hardware.

UNIT III: (9 hrs)

Creating Content in VR and AR: Evaluating Your Project, Planning Your Virtual Reality Project, Planning Your Augmented Reality Project, Assessing Design Software, Capturing Real Life, Assessing Development Software, Distributing Your Content.

UNIT IV: (8 hrs)

Cross-Platform Theory: Role of Game Engines, understanding 3D Graphics, The Virtual Camera, Degrees of Freedom, Portability Lessons from Video Game Design, Simplifying the Controller Input.

Virtual Reality Toolkit: History of VRTK, SteamVR Unity Toolkit, VRTK v4, Future of VRTK, Success of VRTK, Getting Started with VRTK 4.

UNIT V: (6 hrs)

Best Practices: Handling Locomotion in VR & AR, Effective Use of Audio in VR & AR, Common Interactions Paradigms, Inventory for VR, Augmented Reality Raycasts.

UNIT VI: (8 hrs)

Applications: Travel, Museums, Aerospace, Retail, Military, Education, Entertainment, Real Estate, Advertising and Marketing, Mobile Apps for Experiencing Augmented Reality, Future of Virtual Reality and Augmented Reality.

Experiments

1.Installation of Unity and Visual Studio, setting up Unity for VR development, understanding documentation of the same.

2. Demonstration of the working of HTC Vive, Google Cardboard, Google Daydream and Samsung gear VR.

3. Develop a scene in Unity that includes:

   i. a cube, plane and sphere, apply transformations on the 3 game objects.

   ii. add a video and audio source.

4. Develop a scene in Unity that includes a cube, plane and sphere. Create a new material and texture separately for three Game objects. Change the colour, material and texture of each Game object separately in the scene. Write a C# program in visual studio to change the colour and material/texture of the game objects dynamically on button click.

5. Develop a scene in Unity that includes a sphere and plane. Apply Rigid body component, material and Box collider to the game Objects. Write a C# program to grab and throw the sphere using vr controller.

6. Develop a simple UI (User interface) menu with images, canvas, sprites and button. Write a C# program to interact with UI menu through VR trigger button such that on each successful trigger interaction display a score on scene.

7. Create an immersive environment (living room/ battlefield/ tennis court) with only static game objects. 3D game objects can be created using Blender or use available 3D models.

Course Outcomes:

Upon completion of this course, the students will be able to:

CO 1: Gain knowledge on AR & VR and various components involved in manifesting the same.
CO 2: Plan content creation and identify necessary software required in implementing AR & VR.
CO 3: Analyze the portability issues and understand the best practices.
CO 4: Understand how to implement various applications using AR and VR technologies.

Mapping of COs to POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	3	-	3	-	-	-	-	-	-	-	-	-	-	3
CO3	3	-	3	-	3	-	-	-	-	-	-	-	-	3
CO4	3	3	3	-	3	-	-	-	-	-	-	-	3	3

TEXT BOOKS:

1. Paul Mealy, Virtual & Augmented Reality for Dummies, John Wiley & Sons, Inc

2. Erin Pangilinan, Steve Lukas and Vasanth Mohan, Creating Augmented and Virtual Realities, O'Reilly Media Inc.

REFERENCE BOOKS:

1. Kelly S. Hale, Kay M. Stanney, Handbook of Virtual Environments: Design, Implementation, and Applications, Second Edition, CRC Press.

2. Gregory C. Burdea& Philippe Coiffet, John, Virtual Reality Technology, Second Edition, Wiley & Sons, Inc.

3. William R.Sherman, AlanCraig, Understanding Virtual Reality, interface, Application and Design, Elsevier (Morgan Kaufmann).

4. John Vince, Virtual Reality Systems, Pearson Education.

5. Andrew Davison, Killer Game Programming in Java, Oreilly-SPD.

6. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann.

7. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann

8. Steve Aukstakalnis, "Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR", Addison Wesley.

9. Brett S. Martin, "Virtual Reality", Norwood House Press.

10. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi

11. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill.

DEEP LEARNING
(JOB ORIENTED ELECTIVE – III)

Subject Code: UGIT7T0920	**L**	**T**	**P**	**C**
IV Year / I Semester	**2**	**0**	**2**	**3**

Prerequisites: The students should have basic knowledge in linear algebra, statistics, as well as programming in Python and Machine Learning.

Course Objectives:

1. Introduce major deep learning Algorithms, the problem setting and their application to solve real world problems.
2. Identify the deep learning Algorithms which are more appropriate for varies types of learning tasks in various domains.

Syllabus:

UNIT I **(9Hrs)**

Neural Networks: Biological Neuron, Linear Perceptron, Expressing Linear Perceptron's as Neurons, Perceptron Learning Algorithm, Sigmoid, Tanh and ReLu Neurons. **[T1]**

UNIT II: **(8 Hrs)**

Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms. **[T2]**

UNIT III: **(8Hrs)**

Regularization for Deep Learning: Parameter Norm Penalties, Data set augmentation, Noise Robustness, Early stopping, Bagging and other Ensemble methods, Dropouts. **[T2]**

UNIT IV: **(8Hrs)**

Convolution Neural Network: Convolution operation, Building Blocks of CNN, Pooling, Variants of basic convolution function. **[T2]**

UNIT V: **(9 Hrs)**

Recurrent and Recursive Networks: Recurrent Neural Networks, Bidirectional RNNs, Deep recurrent neural networks, Long Short-Term Memory Networks. **[T2]**

UNIT VI: **(9 Hrs)**

Deep Learning Frameworks: Introduction to Keras and TensorFlow, Deep Learning for computer vision –using CIFAR-10, LeNet Deep Learning for Text and Sequences: working with Text Data, Sequence processing with ConvNets, Text Generation with LSTM. **[T3]**

Lab Experiments:

1. Write an application to implement Perception.
2. Write an application to implement AND OR gates using Perception.
3. Write an application to implement a simple neural network
4. Write an application to implement a multi-layered neural network
5. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
6. Design feed forward neural network for solving regression type Problems. (Example: Predicting car purchase amount from car sales datasets)
7. Design Convolution Neural Network for Image classification (use CIFAR-10 dataset for image classification)
8. Design Convolution Neural Network for traffic sign classification (Use LeNet dataset for traffic sign images classification)
9. Design Recurrent Neural Network with LSTM (Example: Stock price prediction)

Course Outcomes:

Upon completion of this course, the students will be able to:

- **CO 1:** Make use of the Algorithms associated with Deep learning and Deep Network architectures for Machine Learning. **[L3]**
- **CO 2:** Determine the deep learning algorithms which are more feasible for operations in various domains. **[L4]**
- **CO 3:** Implement deep learning models using Python libraries and train them with real- world datasets. **[L3]**
- **CO 4:** Evaluate the performance of different deep learning models with respect to the overfitting and under fitting, estimation of test error. **[L5]**

Mapping of COs to POs:

POs/ Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	
CO2		3	-	-	-	-	-	-	-	-	-	-	-	3
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-	3
CO4	-	-	-	3	-	-	-	-	-	-	-	-	-	3

TEXT BOOKS:

1. Fundamentals of Deep Learning, by Nikhil Buduma, Released June 2017, Publisher(s): O'Reilly Media, Inc
2. Deep Learning, Goodfellow, I., Bengio,Y., and Courville,A., MIT Press, 2016.
3. Deep Learning with Python, Francois Chollet, Manning publisher

REFERENCE BOOKS:

1. Artificial Neural Networks, B. Yegnanarayana, PHI Learning Ltd,
2. Neural Networks: A Classroom Approach, Satish Kumar

ONLINE COURSES AND REFERENCES:

1. Introduction to Deep learning offered by HSE University - Coursera.
2. Machine learning, Data Science and Deep learning with Python by SunDog Education – Udemey.com

GO PROGRAMMING
(JOB ORIENTED ELECTIVE-III)

Subject Code: UGCS7T1920	**L**	**T**	**P**	**C**
IV Year / I Semester	**2**	**0**	**2**	**3**

Prerequisites: Familiarity with any programming language.

Course Objectives:
The course is designed to cover the basics and then dive into more advanced features of the Go programming language.

Syllabus:

UNIT I: (7 Lectures)
Introduction: Origins and evolution, Languages that influenced Go, Why a new language?, Targets of the language, Guiding design principles, Characteristics of the language, Uses of the language, Missing features, Programming in Go.
Program Structure: Names, Declarations, Variables, Assignments, Type Declarations, Packages and Files, Scope.

UNIT II: (9 Lectures)
Basic Data Types: Integers, Floating-Point Numbers, Complex Numbers, Booleans, Strings, Constants.
Control Structures: if else construct, switch construct, for construct, break, continue and labels.
Composite Types: Arrays, Slices, Maps, Structs, JSON,Text and HTML Templates.

UNIT III: (9 Lectures)
Functions: Function Declarations, Recursion, Multiple Return Values, Errors, Function Values, Anonymous Functions, Variadic Functions, Deferred Function Calls, Panic, Recover.
Methods: Method Declarations, Methods with a Pointer Receiver, Composing Types by Struct Embedding, Method Values and Expressions, Encapsulation.

UNIT IV: (9 Lectures)
Interfaces: Interfaces as Contracts, Interface Types, Interface Satisfaction, Parsing Flags with flag.Value, Interface Values, The error Interface, Type Assertions, Discriminating Errors with Type Assertions, Querying Behaviors with Interface Type Assertions, Type Switches.
Reading and Writing: Reading input from the user, Reading from and writing to a file, Copying files, Reading arguments from the command-line, Reading files with a buffer, Reading and writing files with slices, Using defer to close a file.

UNIT V: **(9 Lectures)**

Goroutines and Channels: Goroutines, Concurrent Clock Server, Concurrent Echo Server, Channels, Looping in Parallel, Concurrent Web Crawler, Multiplexing with select, Concurrent Directory Traversal, Cancellation, Chat Server.

Concurrency with Shared Variables: Race Conditions, Mutual Exclusion, Read/Write Mutexes, Memory Synchronization, Lazy Initialization, The Race Detector, Concurrent Non Blocking Cache, Goroutines and Threads.

UNIT VI: **(8 Lectures)**

Packages and Go Tool: Introduction, Import Paths, The Package Declaration, Import Declarations, Blank Imports, Packages and Naming, The Go Tool.

Testing: Go Test Tool, Test Functions, Coverage, Benchmark Functions, Profiling, Example Functions.

Course Outcomes:

Upon completion of this course, the students will be able to:

- **CO 1.** Study the basic constructs of Go Programming and learn its structural elements in detail.
- **CO 2.** Develop modular programming and make use of functions and methods.
- **CO 3.** Implement the Interfaces and Goroutines for executing the program independently and simultaneously.
- **CO 4.** Perform Testing and apply concurrency in Go programs and examine different packages in Go.

Mapping of COs to POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	-
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	-

TEXT BOOKS:

1. Alan A. A. Donovan, Brian W. Kernighan, "The Go Programming Language", Addison-Wesley.
2. Ivo Balbaert, "The Way to GO – A Thorough Introduction to the Go Programming Language", i-Universe Publisher.

REFERENCE BOOKS:

1. Mark Summerfield, Programming in Go: Creating applications for the 21st century. Addison-Wesley.
2. Caleb Doxsey, An Introduction to Programming in Go.
3. Tarik Guney, "Hands-On Go Programming: Explore Go by solving real-world challenges", Packt Publishing.

4. John P. Baugh, “Go Programming”, CreateSpace Publisher.
5. Mat Ryer, Go Programming Blueprints, Packt Publishing.

SOFTWARE TESTING METHODOLOGIES

(JOB ORIENTED ELECTIVE–III)

Subject Code: UGIT7T1020	**L**	**T**	**P**	**C**
Year Semester: IV/ I Semester	**2**	**0**	**2**	**3**

Prerequisites:
Basic concepts of Programming, software engineering and analytical skills.

Course Objectives:

This course enables the learners to have a higher level knowledge related to software testing of a product in IT industry.

1. It focuses on various principles, methods and techniques related to various types of software testing as well as efficient testing strategies, software quality management, and automation & testing tools.
2. Learners will get exposure to various real time testing practices testing different types of software through this course.

Syllabus:

UNIT I: (7 hrs)
SOFTWARE TESTING:
Introduction, Evolution, Myths & Facts, Goals, Psychology, Definition, Model for testing, Effective Vs Exhaustive Software Testing.
Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology**. [T1]**

UNIT II: (8 hrs)
VERIFICATION AND VALIDATION:
Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, how to verify code, Validation**. [T2]**
Dynamic Testing, I: Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing. [**T1]**

UNIT III: (7 hrs)
DYNAMIC TESTING II:
White-Box Testing: need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing

Static Testing: inspections, Structured Walkthroughs, Technical reviews. [**T1]**

UNIT IV: (7 hrs)

VALIDATION ACTIVITIES:

Unit testing, Integration Testing, Function testing, system testing, acceptance testing.

Regression testing: Progressives Vs regressive testing, Objectives of regression testing, when regression testing done? Regression testing types, Regression testing techniques. [**T1]**

UNIT V: (6 hrs)

AUTOMATION AND TESTING TOOLS:

Need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools.

UNIT VI: (6 hrs)

Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems. **[T1]**

Experiments:

S.NO	List Of Experiments
1	**Module 1: Introspect The causes for Failure and write down the reasons for failure** A program Written in C language for matrix multiplication fails. Introspect causes and reasons for failures
2	**Module 2: Boundary Value Analysis, Decision Table based Testing** Take any Automated System (Eg:ATM)and apply above mentioned black box techniques
3	**Module 3: White Box Testing** Consider a program which multiplies two matrices then generate i. DDGraph ii. Cyclomatic complexity iii. Design Test Cases For Independent Path
4	**Module 4: Create test cases using Boundary Value Analysis, execute test cases by using JUnit and discuss the Results** Design and Develop a program in Java to solve triangle problem as follows Accept 3 integers which are supposed to be three sides of a triangle determine if the three values represent Equilateral triangle, Isosceles Triangle, Scalene Triangle or they don't form any triangle at all.

5	**Module 5: Selenium IDE** 1.Installation of selenium IDE 2. Using Selenium IDE, write a test suite containing minimum 4 test cases. 3. Conduct a test suite for any two web sites.
6	**Module 6: Selenium TestNG** 1.Installation of TestNG in Eclipse 2.Launching Your tests in Eclipse 3.By using TestNG generate test reports
7	**Module 7: Selenium Tests with Microsoft Excel** 1.Write and Test a program to update 10 student records into table in Excel file 2.Write and test a program to provide total number of objects present/ available on the page

Course Outcomes:

Upon completion of this course, the students will be able to:

CO 1: Understand various testing issues & solutions in software (**L2)**

CO 2: Apply modern software testing processes in relation to software Development and project management. **(L3)**

CO 3: Analyze different types of verification & validation techniques to ensure the Functioning of a software system. **(L4)**

CO 4: Create and execute test cases for object oriented and web based Projects. **(L6)**

CO 5: Evaluate different testing tools and their Working mechanisms **(L5)**

Mapping of COs to POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	-	-	-	-	-	-	-	-	-	-	-	--	-
CO 3	-	3	-	-	-	-	-	-	-	3	-	-	-	-
CO 4	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	3	3	-	-	-	-	-	-	-	3	-

TEXT BOOKS:

1. Naresh Chauhan, Software Testing Principles and Practices, Oxford.
2.YogeshSingh, SoftwareTesting, Cambridge.

REFERENCE BOOKS:

1.BarisBeizer, Software Testing Techniques, 2nd Edition, International Thomson Computer Press.
2. M G Limaye, Software Testing, Principles, Techniques and Tools, TMH.

BIG DATA TECHNOLOGIES

(JOB ORIENTED ELECTIVE-IV)

Subject Code: UGCS7T1420	**L**	**T**	**P**	**C**
IV Year / I Semester	**2**	**0**	**2**	**3**

Prerequisites: The student should have knowledge of high level programming languages and SQL for analyzing the data.

Course Objectives: The student will be able to understand Big Data as a popular term used to describe the exponential growth, availability and use of information, both structured and unstructured. It is imperative that organizations and IT leaders focus on the ever-increasing volume, variety and velocity of information that forms Big Data. Hadoop is the core platform for structuring BigData, and solves the problem of making it useful for Analytics.

Syllabus:

UNIT I: (8 hrs)

Introduction to Big Data: What is Big Data and where it is produced? Rise of BigData, Compare Hadoop vs traditional systems, Limitations and Solutions of existingData Analytics Architecture, Attributes of Big Data, Types of Data, Use Cases of Big Data, Other technologiesvs Big Data.

UNIT II: (9 hrs)

Hadoop Architecture and HDFS: What is Hadoop? Hadoop History, Distributing Processing System, Core Components of Hadoop, HDFS Architecture, Hadoop Master – Slave Architecture, Daemon Types, Name node, Data node, Secondary Name node.

Hadoop Clusters and the Hadoop Ecosystem- What is Hadoop Cluster? Pseudo Distributed mode, Type of Clusters, Hadoop Ecosystem: Pig, Hive, Flume,SQOOP.

UNIT III: (9 hrs)

HadoopMapReduce Framework: Overview of MapReduce Framework,MapReduce Architecture, Job Tracker and Task Tracker, Use Cases ofMap Reduce, Anatomy of Map Reduce Program.

MapReduce Programs in Java: Basic MapReduce API Concepts, WritingMapReduce Driver, Mappers, and Reducers in Java, Speedingup HadoopDevelopment by Using Eclipse, Word Count Example and Weather Dataset Example.

UNIT IV: **(8 hrs)**

Hive and HiveQL- What is Hive? Hive vs MapReduce, Hive DDL:Create/Show/Drop Tables, Internal and External Tables, Hive DML:Load Files &Insert Data, Hive Architecture & Components, Difference between Hive and RDBMS, Partitions in Hive.

UNIT V: **(8 hrs)**

Pig: Pig vs MapReduce, Pig Architecture & Data types, Shell and Utilitycomponents, Pig Latin Relational Operators, Pig Latin: File Loaders and UDF, Programming structure in UDF, Pig Jars Import and limitations of Pig.

UNIT VI: **(9 hrs)**

Apache SQOOP: Why and What is SQOOP? SQOOP Architecture, Benefitsof SQOOP, Importing Data Using SQOOP.

Apache Flume: Introduction, Flume Modeland Goals, Features of Flume, Flume Use Cases.

Course Outcomes:

Upon completion of this course, the students will be able to:

CO 1: Outline importance of BigData in solving real time problems in data analytics.
CO 2: Illustrate Hadoop ecosystem and its components in detail.
CO 3: Make use of distributed file systems and Hadoop and can write MapReduce programs to solve complex problems.
CO 4: Explore the Hadoop ecosystems core components and apply in real-time scenarios.

Mapping of COs to POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	3	3

TEXT BOOKS:

1. Tom White, Hadoop: The Definitive Guide, 3rd Edition, O'reilly
2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", 1st Edition, TMH.

REFERENCE BOOKS:

1. Alex Holmes, Hadoop in Practice, MANNING Publications.
2. SrinathPerera, ThilinaGunarathne, Hadoop MapReduce Cookbook, Packt publishing.

Lab Experiments:

Week 1, 2:

1. (i) Perform setting up and Installing Hadoop in its three operating modes:

   Standalone

   Pseudo distributed

   Fully distributed

   (ii) Use web-based tools to monitor your Hadoop setup.

Week 3:

2. Implement the following file management tasks in Hadoop:

   - Adding files and directories.
   - Retrieving files.
   - Deleting files

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

Week 4:

3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

Week 5:

3. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.

Week 6,7:

4. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Week 8,9:

6. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Week 10:

7. Install and Run Sqoop and extract data from a RDBMS store in Hadoop using MapReduce/Hive.

8. Move the data from RDBMS into HBase.

DEVOPS

(Job Oriented Elective-IV)

Subject Code: UGIT7T1120	**L**	**T**	**P**	**C**
IV Year/ I Semester	**2**	**0**	**2**	**3**

Prerequisites: Good Exposure to Software Engineering concepts and Software Development Methodologies.

Course Objectives:

To get an expertise on the culture of DevOps in Software Development Methodologies for finding ways to adapt and innovate social structure, culture, and technology together in order to work more effectively in the Enterprises.

Syllabus:

UNIT - I: (8 Hrs)

Introduction to DevOps: What is DevOps, A History of DevOps, Fundamental Terminology and Concepts – Software Development Methodologies, Operations Methodologies, Systems Methodologies, Development Release and Deployment Concepts, Infrastructure Concepts, Cultural Concepts. **[T1]**

UNIT-II: (8 Hrs)

Collaboration: Defining Collaboration, Individual Differences and Backgrounds, Opportunities for Competitive Advantage, Mentorship, Introducing Mindsets, Mindsets and Learning Organizations, The Role of Feedback, Reviews and Rankings, Communication and Conflict Resolution Styles, Empathy and Trust, Humane Staffing and Resources **[T1]**

UNIT-III: (9 Hrs)

Affinity: What Makes a Team, Teams and Organizational Structure, Finding Common Ground Between Teams, Benefits of Improved Affinity, Requirements for Affinity, Measuring Affinity, Misconceptions and Troubleshooting of Affinity. **[T1]**

UNIT-IV: (9 Hrs)

Tools: Software Development, Automation, Monitoring, Evolution of the Ecosystem, The Value of Tools to People, The Right Tools for Real Problems, Embracing Open Source, Standardization of Tools, Consistent Processes for Tool Analysis, Exceptions to Standardization, Irrelevance of Tools, The Impacts of Tools on Culture, Selection of Tools. **[T1]**

UNIT- V: **(8 Hrs)**

Scaling: Understanding Scaling, Considering Enterprise DevOps, Organizational Structure, Team Flexibility, Organizational Life cycle, Complexity and Change, scaling for Teams, Team Scaling and Growth Strategies, scaling for Organizations, Misconceptions and Troubleshooting of Scaling. **[T1]**

UNIT VI **(6 Hrs)**

DevOps Practices: Implementing CI/CD and continuous deployment, Understanding IaC practices, DevOps Best Practices: Automating everything, Choosing the right tool, writing all your configuration in code, Designing the system architecture, building a good CI/CD pipeline, integrating tests, Applying security with DevSe. **[T1]**

Experiments:

1) To Perform installation of Git and work on local and remote git repositories
2) To fetch and synchronize Git repository
3) To perform basic branching and merging in Git
4) To install and Jenkins build a job in Jenkins
5) To Create CI/CD pipe line in Jenkins
6) To install Docker and execute basic command in Docker
7) To build image from the Docker file
8) To deploy java application into Docker
9) To perform continuous testing of web applications using Selenium

Course Outcomes:

Upon completion of this course, the students will be able to:

- **CO 1:** Make use the Influence of DevOps on Software Development Methodologies along with its Misconceptions and Anti-Patterns. **[L3]**
- **CO 2:** Illustrate the Methodology of Four Pillars of DevOps and Troubleshoot common problems that can arise in the effective DevOps**. [L2]**
- **CO 3:** Inference the culture of DevOps to the Enterprises for achieving agility and innovation in its business units**. [L4]**

Mapping of COs to POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	3	-	-	-	-	-	-	-	-	3	-	-	-
CO2	-	-	-	3	-	-	-	-	-	-	3	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	3	-	-	-

TEXT BOOKS:

1. Jennifer Davis, RynDaniels, Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale, O'Reilly.
2. Mikael Krief, Learning DevOps, Packt Publications

REFERENCE BOOKS:

1. Gene Kim, Jez Humble, Patrick Debois, John Willis, the DevOPS Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, IT Revolution Press
2. Verona, Joakim. Practical DevOps. Packt Publishing Ltd.
3. By Jez Humble and David Farley, Continuous Delivery: Reliable Software Releases through Build, Test and Deployment Automation, Addison-Wesley Professional
4. Mandi Walls, Building a DevOps Culture, O'Reilly publications.
5. Sanjeev Sharma, "The DevOps Adoption Playbook – A Guide to Adopting DevOps in a Multi-Speed IT Enterprise", Wiley Publications.
6. Gene Kim, Kevin Behr, George Spafford, The phoenix Project, 5th.Anniversary Limited Edition

ONLINE COURSES and References:

1. Devops Culture and Mindset: offered by University of VIRGINIA.
2. Devops Culture and Mindset: offered by UCDAVIS

.NET PROGRAMMING
(JOB ORIENTED ELECTIVE-IV)

Subject Code: UGCS7T1620	**L**	**T**	**P**	**C**
IV Year / I Semester	**2**	**0**	**2**	**3**

Prerequisites: Familiarity with any programming language.

Course Objectives:

To introduce the concepts of Microsoft .NET Framework for developing web applications.

Syllabus:

UNIT I: (6 hrs)

.NET Introduction: Understanding .NET, Writing code using Visual Studio Code, Compiling and Running code using the .NET CLI, Writing top-level programs, Using Git with Visual Studio Code,Looking for help.

UNIT II: (8 hrs)

C# Basics: C# grammar, Variables, Null values, Exploring console applications, Operators, Selection statements, Iteration statements, Casting and converting between types,Arrays, Functions.

UNIT III: (8 hrs)

C# Object-Oriented Programming: Classes, Objects, Storing data within fields, Methods, Properties and Indexers, Pattern matching with objects, Records, Simplifying Methods, Raising and Handling Events, Interfaces, Generics, Inheritance.

UNIT IV: (8 hrs)

.NET Types: Understanding .NET components, publishing your applications for deployment, working with Common .NET Types – Numbers, Text, Pattern matching with regular expressions, Collections, Spans, Indexes, Ranges, Network resources, Types and Attributes, Images.

Files & Streams: Managing the file system, Reading and writing with streams.

UNIT V: (8 hrs)

Working with Databases: Using Entity Framework Core, Querying and Manipulating Data Using LINQ.

ADO.NET: Using Database Connections, Commands, Asynchronous Data Access, Transactions with ADO.NET, Transactions with System. Transactions.

UNIT VI: (8 hrs)

ASP.NET: Understanding app models for .NET, understanding web development, Understanding ASP.NET Core, Exploring Razor Pages, Using Entity Framework Core, Using Razor class libraries, configuring services and the HTTP request pipeline, Building Websites using the MVC Pattern, Building and Consuming Web Services.

Course Outcomes:

Upon completion of this course, the students will be able to:

CO1: Understand the .NET Framework.
CO2: Write various applications using C# Language.
CO3: Access databases using LINQ and ADO.NET
CO4: Develop web applications using ASP.NET

Mapping of COs to POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	-	3	3	3	-	-	3	3	3	-	3	3	-
CO3	3	-	2	2	3	-	-	-	-	-	-	-	3	-
CO4	3	-	3	3	3	-	-	3	3	3	-	-	3	-

TEXT BOOKS:

1. Mark J. Price, C# 9 and .NET 5 – Modern Cross-Platform Development, Packt Publisher.
2. Christian Nagel et al. "Professional C# 7 with .NET CORE 2.0", Wiley India

REFERENCE BOOKS:

1. Jamie Chan, Learn C# in One Day and Learn It Well, LCF Publishing.
2. Joseph Albahari, C# 9.0 Pocket Reference: Instant Help for C# 9.0 Programmers, O'Reilly
3. Ian Gariffiths, "Programming C# 8.0: Build Windows, Web, and Desktop Applications", O'Reilly.
4. Kevin Hoffman, "Microsoft Visual C#", Pearson Education.
5. S. ThamaraiSelvi, R. Murugesan, "A Text Book on C#", Pearson Education.
6. Andrew Troelsen, C# and the .NET Platform, APress.

LAB EXPERIMENTS

1. Create a windows form with the following controls Textbox, Radio button, Check box, Command Button
2. Write a program for Menu option.
3. Create a program to connect with database and manipulate the records in the database using ADO .NET
4. Create a program to implement the concepts of OOPS for creating class, inheritance
5. Create a program to perform input validation using procedure.
6. Write a program to open a file and using I/O operations write contents into a file and read the contents from the file.
7. Create a window form using HTML controls.
8. Create a program to perform validation using validation controls.
9. Create a program in ASP .NET to connect with the database using ADODB connectivity and manipulate the records.
10. Write a program to store the employee details using class and methods in C# .NET
11. Write a program to Handle Exceptions
12. Write a program to create a form with Basic controls. In c#. NET.

SPRING BOOT

(Job Oriented Elective-IV)

Subject Code: UGIT7T1220	**L**	**T**	**P**	**C**
IV Year / I Semester	**2**	**0**	**2**	**3**

Prerequisites:

1. A good working knowledge on web application development using any of the popular IDEs like Eclipse or IntelliJ.
2. Experience using Java and build tools such as Maven or Gradle.

Course Objectives:

1. Build a Java application using Spring Initializer from scratch
2. Understand how to use Spring data as an application backend
3. Create RESTful services with Spring Boot

UNIT I: (8 Hrs)

Spring Framework 5: Architecture, Design principles and Patterns, A simple Spring web application.

Introduction to Spring Boot: Spring boot configuration, features, Spring boot application model. **[T1]**

UNIT II: (8 Hrs)

Spring boot Framework: Spring Initializer, Spring Boot CLI, Spring Boot Properties, Spring Boot Annotations, Spring Boot Dependency Manager, Spring Boot Starters.

Spring boot application design: Creating maven web project, configuring pm.xml file, Creating REST resources, creating the application class, deploy the spring boot application. **[T3]**

UNIT III: (8 Hrs)

Web applications with Spring Boot: Spring boot MVC auto-configuration, Spring boot web ToDo App: design, running and testing, ToDo Client App design, overriding defaults. **[T1]**

UNIT IV: **(8 Hrs)**

Data Access with Spring Boot: Spring data with JDBC, Spring Data with JPA, Spring data REST with Spring boot, MongoDB with Spring Boot. **[T1]**

Unit-V: **(8 Hrs)**

Security with Spring Boot: Spring security, applying basic security with default Login page, Using security with JDBC. **[T1]**

Spring Boot Actuator: Actuator setting in Spring boot application, Custom Actuator Endpoints, Spring boot Actuator Health. **[T1]**

Unit – VI: **(8 Hrs)**

Spring boot in the cloud: Cloud Native architecture, Twelve Factor Applications, Microservices, Pivotal CloudFoundry : Pivotal Application service, PAS Features, deploying Spring application into PAS. **[T1]**

EXPERIMENTS:

1. Write a program to create a simple Spring Boot application that prints a message.
2. Demonstrate how to create a Web Application with Spring Boot and JSP.
3. Write a program to demonstrate RESTful Web Services with spring boot
4. Demonstrate the integration of JDBC with spring boot.
5. Demonstrate to use the Actuator end points to monitor the Spring boot application
6. Design a Login page by applying basic security configuration to spring boot
7. Demonstrate how to deploy the spring boot application into Cloud Foundry server.

Course Outcomes:

Upon the completion of the course, the student will be able to

CO 1: Design Spring Core and maven building blocks for Spring Boot. **[L3]**

CO 2: Understand the Spring Boot's Web capabilities including REST web services. **[L2]**

CO 3: Design database centric spring boot applications by integrating JDBC API. **[L4]**

CO 4: Manipulate the settings of Actuator endpoints to monitor and manage applications. **[L3]**

CO 5: Apply Spring Security to secure Web and REST endpoints in the cloud. **[L3]**

MAPPING OF COs to POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-		-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	3
CO4	-		-	3	-	-	-	-	-	-	-	-	-	3
CO5		-	3	-	-	-	-	-	-	-	-	-	-	3

TEXT BOOKS:

1. Felipe Gutierrez, Pro Spring Boot 2, II Edition, APress.

REFERENCE BOOKS:

1. Packt, Greg L. Turnquist, Learning Spring Boot 2.0, II Edition
2. Jens Boje, Spring Boot 2: How to Get Started and Build a Microservice - Third Edition, CodeBoje
3. Craig walls, Spring Boot in Action, Manning publisher.
   https://dzone.com/articles/introducing-spring-boot
   https://spring.io/

ONLINE COURSES AND REFERENCES:

1. Building scalable Java micro services with spring bid and spring cloud offered by Google Cloud – Coursera.
2. Master micro Services with Spring Boot & spring cloud by in 2 minutes official – udamy.com.

MANAGEMENT SCIENCE

Subject Code: UGMB7T0120	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites:

- General awareness about Principles of Management.
- To have an insight about Production and Operations Management.
- To be able to acquire knowledge about Human Resource Management, Marketing, Strategic Management.

Course Objectives:

1. To create awareness about different Managerial concepts like Management, Production, Marketing, Human Resource and Strategic Management.
2. To make the students equip with knowledge on techniques of PERT and CPM in project management.

SYLLABUS:

UNIT-I: [8 Hrs]

Introduction to Management : Concept and importance of Management, Functions of management, Evaluation of Management thought, Fayol's principles of Management, Maslow's need hierarchy & Herzberg's two factor theory of Motivation, Decision making process, Designing organizational structure, Principles of Organization, Types of organization structures.

UNIT-II: [8 Hrs]

Operations Management : Plant Location Principles and types of plant Layout , Work study, Materials Management: Objectives - Need for inventory control- Inventory control techniques EOQ , ABC, HML, SDE, VED and FSN analysis.

UNIT-III: [8 Hrs]

Human Resources Management (HRM): Concepts of HRM, Basic functions of HR manager, Job Evaluation and Merit Rating, Performance Appraisal, Methods of Performance appraisal Concepts Compensation.

UNIT-IV: [8 Hrs]

Marketing Management: Functions of marketing, Marketing Mix, Marketing strategies based on Product life cycle, Channels of distribution (Place), Promotional Mix.

UNIT-V: [10 Hrs]

Project Management (PERT/CPM): Network analysis, Program Evaluation and Review Technique (PERT), Critical path method (CPM) - Identifying critical path, Difference between PERT & CPM (simple problems).

UNIT-VI: **[8 Hrs]**

Strategic Management: Mission, Goals, objectives, policy, strategy, Environmental scanning, SWOT analysis, Steps in strategy formulation and implementation Generic strategy alternatives.

Course Outcomes:

Upon completing the course, student will be able to

COs	Description	Blooms Level
CO 1	Understand the fundamentals of Management with specific insight as its function and role	Understanding
CO 2	Learn the concepts of production, Management of human Resources and Management of Marketing activities along with business environment	Understanding
CO 3	Apply the problem solving skills to demonstrate logical solution to real life problems	Applying
CO 4	Create the awareness of business strategies to deal with the dynamic business environment	Creating

Mapping of COs to POs:

POs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
CO 1	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CO 2	-	-	-	-	-	2	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	2	-	-	-

Text Books:

T1. Dr. Arya Sri, "Management Science", TMH 2011.

T2. L.M. Prasad, "Principles & Practices of Management" Sultan chand & Sons, 2007.

Reference Books:

R1. K. Aswathappa and K. Sridhara Bhat, "Production and Operations Management", Himalaya Publishing House, 2010.

R2. Philip Kotler Philip Kotler, Kevin Keller, Mairead Brady, Malcolm Goodman, Torben Hansen, "Marketing Management" Pearson Education Limited, 2016.

ETHICAL HACKING

Subject Code: UGIT7K1320	**L**	**T**	**P**	**C**
IV Year / I Semester	**1**	**-**	**2**	**2**

Prerequisite: The student should be familiar with the fundamentals of Linux operating system, Computer Networks, web application, and Cryptography.

Objective: The student will learn how to evaluate the security of and identify vulnerabilities in target systems, networks or system infrastructure to determine whether unauthorized access or other malicious activities are possible.

Tools: Metasploit, Burp Suite, Wireshark, SQL Map, Kali Linux, Cookie Manager, Nessus

Labs/Attacks:

OWASP-10, Cookie/Session based vulnerabilities - Session Fixation, Session Hijacking, Insecure Cookie Attributes

Injection attacks - Cross Site Scripting (XSS), SQL Injection, HTML Injection, CSS Injection, XML injection, OS Command Injection

Remote code execution

local file inclusion

remote file inclusion

Insecure file upload

Path Traversal / Directory Listing

Cache Misconfiguration

Brute force attacks

Denial of Service

Distributed Denial of Service

Course Outcomes:

CO1: Examine the tools for conducting ethical hacking[L5].

CO2: Analyse the vulnerabilities of the target system [L4]

CO3: Articulate the legal and ethical issues related to vulnerability[L3].

Mapping OF COs to POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	3	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	3	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	3	-	-	3	-	3	-	-	-	-