FACULTY OF ENGINEERING

Scheme of Instruction & Examination

And
Syllabi

B.E.VII and VIII Semester

of
Four Year Degree Programme
In

B.E. (Information Technology)

W.e.f. 2023-2024

BATCH 2020-2024

Dean, Faculty of Engineering
Osmania University, Hyderabad – 500 007

2023

Chairperson, BoS **Dean, FoE OU**

SCHEME OF INSTRUCTION & EXAMINATION
B.E (INFORMATION TECHNOLOGY)
VII Semester

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	D/P	Contact Hrs/Wk	CIE	SEE	Duration in Hrs	
Theory Course										
1.	PC701IT	Internet of Things	3	-	-	3	30	70	3	3
2.	PC702IT	Big Data Analytics	3	-	-	3	30	70	3	3
3	OE-II	Open Elective II	3	-	-	3	30	70	3	3
4.	PE-III	Professional Elective-III	3	-	-	3	30	70	3	3
5.	PE-IV	Professional Elective IV	3	-	-	3	30	70	3	3
Practical/Laboratory Courses										
5	PC751IT	Internet Of Things Lab	-	-	2	2	25	50	3	1
6	PW752IT	Project Work–I	-	-	6	6	50	-	-	3
7	SI651IT	Summer Internship	`	-	-	-	50	-	-	2
Total			15	-	08	23	275	400	18	21

PC: Professional Core; **PE**: Professional Elective; **HS**: Humanities and social Science;
MC: Mandatory; **L**: Lecture; **T**: Tutorial; **P**: Practical
CIE: Continuous Internal Evaluation; **SEE**: Semester End Examination (Univ.Exam)

Note:

1. Each contact hour is one clock hour.
2. The duration of practical class is two hours, however it can be extended whenever necessary to enable the students to complete the program.

Open Elective – II	
Course Code	**Course Title**
OE701IT	Principles of Cyber Security

Profession Elective – III	
Course Code	**Course Title**
PE 731 IT	Software Reuse Techniques
PE 732 IT	Cyber Security
PE 733 IT	Scalable Architectures for Large Applications
PE 734 IT	Natural Language Processing
PE 735 IT	Real Time Systems

Profession Elective – IV	
Course Code	**Course Title**
PE 741 IT	Software Project Management
PE 742 IT	Digital Forensics
PE 743 IT	Blockchain Technologies
PE 744 IT	Deep Learning
PE 745 IT	Augmented and virtual Reality

SCHEME OF INSTRUCTION & EXAMINATION
B.E (INFORMATION TECHNOLOGY)
VIII Semester

S.No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	D/P	Contact Hrs/Wk	CIE	SEE	Duration in Hrs	
Theory Course										
1.	PE-V	Professional Elective–V	3	-	-	3	30	70	3	3
2.	OE-III	Open Elective–III	3	-	-	3	30	70	3	3
Practical/Laboratory Courses										
3.	PW861IT	Project Work–II	-	-	16	16	50	100	-	8
Total			06	-	16	22	110	240	06	14

PC: Professional Core; **PE**: Professional Elective; **HS**: Humanities and social Science; **MC**: Mandatory; **L**: Lecture; **T**: Tutorial; **P**: Practical
CIE: Continuous Internal Evaluation; **SEE**: Semester End Examination (Univ.Exam)

Note:

1. Each contact hour is one clock hour.
2. The duration of practical class is two hours, however it can be extended whenever necessary to enable the students to complete the program.

Open Elective – III	
Course Code	**Course Title**
OE 801 IT	Mobile Computing

Profession Elective – V	
Course Code	**Course Title**
PE 851 IT	Agile Software Development
PE 852 IT	Information Security
PE 853 IT	DevOp sand Kubernetes
PE 854 IT	Computational Intelligence
PE 855 IT	Quantum Computing

INTERNET OF THINGS

PC701IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To explore the design characteristics of IoT, Communication models between processes or applications in heterogeneous environments for engineering problems.
2. To impart knowledge on enabling technologies, techniques, resources, and use of modern IT tools for providing IoT-based based solutions.
3. To apply the contextual knowledge to assess the commercial applications/tools/technologies by considering societal, health, safety, legal and cultural issues for IoT applications.

Course Outcome:

Students will be able to

1. Demonstrate the basic principles as well as the core concepts related to the Internet of Things.
2. Analyze the core architectural concepts to meet the challenges in implementing the connected devices.
3. Describe different types of sensors and programming aspects for the domain-specific IoT.
4. Differentiate between the Network Layer protocols and Application layer protocols.
5. Design an IoT network and push the real-time data to the cloud server.

UNIT-I

Introduction to the Internet of Things Definition & Characteristics of IoT, Genesis of IoT, IoT Impact and Challenges IoT Network Architecture and design: M2M IoT Architecture, IoT World Forum Standardized Architecture, Simplified IoT Architecture, Core IoT Functional stack. Application Domains of IoT: Smart Home, Smart Cities, Smart Environment, Logistics, Agriculture, Industry, Health, and Lifestyle.

UNIT-II

Engineering IoT Networks Things in IoT: Sensors, Actuators, Smart Objects, Wireless Sensor Networks, Communication protocols in WSNs, Criteria for connecting smart objects, IoT Access Technologies, IEEE 802.15.4 standard.

UNIT III

IP at the IoT Network Layer: Need for optimization in IP in IoT Networks, IP versions, 6LoWPAN, Comparison of IP protocol stack and IoT Protocol stack, IP Protocol for smart objects (IPSO) Alliances.

UNIT IV

IoT Application Layer protocols: COAP, MQTT, Message format, Comparison between COAP and MQTT Protocol.

UNIT V

IoT Platforms Design Methodology: Introduction, IoT Platform Design Methodology, IoT Physical Devices & Endpoints, Raspberry Pi interfaces, Programming Raspberry Pi with Python, Other IoT Devices.IoT Physical Servers & Cloud Offerings: Introduction to Cloud Storage Models & Communication APIs, WAMP - AutoBahn for IoT, Xively Cloud for IoT, Python Web Application Framework-Django, Amazon Web Services for IoT.

Suggested Readings:

1. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things by David Hanes, et.al, Pearson Publisher, 1st Edition.
2. Vijay Madisetti and Arshdeep Bahga, Internet of Things: A Hands-On Approach, VPT edition1, 2014.
3. Jonathan Follett, Designing for Emerging - UX for Genomics, Robotics, and the Internet of Things Technologies, O'Reilly, 2014.

BIG DATA ANALYTICS

PC702IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. Understand big data for business intelligence.
2. Identify business case studies for big data analytics.
3. Defend big data Without SQL.
4. Discuss the process of data analytics using Hadoop and related tools.

Course Outcomes:

Students will be able to

1. Demonstrate big data and use cases from selected business domains.
2. Apply the knowledge of NoSQL big data management and experiment with Install, configure, andrun Hadoop and HDFS.
3. Analyse map-reduce analytics using Hadoop.
4. Adapt Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics.

UNIT-I

Understanding Big Data: Characteristics of Data, Introduction to Big Data and its importance, Challenges posed by Big Data, Big data analytics and its classification, Big data applications: big data and healthcare – big data in banking – advertising and big data, big data technologies.

UNIT-II

Hadoop Distributed File System: Hadoop Ecosystem, Hadoop Architecture, HDFS Concepts, Blocks, Namenodes and Datanodes, Hadoop FileSystems, The Java Interface, Reading Data from a Hadoop URL, Writing Data, Querying the FileSystem, Deleting Data, Anatomy of File Read and Write

UNIT-III

NOSQL Data Management: Introduction to NOSQL – aggregate data models, aggregates key value and document data models, relationships – graph databases, schema less databases, Sharding - map reduce – partitioning and combining – composing map-reduce calculations.

UNIT-IV

Map Reduce and Yarn: Hadoop Map Reduce paradigm, Map and Reduce

tasks, Job and Task trackers, Mapper, Reducer, Map Reduce workflows, classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – Map Reduce types – input formats – output formats

UNIT-V

Pig: Installing and Running Pig, an Example, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators. Hive: The Hive Shell, An Example, Running Hive, Comparison with Traditional Databases, HiveQL, Tables, Querying Data, User- Defined Functions, writing a User Defined Functions.

Suggested Reading:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilly, 2012, ISBN -13: 978-1449311520, ISBN-10: 1449311520
2. Pramod Sadalage, Martin Fowler, "NoSQL Distilled - A brief guide to the emerging world of polyglot", Addison Wesley 2013
3. Eric Sammer, "Hadoop Operations", O'Reilly, 2012, ISBN -13 978-1449327057, ISBN-10: 1449327052
4. VigneshPrajapati, Big data analytics with R and Hadoop, 2013, ISBN -13: 978- 1782163282
5.. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilly, 2012, ISBN -13: 978-1449319335

SOFTWARE REUSE TECHNIQUES

PE731IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To know the factors that contribute to the success of software reuse.
2. To understand the concept of Design Patterns.
3. To recognize various structural and behavioral patterns.
4. To gain more insight into Architectural Patterns.
5. To study the process of Object-Oriented Business Engineering.

Course Outcomes:

The student will able to

1. Understand why reusing the software is important and the components subsystems.
2. Learn the different types of design patterns.
3. Gain knowledge about the different types of structural and behavioral patterns.
4. Explain the Architectural Patterns.
5. Comprehend the Object-Oriented Business Engineering.

UNIT-I

Software reuse success factors, Reuse driven software engineering as business, Object oriented software engineering, Applications and Component subsystems, Use case components, Object components.

UNIT-II

Design Patterns — Introduction. Creational Patterns — Factory Pattern, Factory Method, Abstract Factory Pattern, Singleton Pattern, Builder Pattern, Prototype Pattern.

UNIT-III

Structural Patterns — Adapter Pattern, Bridge Pattern, Composite Pattern, Decorator Pattern, Façade Pattern, Flyweight Pattern, Proxy Pattern. Behavioural Patterns — Chain of responsibility Pattern, Command Pattern, Interpreter Pattern.

UNIT-IV

Behavioral Patterns—Iterator Pattern, Mediator Pattern, Memento Pattern, Observer Pattern, State Pattern, Strategy Pattern, Template Pattern, Visitor Pattern. Architectural Patterns—Layers, Pipes and Filters, Black board.

UNIT-V

Object Oriented Business Engineering –Business Process Reengineering, Software Engineering Process in reuse business. Component System Engineering building flexible components systems, requirement analysis, robustness analysis, design, implementation and testing the component system.

Suggested Reading:

1. Ivar Jacabson, Martin Griss, Patrick Johnsson,―Software Reuse: Architecture, Process andfor Business Success‖. Pearson Education,2003.

2. James W Cooper, ―Java Design Patterns, a tutorial―, Pearson Education, 2003.

3. Frank Buschmann, et al.,―Pattern Oriented Software Architecture – Volume I‖ John Wiley & Sons,1996.

CYBER SECURITY

PE732IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

To expose the students to the following

1. Instigate cyber threats and cyber security and to facilitate the awareness in the times of growing cyber-crime episodes.
2. Learning how cyber security is going to help to understand the implications of cyber-crime.
3. Facilitating an idea about the legal perspectives and laws related to cyber-crimes in Indian context.
4. Familiarize how to apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cyber-crimes.

Course Outcomes:

The student should be able to

1. Analyze various aspects of Cyber security, Cyber-crimes and its related laws in Indian and Global act.
2. Understand how cyber security is going to help the implications of cybercrime.
3. Examine the legal perspectives and laws related to cybercrimes in Indian context.
4. Apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cybercrimes.

UNIT I

Introduction to Cyber Crimes: Introduction, Definition, Origin, Cyber Crime and Information Security, Cyber Criminals, Classifications of Cyber Crimes, The Legal Perspectives and Indian Perspective, Cyber Crime and Indian ITA 2000, Global Perspective on Cyber Crimes. Cyber Offenses: Introduction, Criminals Planning on Attacks, Social Engineering, Cyber Stalking, Cyber Café and Crimes, Botnets.

UNIT II

Tools and Methods used in Cyber Crime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan horses and Backdoors, Steganography, DoS and DDoS

attacks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

UNIT III

Cyber Crimes and Cyber Security-Legal Perspectives: Introduction, Cyber Crime and the legal landscape around the world. Cyber Laws in Indian Context, The Indian IT Act, Challenges to Indian
Law and Cyber Crime Scenario in India, Consequences of not addressing the weakness in IT Act, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyberlaw, Technology and Students in India Scenario.

UNIT IV

Cyber Security-Organizational Implications: Introduction, Cost of Cyber Crimes and IPR issues, Web Threats for Organizations - Evils and Perils, Security and Privacy Implications from Cloud Computing, Social Media Marketing-Security Risks and Perils for Organizations.

UNIT V

Cyber Security-Organizational Implications: Social Computing and Associated Challenges for Organizations, Protecting People's Privacy in Organization, Organizational Guidelines for Internet
Usage, Safe Computing and Usage Policy, Incident Handling and Best Practices, Media and Asset Protection.

Suggested Readings

1. Nina Gobole, SunitBelapure, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, 1st edition, Wiley India, 2011.
2. Robert Bird, Jonathan J. Darrow, Gerald R. Ferrera, Jacqueline Klosek, Margo E. K. Reder, Stephen D. Lichtenstein, Jeffrey Aresty, “Cyber Law: Text and Cases”, 3 rd Edition, Cengage Learning, 2012.
3. Vivek Sood, “Cyber Law Simplified”, Tata McGraw-Hill, 2017.
4. Prashant Mali, “Cyber Law and Cyber Crimes Simplified”, 4 th Edition, Cyber Infomedia, 2017.

SCALABLE ARCHITECTURE FOR LARGE APPLICATIONS

PE733IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. Students will be able to learn application and building Scalable Machine Learning, Hadoop, SMACK Stack and also Message Services.
2. Students will be able to select the appropriate architecture for enterprise architectures based on the size, scale and applications used in the enterprise

Course Outcomes:

Student will be able to

1. Understand the basic concepts of Scalable Machine Learning
2. To become a data scientist work in some development environment tailored for statistics and Machine Learning.
3. Obtain expertise to turn actionable insights and Fast Data Applications into innovative methods to solve real-world problems.
4. To impart knowledge on Kubernetes and batch processing.

UNIT –I

Introduction to Scalable Machine Learning, Some Machine Learning Background Algorithms for Large scale Learning, Overview of Hadoop and Current Big Data Systems

UNIT II

How Programming for Data Flow Differs, Basic Spark, Working with Vectors and Matrices in Spark, Brief tour of Spark ML, beyond parallelization, Practical Big Data

UNIT III

Anatomy of Fast Data Applications, SMACK Stack – Functional Decomposition, Message Backbone- Understanding messaging requirements, Data ingestion, Fast data& low latency, Message Delivery Semantics, Distributing Messages

UNIT IV

Compute Engines- Micro Batch Processing, One-at-a time Processing, Choice of processing engine, Storage as the Fast Data Borders, The message backbone as Transition Point

UNIT V

Sharing stateful streaming state, Data Driven Micro-services, State and Micro-services. Deployment environments for Fast Data Applications, Application containerization, resource scheduling, Apache Mesos, Kubernetes, Cloud Deployments.

Suggested Reading:

1. Designing Fast Data Application Architectures by Gerard Maas, Stavros Kontopoulos, Sean Glover , Publisher: O'Reilly Media, Inc., June 2018
2. Spark- The definitive Guide by Bill Chambers & Matei Zaharia, O'Reilly Media, Inc., June 2019

NATURAL LANGUAGE PROCESSING

PE734IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To introduce Natural Language understanding along with its applications, representation and organization. To outline Linguistic background for syntactic processing.
2. To study augmented grammars and parsers for feature systems.
3. To use grammar for natural language processing and strive towards efficient parsing.
4. To study basic logical form language to encode ambiguity and to interpret semantics covering ambiguity and link syntax to semantics.
5. To resolve and encode ambiguity using statistical methods to estimate lexical probabilities along with critical study of probabilistic context free grammars and parsing. To study applications and trends.

Course Outcomes:

Student will able to

1. Understand Natural Language processing along with its applications, representation and organization and apply Linguistic background for syntactic processing.
2. Perform top-down and bottom-up parsing, and parsing with features.
3. Use grammar for natural language processing and achieve efficient parsing.
4. Able to encode ambiguity in logical form language and deal with word-sense and ambiguity and to link syntax to semantics.
5. Estimate lexical probabilities, resolve ambiguity, and use probabilistic context-free grammar.

UNIT – I

Natural Language Processing: Introduction to Natural Language Processing, the study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural Language Understanding Systems, Linguistic Background: An outline of English syntax, Words, the elements of

Simple Noun Phrases, Verb Phrases and Simple Sentences, Noun Phrases Revisited, Adjective Phrases, Adverbial Phrases

UNIT – II

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top-Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

UNIT – III

Grammar for Natural Language Processing: Auxiliary Verbs and Verb Phrases, Movement Phenomena in Languages, Handling questions in Context- Free Grammars. Towards Efficient Parsing: Human Preferences in Parsing, Encoding Uncertainty: Shift Reduce Parsers, A Deterministic Parser, Techniques for Efficient Encoding of Ambiguity, Partial Parsing.

UNIT – IV

Semantic Interpretation: word senses and ambiguity, Basic logical form language, Encoding ambiguity in logical from, Thematic role.
Linking syntax and semantics: Semantic Interpretation and Compositionality, A Simple Grammar and Lexicon with Semantic Interpretation, Lexicalized Semantic Interpretation and Semantic Roles, Handling Simple Questions, Semantic Interpretation Using Feature Unification, Generating Sentences from Logical Form

UNIT – V

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part- of- Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context- Free Grammars, Best First Parsing.
Applications: Some applications like Machine translation, Recent trends in NLP.

Suggested Readings:

1. James Allen, ―Natural Language Understanding, Pearson Education
2. Christopher D Manning and Hinrich Schutze, ―Foundations of Statistical Natural Language Processing, MIT Press, 1999.
3. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, ―NLP: A Paninian Perspective,, Prentice Hall, New Delhi
4. D. Jurafsky, J. H. Martin, ―Speech and Language Processing, Pearson

REAL TIME SYSTEMS

PE735IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To provide broad understanding of the requirements of Real Time Operating Systems.
2. To make the student understand, applications of these Real Time features using case studies.

Course Outcomes:

Student will able to

1. Be able to explain real-time concepts such as preemptive multitasking, task priorities, priority inversions, mutual exclusion, context switching, and synchronization, interrupt latency and response time, and semaphores.
2. Able describe how a real-time operating system kernel is implemented.
3. Able explain how tasks are managed.
4. Explain how the real-time operating system implements time management.
5. Discuss how tasks can communicate using semaphores, mailboxes, and queues. Be able to implement a real-time system on an embedded processor and work with real time operating systems like RT Linux, Vx Works, MicroC /OSII, Tiny Os

UNIT I

Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT II

Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

UNIT III

Objects, Services and I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

UNIT IV

Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

UNIT V

Case Studies of RTOS: RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, and Tiny OS.

Suggested Readings:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011
2. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.
3. Advanced UNIX Programming, Richard Stevens
4. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

SOFTWARE PROJECT MANAGEMENT

PE741IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To deliver knowledge regarding software management and to make students understand software economics.
2. To explore the methods of improving software economics, by reducing the various cost incurred in different phases of software development.
3. To recognize software development phases and artifacts of processes.
4. To understand the workflow of the process and to plan projects accordingly.
5. To know the metrics and management, quality indicators of the processes.

Course Outcomes:

The student will able to

1. Gain knowledge of software economics, phases in the life cycle of software development, project organization, and project control and process instrumentation.
2. Summarize software economics, software development life cycle, artifacts of the process, workflows, checkpoints, project organization and responsibilities, project control, and process instrumentation.
3. Choose the right software development approach. Compare various project organizations and responsibilities.
4. Examine the major and minor milestones, artifacts, and metrics from management and technical perspective.
5. Design software products using conventional and modern principles of software project management.

UNIT - I

Conventional Software Management: The waterfall model, conventional software Management performance.Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

UNIT - II

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.The old way and the new: The

principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT - III

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts. Model based software architectures: A Management perspective and technical perspective.

UNIT- IV

Work Flows of the process: Software process workflows, Iteration workflows. Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments. Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations. Process Automation: Automation Building blocks, The Project Environment.

UNIT- V

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation. Tailoring the Process: Process discriminate. Future Software Project Management: Modern Project Profiles, Next generation Software economics, modern process transitions. Case Study: The command Center Processing and Display system- Replacement (CCPDS-R)

Suggested Reading:

1. Software Project Management, Walker Royce: Pearson Education, 2005.
2. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
3. Software Project Management, Joel Henry, Pearson Education.
4. Software Project Management in practice, Pankaj Jalote, Pearson Education.2005.

DIGITAL FORENSICS

PE742IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To understand underlying principles & techniques associated with digital forensic & cyber-crime.
2. To explore knowledge about ethical hacking Methodology.
3. To learn the importance of evidence handling & storage for various devices.
4. To develop understanding of cyber security issues & analyse the ways that exploits securities.
5. To investigate attacks, exploits and "Trap & Trace" computer networks.
6. To apply digital forensic knowledge to use forensic tools & investigation report writing.

Course Outcomes:

Student will able to:

1. Define the concept of ethical hacking & its applications in Information Communication Technology (ICT)world.
2. Underline the need of digital forensic & role of digital evidences.
3. Explain methodology of incident response & various security issues in ICT world, & identify digitalforensic tools for data collection.
4. Recognize importance of digital forensic duplication & various tools for analysis to achieve adequateperspectives of digital forensic investigation in various applications/devices like Windows/Unix system.
5. Apply the knowledge of IDS to secure network and performing router and network analysis
6. List method to generate legal evidence and supporting investigation reports and will also be able to usevarious digital forensic tools.

UNIT-I

Introduction to Cyber Crime and Ethical Hacking Introduction of Cybercrime: Types of cybercrime, categories of cybercrime, Computers roles in crimes, Prevention from Cyber-crime, Hackers, Crackers, Phreakers, etc.Ethical Hacking: Difference between Hacking and Ethical hacking: Steps of Ethical Hacking, Exploring some tools for ethical hacking: reconnaissance tools, scanning tools

UNIT-II

Introduction to Digital Forensics and Digital Evidences Digital Forensic: Rules

for Digital Forensic, the Need for Digital Forensics, Types of Digital Forensics, Ethics in Digital Forensics Digital Evidences: Acquisition of evidence, Types & characteristics and challenges for Evidence Handling

UNIT-III

Computer Security Incident Response Methodology Introduction to Computer Security Incident: Goals of Incident response, Incident Response Methodology, Formulating Response Strategy, IR Process – Initial Response, Investigation, Remediation, Tracking of Significant, Investigative Information, Reporting Pre Incident Preparation, Incident Detection and Characterization. Live Data Collection: Live Data Collection on Microsoft, Windows Systems: Live Data Collection on Unix-Based Systems

UNIT-IV

Forensic Duplication and Disk Analysis and Investigation Forensic Duplication: Forensic Image Formats, Traditional Duplication, Live System Duplication, Forensic Duplication tools Disk and File System Analysis: Media Analysis Concepts, File System, Redundant Array of Inexpensive Disks Special Containers, Hashing, Carving, Forensic Imaging Data Analysis: Static and Dynamic Analysis

UNIT-V

Network Forensics, Forensic Investigation Report and Forensic Tools Technical Exploits and Password Cracking: Types of IDS, Network intrusion & attacks, Collecting Network based evidence, Using Routers as Response Tools Report: Goals of Report, Guidelines for Writing a Report, sample for writing a forensic report. Computer Forensic Tools: need and types of computer forensic tools & Study of open-source Tools

Suggested Reading:

1. Jason Luttgens, Matthew Pepe, Kevin Mandia, “Incident Response and computer forensics”, 3rd EditionTata McGraw Hill, 2014.
2. Nilakshi Jain, Dhananjay Kalbande, “Digital Forensic: The fascinating world of Digital Evidences” WileyIndia Pvt Ltd 2017.
3. Cory Altheide, Harlan Carvey” Digital forensics with open-source tools “Syngress Publishing, Inc. 2011.
4. Chris McNab, Network Security Assessment, By O’Reily.
5. Clint P Garrison “Digital Forensics for Network, Internet, and Cloud Computing A forensic evidence guide for moving targets and data, Syngress Publishing, Inc. 2010.
6. Bill Nelson, Amelia Phillips, Christopher Steuart, “Guide to Computer Forensics and Investigations”.Cengage Learning, 2014.
7. Debra Littlejohn Shinder Michael Cross “Scene of the Cybercrime: Computer Forensics Handbook”, 2nd Edition Syngress Publishing, Inc.2008.
8. Marjie T. Britz, Computer Forensics and Cyber Crime, Pearson, Third Edition.

BLOCKCHAIN TECHNOLOGIES

PE743IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. Understand how BlockChain work.
2. Design build and deploy smart contract distributed applications
3. Integrate ideas from Blockchain Technology into their projects.

Course Outcome:

Students will be able to

1. Demonstrate the ability to compare and contrast distributed database and Blockchain.
2. Explain and experiment with the design principles and mechanism, of Bitcoin and Ethereum mining.
3. Design, Build and Deploy a Distributed smart contract application on Ethereum using solidity programming Language.
4. Examine various crypto currency regulations and justify how BlockChain is applied in various domains

UNIT-I

Basic: Distributed Database, Two General problems, Byzantine General Problem and Fault tolerance tuning complete, Blockchain Advantage over conventional distributed database, cryptographic Hash Functions, Hash pointers and Data Structures, Digital Signature- ECDSA, Public key as Identifiers, A Simple Cryptocurrency, Private and Public Blockchain.

UNIT- II

Decentralization mechanism of Bitcoin: Centralization verses Decentralization, Distributed Consensus,Consensus without identity using a Bitcoin, Nakamoto consensus Incentives and proof of work, putting it all together. Bitcoin transaction, Bitcoin Scripts, Proof of burn, Proof of stake, Application of Bitcoin script, Bitcoin block.

UNIT- III

Storing and Managing Bitcoin: Simple local storage, Hot and cold storage, Splitting and sharing keys, online wallet and exchange, Transaction fees, Currency exchange market, Task of Bitcoin miner, Mining Hardware, Energy

consumption and Ecology, Mining pools, Mining incentives and strategies, need for anomynity, Zerocoin and Zerocash.

UNIT- IV

Ethereum and Smart contact: Ethereum project, Ether, Gas, Ethereum Architecture, Ethereum nodes, Ethereum Account, Transaction blocks, End to End Transaction, Write and deploy smart contact small applications like Hello world, addition of two numbers, Namecoin, Chess using Solidity Programming Language.

UNIT-V

Crypto Currency Regulations: Stake holders, Legal Aspects- Crypto currency exchange, Black Market and Global economy, crypto currency trade regulations in India, Applications Internet of Things, Medical Record Management system and future of Block chain.

Suggested Reading:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press,2016.
2. Solidity Programming Essentials: A beginner's guide to build smart contracts for Ethereum and blockchain, Ritesh Modi, Packt Publications,2018.
3. Bitcoin A Peer-to-Peer Electronic Cash System, Satoshi Nakamoto,2008.
4. Ethereum: A Secure Decentralized Generalized Transaction Ledger Yellow Pages- 2014

DEEP LEARNING

PE744IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1 .Learn about the relationship between machine learning and deep learning.
2. Comprehend the knowledge on Neural Networks and Deep Learning Concepts.
3. Gain knowledge to apply optimization strategies on Neural Networks.
4. Ability to select and use the Learning Networks, Deep Models to model real world system.
5. Ability to apply optimization strategies for large scale applications.

Course Outcomes:

Student will able to
1. Understand connection of deep learning with Machine learning.
2. Describe the various concepts related to Neural Networks.
3. Understand the Deep Neural Network.
4. Develop different parameters for Regularization for Deep Learning.
5. Design Optimized for training Deep Models.

UNIT-I

Machine Learning Review : How Machines Learn, Biological Inspiration, Deep Learning, The Math Behind Machine Learning- Linear Algebra and Statistics, Working of Machine Learning: Regression, Classification, Clustering, underfitting and overfiting , optimization, convex optimization, Gradient Descent, stochastic Gradient Descent, Quazi-Newton optimization model, Generative vs Discriminative models, logistic Regression, Evaluating models, Building an understanding of Machine Learning.

UNIT-II

Foundations of Neural Networks The biological Neuron, Perceptron, Multilayer Feed forward Network, Training the neural network, Activation Functions: Linear, Sigmoid, Tanh, Hard Tanh, Softmax, Rectified linear, Loss function: Notation, regression, classification, reconstruction, Hyper-parameters: Learning rate, Regularization, Momentum, Sparsity.

UNIT – III

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed

forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

UNIT - IV

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi- Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier.

UNIT - V

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second Order Methods, Optimization Strategies and Meta-Algorithms Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing.

Suggested Reading:

1. J., & Gibson, A.” Deep Learning: A Practitioner's Approach Patterson, O'Reilly Media, Inc 2017.
2. Ian Goodfellow and Yoshua Bengio and Aaron Courville ” Deep Learning: An MIT Press Book” , 2019
3. Simon Haykin ,”Neural Networks and Learning Machines” 3rd Edition, Pearson Prentice Hall.
4. Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018
5. Phil Kim, “Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence”, Apress, 2017.

AUGMENTED AND VIRTUAL REALITY

PE745IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To provide broad understanding of the technologies required to work in Virtual Reality.
2. To make the student familiar with VR programming.

Course Outcomes:

Student will able to

1. Have a basic knowledge of VR and its supporting hardware.
2. Be able to perform VR modeling.
3. Have an idea of the broad applications of VR.
4. Develop programming related to VR.
5. Develop high end graphics using VR programming.

UNIT I

Introduction: The three I's of virtual reality, commercial VR technology and the five classic components of a VR system. Input Devices: (Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces.

UNIT II

Output Devices: Graphics displays, sound displays & haptic feedback. Modeling: Geometric modeling, kinematics modeling, physical modeling, behaviour modeling, model management.

UNIT III

Human Factors: Methodology and terminology, user performance studies, VR health and safety issues. Applications: Medical applications, military applications, robotics applications.

UNIT IV

VR Programming-I: Introducing Java 3D, loading and manipulating external models, using a lathe to make shapes.

UNIT V

VR Programming-II: 3D Sprites, animated 3D sprites, particle systems.

Sugested Reading:

1. Virtual Reality Technology, Second Edition, Gregory C. Burdea & Philippe Coiffet, John Wiley & Sons, Inc.,
2. Killer Game Programming in Java, Andrew Davison, Oreilly-SPD, 2005.
3. Understanding Virtual Reality, interface, Application and Design, William R.Sherman, Alan Craig, Elsevier(Morgan Kaufmann).
4. 3D Modeling and surfacing, Bill Fleming, Elsevier(Morgan Kauffman).
5. 3D Game Engine Design, David H.Eberly, Elsevier.
6. Virtual Reality Systems, John Vince, Pearson Education.

PRINCIPLES OF CYBER SECURITY

OE701IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To offer an understanding of principle concepts, central topics and basic approaches in information and cyber security.
2. To know the basics of Security.
3. To acquire knowledge of standard algorithms and protocols employed to provide confidentiality, integrity and authenticity.
4. To enhance awareness about Personally Identifiable Information (PII), Information Management, cyber forensics.

Course Outcomes:

1. Gauge the security protections and limitations provided by today's technology.
2. Identify information security and cyber security threats.
3. Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
4. Build appropriate security solutions against cyber-attacks.

UNIT- I

Security Basics: Introduction, Elements of Information Security, Security Policy, Techniques, Steps, Categories, Operational Model of Network Security, Basic Terminologies in Network Security. Threats and Vulnerability, Difference between Security and Privacy.Digital Signatures: Implementation, Algorithms, Standards (DSS), Authentication Protocol.

UNIT-II

Data Encryption Techniques And Standards: Introduction, Encryption Methods: Symmetric, Asymmetric, Cryptography, Substitution Ciphers. Transposition Ciphers, Stenography applications and limitations, Block Ciphers and methods of operations, Feistal Cipher, Data Encryption Standard (DES), Triple DES, DES Design Criteria, Weak Keys in DES Algorithms, Advance Encryption Standard (AES).

UNIT-III

IP Security: Introduction, Architecture, IPV6, IPv4, IPSec protocols, and Operations, AH Protocol, ESP Protocol, ISAKMP Protocol, Oakkey determination Protocol, VPN. WEB Security: Introduction, Secure Socket Layer

(SSL), SSL Session and Connection, SSL Record Protocol, Change Cipher Spec rotocol, Alert Protocol, Handshake Protocol. Electronic Mail Security: Introduction, Pretty Good Privacy, MIME, S/MIME, Comparison. Secure Electronic Transaction (SET)

UNIT – IV

Firewall And Intrusion: Introduction, Computer Intrusions. Firewall Introduction, Characteristics and types, Benefits and limitations. Firewall architecture, Trusted Systems, Access Control. Intrusion detection, IDS: Need, Methods, Types of IDS, Password Management, Limitations and Challenges.

UNIT -V

Confidentiality And Cyber Forensic: Introduction to Personally Identifiable Information (PII), Cyber Stalking, PII impact levels with examples Cyber Stalking, Cybercrime, PII Confidentiality Safeguards, Information Protection Law: Indian Perspective.

Suggested Readings:

1. Bernard Menezes, “Network Security and Cryptography”, Cengage Learning India, 2014, ISBN No.: 8131513491
2. Nina Godbole, Sunit Belapure, “Cyber Security”, Wiley India, 2014, ISBN No.: 978-81-345-2179-1
3. Eoghan Casey, “Digital Evidence and Computer Crime Forensic Science, Computers and the Internet”, ELSEVIER, 2011, ISBN 978-0-12-374268-1
4. Atul Kahate , “ Cryptography and Network Security”, Mc Graw Hill Publication, 2nd Edition, 2008,
ISBN : 978-0-07-064823-4
5. William Stallings, “Cryptography and network security principles and practices”, Pearson, 6th Edition, ISBN : 978-93-325-1877-3
6. Forouzan, “Cryptography and Network Security (SIE)”, Mc Graw Hill, ISBN, 007070208X, 9780070702080
7. Dr. Nilakshi Jain-Digital Forensic: The Fascinating World of Digital Evidences-Wiley India-ISBN: 9788126565740

INTERNET OF THINGS LAB

PC 751 IT

Instruction	: 2 periods per week
Duration of SEE	: 3 hours
CIE	: 25 marks
SEE	: 50 marks
Credits	: 1

Course Objectives

The objectives of the course are to impart knowledge of the:

1. To become familiar with the architecture and Instruction set of Intel 8086 microprocessor.
2. To provide practical hands-on experience with Assembly Language Programming.
3. To familiarize the students with interfacing of various peripheral devices with 8085 microprocessors.

Course Outcomes

After the completion of the course, the student will be able to:

1. Use microcontroller based embedded platforms in IOT
2. Interface wireless peripherals for exchange of data.
3. Make use of Cloud platform to upload and analyze any sensor data
4. Use of Devices, Gateways and Data Management in IoT.
5. Use the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis.

List of Experiments:

1. Introduction to Arduino platform and programming.
2. Interfacing Arduino to Zigbee module.
3. Interfacing Arduino to GSM module.
4. Interfacing Arduino to Bluetooth Module.
5. Introduction to Raspberry PI platform and Python programming.
6. Interfacing sensors to Raspberry PI.
7. Communicate between Arduino and Raspberry PI using any wireless medium.
8. Setup a cloud platform to log the data.
9. Log Data using Raspberry PI and upload to the cloud platform.
10. Design an IOT based system.

Suggested Weblinks:

1. https://microcontrollerslab.com/zigbee-interfacing-arduino/
2. https://microcontrollerslab.com/apds9960-proximity-gesture-ambient-light-sensor-interfacing-arduino/
3. https://microcontrollerslab.com/gsm-module-interfacing-arduino-send-receive-sms/
4. https://microcontrollerslab.com/hc-05-bluetooth-module-interfacing-arduino/
5. https://www.electronicshub.org/interfacing-ir-sensor-with-raspberry-pi/

PROJECT WORK - I

PW752 IT

Instruction	:6 periods per week
Duration of SEE	: -
CIE	: 50 marks
SEE	: -
Credits	: 3

Course Objectives:

1. To enhance practical and professional skills.
2. To familiarize tools and techniques of systematic literature survey and documentation
3. To expose the students to industry practices and team work.
4. To encourage students to work with innovative and entrepreneurial ideas

Course Outcomes

After completing this course, the student will be able to

1. Demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program to the real-world problems.
2. Evaluate different solutions based on economic and technical feasibility
3. Effectively plan a project and confidently perform all aspects of project management
4. Demonstrate effective written and oral communication skills

The department can initiate the project allotment procedure at the end of VI semester and finalize it in the first two weeks of VII semester.
The department will appoint a project coordinator who will coordinate the following:

- Collection of project topics/ descriptions from faculty members (Problems can also be invited from¬ the industries)
- Grouping of students (max 3 in a group)
- Allotment of project guides

The aim of project work is to develop solutions to realistic problems applying the knowledge and skills obtained in different courses, new technologies and current industry practices. This requires students to understand current problems in their domain and methodologies to solve these problems. To get awareness on current problems and solution techniques, the first 4 weeks of VII semester will be spent on special lectures by faculty members, research scholars, post graduate students of the department and invited lectures by engineers from industries and R&D

institutions. After completion of these seminars each group has to formalize the project proposal based on their own ideas or as suggested by the project guide. Seminar schedule will be prepared by the coordinator for all the students from the 5th week to the last week of the semester which should be strictly adhered to.

Each group will be required to:

1. Submit a one-page synopsis before the seminar for display on notice board.
2. Give a 30 minutes' presentation followed by 10 minutes' discussion.
3. Submit a technical write-up on the talk.

At least two teachers will be associated with the Project Seminar to evaluate students for the award of sessional marks which will be on the basis of performance in all the 3 items stated above.

The seminar presentation should include the following components of the project:

- Problem definition and specification
- Literature survey
- Broad knowledge of available techniques to solve a particular problem.
- Planning of the work, preparation of bar (activity) charts
- Presentation- oral and written.

SUMMER INTERNSHIP

SI651 IT

Instruction	: -
Duration of SEE	: -
CIE	: 50 marks
SEE	: -
Credits	: 2

Course Objective:

1. To train and provide hands-on experience in analysis, design, and programming of information systems by means of case studies and projects.
2. To expose the students to industry practices and team work.
3. To provide training in soft skills and also train them in presenting seminars and technical report writing

Course Outcomes:

The student will be able to

1. Get Practical experience of software design and development, and coding practices within Industrial/R&D Environments.
2. Gain working practices within Industrial/R&D Environments.
3. Prepare reports and other relevant documentation.

Summer Internship is introduced as part of the curricula of encouraging students to work on problems of interest to industries. A batch of three students will be attached to a person from the Government or Private Organisations/Computer Industry/Software Companies/R&D Organization for a period of 4-6 weeks.
This will be during the summer vacation following the completion of the III-year Course. One faculty coordinator will also be attached to the group of 3 students to monitor the progress and to interact with the industry coordinate (person from industry).
The course schedule will depend on the specific internship/training experience. The typical time per topic will vary depending on the internship

- Overview of company/project
- Safety training
- Discussions with project teams
- Background research, review of documents, white papers, and scientific papers
- Planning, designing, and reviewing the planned work
- Executing the plans
- Documenting progress, experiments, and other technical documentation
- Further team discussions to discuss results
- Final report writing and presentation

After the completion of the project, each student will be required to:

1. Submit a brief technical report on the project executed and
2. Present the work through a seminar talk (to be organized by the Department)

Award of sessionals are to be based on the performance of the students at the workplace and awarded by industry guide and internal guide (25 Marks) followed by presentation before the committee constituted by the department (25 Marks).
One faculty member will co-ordinate the overall activity of Industry Attachment Program.

Note: Students have to undergo summer internship of 4-6 weeks at the end of semester VI and credits will be awarded after evaluation in VII semester.

SCHEME OF INSTRUCTION & EXAMINATION
B.E (INFORMATION TECHNOLOGY
VIII Semester

S.No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	D/P	Contact Hrs/Wk	CIE	SEE	Duration in Hrs	
Theory Course										
1.	PE-V	Professional Elective–V	3	-	-	3	30	70	3	3
2.	OE-III	Open Elective–III	3	-	-	3	30	70	3	3
Practical/Laboratory Courses										
3.	PW861IT	Project Work–II	-	-	16	16	50	100	-	8
Total			06	-	16	22	110	240	06	14

PC: Professional Core; **PE**: Professional Elective; **HS**: Humanities and social Science; **MC**: Mandatory; **L: Lecture**; **T**: Tutorial; **P**: Practical
CIE: Continuous Internal Evaluation; **SEE**: Semester End Examination (Univ.Exam)

Note:

1. Each contact hour is one clock hour.
2. The duration of practical class is two hours, however it can be extended whenever necessary to enable the students to complete the program.

Open Elective – III	
Course Code	**Course Title**
OE 801 IT	Mobile Computing

Profession Elective – V	
Course Code	**Course Title**
PE 851 IT	Agile Software Development
PE 852 IT	Information Security
PE 853 IT	DevOp sand Kubernetes
PE 854 IT	Computational Intelligence
PE 855 IT	Quantum Computing

AGILE SOFTWARE DEVELOPMENT

PE851IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To learn the fundamental principles and practices associated with each of the agile development methods.

2. To apply the principles and practices of agile software development on a project of interest and relevance to the student.

Course Outcomes

1. Analyse existing problems with the team, development process and wider organization.
2. Apply a thorough understanding of Agile principles and specific practices
3. Select the most appropriate way to improve results for a specific circumstance or need
4. Judge and craft appropriate adaptations to existing practices or processes depending upon analysis of typical problems
5. Evaluate likely successes and formulate plans to manage likely risks or problems

UNIT-I

Agile Software Development: Basics and Fundamentals of Agile Process Methods, Values of Agile, Principles of Agile, stakeholders, Challenges
Lean Approach 1: Waste Management, Kaizen and Kanban, add process and products add value. Roles related to the lifecycle, differences between Agile and traditional plans, differences between Agile plans at different lifecycle phases.

UNIT-II

Lean Approach 2: Testing plan links between testing, roles and key techniques, principles, understand as a means of assessing the initial status of a project/ How Agile helps to build quality
Agile and Scrum Principles: Agile Manifesto, Twelve Practices of XP, Scrum Practices, Applying Scrum. Need of scrum, working of scrum, advanced Scrum Applications, Scrum and the Organization, scrum values

UNIT-III

Agile Product Management: Communication, Planning, Estimation Managing the Agile approach Monitoring progress, Targeting and motivating the team,

managing business involvement, Escalating issue. Quality, Risk, Metrics and Measurements, Managing the Agile approach Monitoring progress, Targeting and motivating the team, Managing business involvement and Escalating issue.

UNIT-IV

Agile Requirements: User Stories, Backlog Management. Agile Architecture: Feature Driven Development. Agile Risk Management: Risk and Quality Assurance, Agile Tools

Agile Testing: Agile Testing Techniques, Test-Driven Development, User Acceptance Test

UNIT-V

Agile Review: Agile Metrics and Measurements, the Agile approach to estimating and project variables, Agile Measurement, Agile Control: the 7 control parameters. Agile approach to Risk, The Agile approach to Configuration Management, The Atern Principles, Atern Philosophy, The rationale for using Atern, Refactoring, Continuous integration, Automated Build Tools

Scaling Agile for large projects: Scrum of Scrums, Team collaborations, Scrum, Estimate a Scrum Project, Track Scrum Projects, Communication in Scrum Projects, Best Practices to Manage Scrum.

Suggested Readings:

1. Robert C. Martin, Agile Software Development, Principles, Patterns, and Practices Alan Apt Series (2011)
2. Succeeding with Agile: Software Development Using Scrum, Pearson (2010)

INFORMATION SECURITY

PE852IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To learn legal and technical issues in building secure information systems
2. To provide an understanding of network security
3. To expose the students to security standards and practices

Course Outcomes:

The student will be able to

1. Describe the steps in Security Systems development life cycle (Sec SDLC)
2. Understand the common threats, legal and ethical issues.
3. Identify security and risk management for business needs & use of security frameworks in preparing security blue print for the organization.
4. Usage of reactive solutions, firewalls, software and Intrusion Detection techniques.
5. Use ethical hacking tools and secure communication protocols and use of the technical and non-technical security aspects.

UNIT-I

Introduction: History, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC. Need for Security: Business Needs, Threats, Attacks, and Secure Software Development

UNIT-II

Legal, Ethical and Professional Issues: Law and ethics in Information Security, Relevant U.S. Laws, International Laws and Legal Bodies, Ethics and Information Security. Risk Management: Overview, Risk Identification, Risk Assessment, Risk Control Strategies, selecting a Risk Control Strategy, Quantitative versus Qualitative Risk Control Practices, Risk Management Discussion Points, Recommended Risk Control Practices.

UNIT-III

Planning for Security: Security policy, Standards and Practices, Security Blue Print, Security Education,Continuity strategies. Security Technology: Firewalls and VPNs: Physical Design, Firewalls, Protecting Remote connections

UNIT-IV

Security Technology: Intrusion Detection, Access Control, and other Security Tools: Intrusion Detection and Prevention Systems-Scanning, and Analysis Tools- Access Control Devices. Cryptography: Foundations of Cryptology, Cipher methods, Cryptographic Algorithms, Cryptographic Tools, Protocols for Secure Communications, Attacks on Cryptosystems

UNIT-V

Implementing Information Security: Information security project management, Technical topics of implementation, Non-Technical Aspects of implementation, Security Certification and Accreditation. Information Security Maintenance: Security management models, Maintenance model Short case studies in Cryptography and Security: Secure Multi party calculation, Virtual Elections, Single Sign On, Secure Inter Branch Payment transactions, Cross site scripting vulnerability.

Suggested Readings:

1.Michael E Whitman and Herbert J Mattord, *Principles of Information Security*, CengageLearning, 6 th Edition 2018

2. Atul khate, Cruptographu and Network Security" 4 th edition , Tata Mc Graw Hill , 2019

3. Nina Godbole, "Information Systems Security: Security Management, Metrics, Frameworks and Best Practices" Second Edition, WILEY 2017

4. Gupta Sarika, "Information and Cyber Security", Khanna Publishing House, Delhi

5. V.K. Pachghare, "Cryptography and Information Security", PHI Learning

DEVOP AND KUBERNETES

PE853IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. Implement automated system update and DevOps lifecycle.
4. Learn core concepts of container orchestration using Kubernetes.

Course Outcomes:

The students will be able to:

1. Identify components of Devops environment.
2. Describe Software development models and architectures of DevOps, source code management
3. Learn Jenkins continuous Integration tool.
4. Understand automation testing environment.
5. Understand Container orchestration using Kubernetes.

UNIT - I

Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT - II

Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.

Introduction to project management: The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT – III

Integrating the system: Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build

servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT – IV

Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, Regression testing, Testing backend integration points, Test-driven development, REPL-driven development

Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker.

UNIT – V

Container Orchestration using Kubernetes: Introduction to Container Orchestration, Kubernetes Core Concepts ,Understanding Pods, ReplicaSet and Replication Controller, Deployments, DaemonSets, Rolling Updates and Rollbacks , Scaling Application.

Suggested Readings:

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN10: 1788392574

2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley
publications. ISBN: 9788126579952

3. Marko Luksa, Kubernetes in Action, 2nd edition(2018), Manning Publishers.

4. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10.

COMPUTATIONAL INTELLIGENCE

PE854IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To provide a strong foundation on fundamental concepts in Computational Intelligence.
2. To enable Problem-solving through various searching techniques.
3. To apply Computational techniques in applications which involve perception, reasoning andlearning.
4. To apply Computational Intelligence techniques for information retrieval
5. To apply Computational Intelligence techniques primarily for machine learning.

Course Outcomes:

The student will be able to

1. Provide a basic exposition to the goals and methods of Computational Intelligence. Study of the design of intelligent computational techniques.
2. Apply the Intelligent techniques for problem solving real time problems.
3. Improve problem solving skills using the acquired knowledge in the areas of, reasoning, natural language understanding, computer vision, automatic programmingand machine learning.

UNIT I

Introduction: Introduction to Artificial Intelligence-Search-Heuristic Search-A* algorithm- Game Playing- Alpha-Beta Pruning- Expert systems-Inference-Rules-Forward Chaining and Backward Chaining- Genetic Algorithms.

UNIT-II

Knowledge Representation and Reasoning: Proposition Logic - First Order Predicate Logic – Unification – Forward Chaining - Backward Chaining - Resolution – Knowledge Representation - Ontological Engineering - Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information - Prolog Programming.

UNIT-III

Uncertainty Non monotonic reasoning-Fuzzy Logic-Fuzzy rules-fuzzy inference-Temporal Logic- Temporal Reasoning-Neural Networks-Neuro-fuzzy Inference.

UNIT-IV

Learning: Probability basics - Bayes Rule and its Applications - Bayesian Networks – Exact and Approximate Inference in Bayesian Networks - Hidden Markov Models - Forms of Learning - Supervised Learning - Learning Decision Trees – Regression and Classification with Linear Models - Artificial Neural Networks – Nonparametric Models - Support Vector Machines - Statistical Learning - Learning with Complete Data - Learning with Hidden Variables- The EM Algorithm Reinforcement Learning.

UNIT-V

Intelligence and Applications: Natural language processing Morphological Analysis-Syntax analysis-Semantic Analysis- AIl applications – Language Models - Information Retrieval – Information Extraction – Machine Translation – Machine Learning - Symbol-Based – MachineLearning: Connectionist – Machine Learning.

Suggested Readings:

1.Stuart Russell, Peter Norvig, ―Artificial Intelligence: A Modern Approach Third Edition, Pearson Education / Prentice Hall of India, 2010.

2. Elaine Rich and Kevin Knight, ―Artificial Intel igence, Third Edition, Tata McGraw-Hill, 2010.

3. Nina Godbole, "Information Systems Security: Security Management, Patrick H. Winston. "Artificial Intelligence", Third edition, Pearson Edition, 2006.

4. Dan W.Patterson, ―Introduction to Artificial Intelligence and Expert Systems‖, PHI,2006.

5. Nils J. Nilsson, ―Artificial Intelligence: A new Synthesis‖, Harcourt Asia Pvt. Ltd.,2000.

QUANTUM COMPUTING

PE855IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To impart necessary knowledge to the learner so that he/she can develop and implement algorithm and write programs using these algorithms.

Course Outcomes:

The students will be able to:

1. Explain the working of a Quantum Computing program, its architecture and program model
2. Develop quantum logic gate circuits
3. Develop quantum algorithm
4. Program quantum algorithm on major toolkits

UNIT-I

Introduction to Quantum Computing: Motivation for studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.) Origin of Quantum Computing, Overview of major concepts in Quantum Computing Qubits and multi-qubits states, Bra-ket notation: Bloch Sphere representation, Quantum Superposition, Quantum Entanglement

UNIT-II

Math Foundation for Quantum Computing: Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors.

UNIT-III

Building Blocks for Quantum Program: Architecture of a Quantum Computing platform, Details of q-bit system of information representation: Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from quantum algorithmic perceptive e.g. Bell State, Operation on qubits: Measuring and transforming using gates. Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates.

UNIT-IV

Programming model for a Quantum Computing Program: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits.

UNIT-V

Quantum Algorithms: Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks

Suggested Readings:

1. Michael A. Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press. October 2000.
2. David McMahon, "Quantum Computing Explained", Wiley 2007
3. IBM Experience: https://quantumexperience.ng.bluemix.net
4. Microsoft Quantum Development Kit https://www.microsoft.com/en-us/quantum/development-kit Forest SDK PyQuil: https://pyquil.readthedocs.io/en/stable/

MOBILE COMPUTING

OE801IT

Instruction	: 3 periods per week
Duration of SEE	: 3 hours
CIE	: 30 marks
SEE	: 70 marks
Credits	: 3

Course Objectives:

1. To provide broad understanding of the technologies required to perform Mobile computing.
2. To make the student familiar with the protocols and tools of Mobile computing.

Course Outcomes:

Student will be able to:

1. Explain the architecture of cellular wireless communication?
2. Identify network layer protocols to support mobility of mobile devices.
3. Analyze TCP protocols problems and their technical feasibility.
4. Design routing protocol for MANET.
5. Use various Application layer protocols available for mobile communication.

UNIT- I

Introduction to MC, Applications, limitations, and architecture. GSM : Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.(Wireless) Medium Access Control : Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

UNIT-II

Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

UNIT -III

Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT- IV

Mobile Ad hoc Networks (MANETs): Routing, Destination sequence, distance vector Dynamic source routing alternative metrics, overview Adhoc routing protocols.

UNIT -V

Protocols and Tools: Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth User scenarios, Architecture, security, link management) and J2ME.

Suggested Readings:

1. Jochen Schiller, Mobile Communications, 2nd edition, Addison-Wesley, 2004.
2. Asoke K Talukder, Mobile Computing , 2nd Edition, McGraw Education
3. Reza Behravanfar, Mobile Computing Principles, Designing and Developing Mobile Applications with UML and XM, ISBN: 0521817331, Cambridge University Press, October 2004,
4. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, Fundamentals of Mobile and Pervasive Computing, ISBN: 0071412379, McGraw-Hill Professional, 2005.
5. Hansmann, Merk, Nicklous, Stober, Principles of Mobile Computing, Springer, second edition, 2003.
6. Martyn Mallick, Mobile and Wireless Design Essentials, Wiley DreamTech, 2003.

PROJECT WORK - II

PW861IT

Instruction	: 16 periods per week
Duration of SEE	: 3 hours
CIE	: 50 marks
SEE	: 100 marks
Credits	: 8

Course Objectives:

1. To enhance practical and professional skills.
2. To familiarize tools and techniques of systematic literature survey and documentation
3. To expose the students to industry practices and team work.
4. To encourage students to work with innovative and entrepreneurial ideas

Course Outcomes:

The students will be able to:

1. Demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program to the real-world problems.
2. Evaluate different solutions based on economic and technical feasibility
3. Effectively plan a project and confidently perform all aspects of project management
4. Demonstrate effective written and oral communication skills

The aim of Project work –II is to implement and evaluate the proposal made as part of Project Work - I. Students can also be encouraged to do full time internship as part of project work-II based on the common guidelines for all the departments. The students placed in internships need to write the new proposal in consultation with industry coordinator and project guide within two weeks from the commencement of instruction.

The department will appoint a project coordinator who will coordinate the following:

1. Re-grouping of students - deletion of internship candidates from groups made as part of project Work-I
2. Re-Allotment of internship students to project guides
3. Project monitoring at regular intervals

All re-grouping/re-allotment has to be completed by the 1st week of VIII semester so that students get sufficient time for completion of the project.

All projects (internship and departmental) will be monitored at least twice in a

semester through student presentation for the award of sessional marks. Sessional marks are awarded by a monitoring committee comprising of faculty members as well as by the supervisor. The first review of projects for25 marks can be conducted after completion of five weeks. The second review for another 25 marks can be conducted after 12 weeks of instruction.

Common norms will be established for the final documentation of the project report by the respective departments. The students are required to submit draft copies of their project report within one week after completion of instruction.