SYLLABUS
(With effect from 2018-19)

faculty
(2018–19)
VII to VIII Semester
Bachelor Degree
In
Information Science and Engineering

Out Come Based Education
with
Choice Based Credit System

P.E.S. College of Engineering,
Mandya - 571 401, Karnataka
(An Autonomous Institution Affiliated to VTU, Belagavi)
Grant -in- Aid Institution
(Government of Karnataka)
Accredited by NBA, New Delhi
Approved by AICTE, New Delhi.

Ph 08232- 220043, Fax : 08232 – 222075, Web : www.pescemandya.org
Preface

PES College of Engineering, Mandya, started in the year 1962, has become autonomous in the academic year 2008-09. Since, then it has been doing the academic and examination activities successfully. The college is running Eight Undergraduate and Six Postgraduate programs. It consists of four M.Tech programs, which are affiliated to VTU. Other postgraduate programs are MBA and MCA.

India has recently become a Permanent Member by signing the Washington Accord. The accord was signed by the National Board of Accreditation (NBA) on behalf of India on 13th June 2014. It enables not only the mobility of our degree globally but also establishes equivalence to our degrees with that of the member nations such as Taiwan, Hong Kong, Ireland, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa, Turkey, Australia, Canada and Japan. Among other signatories to the international agreement are the US and the UK. Implementation of Outcome Based Education (OBE) has been the core issue for enabling the equivalence and of Indian degrees and their mobility across the countries.

Our Higher Educational Institution has adopted the CBCS based semester structure with OBE scheme and grading system.

The credit based OBE semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching.

The OBE, emphasize setting clear standards for observable, measurable outcomes of programs in stages. There lies a shift in thinking, teaching and learning processes moving towards Students Centric from Teacher Centric education. OBE standards focus on mathematics, language, science, attitudes, social skills & moral values.

The key features which may be used to judge, if a system has implemented an outcome based education system is mainly Standard based assessments that determines whether students have achieved the stated standard. Assessments may take any form, so long as the process actually measure whether the student knows the required information or can perform the required task. Outcome based education is a commitment that all students of all groups will ultimately reach the same minimum standards. Outcome Based Education is a method or means which begins with the end in mind and constantly emphasizes continuous improvement.

Choice Based Credit System (CBCS) provides choice for students to select from the prescribed courses (core, Foundation, Foundation Elective, elective, open elective and minor or soft skill courses). The CBCS provides a ‘cafeteria’ type approach in which the students can Choose electives from a wide range of courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, adopt an interdisciplinary approach to learning which enables integration of concepts, theories, techniques, and, perspectives from two or more disciplines to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline. These greatly enhance the skill/employability of students.

In order to increase the Industry/Corporate readiness, many Soft Skills, Personality Development modules and Technical Skills have been added to the existing curriculum of the academic year 2018-19. Internship have been made compulsory to enhance the field experience. In order to enhance creativity and innovation Technical Skills and Skill Oriented Lab are included in all undergraduate programs.

Dr. Umesh D R
Deputy Dean (Academic)
Associate Professor,
Dept. of CS & Engg

Dr. Girisha R
Dean (Academic)
Professor
Dept. of CS & Engg
PES College of Engineering

Vision
“PESCE shall be a leading institution imparting quality engineering and management education developing creative and socially responsible professionals.”

Mission
1. Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching-learning practices.
2. Impart engineering and managerial skills through competent and committed faculty using outcome based educational curriculum.
3. Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.
4. Promote research, product development and industry-institution interaction.

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

About the Department
The Department of Information Science and Engineering takes pride in producing quality engineers over the past 17 years. The credit for all the flowery results goes to the highly motivating staff, from whom all students draw inspiration. The Department was started in the year 2000. The present intake of the undergraduate program is 60. The department has well equipped classrooms, computer laboratories with high-end systems, department library and good collection of software’s. Also a research centre is a major credential to our department. We are proud to produce the first PhD student in our college. Faculty members of the department are involved in research activities in different fields such as Medical Image Processing, Pattern Recognition, and Data Mining etc. The department is using Outcome-based education (OBE), which is a recurring education reform model, and it is affiliated to Visvesvaraya Technological University (VTU). The department has achieved good Placement, conducted International /national Conferences and other sponsored short-term courses, workshops, National seminars and symposia. The laboratory facilities and the Internet access are available round the clock to the staff and students of the Information Science and Engineering

Vision
“The department strives to equip our graduates with Knowledge and Skills to contribute significantly to Information Science & Engineering and enhance quality research for the benefit of society”.

Mission
M1: To provide students with state of art facilities and tools of Information Science & Engineering to become productive, global citizens and life-long learners.
M2: To prepare students for careers in IT industry, Higher education and Research.
M3: To inculcate leadership qualities among students to make them competent Information Science & Engineering professionals or entrepreneurs.

1.2. State the Program Educational Objectives (PEOs)

Graduates of the program will be able to

PEO1: Establish a productive Information Science & Engineering career in industry, government or academia.

PEO2: Interact with their peers in other disciplines by exhibiting professionalism and team work to contribute to the economic growth of the country.

PEO3: Promote the development of innovative systems and solutions to the problems in Information Science using hardware and software integration.

PEO4: Pursue higher studies in Engineering, Management or Research.
A. List of Program Outcomes (POs)

Engineering Graduates will be able to:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
B. List of Program Specific Outcomes (PSOs)
Information Science & Engineering Graduates will be able to:

PSO1. Analyze, design, develop and test the principles of System software and Database concepts for computer-based systems.

PSO2. Develop computer communication systems and applications for Information security.

PSO3. Apply the knowledge of Information Science and Engineering to solve any software and hardware related problems and to organize, manage and monitor IT Infrastructure.
## VII Semester B.E(IS&E) Scheme of Teaching and Examination 2018-19

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
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### List of Electives

#### Professional Elective – III

| Sl. No | Course Code | Course title                  | |
|--------|-------------|--------------------------------||
| 1.     | P18IS741    | Augmented and Virtual Reality  | |
| 2.     | P18IS742    | Software Project Management    | |
| 3.     | P18IS743    | Distributed Systems            | |
| 4.     | P18IS744    | Block Chain Technology         | |

#### Open Elective – II

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### VIII Semester B.E(IS&E) Scheme of Teaching and Examination 2018-19

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#### Professional Elective - IV

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</table>
Course Title: Data Science

Course Code: P18IS71  Semester: VII  L-T-P-H: 4 : 0 : 0 : 4  Credits: 4
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs  Weightage: CIE:50%, SEE: 50%

Prerequisites:
Data Structures, Discrete Mathematical Structures, Design and Analysis of Algorithms.

Course Learning Objectives (CLOs)

This course aims to
Describe the fundamentals of Data Science and Carry out EDA and to use basic machine learning algorithms on a given dataset by considering ethical issues using R.

Course Content

Unit-I
Statistical Inference - Populations and samples, Statistical modeling, probability distributions, fitting a model.
Self-study component: Intro to R.  10 Hours

Unit-II
Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: RealDirect (online real estate firm).
Three Basic Machine Learning Algorithms - Linear Regression, k-Nearest Neighbors (k-NN), k-means.
Self-study component: Exercise: Basic Machine Learning Algorithms.  10 Hours

Unit-III
One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web.
Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention, Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms, Filters; Wrappers; Decision Trees.
Self-study component: Random Forests.  11 Hours

Unit-IV
Self-study component: Neighborhood properties in graphs.  11 Hours
Unit-V

Data Visualization – Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects, Exercise: create your own visualization of a complex dataset.

Data Science and Ethical Issues – Discussions on privacy, security, ethics, A look back at Data Science.

Self-study component: Next-generation data scientists. 10 Hours

Text Book:

Reference Books:

Course Outcomes
After learning all the units of the course, the student is able to
1. Explain Data Science process and Statistical Inference.
2. Apply basic tools (plots, graphs, summary statistics) to carry out EDA and identify basic Machine Learning algorithms to use in applications.
3. Use APIs and other tools to scrap the Web and identify basic Feature Generation and Feature Selection algorithms to use in applications.
4. Build own recommendation system.
5. Create effective visualization of a given data (to communicate or persuade ethically).

Course Articulation Matrix (CAM)

<table>
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<th>Course Outcomes</th>
<th>Program Outcomes (PO’s)</th>
<th>PSO’s</th>
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Course title: Information and Network Security

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<td>Weightage: CIE:50%, SEE: 50%</td>
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Course Learning Objectives (CLOs)

This course aims to
1. Learn basic principles of Information security and its applications
2. Design various cryptographic algorithms that used for encryption and decryption purposes
3. Understand the concept public key cryptography

Course Contents

Unit-I

PLANNING FOR SECURITY: Introduction; Information Security Policy, Standards, and Practices; The Information Security, Blue Print; Contingency plan a model for contingency plan. SECURITY TECHNOLOGY-1: Introduction; Physical design; Firewalls; Protecting Remote Connections
Self Study: A model for contingency plan
10 Hours

Unit-II

SECURITY TECHNOLOGY – 2: Introduction; Intrusion Detection Systems (IDS); Honey Pots, Honey Nets, and Padded cell, systems; Scanning and Analysis Tools. CRYPTOGRAPHY: Introduction; A short History of Cryptography; Principles of Cryptography; Cryptography, Tools
Self Study: Attacks on Cryptosystems.
10 Hours

Unit-III

INTRODUCTION TO NETWORK SECURITY, AUTHENTICATIONAPPLICATIONS: Attacks, services, and Mechanisms; Security Attacks; Security Services; A model for Internetwork Security. Internet Standards and RFCs. Kerberos, X.509 Directory Authentication Service. ELECTRONIC MAIL SECURITY: Pretty Good Privacy (PGP)
Self Study: S/MIME.
12 Hours

Unit-IV

IP SECURITY: IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating, Combining Security Associations; Key Management.
Self Study: Security Payload
10 Hours

Unit-V

Self Study: Trusted Systems.
10 Hours

Text Books:

Reference Book:
Course Outcomes

After learning all the units of the course, the student is able to
1. Understand the Structure of Security framework and Its Blueprints
2. Analyze the different Security technologies used
3. Understand the basic standards of Network Security
4. Understand the basics of IP Security
5. Identify the various Threats in Web Security

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</table>
Course title: Cyber Security

Course Code: P18IS73  Semester: VII  L-T-P-H : 4 : 0 : 0 : 4  Credit: 4
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs  Weightage: CIE:50%, SEE: 50%

Prerequisite: Computer Network

Course Learning Objectives (CLOs)

This course aims to
1. Summarize the different classes of attacks Define types of incidents including categories, responses and timelines for response and threats and risks within context of the cyber security architecture.
2. Appraise cyber security incidents to apply appropriate response and current structure of cyber security roles across the enterprise, including the roles and responsibilities of the relevant organizations.
3. Evaluate decision making outcomes of cyber security scenarios and trends and patterns that will determine the future state of cyber security and the Assess the strengths and weaknesses of the certification and accreditation approach to cyber security.

Course Content

Unit-I
Self-Study: Cyber Security objectives, cyber security metrics  11 Hours

Unit-II
Self-Study: Counting vulnerabilities, security framework  10 Hours

Unit-III
Tools and method used in Cybercrime: Introduction, Proxy servers and anonymizers, Phishing, Password cracking, Key loggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL injection, Buffer overflow.
Self-Study: Security policy objectives, cyber security management  10 Hours

Unit-IV
Phishing and Identity Theft: Introduction, Phishing: methods of phishing, phishing techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, phishing countermeasures; identity Theft (ID Theft): personally identifiable information, types of identity theft, techniques of ID theft, identity theft countermeasures, how to efface your online identity.
Self-Study: Cyber Governance Issues, Net Neutrality, Internet Names and Numbers.  10 Hours
Unit-V

Cybercrimes and Cyber Security: The legal perspectives: Introduction, Cybercrime and the legal landscape around the world, why do we need cyber laws: the Indian context, The Indian IT act, Challenges to Indian law and cybercrime scenario in India.

Self-Study: Copyrights and Trademark, Email and Messaging. 11 Hours

Text books:

Referenced book:

Course Outcomes
After learning all the units of the course, the student is able to
1. Explain the concepts of confidentiality, availability and integrity in Information Assurance, including physical, software, devices, policies and people.
2. Explaining important principles, and theories used throughout the field of cyber security.
3. Applying knowledge in the field of cyber security to analyze real world problems.
4. Effectively integrating knowledge in the field of cyber security to propose solutions to real world problems.
5. Identify the legal perspectives in cyber security and challenges to Indian law.

Course Articulation Matrix (CAM)

<table>
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Professional Elective-III

Course title: Augmented And Virtual Reality

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Course Learning Objectives (CLOs)

This course aims to
1. Ability to understand the principles of hardware and other requirements for VR/AR and software tools.
2. Analyze the conceptual pipeline of 3D viewing process, Input Techniques/functions/Event handling.
3. To create Animation techniques for the solutions of real world problem.

Course Content

Unit-I


Self study/Industry Partner Potion: Understanding AR Application Development Workflow, Exploring Unity Interface, Unity views, Unity Project views, manage scenes, Understanding Tags, Unity Project view and Inspector view.

10 Hours

Unit-II


Self study/Industry Partner Potion: Introducing AR Camera, Understand the AR UI Design, Understand the AR Sound Design, Understand AR Best Practices.

11 Hours

Unit-III


11 Hours

Unit-IV


Self study/Industry Partner Potion: Lighting, Textures and materials

10 Hours
Unit-V

Self study/Industry Partner Potion: Animating Objects in the Unity Editor, Deploying AR applications. 10 Hours

Text Books:
2. Virtual Reality Systems, John Vince, Published by Dorling Kindersley (India) Pvt Ltd., licensees of Pearson Education in south Asia.

Reference Books:
2. Virtual Reality & Augmented Reality in Industry by DengzheMa, JürgenGausemeier, Xiumin Fan, Michael Grafe By: Springer publications.

Course Outcomes
After learning all the units of the course, the student is able to
1. Apply the knowledge of Basic Science and Computer Graphics to discern the principles of hardware and other requirements for VR/AR and software tools.
2. Design and develop a virtual/augmented Environment using / analyzing the conceptual pipeline of 3D viewing process, Input Techniques/functions/Event handling, to create a sustainable development of products.
3. Illustrate the contextual knowledge of Generic VR system and Computing Architectures for VR/AR applications.
4. Apply the knowledge of Modeling and VR Programming to develop projects in multidisciplinary areas.
5. Design of Animation techniques for the solutions of real world problem for effective communication.

Course Articulation Matrix (CAM)

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Course Title: Software Project Management

Course Code: P18IS742  Semester: VII  L-T-P-H: 2:2:0:4  Credit: 3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs  Weightage: CIE: 50%, SEE: 50%

Course Learning Objectives (CLOs)

This course aims to
1. Expose knowledge to the students on how to evaluate and assess the project and to find the cost of the project using cost benefit evaluation techniques. It also discusses the risk involved in the project and the appropriate strategies for minimizing potential risks.
2. Develop an activity planning for a project and to estimate the overall duration of the project by analyzing the risks involved in it.
3. Control the progress of projects and to assess the risk of slip pages of that project’s requirements can be controlled.

Course Content

Unit-I
Introduction to Software Project Management: Project Definition – Contract Management – Activities covered By Software Project Management – Overview of Project Planning.
Self-Study: Stepwise Project Planning  10 Hours

Unit-II
Self-Study: Risk Evaluation  10 Hours

Unit-III
Self-Study: Hazard Analysis.  12 Hours

Unit-IV
Self-Study: Contract Acceptance.  10 Hours

Unit-V
Self-Study: Health and Safety Case Studies.  10 Hours
Text Books

References Books

Course Outcomes
After learning all the units of the course, the student is able to
1. Identify the stakeholders of a project, their objectives and ways of measuring the success in meeting those objectives.
2. Find the cost of the project using cost benefit evaluation techniques
3. Identify the factors putting a project at risk, categorize and prioritize action for risk elimination or containment.
4. Analyze the progress of project, measure the risk of slippage and control changes to a projects requirements.
5. Identify some of factors that influence people’s behavior in a project environment and understand the characteristics of the various team structures that can be employed.

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Course title: Distributed Systems

Course Code: P18IS743  |  Semester: VII  |  L-T-P-H : 2:2:0:4  |  Credit: 3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs  |  Weightage: CIE:50%, SEE: 50%

Prerequisites: Operating system, computer Network

**Course Learning Objectives (CLOs)**

This course aims to:

1. Understand the fundamental principles of distributed system.
2. Implement the mechanism of RPC and file system in distributed environments.
3. Summarize process synchronization and thread synchronization in distributed systems.
4. Understand concurrency control methods and deadlock occurrence in Distributed systems.
5. Analyze security algorithms and replication services in distributed environment.

**Course Content**

**Unit-I**

**INTRODUCTION:** Introduction to Distributed systems-examples of distributed systems- Trends indistributedsystem-Focusonresourcesharingandthechallenges-IntroductiontosystemModels- physical models-architectural models- fundamental models - Introduction to networking and internetworking-types of network-network principles-internet protocols. Introduction to inter-process communications-external data representation.

Self Study: Marshalling.  
12 Hours

**Unit-II**

**DISTRIBUTED OBJECTS AND FILE SYSTEM:** Introduction to distributed objects - Introduction to remote invocation-request reply protocols-Remote procedure call - Java RMI case Study-IntroductiontoDistributedFileSystem-Fileservicearchitecture-Sunnetworkfilesystem - Introduction to Name Services- Name Services.

Self Study: DNS - Directory and directory services.  
10 Hours

**Unit-III**

**DISTRIBUTED OPERATING SYSTEM SUPPORT:** The operating system layer – Protection - Process and threads - Communication and invocation - Operating system architecture - Introduction to time and global states - Clocks, Events and Process states - Synchronizing physical clocks - Logical time and logical clocks.

Self Study: Distributed debugging – Distributed mutual exclusion.  
10 Hours

**Unit-IV**

**TRANSACTION AND CONCURRENCY CONTROL – DISTRIBUTED TRANSACTIONS**

Transactions – Nested transaction – Locks - Optimistic concurrency control - Timestamp ordering - Comparison of methods for concurrency control - Introduction to distributed transactions - Flat and nested distributed transactions - Concurrency control in distributed transactions.

Self Study: Distributed deadlocks – Transaction recovery  
10 Hours
Unit V

SECURITY AND REPLICATION

Self Study: Transactions with replicated data.  10 Hours

Text books:

Reference Books:

Course Outcomes
After learning all the units of the course, the student is able to
1. Demonstrate principles used in distributed environment.
2. Develop RPC mechanism to access remote application and demonstrate file system in distributed systems.
3. Identify process and thread based synchronization in various distributed systems.
4. Describe concurrency control methods and deadlock occurrences in Distributed systems.
5. Compare security algorithms and fault tolerance services in distributed environment.

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Course title: Block Chain Technology

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**Pre-requisite:** Cryptography and Network Security.

**Course Learning Objectives (CLOs)**

This course aims to

1. To impart knowledge about building and deploying blockchain applications.
2. To facilitate learning of using blockchain for applications other than crypto currency.
3. To explore platforms such as Ethereum, Hyperledger Fabric to build applications on blockchain.

**Course Content**

**Unit-I**

*Introduction:* Overview of Blockchain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Blockchain, Transactions, Distributed Consensus, Public vs Private Blockchain, Understanding Crypto currency to Blockchain, Permissioned Model of Blockchain, Overview of Security aspects of Blockchain Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic crypto currency.

**Self Study Component:** Distributed systems, History of Blockchain. 11 Hours

**Unit-II**


**Self Study Component:** Mining Pool 11 Hours

**Unit-III**

Permissioned Blockchain: Permissioned model and use cases, Design issues for Permissioned blockchains, Execute contracts, State machine replication, Overview of Consensus models for permissioned blockchain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm.

**Self Study Component:** BFT over Asynchronous systems 10 Hours

**Unit-IV**

Enterprise Application of Blockchain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Blockchain, Blockchain enabled Trade, We Trade - Trade Finance Network, Supply Chain Financing.

**Self Study Component:** Identity on Blockchain 10 Hours

**Unit-V**


**Self Study Component:** Ripple and Corda 10 Hours
Text Books:

Reference Books:

Course Outcomes
After learning all the units of the course, the student is able to
1. Discover the secure and efficient transactions with Bitcoin.
2. Identify and analyze the applications of Bitcoin script.
3. Experiment with Bitcoin mining.
4. Develop private Blockchain environment and develop a smart contract on Ethereum.
5. Build the Hyperledger architecture and the consensus mechanism applied in the Hyperledger.

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Course title: Foundations of IT

Course Code: P18ISO751  Semester: VII  L-T-P-H : 3:0:0:3  Credit: 3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs  Weightage: CIE:50%, SEE: 50%

Prerequisites: Subject requires student to know about
1. Basics of computers
2. Basic C programming skills

Course Learning Objectives (CLOs)
1. Explain the fundamentals of data structures and its types
2. Learn the basic operations on stacks, queues and singly linked list
3. Understand fundamental concepts of relational database and its design
4. Familiarise with basics of software engineering approaches and modelling with UML

Course Content

Unit I
Introduction to Data structures
Definition, Classification of Data Structures
Stacks: Representing stack in C, Implementation of push, pop and display operations using arrays, Infix, Postfix, Prefix expressions
Ordinary Queue: Representing queues in C, Implementation of basic operations on ordinary queue
Singly Linked List: Basic operations on SLL: Insert front & rear; delete front & rear; display
Self Study: Circular Linked list

Unit II
Relational Database Management System
Self Study: Case study - Library Management System

Unit III
Structured Query Language (SQL): SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL
Self Study: Case study- ATM operations

Unit IV
Software Engineering Fundamentals: Software Engineering definition, software process models, process activities, coping with change, the rational unified process, agile methods, plan-driven and agile development.
Self Study: Types of Software testing

Unit V
Object Oriented modelling with UML
Introduction: Object Orientation, OO development, OO themes, Modelling Concepts: Modelling, abstraction, the three models, Class Modelling: Object and class concepts, Link and associations concepts, Generalization and Inheritance, A sample class model, Advanced Class Modelling: Advanced object and class concepts, Association ends, N-ary associations, Aggregation
State Modelling: Events, States, Transitions and Conditions, State diagrams, State diagram behavior
Interaction Modelling: Use case models, Sequence models, Activity models.
Self Study: Deployment diagram

Text Books:

Seventh and Eighth Semester Syllabus [CBCS with OBE] of 2018-19 Academic Year 20

Reference Books:

**Course Outcomes**

After learning all the units of the course, the student is able to
1. Design and implement data structures like stack, queues and singly linked lists
2. Design relational models for a given application using schema definition and constraints.
3. Develop queries using SQL to retrieve the required information from database.
4. Explain the various types of software process models.
5. Apply object oriented modelling with UML for developing applications

**Course Articulation Matrix (CAM)**

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Course Title: Software Engineering
Course Code: P17ISO752  Semester : VII  L- T - P - H : 3:0:0:3  Credit : 3
Contact period : Lecture: 52 Hrs, Exam:3 hrs  Weightage: CIE: 50;SEE:50

Course learning objectives (CLOs)
This course aims to
1. Acquire and develop many valuable skills such as the ability to use computer aided software and Evaluate requirements for a software system
2. Apply the process of analysis and design using object oriented approach.
3. Recognize current trends in the area of software engineering
4. Identify the importance of testing in assuring the quality of software with an understanding of managing risks during the progress of the project.

Course contents
Unit-I
Overview, and Requirements
Introduction: FAQ's about software engineering, Professional and ethical responsibility; software process models, process iteration, software specification, software design and implementation, software validation, software evaluation; Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; the software requirements document; requirements engineering processes: feasibility studies, requirements elicitation and analysis, requirement validation and management.
Self Study: CASE Tools.

Unit-II
Software Design
Architectural Design: system structuring, control models, modular decomposition, domain-specific architectures; object oriented design: Objects and Object Classes, An Object-Oriented design process.
Self Study: Design evolution.

Unit-III
Critical System, Verification and Validation
Dependability: critical systems, availability and reliability, safety, security; critical system specification, verification and validation: Verification and Validation: Planning; Software inspections; Automated static analysis, clean room software development; software testing: defect testing, integration testing, object oriented testing, testing workbenches.
Self Study: V&V

Unit-IV
Management
Managing People: limits to thinking, group working, choosing and keeping people, the people capability maturity model; software cost estimation: productivity, estimation techniques, algorithmic cost modeling, project duration and staffing; quality management: quality assurance and standards, quality planning, quality control.
Self Study: Software Cost Estimation.
Unit- V

Evolution
software change: program evolution dynamics, software maintenance, architectural evolution;
software Re-engineering: source code translation, reverse engineering, program structure
improvement, program modularization, data re-engineering.
Self Study: Reverse Engineering Process. 10 Hours

Text book:

Reference books:
2. Software Engineering Theory and Practice -Shari Lawrence Pfleeger, Joanne M. Atlee, 3rd
2004

Course outcomes

After learning all the units of the course, the student is able to
1. Demonstrate an understanding of the principles and techniques of Software Engineering
2. Analyze the various steps involved in the design process and the different design approaches
which include function-oriented design and object-oriented design
3. Understand the activities in project management, requirement engineering process and to
identify the different types of system models
4. Apply the knowledge of design engineering in software development
5. Provide an understanding of the principles of software engineering in a broader system context
and the notions of software engineering process and management.

Course Articulation Matrix (CAM)

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Course title: Machine Learning

Course Code: P18ISO753  Semester: VII  L-T-P-H : 3:0:0:3  Credit:3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs  Weightage: CIE:50%, SEE: 50%

Course Learning Objectives (CLOs)
This course aims to
1. Fundamental concepts of Machine Learning
2. Approaches for building good data sets and model evaluation
3. Regression and classification algorithms and its implementation
4. Clustering algorithm and forecasting in Machine learning

Course Content

Unit - I
Self Study: Binomial distribution in Probability

10 Hours

Unit-II
Descriptive Analytics: Working with DataFrames in Python, Handling Missing Values, Exploration of Data using Visualization.
Self Study: Normal distribution in Probability

10 Hours

Unit-III
Linear Regression: Simple Linear Regression, Steps in Building a Regression Model, Building Simple Linear Regression Model, Model Diagnostics, Multiple Linear Regression
Self Study: Analysis of Variance (ANOVA)

11 Hours

Unit-IV
Classification Problems: Classification Overview, Binary Logistic Regression, Credit Classification, Gain Chart and Lift Chart, Classification Tree (Decision Tree Learning)
Self Study: K-Nearest Neighbors (KNN) algorithm

11 Hours

Unit-V
Clustering: Overview, How Does Clustering Work?, K-Means Clustering, Creating Product Segments Using Clustering
Forecasting: Forecasting Overview, Components of Time-Series Data, Moving Average
Self Study: Decomposing Time Series

10 Hours
Text Book:

Reference Book:

Course Outcomes

After learning all the units of the course, the student is able to
1. Understand fundamental concepts of Machine learning and Python
2. Implementation of data preprocessing on datasets and visualisation in Python
3. Implementation of Linear regression algorithms
4. Implementation of Classification algorithms
5. Implementation of Clustering algorithm and analysing time-series data

Course Articulation Matrix (CAM)

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# Course Title: Robotic Process Automation

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**Prerequisites:** Prior programming knowledge of either Visual Basic or C# will be useful.

**Course Learning Objectives (CLOs)**

This course aims to,

- Understand Robotic Process Automation technology and Learn UiPath programming techniques using UiPath Studio.

## Course Content

### Unit - I


**Record and Play:** Record and Play, UiPath stack, Downloading and installing UiPath Studio, Learning UiPath Studio, Task recorder.

**Self-study:** Step-by-step examples using the recorder.

10 Hours

### Unit - II

**Sequence, Flowchart, and Control Flow:** Sequence, Flowchart, and Control Flow, Sequencing the workflow, Activities, Control flow, various types of loops, and decision making, Step-by-step example using Sequence and Flowchart, Step-by-step example, using Sequence and Control flow.

**Data Manipulation:** Data Manipulation, Variables and scope, Collections, Arguments – Purpose and use, Data table usage with examples, Clipboard management, File operation with step-by-step example.

**Self-study:** CSV/Excel to data table and vice versa (with a step-by-step example).

10 Hours

### Unit - III

**Taking Control of the Controls:** Taking Control of the Controls, Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Working with UiExplorer, Handling events, Revisit recorder, Screen Scraping, When to use OCR, Types of OCR available, How to use OCR, Avoiding typical failure points.

**Tame that Application with Plugins and Extensions:** Tame that Application with Plugins and Extensions, Terminal plugin, SAP automation, Java plugin, Citrix automation, Mail plugin, PDF plugin, Web integration, Excel and Word plugins, Credential management.

**Self-study:** Extensions – Java, Chrome, and Firefox.

11 Hours

### Unit - IV

**Handling User Events and Assistant Bots:** Handling User Events and Assistant Bots, What are assistant bots? Monitoring system event triggers, monitoring image and element triggers, Launching an assistant bot on a keyboard event.

**Exception Handling, Debugging, and Logging:** Exception Handling, Debugging, and Logging, Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots, debugging techniques, Collecting crash dumps.

**Self-study:** Error reporting.

10 Hours
Unit - V

Managing and Maintaining the Code: Managing and Maintaining the Code, Project organization, Nesting workflows, Reusability of workflows, Commenting techniques, State Machine, When to use Flowcharts, State Machines, or Sequences.

Deploying and Maintaining the Bot: Deploying and Maintaining the Bot, Publishing using publish utility, Overview of Orchestration Server, Using Orchestration Server to control bots, Using Orchestration Server to deploy bots, License management.

Self-study: Publishing and managing updates.

10 Hours

Text Book:

Reference Books:

Course Outcomes

After learning all the units of the course, the student is able to
1. Explain Robotic Process Automation & Record and Play feature of UiPath Studio.
2. Build Bots using UiPath programming techniques & data manipulation techniques.
3. Extract control of the controls& Tame the application with Plugins and Extensions.
5. Supervise the code & also Deploy and Maintain the Bot.

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Seventh and Eighth Semester Syllabus [CBCS with OBE] of 2018-19 Academic Year
Course Title: Data Science Laboratory

**Course Code:** P18ISL76  **Semester:** VII  **L-T-P-H:** 0:0:3:3  **Credits:** 1.5  
**Contact Period:** Lecture: 36Hrs, Exam: 3 Hrs  **Weightage:** CIE:50%, SEE: 50%

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**Course Learning Objectives (CLOs)**

This course aims to explore Data science process on structured data using R.

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**Course Content**

1. Program to perform Data exploration and Pre-processing on a given dataset.
2. Program to implement Linear regression for a given dataset.
3. Program to implement Multiple Linear regression for a given dataset.
4. Program to implement K-NN algorithm on a given dataset.
5. Build model to perform clustering using K-means and also determine the optimal value of K using Elbow method.
6. Program to implement Naive Bayes classifier on a given dataset.
7. Build models using Decision trees.
8. Build your own recommendation system.

**Note:** The above programs / models have to be implemented using R Studio.

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**Course Outcomes**

After learning all programs of the course, the student is able to:

1. Develop codes using R programming language.
2. Implement Data science process on structured data using R.

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**Course Articulation Matrix (CAM)**

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Course Title: Devops Laboratory

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Contact Period: Lecture: 36Hrs, Exam: 3 Hrs | Weightage: CIE:50%, SEE: 50% |

Practice Work

Note: This Practice should be done in linux to create a hands-on experience in command line interface.

1. Linux Basics (Including GIT Basics)
2. Network Basics
3. Shell / Bash Scripting
4. Docker Basics

Lab Questions

1. A developer called Ram has newly joined GitHub community; He needs to push the development works into GitHub for collaborating with other team members. Perform the as stated below -

   1.1 Could you please help Ram with the commands to execute and update the files in GitHub.

   1.2 Initiate the process with initial ReadMe.md file.

   1.3 List the total contributors in the project.

   1.4 Identify top contributors of top 5 open pull requests by these contributors. Also, show the top 5 closed pull requests by them.

   1.5 Identify the number of forks that have been made of the selected repo.

2. Assume that Ram is ready with the application development, he need to provide the application setup and deployment script to deploy the application. Please help Ram in writing the shell script to deploy the application. {Assume it is a JBOSS/Apache Application}.

3. Create an EC2 instance with tomcat server application and retrieve the web application in tomcat web manager.

4. Write a dockerfile which has base ubuntu latest and apache latest. Run the apache default when you create a containers and apache welcome page should be displayed with your name.

5. Create a Deployment Named webapp in the web Namespace and Verify Connectivity and forward the traffic from the pods.

6. Create a Deployment and a service to expose your web front end and a database server to serve as the backend database. Also create a network policy that will deny communication by default. Apply those labels and create a communication over the PORT 3309 to the database server.
7. Create a Jenkins job by building maven project. after the build trigger process automatically.

**Course Outcomes**

After learning all programs of the course, the student is able to

1. Remember the importance of DevOps tools used in software development life cycle.
2. Examine the different Version Control strategies.
3. Analyze & Illustrate the Containerization of OS images and deployment of applications over Docker.
4. Summarize the importance of Software Configuration Management in DevOps.
5. Understand the importance of Jenkins to Build, Deploy and Test Software Applications.

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Project Work: The Project Work (Phase I + Phase II) carries 8 credits (2 credits+6 credits) and spreads over TWO semesters, i.e. during 7th and 8th semesters.

I. Project Phase – I and Project seminar Comprises of Literature Survey, Problem identification, Objectives and Methodology. CIE marks shall be based on the report covering Literature Survey, Problem identification, Objectives and Methodology and seminar presentation skill.

II. The Assessment marks (CIE) in the case of Project Work - Phase I, shall be based on the evaluation at the end of the 7th semester by a committee consisting of Head of the concerned department, two senior faculty members of the department, one of them may be the internal guide. The work may be evaluated
by the committee for award of Assessment marks (CIE) based on a Report [comprising of synopsis, Introduction, Literature survey, Objective and Methodology], presentation and viva voce.

III. The project work shall be carried out by candidate(s) independently/in a group (maximum of four) during the seventh and eighth semester under the guidance of one of the faculty members of the Department of study. If the project work is of inter-disciplinary nature, a co-guide shall be taken from the same or any other relevant Department. If a project work has to be carried out in any industry / factory / organization, outside the campus, the permission for the same and the name of co-guide at any of these organizations shall be intimated to the authorities at the beginning of seventh semester by the Head of the Department.

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**Course title: Big Data**

- **Course Code:** P18IS81
- **Semester:** VIII
- **L-T-P-H:** 4 : 0 : 0 : 4
- **Credit:** 4

**Contact Period:** Lecture: 52 Hrs, Exam: 3 Hrs

**Weightage:** CIE: 50%, SEE: 50%

**Prerequisites:**

1. Proficiency in programming language such as, Java, Python, R
2. Basic understanding of SQL and data pre-processing

**Course Learning Objectives (CLOs)**

1. To provide students with the fundamentals and essentials of Big Data.
2. To discuss the challenges traditional data mining algorithms face when analyzing Big Data.
3. To enable the students to optimize businesses decisions and create competitive advantage with Big Data analytics.
4. To impart the architectural concepts of Hadoop and map reduce paradigm and to enable the students to make use of programming tools PIG & HIVE in Hadoop echo system.
**Course Content**

**Unit–I**

**Introduction to Big Data:** Introduction, Big Data, Defining Big Data, why Big Data and why now? Big Data example. **Working with Big data:** Introduction, Data explosion, Data volume, Data velocity, Data variety. **Big Data Processing Architecture:** Introduction, Introduction, Data processing revisited, Data processing techniques, Data processing infrastructure challenges, Shared-everything and shared-nothing architecture, Big data processing.

**Self-Study:** Telco big data study.  

10 Hours

**Unit–II**

**Introducing big data Technologies:** Introduction, Distributed data processing, Big data processing requirements. **NoSQL data management:** Introduction to NoSQL, Why NoSQL? Types of NoSQL, Schema less databases, Materialized views, Distribution models, Sharding. **Understanding Hadoop ecosystem:** Hadoop, HDFS, Map-Reduce, YARN, Hbase, Hive, Pig and Pig latin, Sqoop, Zookeeper.

**Self-study:** Flume, Oozie  

11 Hours

**Unit–III**

**Getting Ready to Use R and Hadoop:** Understanding Hadoop features, learning the HDFS and Map-Reduce architecture. **Writing Hadoop Map-Reduce Programs:** Understanding the basics of Map-Reduce, Introducing Hadoop Map-Reduce, Understanding the Hadoop Map-Reduce fundamentals, writing a Hadoop Map-Reduce example.

**Self-study:** Installing Hadoop  

10 Hours

**Unit–IV**

**Testing and Debugging Map-Reduce Applications:** Debugging Hadoop Map-Reduce locally, performing unit test for Map-Reduce applications, performing local application testing with eclipse, logging for Hadoop testing, application log processing, defensive programming in Map-Reduce. Understanding Hadoop YARN architecture: Background of YARN, Advantages of YARN, YARN architecture, working of YARN, YARN schedulers, Backward compatibility with YARN, YARN configurations, YARN commands, YARN containers, Registry.

**Self-study:** Log management in Hadoop.  

11 Hours

**Unit–V**

**Exploring Hive:** Introducing Hive, Getting started with Hive, Hive services, Data types in Hive, Built-in functions in Hive, Hive DDL, Data manipulation in Hive, Data retrieval Queries, using joins in Hive. **Analyzing Data with Pig:** Introduction to Pig, Running Pig, Getting started with Pig Latin, working with operation in Pig, Debugging Pig, working with functions in pig, error handling in pig.

**Self-study:** Using Oozie: Introducing Oozie.  

10 Hours

**Text Books:**
1. Data Warehousing in the Age of Big Data by Krish Krishnan, Morgan Kaufmann 2013.
4.
Reference Books:

Course Outcomes
After learning all the units of the course, the student is able to
1. Demonstrate the characteristics of Big Data using Map Reduce.
2. Apply data modeling techniques to large data sets using HDFS.
3. Develop applications for Big Data analytics with the use of Pig.
4. Evaluate Local and Distributed Modes using Pig.
5. Make use of Hive Data Manipulation Language for Querying and Analyzing Data

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Course title: Management Information System

Course Code: P18IS821 Semester: VIII L-T-P-H : 2:2:0:4 Credit: 3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs Weightage: CIE:50%, SEE: 50%

Course Learning Objectives (CLOs)

This course aims to,
1. To enable students evaluate the role of information systems in today's competitive business environment
2. To enable students understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive.
3. Apply a framework for evaluating information-related ethical dilemmas commonly faced by managers.
4. Enhance self-confidence, ability to make proper decisions and effective communication, and Pursue lifelong learning and continuing education.

Course Content

Unit-I

Foundation Concepts


Unit-II

Business Applications - 1


Unit-III

Business Applications - 2

Support, Knowledge management system.  
**Self Study:** Business and AI, The Domains of Artificial Intelligence.

**Unit-IV**

**Development Processes**


**Self Study:** Implementing Business Systems.

**10 Hours**

**Unit-V**

**Management Challenges**


**Self Study:** Managing Global IT.

**11 Hours**

**Text Books:**


**Reference Books:**


**Course Outcomes**

After learning all the units of the course, the student is able to

1. Identify the business applications in MIS.
2. Explain the Changing Business Environment for Information Technology.
3. Illustrate the Computer Hardware and Software Work Service Level Agreements.
4. Implementation of information technology solutions in organization.
5. Explain issues and challenges in security and professional ethics.
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Course title: Semantic Web

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Prerequisite: Basics of Web Technology

Course Learning Objectives (CLOs)

This course aims to
1. Able to understand the Basics of Semantic web and RDF
2. Able to describe RDF and its taxonomy and ontology
3. Understand the concept of Owl and its various classes

Course Contents

Unit-I

The basics of semantic web: Traditional web to semantic web – WWW and its usage-meta data and its creation, addition in the web page; meta data tools-search engines for semantic web-search engine for web page mark up problem and query building problem.

Self Study: Search Engine for “Common Vocabulary” Problem 10 Hours

Unit-II

Resource description frame work (rdf): RDF and its basic elements-Why we need RDF-RDF triples-RDF tools Fundamental rules of RDF-relationship between DC,and RDF and XML and RDF core elements of RDF- ontology and taxonomy-inferencing based on RDF.

Self Study: A Hypothetical Real-World Example of aggregation and distributed information 11 Hours

Unit-III

Web ontology language (owl): The basics idea of Web ontology language– OWL to define classes- OWL to define properties-set operators-Three faces of OWL-Ontology Matching and Distributed Information- Validating OWL ontology.

Self Study: Camera Ontology Rewritten in OWL 10 Hours

Unit-IV

Semantic web services: Web services – web services standards – web services to semantic web services-UDDI and its usage- Concept of OWL-S and its building blocks - mapping OWL-S to UDDI- WSDL-S overview and its usage.

Self Study: Matchmaking Engines 10 Hours

Unit-V


Self Study: Semantic Markup Issues 11 Hours

Text Book:
Reference Books:
CS-Engg&Tech-SRM-2013

Course Outcomes

After learning all the units of the course, the student is able to
1. Understand the concepts of semantic web technology
2. Create ontology's in RDFS, including classes and subclasses, properties and sub properties, domains and ranges, instances, and facets, and determine resulting inference and querying capabilities
3. Describe OWL and its usage in semantic web
4. Understand various technologies related to semantic web services
5. Create reusable formal models, and processes to create/update/query such models that help to describe formal semantics used in a multimedia application

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Seventh and Eighth Semester Syllabus [CBCS with OBE] of 2018-19 Academic Year 38
Course title: Natural Language Processing

Course Code: P18IS823  Semester: VIII  L-T-P-H : 2:2:0:4  Credit: 3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs  Weightage: CIE:50%, SEE: 50%

Pre Requisites: Basics of Python programming

This course aims to

1. Learn the concepts of natural language processing and corpus Linguistics
2. Be familiar with Processing of Raw Text
3. Learn the concept of Extracting Information from text and analyze the structure of sentence.

Course Learning Objectives (CLOs)

Course Content

Unit–I
Self Study: WordNet 11 Hours

Unit-II
Processing Raw Text: Accessing Text from Web and from Disk, Strings: Text Processing at the Lowest Level, Text Processing with Unicode, Regular Expressions for Detecting Word Patterns, Useful Applications of Regular Expressions, Normalizing Text, and Regular Expressions for Tokenizing text, Segmentation.
Self Study: Formatting: From List to Strings. 10 Hours

Unit-III
Self Study: A sample of python Libraries. 10 Hours

Unit-IV
Categorizing and Tagging Words:
Self study: How to determine the category of a word, Modeling Linguistic Patterns 11 Hours

Unit-V
Self Study: Relation Extraction 10 Hours

Text Books:
Reference Books:

Course outcomes
After learning all the units of the course, the student is able to
1. Develop python code use of text corpora, lexical resources and Natural Language Processing.
2. Illustrate python code to Process Raw Text.
3. Construct Structured Program for text processing.
4. Build models of language using salient features to perform language processing tasks.
5. Analyze the sentence which is used to build a syntax tree and extracting the information from the text.

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Course Title: Multi-Core Programming

Course Code: P18IS824  Semester: VIII  L-T-P-H : 2:2:0:4  Credits: 3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs  Weightage: CIE:50%, SEE: 50%

Prerequisites:
Knowledge of Computer Architecture, Operating Systems and at least one high-level language, preferably C/C++.

Course Learning Objectives (CLOs)
This course aims to
Identify the issues involved in multi-core architectures, parallel programming and Explore OpenMP programming model.

Course Content
Unit-I
Introduction to Multi-core Architecture:
Motivation for Concurrency in software, Parallel Computing Platforms, Parallel Computing in Microprocessors, Differentiating Multi-core Architectures from Hyper-Threading Technology, Multi-threading on Single-Core versus Multi-Core Platforms Understanding Performance, Amdahl’s Law.
System Overview of Threading:
Defining Threads, System View of Threads, Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, What Happens When a Thread Is Created, Application Programming Models and Threading, Virtual Environment: VMs and Platforms, Runtime Virtualization.
Self-Study: Growing Returns: Gustafson’s Law, System Virtualization. 11 Hours

Unit-II
Fundamental Concepts of Parallel Programming:
Threading and Parallel Programming Constructs:
Self-Study: Other Alternatives, Implementation-dependent Threading Features. 11 Hours

Unit-III
Threading APIs:
Threading APIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft .NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization.
Self-Study: Signaling, Compilation and Linking. 10 Hours
Unit-IV
OpenMP: A Portable Solution for Threading:
Self-Study: Performance.
10 Hours

Unit-V
Solutions to Common Parallel Programming Problems:
Self-Study: Data Organization for High Performance.
10 Hours

Text Book:

Reference Books:

Web Link:
http://www.intel.com/multi-core/

Course Outcomes
After learning all the units of the course, the student is able to
1. Identify the issues involved in multi-core architectures.
2. Explain fundamental concepts of parallel programming and its design issues.
3. Apply an appropriate threading API’s for developing applications.
4. Apply OpenMP programming model.
5. Circumvent common parallel programming problems.
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**Guidelines for Internship:**

I. Internship is of minimum eight weeks duration and to be completed between the vacation period of VI & VII semester and VII & VIII semester.

II. The internship can be carried out in any industry/ R & D Organization/ Research/ Institute/ Educational institute of repute/ Internshala (ACITE MoU Internship).

III. The Department/college shall nominate staff member/s to facilitate, guide and supervise students under internship.

IV. The Internal Guide has to visit place of internship at least once during the student’s internship.

V. The students shall report the progress of the internship to the guide in regular intervals and seek his/her advice.

VI. After the completion of Internship, students shall submit a report with completion and attendance certificates to the Head of the Department with the approval of both internal and external guides.

VII. There will be 50 marks CIE (Seminar: 25, Internship report: 25) and 50 marks for Viva Voce conducted during Semester End Examination (SEE) of VIII Semester. For the conduction of Internship Semester End Examination following instructions are issued:

   a. The Semester End Examination (SEE) for 50 marks shall be conducted similar to final semester project work / lab examination.
   b. Internal & External Examiners shall be appointed by the BoE – Chairperson in consultation with HoD and approval of the same by the Principal & Controller of Examination.
   c. External Examiner may be from the Industry. If the external examiner from the industry is not available, alternative arrangement shall be made by the BoE - Chairperson by appointing a faculty from out of the available faculty in the department, wherein the student is studying.

VIII. The students are permitted to carry out the internship anywhere in India or abroad. The Institution will not provide any kind of financial assistance to any student for carrying out the Internship.

IX. Failing to undergo Internship: Internship is one of the head for obtaining degree, therefore completion of internship is mandatory.
Project Work: The Project Work (Phase I + Phase II) carries 8 credits (2 credits+6 credits) and spreads over TWO semesters, i.e. during 7th and 8th semesters.

I. Project Phase – I and Project seminar Comprises of Literature Survey, Problem identification, Objectives and Methodology. CIE marks shall be based on the report covering Literature Survey, Problem identification, Objectives and Methodology and seminar presentation skill.

II. The Assessment marks (CIE) in the case of Project Work - Phase I, shall be based on the evaluation at the end of the 7th semester by a committee consisting of Head of the concerned department, two senior faculty members of the department, one of them may be the internal guide. The work may be evaluated by the committee for award of Assessment marks (CIE) based on a Report [comprising of synopsis, Introduction, Literature survey, Objective and Methodology], presentation and viva voce.

III. The project work shall be carried out by candidate(s) independently/in a group (maximum of four) during the seventh and eighth semester under the guidance of one of the faculty members of the Department of study. If the project work is of inter-disciplinary nature, a co-guide shall be taken from the same or any other relevant Department. If a project work has to be carried out in any industry / factory / organization, outside the campus, the permission for the same and the name of co-guide at any of these organizations shall be intimated to the authorities at the beginning of seventh semester by the Head of the Department.

IV. The weekly progress of the Project work shall be monitored and reviewed by the Project Guide assigned by DUGC. The method of evaluation, including intermediate assessment shall be evolved by the pertinent DUGC.

V. A candidate shall submit N+3 (No. of candidates+3) copies of the Report of the Project Work to Head, DUGC on or before the specified date. The report shall be in the format prescribed by the Institute. The candidate shall submit a report of the project work (dissertation) duly approved by the guide and co-guide. The project report shall be countersigned by the guide, co-guide (if any) and the Head of the Department

VI. The last date for the submission of Report shall be Two weeks before the closure of the semester in which the project work credits have been registered for and is expected to be completed or as announced by the COE. The date of submission of the dissertation may be extended up to a maximum of eight academic years, from the date of commencement of the first semester in which the candidate has taken admission to the course.

VII. The final evaluation (CIE & SEE) for Project Work - Phase II is done by a Project Work Evaluation Committee (PWEC) constituted by the pertinent DUGC. There shall be an open seminar followed by a viva – voce examination
as part of the final evaluation. After the final evaluation, appropriate letter grade is awarded.

VIII. If in the opinion of the PWEC, the Project Report is acceptable with minor modifications for the minimum passing grade ‘E’ (Fair) in the case of project, the PWEC shall value and instruct the candidate suitably to incorporate the necessary modifications and to resubmit it to the Chairman, PWEC. After such resubmission, the Chairman, PWEC will certify that the necessary modification has been incorporated.

IX. The Assessment marks in case of Project Work - Phase II and seminar shall be based on the evaluation, as per the guidelines, at the end of the 8th semester by a committee consisting of Head of the concerned department, two senior faculty members of the department (one of them may be the internal guide).

X. The Assessment marks sheet shall bear the signature of all those concerned, along with the date and seal of the Principal.
In the Self-Study course & Seminar, the student has to choose & study the courses related to the program discipline with her/his own efforts under the guidance of a Course Instructor/Project guide, using study materials available in open sources i.e. Massive Open Online Course (MOOC) NPTEL Courses. The intention of the course is to encourage the habit of self-learning.

Further, in addition to the above, the department has to release the pool of courses from the list of available 8 weeks NPTEL online courses. The student has to register for the course from the available pool during VII / VIII Semester and the same will be reflected in the Grade Card of the VIII Semester. The 50 marks CIE assessment is based on the final NPTEL score (i.e. Online assignments: 25% + Proctored exam: 75%). The NPTEL score will be mapped directly to the CIE marks as per the calculation below only if he /she has completed the NPTEL course (i.e. Certification).

\[
    \text{CIE} = \frac{\text{NPTEL Score} \times 1.5}{2} \quad \text{[Maximum CIE should be 50 Marks]}
\]

[Ex. - 1: If NPTEL Score is 60 then the CIE will be = \((60 \times 1.5)/2 = 45\)
Ex. - 2: If NPTEL Score is 80 then the CIE will be = \((80 \times 1.5)/2 = 50\) (Max. CIE should be 50 Marks)]

If the student fails to complete the NPTEL course at the end of the VIII Semester, then the department has to constitute a committee consisting of the Head of the department, two senior faculty members of the department, one of them may be the internal guide. The evaluation is based on a Report, Presentation, and Viva-Voce and the assessment is a relative evaluation in context to the student completed NPTEL course Certification (i.e. the CIE Score should be less than the score of the student cleared NPTEL Course).