| Course Title | Artificial Intelligence | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS61 | CIE | 50 |
| Total No. of Contact Hours | 50 | SEE | 50 |
| No. of Contact Hours/week | 5  (L : T : P :: 3 : 2 : 0) | Total | 100 |
| Credits | 4 | Exam. Duration | 3 Hours |

Course objective is to: *This course will enable students to*

Identify the problems where AI is required and the different methods available.

Compare and contrast different AI techniques available.

Define and explain learning algorithms.

Design different learning algorithms for improving the performance of AI systems.

Implement projects using different AI learning techniques.

| Module-1 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

What is artificial intelligence, Problems, Problem Spaces and search, Heuristic search technique.


Application:

Solving various AI based problems.

Video Link:


http://www.nptelvideos.in/2012/11/artificial-intelligence.html

https://www.cualit.com/artificial-intelligence-practical-use-cases/

| Module-2 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Knowledge Representation Issues, Using Predicate Logic, Representing knowledge using Rules.

Application:

Developing information about the objects

Video Link:

http://www.nptelvideos.in/2012/11/artificial-intelligence.html

https://www.cualit.com/artificial-intelligence-practical-use-cases/

| Module-3 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Symbolic Reasoning under Uncertainty, Statistical reasoning, Weak Slot and Filter Structures.


Application:

Connecting one concept to another , combining ideas about data.

Video Link:


http://www.nptelvideos.in/2012/11/artificial-intelligence.html

https://www.cualit.com/artificial-intelligence-practical-use-cases/

| Module-4 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Strong slot-and-filler structures, Game Playing.

Application:

Designing Smart Games

Video Link:

http://www.nptelvideos.in/2012/11/artificial-intelligence.html

https://www.cualit.com/artificial-intelligence-practical-use-cases/

| Module-5 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Natural Language Processing, Learning, Expert Systems.

Application:

Sentiment analysis

| Video Link: |
|---|
| http://www.nptelvideos.in/2012/11/artificial-intelligence.html |
| https://www.cualit.com/artificial-intelligence-practical-use-cases/ |

**Course outcomes:**

| CO1 | Identify the AI based problems. |
|---|---|
| CO2 | Apply techniques to solve problems |
| CO3 | Define learning and explain various learning techniques. |
| CO4 | Discuss expert systems |
| CO5 | Implement projects using different AI learning techniques. |

**Text/Reference Books:**

| 1. | E. Rich , K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGraw Hill. |
|---|---|
| 2. | Stuart Russel, Peter Norvig, "Artificial Intelligence: A Modern Approach" , 2nd Edition, Pearson Education, 2003. |
| 3. | Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hal of India. |
| 4. | G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem Solving", Fourth Edition, Pearson Education, 2002. |

**CIE Assessment:**

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

Quizzes/mini tests (4 marks)

Mini Project / Case Studies (8 Marks)

Activities/Experimentations related to courses (8 Marks)

**SEE Assessment:**

Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

One question must be set from each unit.  The duration of examination is 3 hours.

| CO-PO Mapping | | | | | | | | | | | | |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 2 | 2 | 3 | | 2 | | | | | | | |
| CO2 | 2 | 3 | 3 | 3 | 2 | | | | | | | |
| CO3 | | 2 | 2 | 2 | | | | | | | | |
| CO4 | | 2 | 2 | 3 | | | | | | | | |
| CO5 | 3 | 3 | 3 | 3 | 3 | | | | | | | |

High-3, Medium-2, Low-1

| Course Title | Internet of Things | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS62 | CIE | 50 |
| Total No. of Contact Hours | 50 | SEE | 50 |
| No. of Contact Hours/week | 5  (L : T : P :: 3 : 2 : 0) | Total | 100 |
| Credits | 4 | Exam. Duration | 3 Hours |

| Course objective is to: *This course will enable students to* |
|---|
| Assess the genesis and impact of IoT applications, architectures in real world. |
| Illustrate diverse methods of deploying smart objects and connect them to network. |
| Compare different Application protocols for IoT. |
| Infer the role of Data Analytics and Security in IoT. |
| Identify sensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry. |

| Module-1 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.


Application:
Connecting Smart Things
Video Link:
1. https://www.postscapes.com/internet-of-things-technologies/
2. https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT
3. https://www.iotforall.com/iot-ebooks/

| Module-2 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.

Application:

Designing Smart Circuits

Video Link:

1. https://www.postscapes.com/internet-of-things-technologies/

2. https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT

3. https://www.iotforall.com/iot-ebooks/

| Module-3 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.

Application:

Data transmission using wireless technology

Video Link:

1. https://www.postscapes.com/internet-of-things-technologies/

2. https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT

3. https://www.iotforall.com/iot-ebooks/

| Module-4 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment

Application:

Designing Smart Systems

Video Link:

1. https://www.postscapes.com/internet-of-things-technologies/

2. https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT

3. https://www.iotforall.com/iot-ebooks/

| Module-5 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.

Application:

Securing and handling Smart systems

Video Link:

1. https://www.postscapes.com/internet-of-things-technologies/

2. https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT

3. https://www.iotforall.com/iot-ebooks/

Course outcomes:

| CO1 | Interpret the impact and challenges posed by IoT networks leading to new architectural models. |
|---|---|
| CO2 | Compare and contrast the deployment of smart objects and the technologies to connect them to network. |
| CO3 | Appraise the role of IoT protocols for efficient network communication. |
| CO4 | Elaborate the need for Data Analytics and Security in IoT. |
| CO5 | Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry. |

| Text/Reference Books: | |
|---|---|
| 1. | David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743) |
| 2. | Srinivasa K G, "Internet of Things",CENGAGE Leaning India, 2017 |
| 3. | Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on- Approach)", 1stEdition, VPT, 2014. (ISBN: 978-8173719547) |
| 4. | Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224) |

| CIE Assessment: |
|---|
| CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests Quizzes/mini tests (4 marks) Mini Project / Case Studies (8 Marks) Activities/Experimentations related to courses (8 Marks) |
| **SEE Assessment:** |
| Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. One question must be set from each unit.  The duration of examination is 3 hours. |

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 3 | | 2 | | | | | | | |
| CO2 | 2 | 3 | 3 | 3 | 2 | | | | | | | |
| CO3 | | 2 | 2 | 2 | | | | | | | | |
| CO4 | | 2 | 2 | 3 | | | | | | | | |
| CO5 | 3 | 3 | 3 | 3 | 3 | | | | | | | |

High-3, Medium-2, Low-1

| Course Title | Data Mining | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS631 | CIE | 50 |
| Total No. of Contact Hours | 40 | SEE | 50 |
| No. of Contact Hours/week | 4  (L : T : P :: 4 : 0 : 0) | Total | 100 |
| Credits | 3 | Exam. Duration | 3 Hours |

| Course objective is to: |||
|---|---|---|
| Gather and analyze large sets of data to gain useful business understanding ||| 

**Course objective is to:**

Gather and analyze large sets of data to gain useful business understanding

Understand the data mining functionalities, technologies and steps in pre-processing the data

Learn data mining algorithms, methods and tools

| Module-1 | L1, L2, L3 | 12 Hours |
|---|---|---|

Raw data to valuable information-Lifecycle of Data - What is data warehousing - The building Blocks: Defining Features - Data warehouses and data marts - Overview of the components - Metadata in the data warehouse - Basic elements of data warehousing - Principles of dimensional modelling: Star schema, Snowflake schema and Galaxy schema.

Application:

 Identify the potential risk of default and manage and control collections

Performance analysis of each product, service, interchange, and exchange rates

Store and analyze information about faculty and students

Maintain student portals to facilitate student activities

Video Link:

https://www.youtube.com/watch?v=8lHpioyvSng

| Module-2 | L1,L2,L3 | 12 Hours |
|---|---|---|

Introduction to Data Mining Systems, Knowledge Discovery Process -Data Objects and attribute types, Statistical description of data, Data Preprocessing- Data Cleaning, Data Integration and Transformation, Data Reduction.

Application:

Financial Analysis

Telecommunication Industry.

Intrusion Detection

Retail Industry

Higher Education


Video Link:

https://www.youtube.com/watch?v=QRZlYzxEFDg

| Module-3 | L1,L2,L3 | 12 Hours |
|---|---|---|

Market Basket Analysis, Frequent Item sets, Closed Itemsets, Association Rules, Frequent Itemset Mining Methods- Apriori algorithm, Generating Association rules from Frequent Itemsets, A Pattern- Growth Approach for mining frequent Itemsets, Mining Frequent Itemsets using the Vertical Data Format.

Application:

Market Basket Analysis

Medical Diagnosis:

Census Data

Protein Sequence


Video Link:

https://www.youtube.com/watch?v=RiFrbyiYpRs

| Module-4 | L1,L2,L3 | 12 Hours |
|---|---|---|

Classification and Prediction ,Basic Concepts, Decision Tree Induction, Bayesian Classification ,Rule Based Classification, Classification by Back propagation , Support Vector Machines, Lazy learners.

Application:

Sentiment Analysis

Email Spam Classification

[Document Classification](#)

[Image Classification](#)


Video Link:

[https://www.youtube.com/watch?v=gkagE_fE2sk](https://www.youtube.com/watch?v=gkagE_fE2sk)


| Module-5 | L1,L2,L3 | 12 Hours |
|---|---|---|

Types of Data in Cluster Analysis , Data similarity and dissimilarity measures ,A Categorization of Major Clustering Methods -Partitioning Methods-K-means, K-medoids , Hierarchical Methods-Agglomerative vs Divisive, Distance measures, BIRCH, Clustering High-Dimensional Data- Outlier Analysis and Detection.

Application:

Clustering analysis

In the field of biology, it can be used to derive plant and animal taxonomies.

Identification of areas of similar land use in an earth observation database.

Video Link:

[https://www.youtube.com/watch?v=2QTeuO0C-fY](https://www.youtube.com/watch?v=2QTeuO0C-fY)

Experimental Part:

Apriori Algorithm for market Basket Analysis

Bayesian Classification

Decision Tree Induction Algorithm

Frequent Pattern-Growth Algorithm

Course outcomes:

| CO1 | Design data warehouse by applying principles of dimensional modelling and ETL concepts |
|---|---|
| CO2 | Analyze various data pre-processing techniques for efficient data mining. |
| CO3 | Apply association rule mining for finding hidden and interesting patterns in data. |
| CO4 | Apply statistical procedure, machine learning and neural network based classification algorithms for data prediction |
| CO5 | Apply clustering algorithms for the application and generalizations for real time problems |

| Text/Reference Books: | |
|---|---|
| 1. | Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012. |
| 2. | Paulraj Ponniah, Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals, Wiley, 2010 |
| 3. | Alex Berson, Stephen J Smith, Data warehousing, Data mining, and OLAP, Tata McGraw Hill edition, 2007 |
| 4. | Pang-Ning Tan, Michael Steinbach and Vipin Kumar,Introduction to Data Mining, Pearson Education, 2007 |
| 5. | G. K. Gupta ,Introduction to Data Mining with Case Studies, Easter Economy Edition, Prentice Hall of India, 2006 |

| CIE Assessment: |
|---|
| CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests |
| Quizzes/mini tests (4 marks) |
| Mini Project / Case Studies (8 Marks) |
| Activities/Experimentations related to courses (8 Marks) |
| **SEE Assessment:** |
| Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. |
| Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. One question must be set from each unit.  The duration of examination is 3 hours. |

| CO-PO Mapping | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 3 | 3 | 3 | 3 | 3 | | 2 | | | | | |
| CO2 | 3 | 3 | 3 | 3 | 3 | | 2 | | | | | |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | | | | | | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 | | | | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | | | | | | 3 |

High-3, Medium-2, Low-1

| Course Title | Web Technology | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS632 | CIE | 50 |
| Total No. of Contact Hours | 40 | SEE | 50 |
| No. of Contact Hours/week | 4  (L : T : P :: 3 : 0 : 1) | Total | 100 |
| Credits | 3 | Exam. Duration | 3 Hours |

Course objective is to:

Teach students HTML and CSS for designing web pages.

Introduce students to the basics of JavaScript as a programming language.

Familiarize students with the Document Object Model and enable them to create dynamic web pages that react to user input.

Teach students about installing and configuring Apache Server and incorporating backend support for their web pages.

Introduce students to the newer features available as part of the HTML standard

| Module -1 | L1,L2,L3 | 12 Hours |
|---|---|---|

Introduction, UI Design and UX : Internet, WWW, Web Servers and Browsers, URLs, MIME, HTTP, Basic Markup, Images, Hyperlinks, Lists, Tables, Forms, DataList, Canvas, Audio and Video, Geo-Location, Local Storage, Web Workers, Offline Web Applications, Drag and Drop.HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats

Application: To deliver data (HTML files, image files, query results) on the World Wide Web.

Video Link:

https://www.freecodecamp.org/

https://developer.mozilla.org/en-US/docs/Web/CSS

| Module -2 | L1,L2,L3 | 12 Hours |
|---|---|---|

Style Sheets: CSS Introduction to Cascading Style Sheets-Features-Core Syntax-Style

Sheets and HTML Style Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout-Beyond the Normal Flow-Other Properties-Case Study. Client- Side Programming:

Application: Describing the presentation of Web pages, including colors, layout, and fonts

Video Link:

https://www.vogella.com/tutorials/CSS/article.html

https://nptel.ac.in/courses/106/105/106105084/

| Module - 3 | L1,L2,L3 | 12 Hours |
|---|---|---|

JavaScript: Introduction to Client-Side Scripting, JavaScript Basics, Screen Input and Keyboard Output, Functions, Objects, Inheritance, Hoisting, Arrays, JavaScript Objects, Accessing and Modifying DOM, Events and Event Handlers - Load, Mouse, Synthetic Events, Key and Form Related Events, Event Bubbling, Cookies.

Application: Web Sites, Web Server Applications, Mobile Apps, Games Platform

Video Link:

https://www.udemy.com/courses/development/web-development/

https://javascript.info/hello-world#modern-markup

| Module-4 | L1,L2,L3 | 12 Hours |
|---|---|---|

PHP Arrays and Superglobals, Arrays, $_GET and $_POST Superglobal Arrays, $_SERVERArray, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions, PHP Error Reporting, PHP Error and Exception Handling

Application: e-Commerce Applications. Web Pages and Web-Based Applications

Video Link:

http://www.nptelvideos.com/video.php?id=2142&c=27

http://www.nptelvideos.com/video.php?id=2131&c=27

http://www.nptelvideos.com/video.php?id=2116&c=27

| Module-5 | L1,L2,L3 | 12 Hours |
|---|---|---|

Bootstrap: Grid Systems, Layout, Tables and Forms, Buttons and Images, Progress Bar, Navigations. jQuery: Usage, Selecting DOM Elements, Getting and Setting Attributes, Changing Styles, File Handling and System Calls, Arrays, Cookies, Sessions, Database Access.

Application: Bootstrap is a front-end framework used to create modern websites and web apps

Video Link:

https://getbootstrap.com/docs/4.5/examples/

https://www.w3schools.com/bootstrap/bootstrap_buttons.asp

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Practical Experiments:

Create a web page with the following. a. Cascading style sheets. b. Embedded style sheets. c. Inline style sheets. Use our college information for the web pages.

JavaScript to design a simple calculator

Java script to Validate the Registration, user login, user profile and payment by credit card pages

PHP program to display a digital clock which displays the current time of the server..

PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors

---

Course outcomes:

| | |
|---|---|
| CO1 | Outline the basic concepts of information and web architecture. |
| CO2 | Design solutions for programming questions using JavaScript |
| CO3 | Study Hyper Text markup language and create websites using HTML, CSS Codes. |
| CO4 | Setup a web server and host a website with back end support. |
| CO5 | Incorporate the latest HTML features in the web pages designed by them with fallback options wherever required. |

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Text/Reference Books:

| 1. | Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006. |
|---|---|
| 2. | Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education |
| 3. | Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006. |
| 4. | Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001 |
| 5. | Bates, "Developing Web Applications", Wiley, 2006. |

## CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

Quizzes/mini tests (4 marks)

Mini Project / Case Studies (8 Marks)

Activities/Experimentations related to courses (8 Marks)

## SEE Assessment:

Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. One question must be set from each unit.  The duration of examination is 3 hours.

## CO-PO Mapping

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 3 | | | | | 2 | | 2 |
| CO2 | 3 | 3 | 3 | 2 | 3 | | | | | 2 | | 2 |
| CO3 | 3 | 3 | 2 | 2 | 3 | | | | | 2 | | 2 |
| CO4 | 3 | 3 | 2 | 2 | 3 | | | | | 2 | | 3 |
| CO5 | 3 | 3 | 3 | 2 | 3 | | | | | 2 | | 2 |

High-3, Medium-2, Low-1

| Course Title | Information Storage Management | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS633 | CIE | 50 |
| Total No. of Contact Hours | 40 | SEE | 50 |
| No. of Contact Hours/week | 4 (L : T : P :: 4 : 0 : 0) | Total | 100 |
| Credits | 3 | Exam. Duration | 3 Hours |

**Course objective is to:**

Understand data creation, the amount of data being created, the value of data to a business, challenges in data storage and data management

Understand solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities

Understand the storage architecture and available technologies.

Learn to establish & manage data center.

Learn security aspects of storage & data center.

| Module-1 | L1,L2,L3 | 12 Hours |
|---|---|---|

Introduction to Information Storage- Information Storage, Data, Types of Data, Big Data, Information, Storage, Evolution of Storage Architecture, Data Centre Infrastructure, Core Elements, Key characteristics for Data Centre Elements, Managing Data center, Virtualization and Cloud Computing. Data Centre Environment -Application, DBMS, Host, OS, Memory Virtualization, Device Driver, Volume Manager, File System, Compute Virtualization, Connectivity Physical Components of Connectivity, Interface protocols-IDE/ATA and Serial ATA, SCSI and Serial SCSI, Fiber Channel, Internet Protocol, Storage

Application:

Identifying information storage systems

Video Link:

https://nptel.ac.in/courses/106/108/106108058/

| Module-2 | L1,L2,L3 | 12 Hours |
|---|---|---|

Data Protection: RAID - Implementation of RAID, Software RAID, Hardware RAID, RAID Array Components, RAID Techniques- Striping, Mirroring, Parity; RAID LevelsRAID 0, RAID 1, Nested RAID, RAID 3, RAID 4, RAID 5, RAID 6, RAID Impact on Disk Performance, Application IOPS and RAID Configurations, RAID Comparison, Hot Spares.

Application:

Configuration of RAID Models

Video Link:

https://nptel.ac.in/courses/106/108/106108058/

| Module-3 | L2,L3 | 12 Hours |
|---|---|---|

Intelligent Storage System - Components of an Intelligent Storage System, Front End, Cache- Structure of Cache, Read Operation with Cache, Write Operation with Cache, Cache Implementation, Cache management, Cache Data Protection, Back End, Physical Disk, Storage Provisioning- Traditional Storage Provisioning, LUN Expansion: Meta LUN, Virtual Storage Provisioning, LUN Masking, Types of Intelligent Storage Systems- High end Storage Systems, Mid Range Storage Systems.

Application:

Working of cache memory

Video Link:

https://nptel.ac.in/courses/106/108/106108058/

| Module-4 | L2,L3 | 12 Hours |
|---|---|---|

Network-Attached Storage - General-Purpose Servers vs. NAS Devices, Benefits of NAS, File Systems and Network File Sharing- Accessing a File System, Network File Sharing; Components of NAS, NAS I/O Operations, NAS Implementations- Unified NAS, Unified NAS Connectivity, Gateway NAS, Gateway NAS Connectivity, Scale Out NAS, Scale Out NAS Connectivity, NAS File-Sharing Protocols- NFS, CIFS; Factors Affecting NAS Performance, File Level Virtualization.

| Application: | | |
|---|---|---|
| Storage devices as servers. | | |
| Video Link: | | |
| https://nptel.ac.in/courses/106/108/106108058/ | | |

| Module-5 | L2,L3 | 12 Hours |
|---|---|---|

Backup Purpose- Disaster Recovery, Operational Backup, Archival, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments- Server Based and Server less Backup, NDMP- Based Backup; Backup Targets- Backup to Tape, Physical Tape Library, Limitations of Tape; Backup to Disk, Backup to Virtual Tape, Data Deduplication for Backup- Data Deduplication Methods, Data Deduplication Implementation, Backup in Virtualized Environments, Data Archive, Archiving Solution Architecture

Application:

Data Backup to avoid data loss.

Video Link:

https://nptel.ac.in/courses/106/108/106108058/

| CASE STUDY | L3 | 20 Hours |
|---|---|---|

cloud computing

Parallel SCSI

Remote Replication

Securing and Managing Storage Infrastructure

Exploring AWS

**Course outcomes:**

| CO1 | Select from various storage technologies to suit for required application. |
|---|---|
| CO2 | Apply security measures to safeguard storage & farm |
| CO3 | Analyse QoS on Storage. |
| CO4 | Describe the different role in providing disaster recovery and business continuity capabilities. |
| CO5 | Distinguish different remote replication technologies. |

| Text/Reference Books: | |
|---|---|
| 1. | Information Storage and Management, Second Edition, EMC Education Services, Wiley India Edition |
| 2. | Storage Networks Explained, Ulf Tropan, Rainer Erkens, Wofgang Muller, Wiley, ISBN: 9788126518326 |
| 3. | Robert Spalding, –Storage Networks: The Complete Reference–, Tata McGraw Hill , Osborne, 2003. |

| CIE Assessment: |
|---|
| CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests<br><br>Quizzes/mini tests (4 marks)<br><br>Mini Project / Case Studies (8 Marks)<br><br>Activities/Experimentations related to courses (8 Marks) |
| SEE Assessment: |
| Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.<br><br>Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. One question must be set from each unit.  The duration of examination is 3 hours. |

### CO-PO Mapping

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | 3 | 2 | 2 | 2 | | 2 | | 1 | 2 | 2 |
| CO2 | | 3 | 3 | 2 | 2 | 2 | | 2 | | 2 | 2 | 2 |
| CO3 | | 3 | 3 | 2 | 2 | 2 | | 2 | | 3 | 2 | 2 |
| CO4 | | 3 | 3 | 2 | 2 | 2 | | 2 | | 3 | 2 | 2 |
| CO5 | | 3 | 3 | 2 | 2 | 2 | | 2 | | 2 | 2 | 2 |

High-3, Medium-2, Low-1

| Course Title | Compiler Design | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS634 | CIE | 50 |
| Total No. of Contact Hours | 40 | SEE | 50 |
| No. of Contact Hours/week | 4  (L : T : P :: 3 : 0 : 1) | Total | 100 |
| Credits | 3 | Exam. Duration | 3 Hours |

**Course objective is to:**

Learn the design principles of a Compiler.

Learn the various parsing techniques and different levels of translation

Learn how to optimize and effectively generate machine codes

Understand intermediate code generation and run-time environment.

Learn to implement code generator.

| Module-1 | | L1,L2,L3 | 8 Hours |
|---|---|---|---|

Translators-Compilation and Interpretation-Language processors -The Phases of Compiler-Errors Encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools - Programming Language basics.

Application:

Identifying Phases in a compiler.

Video Link:

https://nptel.ac.in/courses/106/105/106105190/

| Module-2 | | L2,L3 | 8 Hours |
|---|---|---|---|

Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language

Application:

Analyzing and identifying tokens in Compiler.

Video Link:

https://nptel.ac.in/courses/106/105/106105190/

| Module-3 | L2,L3 | 8 Hours |
|---|---|---|

Need and Role of the Parser-Context Free Grammars -Top Down Parsing -General Strategies-Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item-Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language .

Application:

Analyzing and identifying syntactical structure in Compiler.

Video Link:

https://nptel.ac.in/courses/106/105/106105190/

| Module-4 | L2,L3 | 8 Hours |
|---|---|---|

Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator - Type Systems-Specification of a simple type checker-Equivalence of Type Expressions-Type Conversions. RUN-TIME ENVIRONMENT: Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing-Symbol Tables-Dynamic Storage Allocation-Storage Allocation in FORTAN.

Application:

Parsing a string of the grammar and storage.

Video Link:

https://nptel.ac.in/courses/106/105/106105190/

| Module-5 | L2,L3 | 8 Hours |
|---|---|---|

Principal Sources of Optimization-DAG- Optimization of Basic Blocks-Global Data Flow Analysis-Efficient Data Flow Algorithms-Issues in Design of a Code Generator - A Simple Code Generator Algorithm.

Application:

Code modification to improve code quality and efficiency.

Video Link:

https://nptel.ac.in/courses/106/105/106105190/

| Practical Experiments | L3 | 20 Hours |
|---|---|---|

Implementation of Symbol Table

Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.) Implementation of Lexical Analyzer using Lex Tool 4. Generate YACC specification for a few syntactic categories.

Implement type checking

Implement control flow analysis and Data flow Analysis

Implement any one storage allocation strategies (Heap,Stack,Static)

Construction of DAG

| Course outcomes: | |
|---|---|
| CO1 | Design and implement a prototype compiler. |
| CO2 | Perform Lexical analysis |
| CO3 | Perform Syntax analysis |
| CO4 | Apply the various optimization techniques. |
| CO5 | Use the different compiler construction tools. |

| Text/Reference Books: | |
|---|---|
| 1. | Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, "Compilers – Principles, Techniques and Tools", 2nd Edition, Pearson Education, 2007. |
| 2. | Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence-based Approach", Morgan Kaufmann Publishers, 2002. |
| 3. | Steven S. Muchnick, "Advanced Compiler Design and Implementation, "Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003. |
| 4. | Keith D Cooper and Linda Torczon, "Engineering a Compiler", Morgan Kaufmann Publishers Elsevier Science, 2004. |
| 5. | Charles N. Fischer, Richard. J. LeBlanc, "Crafting a Compiler with C", Pearson Education, 2008. |
| CIE Assessment: | |

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

Quizzes/mini tests (4 marks)

Mini Project / Case Studies (8 Marks)

Activities/Experimentations related to courses (8 Marks)

| SEE Assessment: |
|---|
| Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. |
| Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. One question must be set from each unit.  The duration of examination is 3 hours. |

| CO-PO Mapping | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | | | 2 | | | | | | | | | |
| CO2 | | | 3 | | | | | | | | | |
| CO3 | | | 3 | | | | | | | | 3 | |
| CO4 | | | 3 | | | | | | 2 | 1 | | |
| CO5 | | | 3 | | 2 | | | | 2 | | | |

High-3, Medium-2, Low-1

| Course Title | Unix System Programming | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS641 | CIE | 50 |
| Total No. of Contact Hours | 40 | SEE | 50 |
| No. of Contact Hours/week | 4  (L : T : P :: 4 : 0 : 0) | Total | 100 |
| Credits | 3 | Exam. Duration | 3 Hours |

Course objective is to:

Explain the fundamental design of the Unix operating system.

Familiarize with the systems calls provided in the Unix environment.

Design and build an application/service over the Unix operating system.

Familiarize with signals and daemon process characteristics.

Explain inter-process communication.

| Module-1 | L1,L2,L3 | 12 Hours |
|---|---|---|

UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO, C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standards. UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristic.

Application: Operating system

Video Link: https://www.youtube.com/watch?v=hy4OeVCLGZ4

| Module-2 | L1,L2,L3 | 12 Hours |
|---|---|---|

File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links. UNIX File APIs: General File APIs, File and Record Locking, Directory File, APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs.

Application: Organizing and storing large data

Video Link: https://www.youtube.com/watch?v=HIXzJ3Rz9po

| Module-3 | L1,L2,L3 | 12 Hours |
|---|---|---|

The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes. Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification,

Process Times, I/O Redirection. Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control, Shell Execution of Programs, Orphaned Process Groups

Application: booting of the system

Video Link: https://www.youtube.com/watch?v=4bfzEyb4YD0

| Module-4 | L1,L2,L3 | 12 Hours |
|---|---|---|

The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers.

Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model.

Application: Communication

Video Link: https://www.youtube.com/watch?v=X8VDJHzrHRE

| Module-5 | L1,L2,L3 | 12 Hours |
|---|---|---|

Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores, Shared Memory, Client-Server Properties, Stream Pipes, Passing File Descriptors, An Open Server-Version 1, Client-Server Connection Functions.

Application: Data flow, Communication

| Video Link: https://www.youtube.com/watch?v=W0BX6geRCDQ | | |
|---|---|---|
| **Practical Experiments:**<br><br>program to demonstrates inter-process communication.<br><br>Programs using mkfifo, open, read, write and close APIs.<br><br>program to check whether the region is locked or not. If the region is locked, print pid of the process which has locked. If the region is not locked, lock the region with an exclusive lock, read the last 50 bytes and unlock the region.<br><br>program to illustrate the race condition. | L3 | 20 Hours |

| Course outcomes: | |
|---|---|
| CO1 | Understand and reason out the working of Unix system and POSIX standards |
| CO2 | Understand the UNIX file system and build an application/service over the Unix operating system |
| CO3 | Demonstrate the Unix process environment and process control |
| CO4 | Explain signals and daemon process characteristics. |
| CO5 | Understand and write UNIX programs on inter-process communication. |

| Text/Reference Books: | |
|---|---|
| 1. | Unix System Programming Using C++ - Terrence Chan, PHI, 1999. |
| 2 | Advanced Programming in the UNIX Environment - W.Richard Stevens, Stephen A. Rago, 3nd Edition, Pearson Education / PHI, 2005. |
| 3 | Advanced Unix Programming- Marc J. Rochkind, 2nd Edition, Pearson Education, 2005. |
| 4 | The Design of the UNIX Operating System - Maurice.J.Bach, Pearson Education / PHI, 1987. |
| 5 | Unix Internals - Uresh Vahalia, Pearson Education, 2001. |

| CIE Assessment: |
|---|
| CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the |

semester (30 marks each), the final IA marks to be awarded will be the average of three tests

Quizzes/mini tests (4 marks)

Mini Project / Case Studies (8 Marks)

Activities/Experimentations related to courses (8 Marks)

**SEE Assessment:**

Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

One question must be set from each unit.  The duration of examination is 3 hours.

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 |  | 2 |  |  |  |  |  |  |  |  | 2 |  |
| CO2 |  |  | 2 |  |  |  |  |  |  |  |  |  |
| CO3 |  |  |  | 2 |  |  |  |  |  |  |  | 2 |
| CO4 |  |  | 2 |  |  |  |  |  |  |  |  |  |
| CO5 |  | 2 |  |  |  |  |  |  |  |  |  |  |

High-3, Medium-2, Low-1

| Course Title | Virtual Reality | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS642 | CIE | 50 |
| Total No. of Contact Hours | 40 | SEE | 50 |
| No. of Contact Hours/week | 4  (L : T : P :: 4 : 0 : 0) | Total | 100 |
| Credits | 3 | Exam. Duration | 3 Hours |

| Course objective is to: |
|---|
| Explain this technology, underlying principles, its potential and limits |
| Knowledge about devices involved |
| Learn about the criteria for defining useful applications. |
| Illustrate process of creating virtual environments |
| Applications of Virtual Reality |

| Module-1 | L1,L2,L3 | 12 Hours |
|---|---|---|

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.

Application: Students can understand the basics of Virtual Reality.

Video Link: https://nptel.ac.in/courses/106/106/106106138/

| Module-2 | L1,L2,L3 | 12 Hours |
|---|---|---|

Output Devices: Graphics displays, sound displays & haptic feedback.

Application: Students can get knowledge about the hardware involved in virtual reality.

Video Link: https://www.youtube.com/watch?v=Z1jQ62VDVSo

| Module-3 | L1,L2,L3 | 12 Hours |
|---|---|---|

Modeling: Geometric modelling, kinematics modeling, physical modeling, behaviour modeling, model management

Application: Students will get the knowledge about various modeling techniques.

| Video Link: https://www.youtube.com/watch?v=dF4QEfj61XQ | | |
|---|---|---|
| Module-4 | L1,L2,L3 | 12 Hours |
| Human Factors: Methodology and terminology, user performance studies, VR health and safety issues. Application: Students will learn impact of virtual reality of real life. Video Link: https://www.youtube.com/watch?v=8DvwtzdNK5U | | |
| Module-5 | L1,L2,L3 | 12 Hours |
| Medical applications, military applications, robotics applications Application: Students can get the knowledge about the applications of virtual reality. Video Link: https://www.youtube.com/watch?v=fJES5HYMOg0 | | |
| Practical Experiments/Research paper Study: Mobile Augmented Reality Based Experiments Simulating Educational Physical Experiments in Augmented Reality Web based Virtual Reality | L3 | 20 Hours |

| Course outcomes: | |
|---|---|
| CO1 | Illustrate technology, underlying principles |
| CO2 | Explain process of creating virtual environments |
| CO3 | Explain its potential and limits and to learn about the criteria for defining useful applications. |
| CO4 | Simulate physical experiments |
| CO5 | Explain future research scope of virtual reality |

| Text/Reference Books: | |
|---|---|
| 1. | Virtual Reality Technology, Second Edition, Gregory C. Burdea & Philippe Coiffet, John Wiley & Sons |

| CIE Assessment: |
| --- |
| CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests<br><br>Quizzes/mini tests (4 marks)<br><br>Mini Project / Case Studies (8 Marks)<br><br>Activities/Experimentations related to courses (8 Marks) |
| SEE Assessment: |
| Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.<br><br>Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.<br><br>One question must be set from each unit.  The duration of examination is 3 hours. |

## CO-PO Mapping

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CO1 | 2 | 1 | 2 | 2 | | | | | | 1 | 2 | 2 |
| CO2 | 2 | 2 | 2 | 1 | | | | | | 1 | | |
| CO3 | 2 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | | | 1 |
| CO4 | 3 | 2 | 1 | 1 | | 1 | 1 | 1 | 1 | | | 2 |
| CO5 | 1 | 1 | 1 | 2 | | | | | | 1 | 1 | |

High-3, Medium-2, Low-1

| Course Title | Cryptography and Information Security | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS643 | CIE | 50 |
| Total No. of Contact Hours | 40 | SEE | 50 |
| No. of Contact Hours/week | 4  (L : T : P :: 3 : 0 : 1) | Total | 100 |
| Credits | 3 | Exam. Duration | 3 Hours |

| Course objective is to: |
|---|
| Understand the basics of computer security concepts. |
| Understand the security risk and prepare the plans to avoid security exploitation. |
| Understand the cryptography and various algorithms. |
| Learn various cloud security for data protection. |
| Understand various kinds of wireless communication and its threat. |

| Module-1 | L1,L2,L3 | 12 Hours |
|---|---|---|
| Overview: Computer Security Concepts, Requirements, Architecture, Trends, Strategy. Perimeter Security: Firewalls, Intrusion Detection, Intrusion Prevention Systems, Honeypots. User Authentication: Password, Password - Based, Token - Based, Biometric, Remote User Authentication. Access Control: Principles, Access Rights, Discretionary Access Control, UNIX File Access Control, Role Based Access Control. Internet Authentication Applications: Kerberos, X.509, PKI.  Application: Authentication  Video Link: https://www.youtube.com/watch?v=_44CHD3Vx-0 | | |

| Module-2 | L1,L2,L3 | 12 Hours |
|---|---|---|
| Human Factors: Security Awareness, Training and Education, Organization Security Policy, Employment Practices and Policy. IT Security Management and Risk Assessment: IT Security Management, Risk Assessment, Analysis of IT Security Controls. Plans and Procedures: IT Security Management Implementation, Security Controls, Plan, Implementation of Controls.  Application: Prevention of application security defects and vulnerabilities  Video Link: https://www.youtube.com/watch?v=fXbC_IFrhuE | | |

| Module-3 | L1,L2,L3 | 12 Hours |
|---|---|---|
| Cryptographic Tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Digital Signatures, Random Numbers, Symmetric Encryption. Message Confidentiality: DES, AES, Stream Ciphers, Cipher Block Modes of Operation, Key Distribution. Public Key Cryptography and Message Authentication: Asymmetric Encryption, Secure Hash Functions, HMAC, RSA, Diffie Hellman Algorithm. Internet Security Protocols: SSL, TLS, IPSEC, S/ MIME.<br><br>Application: Authentication, Confidentiality, Security Token<br><br>Video Link: https://www.youtube.com/watch?v=h8YRvQY7lcs | | |
| Module-4 | L1,L2,L3 | 12 Hours |
| Cloud Security: Cloud Computing Service Models and Layers, Security Issues in Cloud Computing. Bluetooth Security: Bluetooth Protocol Stack, Multiple Security Modes. Mobile Security: Security Concepts, Requirements, Architecture.<br><br>Application : Web access<br><br>Video Link : https://www.youtube.com/watch?v=36zducUX16w | | |
| Module-5 | L1,L2,L3 | 12 Hours |
| Wireless Network Security: Wireless Communications and 802.11 WLAN Standards Wireless Protected Access (WPA), IEEE 802.1x, 802.11i/ WPA2, Wireless Network Threats, ZigBee Security, Wireless Mesh Network Security.<br><br>Application: Access control, transmission of data over long distance<br><br>Video Link: https://www.youtube.com/watch?v=yBgcYT1riz8 | | |
| Practical Experiments: | L3 | 20 Hours |
| program to perform encryption and decryption<br><br>program to implement the BlowFish algorithm logic<br><br>Case Study: Digital Signature<br><br>Case Study: Java Security Features/ Matlab Security Features<br><br>Case Study: Authentication in Kerberos | | |
| Course outcomes: | | |
| CO1 | Explain authentication and its application. | |
| CO2 | Choose Cryptography Algorithms based on the application domain of the network. | |

| CO3 | Write code to implement various Encryption/ Decryption algorithms. |
|-----|--------------------------------------------------------------------|
| CO4 | Explain Bluetooth security and mobile security. |
| CO5 | Apply Authentication Protocols and Processes. |

| Text/Reference Books: | |
|-----|--------------------------------------------------------------------|
| 1. | Computer Security: Principles and Practice", William Stallings, Lawrie Brown, Indian Edition, Pearson, 2010. |

| CIE Assessment: |
|-----------------|
| CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests<br>Quizzes/mini tests (4 marks)<br>Mini Project / Case Studies (8 Marks)<br>Activities/Experimentations related to courses (8 Marks) |
| SEE Assessment: |
| Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.<br>Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.<br>One question must be set from each unit.  The duration of examination is 3 hours. |

CO-PO Mapping

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 |  | 2 |  |  |  |  |  |  |  |  |  | 2 |
| CO2 |  |  | 2 |  |  |  |  |  |  |  | 2 |  |
| CO3 |  |  | 2 |  |  |  |  |  |  |  |  |  |
| CO4 |  |  |  | 2 |  |  |  |  |  |  |  |  |
| CO5 |  |  |  |  | 2 |  |  |  |  |  |  |  |

High-3, Medium-2, Low-1

| Course Title | Blockchain Technology | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS644 | CIE | 50 |
| Total No. of Contact Hours | 40 | SEE | 50 |
| No. of Contact Hours/week | 4  (L : T : P :: 3 : 0 : 1) | Total | 100 |
| Credits | 3 | Exam. Duration | 3 Hours |

**Course objective is to:** *This course will enable students to*

Understand how blockchain systems (mainly Bitcoin and Ethereum) work,

To securely interact with them,

Design, build, and deploy smart contracts and distributed applications,

Integrate ideas from blockchain technology into their own projects.

List and describe differences between proof-of-work and proof-of-stake consensus.

| Module-1 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

Application: Elliptic Curve Digital Signature

Video                                                                                                            Link:

https://www.youtube.com/watch?v=jTwOeWgP2eU&list=PLbRMhDVUMngfxxy

| Module-2 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions

and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public Blockchain.

Application: Supply chain and logistics monitoring

Video Link: https://www.youtube.com/watch?v=eS39tn5Cy20

| Module-3 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Application: Approval of transactions on a chain.

Video Link: https://www.youtube.com/watch?v=CdyDoCk8IKs

| Module-4 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

Application : Writing code that controls money, and build. Cryptocurrency exchange.

Video Link: https://www.youtube.com/watch?v=bEHBBLHEeAE

| Module-5 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Application: Real-time IoT operating systems, Personal identity security

Video                                                                                               Link:

https://www.youtube.com/watch?v=u5AbhtoNMYs&list=PLbRMhDVUMngfxxy

| Practical Experiments: |
|---|
| Naive Blockchain construction, |
| Memory Hard algorithm |
| Hashcash implementation, |
| Direct Acyclic Graph, |
| Play with Go-ethereum, |
| Smart Contract Construction, |
| Toy application using Blockchain, |
| Mining puzzles |

| Course outcomes: | |
|---|---|
| CO1 | Learn design principles of Bitcoin and Ethereum and Nakamoto consensus. |
| CO2 | Explain the Simplified Payment Verification protocol. |
| CO3 | Interact with a blockchain system by sending and reading transactions. |
| CO4 | Design, build, and deploy a distributed application. |
| CO5 | Evaluate security, privacy, and efficiency of a given blockchain system. |

| Text/Reference Books: | |
|---|---|
| 1. | Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016). |
| 2. | Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies |
| 3. | Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System |
| 4. | DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper.2014. |
| 5. | Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts |

| CIE Assessment: |
|---|
| CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests |
| Quizzes/mini tests (4 marks) |

| Mini Project / Case Studies (8 Marks) |
|---|
| Activities/Experimentations related to courses (8 Marks) |

| SEE Assessment: |
|---|
| Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. |
| Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. |
| One question must be set from each unit.  The duration of examination is 3 hours. |

CO-PO Mapping

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 3 |   | 2 |   |   |   |   |   |   |   |
| CO2 | 2 | 2 | 3 | 3 | 2 |   |   |   |   |   |   |   |
| CO3 | 3 |   | 2 | 2 |   |   |   |   |   |   |   |   |
| CO4 | 3 |   | 2 | 3 |   |   |   |   |   |   |   |   |
| CO5 | 3 | 3 | 3 | 3 | 3 |   |   |   |   |   |   |   |

High-3, Medium-2, Low-1

| Course Title | Wireless Sensor & Adhoc Network | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS651 | CIE | 50 |
| Total No. of Contact Hours | 40 | SEE | 50 |
| No. of Contact Hours/week | 4  (L : T : P :: 3 : 1 : 0) | Total | 100 |
| Credits | 3 | Exam. Duration | 3 Hours |

| Course objective is to: *This course will enable students to* |
|---|
| Understand the design issues in ad hoc and sensor networks. |
| Learn the different types of MAC protocols. |
| Be familiar with different types of ADHOC routing protocols. |
| Be expose to the TCP issues in ADHOC networks. |
| Learn the architecture and protocols of wireless sensor networks. |

| Module-1 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs) :concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

Application: Television remote control, Wi-Fi, Cell phones, wireless power transfer, computer interface device

Video Link: http://coset.tsu.edu/lab35/

| Module-2 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

Application: Enhancing Learning Using Modular Wireless Sensor Networking (WSN)

Video Link: http://faculty.cs.tamu.edu/ajiang/sensor.pdf

| Module-3 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

Application:

Video Link: https://link.springer.com/chapter/10.1007/978-3-642-11723-7_34

| Module-4 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Single node architecture: hardware and software components of a sensor node - WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4

Application:  An Experimental Study of Low-Power Wireless Sensor Networks

Video Link: https://hal.inria.fr/hal-01147346/file/main.pdf

| Module-5 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.

Application: Research study on choosing an experimentation platform for wireless sensor networks

Video                                                                                                    Link:

https://www.youtube.com/watch?v=3V19nPxpMp8&lc=Ugij232bvNB14ngCoAEC

| Practical Experiments: | |
|---|---|
| An Experimental Study of Low-Power Wireless Sensor Networks | |
| Enhancing Learning Using Modular Wireless Sensor Networking (WSN) | |
| Research study on choosing an experimentation platform for wireless sensor networks | |

| Course outcomes: | |
|---|---|
| CO1 | Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks |
| CO2 | Analyze the protocol design issues of ad hoc and sensor networks |
| CO3 | Design routing protocols for ad hoc networks with respect to some protocol design issues |
| CO4 | Design routing protocols for wireless sensor networks with respect to some protocol design issues |
| CO5 | Evaluate the QoS related performance measurements of ad hoc and sensor networks |

| Text/Reference Books: | |
|---|---|
| 1. | C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008, 89 |
| 2. | Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006. |
| 3. | Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication - 2002. |
| 4. | Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005 |
| 5. | Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, and Applications", John Wiley, 2007. |

| CIE Assessment: | |
|---|---|
| CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests | |

Quizzes/mini tests (4 marks)

Mini Project / Case Studies (8 Marks)

Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. One question must be set from each unit.  The duration of examination is 3 hours.

CO-PO Mapping

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1   |     | 2   |     |     |     |     |     |     |     |      |      | 2    |
| CO2   |     | 2   |     | 2   |     |     |     |     |     |      |      |      |
| CO3   |     |     |     |     | 2   |     |     |     |     |      | 2    |      |
| CO4   |     |     | 2   |     |     |     |     |     |     |      |      |      |
| CO5   |     |     |     |     | 2   |     |     |     |     |      |      |      |

High-3, Medium-2, Low-1

| Course Title | TCP/IP Protocol Suit | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS652 | CIE | 50 |
| Total No. of Contact Hours | 40 | SEE | 50 |
| No. of Contact Hours/week | 4  (L : T : P :: 3 : 1 : 0) | Total | 100 |
| Credits | 3 | Exam. Duration | 3 Hours |

Course objective is to: *This course will enable students to*

Protocols and standards

Know about host resolving protocols and packet deliver

To understand the functions of UDP, TCP protocols

To get the knowledge about network management protocols

To get the knowledge about FTP

| Module-1 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Standards – Internet – History- OSI model – Protocol suite – Addressing – Transmission media – Local Area and Wide Area Networks – Switching – Connecting devices – IP addressing

Application: Identify the IP address of an existing web check

Video Link:  https://www.youtube.com/watch?v=Jlc4E5zxCHQ

| Module-2 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Subnetting – Supernetting – IP packets – Delivery – Routing – Routing model – Routing table – Datagram – Fragmentation – Checksum – IP Design – ARP – RARP – Internet control message protocol – Internet group management protocol

Application: Relieve network congestion

Video Link:  https://www.youtube.com/watch?v=Ct4PU6CyvTQ

| Module-3 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

User Datagram protocol – UDP operation – Use – UDP design – TCP services – Flow control – Error control – TCP operation and design – connection – Transition diagram – Congestion control.

Application: Routing update protocols

Video Link:  NPTEL: https://www.youtube.com/watch?v=f1y25BfOH9I

| Module-4 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

Concurrency – BOOTP – DHCP – Domain name system – Name space – Distribution – Resolution – Messages – Telnet – Rlogin – Network Virtual Terminal – Character Set – Controlling the server – Remote login.

Application: Automate the process of configuring devices on IP networks

Video Link:  NPTEL: https://www.youtube.com/watch?v=8LeqAH_ppsA

| Module-5 | L1,L2,L3 | 12 Hours |
|---|---|---|

Syllabus Content:

File Transfer Protocol – Connections – Communication – Simple Mail Transfer Protocol – Simple Network Management Protocol – Hyper Text Transfer Protocol – Transaction – Request and Response messages.

Application: Network protocol for transferring files between computers over a TCP/IP

Video Link:

NPTEL:  https://www.youtube.com/watch?v=6uzEsZNUfmk

**Hands on experiment :**

Implementation of Client server technology.

Implementation of online result system(Using tomcat server/servlet)

Demo using remote file access.

| CCNA – certification course | |
|---|---|

| Course outcomes: | |
|---|---|
| CO1 | Importance of standards for data transmission |
| CO2 | Know about how the node to node data transmission occur |
| CO3 | Get knowledge about where and how to use TCP and UDP protocols |
| CO4 | Get the knowledge about Network administration |
| CO5 | How to use FTP for transfer files between systems. |

| Text/Reference Books: | |
|---|---|
| 1. | Behrouz A. Forouzan, "TCP/IP Protocol Suite", Tata McGraw Hill Edition 2000. |
| 2. | Douglas E. Comer, David L. Stevens, "Internetworking with TCP/IP – Volume I, II and III", Prentice-Hall of India Pvt. Ltd., 2nd Edition 1994 |

| CIE Assessment: |
|---|
| CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests<br><br>Quizzes/mini tests (4 marks)<br><br>Mini Project / Case Studies (8 Marks)<br><br>Activities/Experimentations related to courses (8 Marks) |
| SEE Assessment: |
| Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.<br><br>Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.<br><br>One question must be set from each unit.  The duration of examination is 3 hours. |

## CO-PO Mapping

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1   |     | 2   |     |     |     |     |     |     |     |      |      | 2    |
| CO2   |     |     | 2   |     |     |     |     |     |     |      |      |      |
| CO3   |     | 2   |     |     | 2   |     |     |     |     |      | 2    |      |
| CO4   |     |     |     | 2   |     |     |     |     |     |      |      |      |
| CO5   |     |     |     |     |     | 2   |     |     |     |      |      |      |

High-3, Medium-2, Low-1

| Course Title | Programming Language Principles | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS653 | CIE | 50 |
| Total No. of Contact Hours | 40 | SEE | 50 |
| No. of Contact Hours/week | 4  (L : T : P :: 3 : 1 : 0) | Total | 100 |
| Credits | 3 | Exam. Duration | 3 Hours |

Course objective is to:

Learn constructs in a language.

Understand data, data types, and basic statements and understand call-return Statements, ways of implementing them.

Design a new construct/ language.

Choose appropriate language for real world problem solving, based on the required features.

Evaluate various language design features considering the programming paradigm.

| Module -1 | L1,L2,L3 | 12 Hours |
|---|---|---|

Reasons for Studying, Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Programming Paradigms – Imperative, Object Oriented, Functional Programming, Logic Programming, Programming Language Implementation – Compilation and Virtual Machines, Programming Environments. Names, Binding, Type Checking and Scopes: Names, Variables, Binding of Attributes to Variables, Type Bindings, Type Inferencing, Type Checking, Strong Typing

Application: Developing application or System Software's.

Video Link:

https://www.freecodecamp.org/news/what-exactly-is-a-programming-paradigm/

https://nptel.ac.in/courses/106/102/106102067/

| Module -2 | L1,L2,L3 | 12 Hours |
|---|---|---|

Type Equivalence, Scope, Scope and Lifetime, Referencing Environments. Data types: Introduction, Primitives, Character, User Defined, Array, Associative, Record, Union, Pointer and Reference Types, Design and Implementation Issues Related to These Types, Names, Variable, Concept of Binding, Type Checking, Strong Typing, Type Compatibility, Named Constants, Variable Initialization. Expressions and Statements: Short Circuit Evaluation, Mixed Mode Assignment, Assignment Statements, Cascading Operators.

Application: Developing application or System Software's

Video Link:

https://www.digimat.in/nptel/courses/video/106102067/L40.html

| Module - 3 | L1,L2,L3 | 12 Hours |
|---|---|---|

Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, Guarded Commands. Subprograms and Blocks: Fundamentals of Subprograms, Scope and Lifetime of Variable, Static and Dynamic Scope, Design Issues of Subprograms and Operations, Local Referencing Environments, Parameter Passing Methods, Overloaded Subprograms, Generic Subprograms, Parameters that are Subprogram Names.

Application: Developing application or System Software's

Video Link:

https://www.digimat.in/nptel/courses/video/106102067/L22.html

| Module-4 | L1,L2,L3 | 12 Hours |
|---|---|---|

Design Issues for Functions, User Defined Overloaded Operators, Co-Routines and Function Closures. Abstract Data types: Abstractions and Encapsulation, Introduction to Data Abstraction, Design Issues, Object Oriented Concepts with Reference to Java and Python.

Application: Developing application or System Software's

Video Link:

| Module-5 | L1,L2,L3 | 12 Hours |
|---|---|---|

Exception handling: Exceptions, Specifications, Exception Propagation. Logic Programming Language: Introduction and Overview of Logic Programming, Basic Elements of Prolog, Application of Logic Programming. Functional Programming Languages: Introduction, Fundamentals of FPL, Applications of Functional Programming Languages and Exploration of the Features, Comparison of Functional and Imperative Languages.

Application: Developing application or System Software's

Video Link:

Practical Experiments:

Programs on Array

Programs on Function

Programs on Control Structure

Programs on overloaded operators

Programs on Object Oriented Concepts with Reference to Java and Python.

Course outcomes:

| CO1 | Choose a particular language for problem solving depending on the application domain. |
|---|---|
| CO2 | Analyze and compare programming language concepts. |
| CO3 | Analyze the implementation issues related to a language design. |
| CO4 | Identify the language design features of any language and evaluate them. |
| CO5 | Identify language features required for supporting various paradigms. |

| Text/Reference Books: | |
|---|---|
| 1. | Concepts of Programming Languages", Robert W Sebesta, Pearson Education, 10th Edition, 2012 |
| 2. | Programming Language Pragmatics", Michael L Scott, Elsevier, 3rd Edition, 2009. |
| 3. | Programming Languages Design and Implementation", Pratt, Zelkowitz, Prentice Hall/ Pearson Education, 4th Edition, 2001. |

| CIE Assessment: |
|---|
| CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests<br><br>Quizzes/mini tests (4 marks)<br><br>Mini Project / Case Studies (8 Marks)<br><br>Activities/Experimentations related to courses (8 Marks) |
| SEE Assessment: |
| Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.<br><br>Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.<br><br>One question must be set from each unit.  The duration of examination is 3 hours. |

### CO-PO Mapping

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 3 | | | | | 2 | | |
| CO2 | 3 | 3 | 3 | 2 | 3 | | | | | 2 | | |
| CO3 | 3 | 3 | 2 | 2 | 3 | | | | | 2 | | |
| CO4 | 3 | 3 | 2 | 2 | 3 | | | | | 2 | | |
| CO5 | 3 | 3 | 3 | 2 | 3 | | | | | 2 | | |

High-3, Medium-2, Low-1

| Course Title | Free and Open-Source Software | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19IS654 | CIE | 50 |
| Total No. of Contact Hours | 40 | SEE | 50 |
| No. of Contact Hours/week | 4 (L : T : P :: 4 : 0 : 0) | Total | 100 |
| Credits | 3 | Exam. Duration | 3 Hours |

| Course objective is to: |  |  |
|---|---|---|
| Learn about Open Source Software |  |  |
| Open Source Software Licensing |  |  |
| Legal Issues and Software Licensing |  |  |
| Software Development models in Open Source Software |  |  |
| Open Source Software Practice |  |  |
| Module -1 | L1,L2,L3 | 12 Hours |

Open Source Licensing, Contract, and Copyright Law: Basic Principles of Copyright Law - Contract and Copyright - Open Source Software Licensing - Issues with Copyrights and Patents - The Open Source Definition – Warranties.

The MIT, BSD, Apache, and Academic Free Licenses: The MIT (or X) License - The BSD License - The Apache License, v1.1 and v2.0 17 - The Academic Free License - Application and Philosophy.

The GPL, LGPL, and Mozilla Licenses: GNU General Public License -

GNU Lesser General Public License - The Mozilla Public License 1.1 (MPL 1.1) - Application and Philosophy

Application: Make the informed decision to choose the right budget friendly software to meet the required need by understanding open source rules and copyrights.

Video Link:

https://www.gnu.org/licenses/license-list.en.html

| Module -2 | L1,L2,L3 | 12 Hours |
|---|---|---|

The Q Public License - Artistic License (Perl) - Creative Commons Licenses.

Non-Open Source Licenses: Classic Proprietary License - Sun Community Source License - Microsoft Shared Source Initiative

Application: Make the informed decision to choose the right budget friendly software to meet the required need for office automation, web design, content management

Video Link:

https://doc.qt.io/qt-5/licenses-used-in-qt.html

| Module - 3 | L1,L2,L3 | 12 Hours |
|---|---|---|

Entering Contracts - Statutory Developments Related to Software Contracts - The Self-Enforcing Nature of Open Source and Free Software Licenses - The Global Scope of Open Source and Free Software Licensing - The "Negative Effects" of Open Source and Free Software Licensing - Community Enforcement of Open Source and Free Software Licenses - Compatible and Incompatible Licensing: Multiple and Cross Licensing

Application: Make the informed decision to choose the right budget friendly software to meet the required need by understanding complete legal terms and conditions and its impact if a open source software is selected.

Video Link:

https://resources.whitesourcesoftware.com/blog-whitesource/open-source-licenses-explained

| Module-4 | L1,L2,L3 | 12 Hours |
|---|---|---|

Models of Open Source and Free Software Development – Forking - Choosing an Open Source or Free Software License - Drafting Open Source Licenses

Application: Make the informed decision to choose the right budget friendly software to meet the required need by understanding complete legal terms and

conditions and its impact if a open source software is selected for software development and its commercial use.

Video Link:

https://moqod.com/understanding-open-source-and-free-software-licensing/

| Module-5 | L1,L2,L3 | 12 Hours |
|---|---|---|

MySQL – Open Source Tools: - Joomla-components-themes-template-webpage design.

Programming Language: Intro to Python Data types-data structures- Subroutines-Python-files-object oriented programming using Python.

Application: Office automation, web design, content management ,Data Science

Video Link:

https://eprints.qut.edu.au/13673/1/open_source_book.pdf

Practical Experiments:

Hands-On (Linux software installation)

Hands-On training - Python

Hands-On (My Sql install ,create a schema, Create Table etc)

Develop Web Application with MVC Architecture Using only Open Source Software or Tools.

Do a market Survey and arrive top 3 most used open source Databases and Scripting Languages also list down five pros and cons for each open source Software.

Course outcomes:

| CO1 | Distinguish the different between Free and Non-Free Software |
|---|---|
| CO2 | Licensing about open source software |
| CO3 | Consequences of pirated software |
| CO4 | Open source software development models |
| CO5 | Can develop database and programming using Python. |

| Text/Reference Books: | |
|---|---|
| 1. | Andrew M. St. Laurent, Understanding Open Source and Free Software Licensing, O'relly media, 2011. |
| 2. | Larry Ullman, PHP and MySQL for Dynamic Web Sites: Visual QuickPort Guide, 2011, 4th Edition, Peachpit Press. |
| 3. | Dr. Martin Jones, Python for complete beginners, 2015, First edition, Create Space Independent Publishing Platform. |
| 4. | Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell", Sixth Edition, OReilly Media, 2009. |

| CIE Assessment: |
|---|
| CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests<br><br>Quizzes/mini tests (4 marks)<br><br>Mini Project / Case Studies (8 Marks)<br><br>Activities/Experimentations related to courses (8 Marks) |
| SEE Assessment: |
| Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.<br><br>Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.<br><br>One question must be set from each unit. The duration of examination is 3 hours. |

## CO-PO Mapping

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 3 | 2 | 3 | | | | | 2 | | |
| CO2 | 3 | 3 | 3 | 2 | 3 | | | | | 2 | | |
| CO3 | 3 | 3 | 2 | 2 | 3 | | | | | 2 | | |
| CO4 | 3 | 3 | 2 | 2 | 3 | | | | | 2 | | |
| CO5 | 3 | 3 | 3 | 2 | 3 | | | | | 2 | | |

High-3, Medium-2, Low-1

| Course Title | Artificial Intelligence Laboratory | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19ISL66 | CIE | 50 |
| Total No. of Contact Hours | 30 | SEE | 50 |
| No. of Contact Hours/week | 3 (L : T : P :: 0 : 1 : 2) | Total | 100 |
| Credits | 2 | Exam. Duration | 3 Hours |

Course objective is to: *This course will enable students to*

Demonstrate PROLOG in AI

Compare and contrast different AI techniques available.

Demonstrate learning algorithms

Design different learning algorithms for improving the performance of AI systems.

Implement projects using different AI learning techniques.

| Sl No | Experiment Name | RBT Level | Hours |
|---|---|---|---|
| 1 | Study of PROLOG. | L3 | 4 |
| 2 | Write simple fact for the statements using PROLOG. | L3 | 4 |
| 3 | Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below | L3 | 4 |
| 4 | Write a program to solve the Monkey Banana problem. | L3 | 4 |
| 5 | WAP in turbo PROLOG for medical diagnosis and show the advantage and disadvantage of green and red cuts. | L3 | 4 |
| 6 | WAP to implement factorial, Fibonacci of a given number. | L3 | 4 |
| 7 | Write a program to solve 4-Queen problem. | L3 | 4 |
| 8 | Write a program to solve traveling salesman problem | L3 | 4 |
| 9 | Write a program to solve water jug problem using LISP | L3 | 4 |
| 10 | Implement mini project using PROLOG | L3 | 4 |

| Course outcomes: | |
|---|---|
| CO1 | Demonstrate PROLOG commands |
| CO2 | Apply AI search Models and Generic search strategies. |

| | |
|---|---|
| CO3 | Write Logic for representing Knowledge and Reasoning of AI systems. |
| CO4 | Design different learning algorithms for improving the performance of AI systems. |
| CO5 | Implement projects using different AI learning techniques. |

**CIE Assessment:**

Regular Lab work :20

Record writing :5

Lab Tests(Minimum 2 tests shall be conducted for 15 marks and average of two will be taken)

Viva 10 marks

**SEE Assessment:**

Examinations will be conducted for 100 marks and scaled-down to 50. The weightage shall be,

Write-up : 20 marks

Conduction : 40 marks

Analysis of results : 20 marks

Viva : 20

**CO-PO Mapping**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | | 2 | | | | | | | |
| CO2 | 2 | 2 | 3 | | 2 | | | | | | | |
| CO3 | 3 | 2 | 3 | | 2 | | | | | | | |
| CO4 | 2 | 1 | 3 | | 2 | | | | | | | |
| CO5 | 2 | 1 | 3 | | 2 | | | | | | | |

High-3, Medium-2, Low-1

| Course Title | Internet of Things Laboratory | Semester | VI |
|---|---|---|---|
| Course Code | MVJ19ISL67 | CIE | 50 |
| Total No. of Contact Hours | 30 | SEE | 50 |
| No. of Contact Hours/week | 3 (L : T : P :: 0 : 1 : 2) | Total | 100 |
| Credits | 2 | Exam. Duration | 3 Hours |

Course objective is to: *This course will enable students to*

Install IoT applications and handling IoT tools.

Illustrate the methods of deploying smart objects and connect them to network.

Compare different Application protocols for IoT.

Infer the role of Data Analytics and Security in IoT.

Identify sensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.

| Sl No | Experiment Name | RBT Level | Hours |
|---|---|---|---|
| 1 | Create a program that blinks the LED on the Arduino development board. Create a program that blinks the LED on the Raspberry Pi development board using | L3 | 4 |
| 2 | Create a program that sensor can able to communicate with the attached PC. Use a serial terminal for the communication. Create a program that displays data from the sensor in regular intervals in a compact format. | L3 | 4 |
| 3 | Develop one-one connection from the available sensors and actuators and create code that will display the sensed data on the PC using Arduino | L3 | 4 |
| 4 | Attach the radio unit to the board. The radio uses SPI bus. Identify and connect the appropriate pins. Take care about interference between sensor and the radio! And Check the | L3 | 4 |

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|---|---|---|---|
| | operation of the communication at the gateway. Check that the communication is working bidirectionally. | | |
| 5 | Creating a virtual device: Login to devicehub.net and create a project then create a virtual device. Add the corresponding sensor and actuator to the virtual device. Take note of the IDs and data required for accessing the virtual devices. Examine how the virtual sensors and actuators can be reached using MQTT protocol. | L3 | 4 |
| 6 | Create a connection from an MQTT capable device/software with an MQTT broker then send and receive data using it. The PCs have MQTTfx installed but other software can be used as well.<br>Send and receive messages to/from the virtual device. The format and channel of the messages are detailed in the syllabus. | L3 | 4 |
| 7 | Develop a program that your Raspberry Pi interact with online services through the use of public APIs and SDKs. | L3 | 4 |
| 8 | Develop Python-based IDE (integrated development environments) for the Raspberry Pi. Trace and debug Python code on the device | L3 | 4 |
| 9 | Develop a project using IoT devices and Cloud for automation | L3 | 4 |
| 10 | Developing a simple automation project using Arduino Uno Or Raspberry Pi for Agriculture irrigation using various related sensors | L3 | 4 |
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| Course outcomes: | |
|---|---|
| CO1 | Learn and understand IoT applications and tools |
| CO2 | Interfacing Sensor and Actuator with Arduino and Raspberry Pi development board. |
| CO3 | Implementing IoT device by interfacing communication modules |

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|---|---|
| CO4 | Developing real tome examples using Python |
| CO5 | Elaborate the use of smart objects for designing smart systems |

| CIE Assessment: |
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| Regular Lab work :20 |
| Record writing :5 |
| Lab Tests(Minimum 2 tests shall be conducted for 15 marks and average of two will be taken) |
| Viva 10 marks |
| SEE Assessment: |
| Examinations will be conducted for 100 marks and scaled-down to 50. The weightage shall be, |
| Writeup : 20 marks |
| Conduction : 40 marks |
| Analysis of results : 20 marks |
| Viva : 20 |
| CO-PO Mapping |

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 2 | | | | | | | |
| CO2 | 3 | 3 | 3 | 2 | 2 | 2 | | | | | | |
| CO3 | 3 | 3 | 3 | 3 | 2 | | | | | | | |
| CO4 | 2 | 1 | 3 | | 2 | | | | | | | |
| CO5 | 2 | 1 | 3 | | 2 | | | | | | | |

High-3, Medium-2, Low-1