



MVJCE CURRICULUM

FOR

**COMPUTER SCIENCE &
ENGINEERING (Scheme 2019)**

VI SEMESTER

Course Title	PYTHON APPLICATION PROGRAMMING	Semester	06
Course Code	MVJ19CS61	CIE	50
Total No. of Contact Hours	50	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 2 : 0)	Total	100
Credits	4	Exam. Duration	3 Hours

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

- Learn the syntax and semantics of Python programming language.
- Illustrate the process of structuring the data using lists, tuples and dictionaries.
- Demonstrate the use of built-in functions to navigate the file system.

- Implement the Object Oriented Programming concepts in Python.
- Appraise the need for working with various documents like Excel, PDF, Word and Others.

Module-1	L1, L2, L3, L4	Hours 10
<p>Python Basics, Entering Expressions into the Interactive Shell, Various Interactive shells: IDLE, Jupyter Notebook, Spyder , Google Colabs, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Dissecting Your First Program,</p> <p>Flow control, Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(),</p> <p>Functions, def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments, Lambda Functions, Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number</p> <p>Real Time Applications: Using github or SVN for maintaining versions of python project</p> <p>Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> • https://nptel.ac.in/courses/106/106/106106145/ • https://www.youtube.com/watch?v=9MmC_uGjBsM&feature=emb_logo • https://www.youtube.com/watch?v=HGGdN94SvC8&feature=emb_logo 		
Module-2	L1, L2, L3, L4	Hours 10
<p>Lists, The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List,</p> <p>Tuples: Working with Tuples, Mutable vs. Immutable, Methods</p> <p>Sets: Working with Sets, Methods</p> <p>Dictionaries and Structuring Data, The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things,</p> <p>Manipulating Strings, Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup</p> <p>Real Time Applications: Analyze Craft Beer with Dictionaries</p> <p>Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> • https://www.coursera.org/learn/python-data/home/welcome • https://www.youtube.com/watch?v=IR8DWx2fcbQ&feature=emb_logo • https://www.youtube.com/watch?v=Uu4PnnWlqsA&feature=emb_logo 		
Module-3	L1, L2, L3, L4	Hours 10

Pattern Matching with Regular Expressions,

Finding Patterns of Text Without Regular Expressions, Finding Patterns of Text with Regular Expressions, More Pattern Matching with Regular Expressions, Greedy and Nongreedy Matching, The findall() Method, Character Classes, Making Your Own Character Classes, The Caret and Dollar Sign Characters, The Wildcard Character, Review of Regex Symbols, Case-Insensitive Matching, Substituting Strings with the sub() Method, Managing Complex Regexes, Combining re .IGNORECASE, re .DOTALL, and re .VERBOSE, Project: Phone Number and Email Address Extractor,

Reading and Writing Files, Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the print.format() Function, Project: Generating Random Quiz Files, Project: Multiclipboard,

Organizing Files, The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Project: Renaming Files with American-Style Dates to European-Style Dates, Project: Backing Up a Folder into a ZIP File,

Debugging, Raising Exceptions, Getting the Traceback as a String, Assertions, Logging, IDLE's Debugger.

Real Time Applications: Extracting emails from a Text Document

Video link / Additional online information (related to module if any):

- <https://www.coursera.org/lecture/python-network-data/11-1-regular-expressions-bMyWb>
- https://www.youtube.com/watch?v=FWB0t6TcH3E&feature=emb_logo

Module-4

L1,L2,L3,L4

Hours 10

Classes and objects, Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying,

Classes and functions, Time, Pure functions, Modifiers, Prototyping versus planning,

Classes and methods, Object-oriented features, Printing objects, Another example, A more complicated example, The init method, The-str method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation,

Inheritance, Card objects, Class attributes, Comparing cards, Decks, Printing the deck, Add, remove, shuffle and sort, Inheritance, Class diagrams, Data encapsulation

Real Time Applications: Python code that uses object-oriented programming to flip a coin

Video link:

- <https://www.udemy.com/course/python-beyond-the-basics-object-oriented-programming/>

Module-5

L1,L2,L3,L4

Hours 10

Web Scraping, Project: MAPIT.PY with the web browser Module, Downloading Files from the Web with the requests Module, Saving Downloaded Files to the Hard Drive, HTML, Parsing HTML with the BeautifulSoup Module, Project: "I'm Feeling Lucky" Google Search, Project: Downloading All XKCD Comics, Controlling the Browser with the selenium Module,

Working with Excel Spreadsheets, Excel Documents, Installing the openpyxl Module, Reading Excel Documents, Project: Reading Data from a Spreadsheet, Writing Excel Documents, Project: Updating a Spreadsheet, Setting the Font Style of Cells, Font Objects, Formulas, Adjusting Rows and Columns, Charts,

Working with PDF and Word Documents, PDF Documents, Project: Combining Select Pages from Many PDFs, Word Documents,

Working with CSV files and JSON data, The csv Module, Project: Removing the Header from CSV Files, JSON and APIs, The json Module, Project: Fetching Current Weather Data,

Real Time Applications: build a real-time scraper with Python, Flask, Requests, and BeautifulSoup!

Video link:

- <https://www.udemy.com/course/web-scraping-python-tutorial/>
- <https://www.udemy.com/course/automationpython/>

Course Outcomes:

C01	Understand Python syntax and semantics and be fluent in the use of Python flow control and functions.
C02	Demonstrate proficiency in handling Strings and File Systems.
C03	Implement Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
C04	Interpret the concepts of Object-Oriented Programming as used in Python
C05	Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

Text Books:

1	Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", 1st Edition, Create Space Independent Publishing Platform, 2016. (http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf)
2	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015. (http://greenteapress.com/thinkpython2/thinkpython2.pdf)

Reference Books:

1	Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd.
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	ISBN-13: 978-8126556014
2	Mark Lutz, "Programming Python", 4th Edition, O'Reilly Media, 2011. ISBN-13: 978-9350232873
3	Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365
4	Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "Data Structures and Algorithms in Python", 1st Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176
5	Reema Thareja, "Python Programming using problem solving approach", Oxford university press, 2017
6	Al Sweigart, "Automate the Boring Stuff with Python", 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/)

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:

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

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	1	-	-	-	-	-	-	2	3	-
CO2	3	3	3	-	-	-	-	-	1	-	1	2	-	
CO3	2	2	2	1	3	-	-	-	-	-	1	3	2	3
CO4	3	2	3	-	-	-	-	-	-	2	3	2	-	-
CO5	3	2	3	-	-	-	-	-	-	2	3	2	2	3

High-3, Medium-2, Low-1

Course Title	CRYPTOGRAPHY AND NETWORK SECURITY	Semester	06
Course Code	MVJ19CS62	CIE	50
Total No. of Contact Hours	50	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 2 : 0)	Total	100
Credits	4	Exam. Duration	3 Hours

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

- Acquire fundamental knowledge on the concepts of finite fields and number theory.
- To gain various block cipher and stream cipher models.
Describe the principles of public key cryptosystems, hash functions and digital signature.
Learn the various malicious attacks and firewall applications.
To develop various security protocols for web and email applications

Module-1	L1, L2, L3	Hours 10
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INTRODUCTION & NUMBER THEORY: Services, Mechanisms and attacks– Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques. finite fields and number theory: Groups, Rings, Fields–Modular arithmetic– Euclid’s algorithm–Finite fields– Polynomial Arithmetic Prime numbers–Fermat’s and Euler’s theorem– Testing for primality –The Chinese remainder theorem– Discrete logarithms.

Applications: Developing cryptographic algorithms

Video link / Additional online information (related to module if any):

- <https://www.cc.gatech.edu/~echow/ipcc/hpc-course/>
- <https://nptel.ac.in/courses/111/103/111103020/>

Module-2

L2, L3

Hours 10

BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY:Data Encryption Standard–Block cipher principles– block cipher modes of operation–Advanced Encryption Standard (AES)–Blowfish–RC5 algorithm. Public key cryptography: Principles of public key cryptosystems–The RSA algorithm–Key management – Diffie Hellman Key exchange– Elliptic curve arithmetic–Elliptic curve cryptography.

Applications: Online transactions

Video link / Additional online information (related to module if any):

- <http://www.infocobuild.com/education/audio-video-courses/computer-science/IntroductionToCryptography-Ruhr/lecture-08.html>
- <https://www.comparitech.com/blog/information-security/diffie-hellman-key-exchange/>

Module-3

L2,L3, L4

Hours 10

HASH FUNCTIONS AND DIGITAL SIGNATURES:Authentication requirement Authentication function MAC Hash function Security of hash function and MAC MD5 – SHA – HMAC CMAC – Digital signature and authentication protocols DSS El Gamal Schnorr.

Applications: Cyber forensic

Video link / Additional online information (related to module if any):

- <https://www.educba.com/md5-algorithm/>
- https://www.tutorialspoint.com/cryptography/cryptography_digital_signatures.htm

Module-4

L3,L4, L6

Hours 10

SECURITY PRACTICE & SYSTEM SECURITY: Authentication applications Kerberos X.509 Authentication services – Internet Firewalls for Trusted System: Roles of Firewalls Firewall related terminology– Types of Firewalls – Firewall designs – SET for E-Commerce Transactions. Intruder Intrusion detection system Virus and related threats Countermeasures.

Applications:Antivirus / Malware detecting software

Video link / Additional online information (related to module if any):

- <https://www.simplilearn.com/what-is-kerberos-article>
- <https://searchsecurity.techtarget.com/feature/The-five-different-types-of-firewalls>

Module-5	L4,L5,L6	Hours 10
<p>E-MAIL, IP & WEB SECURITY: E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IPSecurity: Overview of IPsec - IP and IPv6-Authentication Header-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSL-SET</p> <p>Applications: Email and Banking applications</p> <p>Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> • https://www.barracuda.com/glossary/email-security • https://www.youtube.com/watch?v=ubHZQrECeew 		
Course Outcomes:		
CO1	Implement number theory for various identified attacks.	
CO2	Design and develop the public key cryptographic algorithms.	
CO3	Develop the digital signature and hashing algorithms	
CO4	Design a firewall for detecting malicious attacks.	
CO5	Design the protocols for improving security on email, web and IP.	

Text Books:	
1	William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.
2	Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.
3	Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007.

Reference Books:	
1	Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
2	Charles Pfleeger, "Security in Computing", 4th Edition, Prentice Hall of India, 2006.
3	Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.

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- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

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

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	-	1	-	2	-	-	2	3
CO2	3	2	2	1	-	-	-	-	-	2	-	1	2	2
CO3	2	3	1	3	-	1	1	1	-	1	-	2	2	1
CO4	3	2	2	1	-	2	-	-	-	-	2	1	2	2
CO5	2	2	3	3	-	1	2	1	2	-	1	2	2	2

High-3, Medium-2, Low-1

Course Title	MOBILE APPLICATION DEVELOPMENT	Semester	06
Course Code	MVJ19CS631	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

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

- Understand system requirements for mobile applications.
- Generate suitable design using specific mobile development frameworks.
- Implement the design using specific mobile development frameworks.
- Deploy the mobile applications in marketplace for distribution.

Module-1	L1,L2 ,L3	Hours 8
<p>Introduction: Introduction to mobile application – Market values for mobile applications System requirements for mobile application Mobile application development architecture.</p> <p>Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> • https://www.tutorialspoint.com/android/ Online 		
Module-2	L2, L3	Hours 8

<p>Designing Applications using Android: Developing user interfaces –Layout –Input Controls and Events– Menus – Dialogs, Notifications and Toasts Applications: Design a Simple Calculator App Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> • http://www.androidhive.info/ 		
Module-3	L2,L3, L4	Hours 8
<p>Multimedia & Services: Lifecycle of a Service – Managing Services GPS location API Playing audio, video. Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> • https://nptel.ac.in/courses/106/106/106106147/ 		
Module-4	L3,L4, L6	Hours 8
<p>Technology I Android: Introduction Establishing the development environment Android architecture Activities and views Interacting with UI Persisting data using SQLite Packaging and deployment. Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> • http://developer.android.com/develop/index.htm 		
Module-5	L4,L5, L6	Hours 8
<p>Technology II IOS: Introduction to Objective C IOS features UI implementation Touch frameworks Data persistence using Core Data and SQLite. Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> • https://www.codeschool.com/learn/ios 		
Course Outcomes:		
CO1	Demonstrate knowledge on basics of mobile application.	
CO2	Understand the framework of mobile application and design simple interfaces	
CO3	Create an application using multimedia components.	
CO4	Develop and deploy application with server side connectivity.	
CO5	Understand basic concepts of IOS	

Text Books:	
1	Jeff McW herter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
2	David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6 Development: Exploring the iOS SDK", Apress, 2013.

Reference Books:	
1	James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012
2	Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012

CIE Assessment:

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- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

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

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	-	-	-	-	-	-	-	3	1	-
CO2	3	3	1	-	-	-	-	-	-	-	-	3	3	-
CO3	3	3	1	2	-	-	-	-	-	1	-	3	1	-
CO4	3	3	3	3	-	-	-	2	2	2	-	3	2	2
CO5	3	3	3	3	-	-	2	2	3	2	-	3	1	-

High-3, Medium-2, Low-1

Course Title	CLOUD COMPUTING	Semester	06
Course Code	MVJ19CS632	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

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

- Understand the fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges;
- Introduce the basic ideas and principles in data center design; cloud management techniques and cloud software deployment considerations;
- Discuss the different CPU, memory and I/O virtualization techniques that serve in offering software, computation and storage services on the cloud; Software Defined Networks (SDN) and Software Defined Storage (SDS);
- Introduce cloud storage technologies and relevant distributed file systems, NoSQL databases and object storage;
- Discuss the variety of programming models and develop working experience in several of them.

Module-1

L1,L2 , L3

Hours 8

Introduction to Cloud Computing: Cloud Computing in a Nutshell, Roots of Cloud Computing, Layers and Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks, Broad Approaches to

Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud. Introduction to big data analytics, using MapReduce/Hadoop for analyzing unstructured data, Hadoop ecosystem of tools.

Applications:

Microsoft Azure, Amazon Web Services

Video link / Additional online information :

- <https://www.youtube.com/watch?v=PW-V-72MJNY>

Module-2	L2 , L3	Hours 8
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'Integration as a Service' Paradigm for the Cloud Era :An Introduction, The Onset of Knowledge Era, The Evolution of SaaS , The Challenges of SaaS Paradigm, Approaching the SaaS Integration Enigma, New Integration Scenarios, The Integration Methodologies, SaaS Integration Products and Platforms , SaaS Integration Services, Businesses-to-Business Integration (B2Bi) Services, A Framework of Sensor-Cloud Integration, SaaS Integration Appliances, Issues for Enterprise Applications on the Cloud, Transition Challenges, Enterprise Cloud Technology and Market Evolution, Business Drivers Toward a Marketplace for Enterprise Cloud Computing, The Cloud Supply Chain

Laboratory Sessions/ Experimental learning:

1. Installation and Configuration of Hadoop.

Applications: PAAS(Facebook, Google App Engine)

Video link / Additional online information :

- <https://www.youtube.com/watch?v=ifZh5SJAujA>

Module-3	L2, L3, L4	Hours 8
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Virtual Machines Provisioning and Migration Services: Introduction and Inspiration- Background and Related Work-Virtual Machines Provisioning and Manageability- Virtual Machine Migration Services- VM Provisioning and Migration in Action Provisioning in the Cloud Context- The Anatomy of Cloud Infrastructures-Distributed Management of Virtual Infrastructures - Scheduling Techniques for Advance Reservation of Capacity- Capacity Management to meet SLA Commitments- RVWS Design and Cluster as a Service: The Logical Design

Laboratory Sessions/ Experimental learning:

Implementation of Para-Virtualization using VM Ware's Workstation/ Oracle's Virtual Box and Guest O.S

Applications:

Hardware Virtualization, Operating system Virtualization, Server Virtualization, Storage Virtualization

Video link / Additional online information :

- <https://www.youtube.com/watch?v=7m3f-P-WWbg>

Module-4	L3,L4 , L6	Hours 8
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Platform and Software as a Service:Technologies and Tools for Cloud Computing- Aneka Cloud Platform- Aneka Resource Provisioning Service- Hybrid Cloud Implementation - CometCloud

Architecture- Autonomic Behavior of CometCloud- Overview of CometCloud-based Applications- Implementation and Evaluation- Workflow Management Systems and Clouds- Architecture of Workflow Management Systems - Utilizing Clouds for Workflow Execution- Case Study: Evolutionary Multi objective Optimizations- Visionary thoughts for Practitioners

Laboratory Sessions/ Experimental learning:

Create an application (Ex: Word Count) using Hadoop Map/Reduce.

Applications: Schedule book

Video link / Additional online information :

- <https://www.youtube.com/watch?v=3KJjKY8k9Lk>

Module-5	L4, L5, L6	Hours 8
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MapReduce Programming Model and Implementations:MapReduce Programming Model- Major MapReduce Implementations for the Cloud- The Basic Principles of Cloud Computing-A Model for Federated Cloud Computing- Traditional Approaches to SLO Management- Types of SLA- Life Cycle of SLA- SLA Management in Cloud- Automated Policy-based Management- The Current State of Data Security in the Cloud-Data Privacy and Security Issues-Producer_Consumer Relationship-Cloud Service Life Cycle

Laboratory Sessions/ Experimental learning:

Create your resume in a neat format using google and zoho cloud Programs on PaaS

Applications: Network Storage, Google Apps and Microsoft office online

Video link / Additional online information :

- https://www.youtube.com/watch?v=uj2Sb7b_Do0

Course Outcomes:

CO1	Recall the recent history of cloud computing, illustrating its motivation and evolution.
CO2	List some of the enabling technologies in cloud computing and discuss their significance
CO3	Articulate the economic benefits as well as issues/risks of the cloud paradigm for businesses as well as cloud providers
CO4	Define SLAs and SLOs and illustrate their importance in Cloud Computing.
CO5	List some of the common cloud providers and their associated cloud stacks and recall popular cloud use case scenarios.

Text Books:

1	Cloud Computing, Principles and Paradigms, Rajkumar Buyya, James Broberg, Wiley Publication
2	Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier(MK) 2013.

Reference Books:

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1	Barrie Sosinsky, "Cloud Computing Bible", John Wiley & Sons, 2010.
2	Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly, 2009.

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

SEE Assessment:

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CO-PO/PSO Mapping

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CO1	2	1	1	-	1	1	2	-	-	-	-	-	1	-
CO2	3	3	3	3	2	-	-	-	-	-	-	-	-	-
CO3	1	-	-	1	1	-	2	3	3	3	3	-	2	-
CO4	3	3	2	2	2	-	-	-	-	-	-	3	-	-
CO5	3	3	3	3	3	2	-	-	3	3	3	3	2	1

High-3, Medium-2, Low-1

Course Title	AGILE TECHNOLOGIES	Semester	06
Course Code	MVJ19CS633	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours
Course objective is to:			
<ul style="list-style-type: none"> • Discuss the essence of agile development methods. • Carry out all stages of an agile software process in a team, to produce working software. • Provide practical knowledge of how to manage a project using Scrum framework. • Use test driven development to ensure software quality. • Should be able to demonstrate a more advanced capability to apply lean and agile development techniques to solve complex problems. 			
Module-1		L1,L2 ,L3	Hours 8
Fundamentals of Agile: The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools			
Module-2		L1,L2 ,L3	Hours 8
Agile Scrum Framework: Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management			
Module-3		L1,L2 ,L3	Hours 8
Agile Testing: The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester			
Module-4		L1,L2 ,L3	Hours 8
Agile Software Design and Development: Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control.			
Module-5		L1,L2 ,L3	Hours 8

Industry Trends: Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies.

Course Outcomes:

CO1	Understand the background and driving forces for taking an Agile approach to software development.
CO2	Understand the business value of adopting Agile approaches.
CO3	Drive development with unit tests using Test Driven Development
CO4	Deploy automated build tools, version control and continuous integration
CO5	Apply design principles and refactoring to achieve Agility.

Text Books:

1	Ken Schawber, Mike Beedle, "Agile Software Development with Scrum", Pearson Education.
2	Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams", Addison Wesley.

Reference Books:

1	Robert C. Martin, "Agile Software Development, Principles, Patterns and Practices", Prentice Hall.
2	Robert Spalding: "Storage Networks the Complete Reference", Tata McGraw –Hill, 2011.
3	Alistair Cockburn, "Agile Software Development: The Cooperative Game", Addison Wesley
4	Mike Cohn , "User Stories Applied: For Agile Software", Addison Wesley

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:

- i. 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.

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

CO-PO/PSO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	3	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	3	2	-
CO3	3	2	1	-	-	-	-	-	-	-	-	3	1	1
CO4	3	2	1	-	-	-	-	-	-	-	-	3	1	-
CO5	3	2	1	-	-	-	-	-	-	-	-	3	2	1

High-3, Medium-2, Low-1

Course Title	SOCIAL NETWORK ANALYSIS	Semester	06
Course Code	MVJ19CS634	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

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

- Develop the skills of Social Network Concepts and Techniques
- Represent and process Network Relations
- Familiarize with Web based Social Network Applications

Module-1

L1,L2, L3

Hours 8

INTRODUCTION: Analyzing the Social Web, A brief history of the Social Web, Websites discussed, Tools used.

NODES, EDGES AND NETWORK MEASURES: Basics of Network Structure, Representing Networks, Basic Network Structures and Properties.

NETWORK STRUCTURE AND MEASURES: Describing Nodes and Edges, Describing Networks

Video link / Additional online information (related to module if any):

- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod01lec05.mp4>
- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod01lec07.mp4>
- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod02lec19.mp4>

Module-2

L1,L2, L3

Hours 8

NETWORK VISUALIZATION: Layouts, Visualizing Network features. **TIE STRENGTH:**

The role of Tie Strength, Measuring Tie Strength, Tie Strength and Network Structure, Tie Strength and Network Propagation

Video link / Additional online information (related to module if any):

- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod03lec30.mp4>
- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod03lec31.mp4>
- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod04lec40.mp4>

Module-3

L1,L2 ,L3

Hours 8

ENTITY RESOLUTION AND LINK PREDICTION: Link Prediction, Entity Resolution, Link Prediction: Case Study Friend Recommendation.

COMMUNITY DISCOVERY IN SOCIAL NETWORKS: Introduction to Community Discovery, Communities in Context, Quality Functions, The Kernighan-Lin algorithm, Agglomerative/Divisive Algorithms,

Video link / Additional online information (related to module if any):

- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod06lec79.mp4>
- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod06lec80.mp4>
- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod06lec81.mp4>

Module-4

L1,L2 ,L3

Hours 8

COMMUNITY DISCOVERY IN SOCIAL NETWORKS (CONTD): Spectral Algorithms, Multi-level Graph Partitioning, Markov Clustering, Other Approaches.

MODELS AND ALGORITHMS FOR SOCIAL INFLUENCE ANALYSIS: Introduction to Social Influence, Influence Related Statistics, Social Similarity and Influence, Homophily, Existential Test for Social Influence, Influence and Actions, Influence and Interaction, Influence Maximization in Viral Marketing, Other Applications.

Video link / Additional online information (related to module if any):

- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod05lec70.mp4>
- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod05lec71.mp4>

Module-5

L1,L2,L3

Hours 8

MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION: Ontology and their role in the Semantic Web: Ontology-based knowledge Representation –Ontology languages for the Semantic Web: Resource Description Framework Web Ontology Language Modelling and aggregating social network data: State-of-the-art in network data representation Ontological representation of social individuals Ontological representation of social relationships Aggregating and reasoning with social network data Advanced representations.

Video link / Additional online information (related to module if any):

- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod10lec133.mp4>
- <https://nptel.ac.in/content/storage2/106/106/106106169/MP4/mod12lec152.mp4>

Course Outcomes:

CO1	Understand and visualize the basic concepts of network structure and representation of Social Network Analysis
CO2	Analyze the Social Network structure and its visualize them in the form of layouts
CO3	Apply the Social Network Concepts in solving problems related to social, personal, business and international levels
CO4	Understand and Implement the algorithm for discovering communities in Social Networks
CO5	Understand the algorithm and models for social influence analysis

Text Books:

1	Jennifer Goldbeck, "Analyzing the Social Web", Morgan Kaufmann Publications, 2013
2	Charu C. Aggarwal, "Social Network Data Analytics", Springer Publications, 2011

Reference Books:

1	Peter Mika, Social Networks and the Semantic Web, First Edition, Springer 2007.
2	Borko Furht, Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010.

CIE Assessment:

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- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

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

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	1	-	-	-	-	-	-	2	2	-
CO2	3	3	3	2	-	-	-	-	1	-	1	2	2	2
CO3	2	2	2	1	3	-	-	-	-	-	1	3	2	2
CO4	3	2	3	2	1	-	-	-	-	2	3	2	2	3
CO5	3	2	3	1	-	-	-	-	-	2	3	2	2	-

High-3, Medium-2, Low-1

Course Title	ARTIFICIAL INTELLIGENCE	Semester	06
Course Code	MVJ19CS641	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

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

- Describe the basic principles, techniques, and applications of Artificial Intelligence
- Analyze and explain different AI learning methods.
- Compare and contrast different AI techniques available.

Module-1

L1,L2

Hours 8

INTRODUCTION: What Is AI? The Foundations of Artificial Intelligence ,The History of Artificial Intelligence, The State of the Art .

Intelligent Agents : Agents and Environments ,Good Behavior: The Concept of Rationality ,The Nature of Environments, The Structure of Agents. Knowledge Representation Issues, Using Predicate Logic, Representing knowledge using Rules.

Experimental Learning: Implementation of Relational and Inheritable Knowledge

Video Links		
<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=3MW3ICnkQ9k 		
Module-2	L1,L2 ,L3	Hours 8
<p>PROLOG- The natural Language of Artificial Intelligence: Introduction, Converting English to Prolog Facts and Rules, Goals, Prolog Terminology, Variables, Control Structures, Arithmetic operators, Matching in Prolog, Backtracking, Cuts, Recursion, Lists, Dynamic databases, Input/Output and Streams</p> <p>Using Predicate Logic: Representing simple facts in logic, representing instance and ISA relationships, Computable Functions and Predicates, Resolution, Natural Deduction.</p> <p>Experimental Learning: Implementing programs in PROLOG to solve problems of Predicate Logic</p> <p>Video Links:</p> <ul style="list-style-type: none"> • https://www.youtube.com/watch?v=pzUBrJLIESU • https://www.youtube.com/watch?v=2juspgYR7as • https://www.youtube.com/watch?v=h9jLWM2IFrO • https://www.youtube.com/watch?v=-v1K9AnkAeM 		
Module-3	L1,L2 ,L3	Hours 8
<p>Heuristic search techniques: Generate and test, Hill Climbing, Best First Search, Problem Reduction, Constraint Satisfaction, Means-ends Analysis.</p> <p>Weak Slot- and- Filler Structures: Semantic Nets ,Frames.</p> <p>Strong slot-and Filler Structures- Conceptual Dependency, Scripts.</p> <p>Experimental Learning : Program to implement Best first Search, A*, AO* algorithm</p> <p>Video Links:</p> <ul style="list-style-type: none"> • https://www.youtube.com/watch?v=ieZr_TpRwnQ • https://www.youtube.com/watch?v=ICrHYT_EhDs 		
Module-4	L1,L2 ,L3	Hours 8
<p>Game Playing : Overview, Minimax Search Procedure, Adding alpha beta cut off, Additional Refinements, Iterative Deepening, References on Specific games.</p> <p>Learning: What is learning?, Forms of learning, Rote learning, learning by taking advice, Learning in problem solving, Induction leaning, Explanation based learning, Discovery, Analogy, Formal learning Theory, Neural Network Learning.</p> <p>Experimental Learning : Real time problem solving using Game Playing</p> <p>Video Links:</p> <ul style="list-style-type: none"> • https://www.youtube.com/watch?v=_i-lZcbWkps • https://www.youtube.com/watch?v=l-hh51ncgDI 		
Module-5	L1,L2 ,L3	Hours 8

Natural Language Processing: Syntactic Processing, Semantic Analysis, Discourse and Pragmatic processing, Statistical Natural language processing and Spell checking.

Genetic Algorithms: A peek into the biological world, Genetic Algorithms(GAs),Significance of genetic operators, termination parameters, niching and speciation, evolving neural network, theoretical grounding.

Experimental Learning :

Program to implement spell checking problem

Video Links:

- <https://www.youtube.com/watch?v=zG8A|hVy5NY>
- https://www.youtube.com/watch?v=Z_8MpZeMdD4

Course Outcomes:

CO1	Identify AI based problems and understand Intelligent agents
CO2	Apply predicate logic and heuristic techniques to solve AI problems.
CO3	Understand the different representation of knowledge.
CO4	Understand the concepts of learning and Natural Language Processing.
CO5	Understand Genetic Algorithms and solve AI problems using PROLOG.

Text Books:

1	Artificial Intelligence: A Modern Approach, Stuart Rusell, Peter Norving, Pearson Education 2nd Edition.
2	E. Rich , K. Knight & S. B. Nair – Artificial Intelligence, 3/e, McGraw Hill.

Reference Books:

1	Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems Prentice Hal of India.
2	G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem Solving", Fourth Edition, Pearson Education, 2002.
3	N.P. Padhy "Artificial Intelligence and Intelligent Systems" , Oxford University Press-2015

CIE Assessment:

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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/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	2	-	-	-	-	-	-	-	2	1	-
CO2	3	3	2	3	1	-	-	-	-	-	-	2	2	2
CO3	3	3	2	3	1	-	-	-	-	-	-	2	3	-
CO4	3	3	2	3	2	-	-	-	-	-	-	2	3	-
CO5	3	3	2	3	2	-	-	-	-	-	-	2	3	1

High-3, Medium-2, Low-1

Course Title	DATA ANALYTICS	Semester	06
Course Code	MVJ19CS642	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to: *This course will enable students to be exposed to big data*

- Learn the different ways of Data Analysis
- Be familiar with data streams
- Learn the mining and clustering
- Be familiar with the visualization

Module-1

L1,L2, L3

Hours 8

INTRODUCTION TO BIG DATA : Introduction to Big Data Platform Challenges of conventional systems – Web data Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting – Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.

Experimental learning:How to calculate Standard Deviation, Mean, Variance Statistics in Excel

Applications: Agriculture, Economic

Video link :<https://www.youtube.com/watch?v=Vfo5le26lhY>

Module-2

L2, L3

Hours 8

DATA ANALYSIS : Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics – Rule induction – Neural networks: learning and generalization, competitive

learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

Experimental learning:

- How to read a data set using python
- How to perform data preprocessing

Applications: Autonomous Vehicles

Video link :<https://www.youtube.com/watch?v=Vfo5le26lhY>

Module-3	L2, L3	Hours 8
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MINING DATA STREAMS: Introduction to Streams Concepts Stream data model and architecture – Stream Computing, Sampling data in a stream Filtering streams Counting distinct elements in a stream Estimating moments Counting oneness in a window Decaying window Real time Analytics Platform(RTAP) applications – case studies – real time sentiment analysis, stock market predictions.

Laboratory Sessions:

- Build cats classifier using neural network
- Build a model to classify clothes into various categories in Fashion dataset.

Applications: Image Processing

Video link :<https://www.youtube.com/watch?v=DooxDIRAkPA>

Module-4	L2, L3	Hours 8
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FREQUENT ITEMSETS AND CLUSTERING : Mining Frequent item sets – Market based model Apriori Algorithm Handling large data sets in Main memory Limited Pass algorithm Counting frequent item sets in a stream Clustering Techniques Hierarchical K- Means Clustering high dimensional data CLIQUE and PROCLUS Frequent pattern based clustering methods Clustering in non-euclidean space Clustering for streams and Parallelism.

Laboratory Sessions: Word Count Map Reduce program to understand Map Reduce Paradigm
Installing and configuring Hadoop

Application: Social Media

Video link :<https://www.youtube.com/watch?v=1vbXmCrkT3Y>

Module-5	L2, L3	Hours 8
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FRAMEWORKS AND VISUALIZATION : MapReduce Hadoop, Hive, MapR Sharding NoSQL Databases – S3 – Hadoop Distributed file systems Visualizations – Visual data analysis techniques, interaction techniques; Systems and applications

Laboratory Sessions: Create Bar chart, Histogram, Heap Map, scatter plot, Box Plot, Corellogram, Area Chart

Application: Customer Engagement

Video link :<https://www.youtube.com/watch?v=9HR3p6MmwU0>

Course Outcomes:	
CO1	Apply the statistical analysis methods.
CO2	Compare and contrast various soft computing frameworks.
CO3	Design distributed file systems.
CO4	Apply Stream data model.
CO5	Use Visualisation techniques

Text Books:	
1	Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2	Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.

Reference Books:	
1	Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analytics, John Wiley & sons, 2012.
2	Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.
3	Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

CIE Assessment:
<p>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</p> <ul style="list-style-type: none"> - Quizzes/mini tests (4 marks) - Mini Project / Case Studies (8 Marks) - Activities/Experimentations related to courses (8 Marks)
SEE Assessment:
<p>i. 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.</p>

- ii. 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.
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CO-PO/PSO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	-	-	-	-	-	-	-	-	-	1	-
CO2	2	2	3	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	2	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	-	1
CO5	3	2	3	-	-	-	-	-	-	-	-	-	-	1

High-3, Medium-2, Low-1

Course Title	LANGUAGE PROCESSORS	Semester	06
Course Code	MVJ19CS643	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours
Course objective is to: <i>This course will enable students to</i>			
<ul style="list-style-type: none"> ● Understand, design and construct a lexical analyzer and parser. ● Employ code generation schemes. ● Perform optimization of codes and gain knowledge about runtime environments. ● Use Lex and YACC tools 			
Module-1		L1,L2, L3	Hours 8
<p>Introduction To Compilers: Definition of compiler, interpreter and its differences, the phases of a compiler, role of lexical analyzer, LEX-lexical analyzer generator.</p> <p>Parsing: context free grammar, derivations, parse trees, ambiguity, elimination of left recursion, left factoring, top-down parsing backtracking, recursive-descent parsing, predictive parsers, LL(1) grammars.</p> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> ● https://nptel.ac.in/courses/106/108/106108113/ 			
Module-2		L1,L2, L3	Hours 8
<p>Bottom-Up Parsing: Definition of bottom-up parsing, handles, handle pruning, stack implementation of shift-reduce parsing, conflicts during shift-reduce parsing, LR grammars, LR parsers-simple LR, canonical LR and Look Ahead LR parsers, handling of ambiguous grammar, YACC-automatic parser generator.</p> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> ● http://www.infocobuild.com/education/audio-video-courses/computer-science/PrinciplesCompilerDesign-IISc-Bangalore/lecture-11.html 			
Module-3		L1,L2, L3	Hours 8

Syntax-Directed Translation: Syntax directed definition, construction of syntax trees, S-attributed and L-attributed definitions, and translation schemes.

Intermediate Code Generation: Intermediate forms of source programs abstract syntax tree, polish notation and three address code, types of three address statements and its implementation.

Video link / Additional online information:

- <https://www.youtube.com/watch?v=M-wlosep5Zs>

Module-4	L1,L2, L3	Hours 8
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Semantic Analysis : Definition of type checking, type expressions, type systems, static and dynamic checking of types, specification of a simple type checker, equivalence of type expressions.

Video link / Additional online information:

- <https://www.youtube.com/watch?v=ExG0ToMUsEM>

Module-5	L1,L2, L3	Hours 8
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Code Optimization: Organization of code optimizer, basic blocks and flow graphs, the principal sources of optimization, the dag representation of basic block.

Code Generator: Design issues, object code forms, the target machine, a simple code generator, peephole optimization.

Video link / Additional online information:

- <https://nptel.ac.in/courses/106/108/106108052/>

Course Outcomes:

CO1	Design a lexical analyzer to identify the tokens in a program
CO2	Construct a parser through the application of grammar
CO3	Understand intermediate code generation and symbol table organization techniques
CO4	Analyze the equivalence of type expressions.
CO5	Design a compiler for a small language with code generation and optimization strategies.

Text Books:

1	Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman (2011), Compilers Principles, Techniques and Tools, Low price edition, Pearson Education.
2	Alfred V. Aho, Jeffrey D. Ullman, Principles of Compiler Design, 1st edition

Reference Books:

1	Alfred V. Aho, Jeffrey D. Ullman (2001), Principles of compiler design, Indian student edition,
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	Pearson Education
2	Kenneth C. Loudon, Thomson (1997), Compiler Construction – Principles and Practice, 1st edition, PWS Publishing.
3	Andrew W. Appel (2004), Modern Compiler Implementation C, Cambridge University Press.

CIE Assessment:

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- Quizzes/mini tests (4 marks)
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SEE Assessment:

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CO2	3	3	3	-	-	-	-	-	1	-	1	2	2	-
CO3	2	2	2	1	3	-	-	-	-	-	1	3	2	3
CO4	3	2	3	-	-	-	-	-	-	2	3	2	2	-
CO5	3	2	3	-	-	-	-	-	-	2	3	2	1	2

High-3, Medium-2, Low-1

Course Title	USER INTERFACE DESIGN	Semester	06
Course Code	MVJ19CS644	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

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

- Study the concept of menus, windows, interfaces.
- Study about business functions.
- Study the characteristics and components of windows and the various controls for the windows.
- Study about various problems in window design with text, graphics.
- Study the testing methods.

Module-1	L1,L2, L3	Hours 8
<p>Introduction-Importance-Human-Computer interface-characteristics of graphics interface-Direct manipulation graphical system - web user interface-popularity characteristic & principles.</p> <p>Case Study- Bright Colors in UI Design: Strong and Weak Sides</p> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> • https://www.mockplus.com/blog/post/learn-ui-design • https://nptel.ac.in/courses/124/107/124107008/ • https://nptel.ac.in/courses/107/103/107103083/ 		
Module-2	L1,L2, L3	Hours 8
<p>User interface design process-Obstacles-usability-human characteristics in design - Human interaction speed-business functions-requirement analysis-Direct- Indirect methods-basic business functions-Design standards-system timings - Human consideration in screen design - structures of menus - functions of menus-contents of menu-formatting -phrasing the menu - selecting menu choice navigating menus-graphical menus.</p> <p>Case Study - UnivCam - Album & Image sorting application</p> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> • https://www.mockplus.com/blog/post/learn-ui-design • https://nptel.ac.in/courses/124/107/124107008/ • https://nptel.ac.in/courses/107/103/107103083/ 		
Module-3	L2,L3,L4	Hours 8
<p>Windows-Characteristics- components - presentation styles-types-managements organizations-</p>		

operations–web systems–device–based controls: characteristics– Screen –based controls: operate control – text boxes–selection control combination control–custom control–presentation control.

Case Study – Fitbit: The UX behind the habit of exercise

Video link / Additional online information:

- <https://www.mockplus.com/blog/post/learn-ui-design>
- <https://nptel.ac.in/courses/124/107/124107008/>
- <https://nptel.ac.in/courses/107/103/107103083/>

Module-4	L3,L4, L6	Hours 8
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Text for web pages –Effective feedback–guidance & assistance– Internationalization–accessibility – Icons–Image–Multimedia–coloring.

Mini Project – Designing a VUI Voice User Interface

Video link / Additional online information:

- <https://www.mockplus.com/blog/post/learn-ui-design>
- <https://nptel.ac.in/courses/124/107/124107008/>
- <https://nptel.ac.in/courses/107/103/107103083/>

Module-5	L3,L4, L5	Hours 8
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Windows layout–test – Prototypes – kinds of tests – retest – Information search – visualization – Hypermedia – www – Software tools.

Case Study–Media coverage through data visualization

Video link / Additional online information:

- <https://www.mockplus.com/blog/post/learn-ui-design>
- <https://nptel.ac.in/courses/124/107/124107008/>
- <https://nptel.ac.in/courses/107/103/107103083/>

Course Outcomes:

CO1	Describe the Characteristics of Graphics Interface and its Principles
CO2	Design the standards and structures for Human computer interaction
CO3	Understand the components of web systems and text boxes
CO4	Demonstrate the Guidance of multimedia systems and its accessibility .
CO5	Summarize the concepts of windows layout and visualization

Text Books:

1	Wilbent. O. Galitz , "The Essential Guide to User Interface Design", John Wiley& Sons, 2001.
2	Ben Sheiderman, "Design the User Interface", Pearson Education, 1998.

Reference Books:

1	Alan Cooper, "The Essential of User Interface Design", Wiley - Dream Tech Ltd., 2002.
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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:

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

CO-PO/PSO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	3	-	2	1	-	-	-	-	1	1	1	-
CO2	2	1	3	-	2	1	-	-	-	-	1	1	1	2
CO3	2	1	3	-	2	1	-	-	-	-	1	1	3	-
CO4	2	1	3	-	2	1	-	-	-	-	1	1	1	-
CO5	2	1	3	-	2	1	-	-	-	-	1	1	-	-

High-3, Medium-2, Low-1

Course Title	OBJECT ORIENTED ANALYSIS AND DESIGN	Semester	06
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Course Code	MVJ19CS651	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

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

- Learn the concept of Object Oriented Software Development Process.
- Get acquainted with UML Diagrams.
- Understand Object Oriented Analysis Processes.
- Make them understand different problems in design along with learning how solve them using design patterns.

Module-1	L1,L2 ,L3	Hours 8
<p>Object Basics, Object oriented philosophy, objects, classes, attributes, object behaviour and methods, encapsulation and information hiding, class hierarchy, polymorphism, object relationships and associations, aggregations and object containment, case study, object identity, persistence. Object oriented systems development life cycle: Software development process, building high quality software, use- case driven approach, reusability.</p> <p>Video links:</p> <ul style="list-style-type: none"> • https://nptel.ac.in/courses/106/105/106105153/ • https://www.youtube.com/watch?v=qiyMyYqZVY 		
Module-2	L1,L2, L3	Hours 8
<p>Object Oriented Methodologies: Rumbaugh etc all object modelling technique, Booch methodology, Jacobson et al methodologies, patterns, frameworks, the unified approach. Unified modelling language: Static and dynamic models, UML diagrams, UML class diagrams, use-case diagrams, UML dynamic modelling, packages, UML extensibility and UML meta model.</p> <p>Video links:</p> <ul style="list-style-type: none"> • https://nptel.ac.in/courses/106/105/106105224/ 		
Module-3	L1,L2, L3	Hours 8
<p>Object Oriented Analysis Process: Business object analysis, use-case driven object oriented analysis, business process modelling, use-case model, developing effective documentation, case study. Classification: Classification theory, noun phrase approach, common class patterns approach, use-case driven approach, classes, responsibilities, and collaborators, naming classes.</p> <p>Video links:</p> <ul style="list-style-type: none"> • https://www.digimat.in/nptel/courses/video/106105153/L01 		
Module-4	L1,L2, L3	Hours 8

Identifying Object Relationships, Attributes and Methods: Association, super-subclass relationships, a-part of relationships, case study, class responsibility, defining attributes for via net bank objects, object responsibility, defining methods for via net bank objects Design process and design axioms: Corollaries, design patterns.

Video links:

- <https://www.digimat.in/nptel/courses/video/106105153/L16>

Module-5	L1,L2 , L3	Hours 8
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Designing Classes: UML object constraint languages, designing classes, class visibility, refining attributes for the via net bank objects, designing methods and protocols, designing methods for the via net bank objects, packages and managing classes. Designing access layer, case study. Designing view layer, macro level process.

Video links:

- <https://www.digimat.in/nptel/courses/video/106105153/L51>

Course outcomes:

CO1	Understand Object Oriented Software Development Process, Master key principles in OO analysis, design, and development.
CO2	Gain exposure to Object Oriented Methodologies & UML Diagrams.
CO3	Apply Object Oriented Analysis Processes for projects.
CO4	Understand the basics of object oriented design and design patterns.
CO5	Familiarize with the application of the Unified Modelling Language(UML) towards analysis and design.

Text Books:

1	Ali Bahrami, Object Oriented Systems Development using the Unified Modelling Language, McGraw Hill, Reprint 2009.
2	Craig Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition, Pearson Education, 2005.

Reference Books:

1	Martin Fowler, UML Distilled: A Brief Guide to the Standard Object Modeling Language, Third edition, Addison Wesley, 2003.
2	Grady Booch: Object-oriented analysis and design, Addison Wesley, 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

- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

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

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2	1	0	2	1	1	2	-
CO2	1	1	1	1	1	1	1	1	-	1	1	1	1	-
CO3	3	3	3	3	3	3	2	1	0	1	1	1	2	2
CO4	2	2	2	2	2	2	2	1	1	1	1	1	3	-
CO5	1	1	3	3	1	3	1	1	1	0	1	0	-	1

High-3, Medium-2, Low-1

Course Title	WEB TECHNOLOGIES	Semester	06
Course Code	MVJ19CS652	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

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

- Understand different Internet Technologies.
- Learn java-specific web services architecture
- Understand the SQL and JDBC
- Learn the AJAX and JSON

Module-1

L1,L2, L3

Hours 8

Website Basics, HTML5, CSS 3, Web 2.0: Web Essentials: Clients, Servers and Communication ,The Internet, Basic Internet protocols, World wide web, HTTP Request Message , HTTP Response Message, Web Clients, Web Servers, HTML5 : Tables, Lists, Image, HTML5 control elements , Semantic elements , Drag and Drop, Audio, Video controls, CSS3: Inline, embedded and external style sheets, Rule cascading, Inheritance, Backgrounds, Border Images, Colours, Shadows, Text, Transformations

Laboratory Sessions/ Experimental learning:

1. Design HTML form for keeping student record.
2. Write a HTML code to generate following output.
Create an html page with following specifications
 - a. Title should be about my college
 - b. Put the image in the background
 - c. Place your College name at the top of the page in large text followed by address in smaller size
 - d. Add names of courses offered each in a different color, style and typeface
 - e. Add scrolling text with a message of your choice

Video link / Additional online information:

- <https://www.youtube.com/watch?v=QEtWL4IWIL4>
- https://www.youtube.com/watch?v=h_RftxdJTzs

Module-2

L1,L2, L3

Hours 8

Client side Programming: An Introduction to java Script, JavaScript DOM Model, Date and Object, Regular Expression, Exception Handling, Validation, Built-in Objects, Event Handling, DHTML with JavaScript, JSON introduction, Syntax, Function Files, Http Request, SQL.

Laboratory Sessions/ Experimental learning:

1. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
2. Write a JavaScript code that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt.

Video link / Additional online information:

- <https://www.youtube.com/watch?v=uDwSnnhl1Ng&list=PLsyeobzWxl7qtP8Lo9TReqUMkiOp446cV>
- <https://www.youtube.com/watch?v=zPTY1hKq3SU&list=PLVIQHNRLfIP-ByWEVjCZAj79kJdshKQwu>

Module-3

L1,L2 , L3

Hours 8

Server Side Programming: Java Servlet Architecture, Servlet Life Cycle, Form GET and POST actions, Session handling, Installing and Configuring Apache Tomcat Web Server, Database Connectivity: JDBC perspectives, JDBC Program Example, JSP: Understanding Java server page, JSP Standard Tag Library (JSTL), Creating HTML form using JSP Code.

Laboratory Sessions/ Experimental learning:

1. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following.
 - a. Create a Cookie and add these four user id's and passwords to this Cookie.
 - b. Read the user id and passwords entered in the Login form and authenticate with the values available in the cookies.
2. Write a JSP which insert the details of the 3 or 4users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database.

Video link / Additional online information:

- https://www.youtube.com/watch?v=7TOmdDjcl4s&list=PLsyeobzWxl7pUPF2xjjiG4BKC9x_GY46
- <https://www.youtube.com/watch?v=xve6QEglR-0&list=PL0zysOfIRCeI5BSXoslpfDawe8FyyOSZb>
- <https://www.youtube.com/watch?v=0pzR2FGTEhk>

Module-4

L1,L2, L3

Hours 8

PHP: Introduction to PHP, PHP using PHP, Variables, Program Control, Built-in Functions, Form Validation, Basic command with PHP examples, Connection to server, creating Database, Selecting Database, Listing Database, listing table names Creating a table, Inserting data, deleting data and tables, altering tables.

Laboratory Sessions/ Experimental learning:

1. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
2. Write a PHP program to display a digital clock which displays the current time of the server.
3. Write a PHP program to sort the student records which are stored in the database using selection sort.
4. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.

Video link / Additional online information :

- <https://www.youtube.com/watch?v=itRkLa2kq6w>
- <https://www.youtube.com/watch?v=KJHYdkKtafU>
- https://www.youtube.com/watch?v=G_CFRAdbXfl&list=PL_RGaFnxSHWrjpkK2zD4TWKWMWVfeYK-b

Module-5

L1,L2, L3

Hours 8

AJAX: Ajax client server architecture, Xml HTTP request object, Call back methods. Advanced JavaScript and jQuery, JavaScript Pseudo-Classes, jQuery Foundations, Web Services: Introduction, Java web services Basics, Creating, Publishing, Testing and Describing a web services, Database driven web service from an application.

Laboratory Sessions/ Experimental learning:

1. Creating simple application to access data base using JDBC Formatting HTML with CSS.
2. Write a Program for manipulating Databases and SQL with real time application.
3. Write a Java applet to display the Application Program screen i.e. calculator and other.

Video link / Additional online information

- <https://www.youtube.com/watch?v=qk9MWbyRlhE>
- <https://www.youtube.com/watch?v=0pzR2FGTEhk>
- <https://www.youtube.com/watch?v=Hgvlox6ehkM>

Course Outcomes:

C01	Construct a basic website using HTML and Cascading Style Sheets.
C02	Build dynamic web page with validation using Java Script objects and by applying different event handling mechanism.
C03	Develop server side programs using Servlets and JSP.
C04	Construct simple web pages in PHP and to represent data in XML format.
C05	Use AJAX and web services to develop interactive web applications.

Text Books:

1	Deitel and Deitel and Nieto, Internet and World Wide Web, How to Program, Prentice Hall, 5th Edition, 2011.
2	Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1st Edition, Pearson Education India. (ISBN:978-9332575271)

Reference Books:

1	Stephen Wynkoop and John Burke —Running a Perfect Website QUE, 2nd Edition, 1999
2	Chris Bates, Web Programming –Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3	UttamK.Roy, —Web Technologies , Oxford University Press, 2011.

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:

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

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	3	-	-	-	-	-	-	1	-	2
CO2	3	3	1	-	-	-	-	-	-	-	-	1	1	3
CO3	3	3	1	-	-	-	-	-	-	-	-	1	1	2
CO4	3	3	1	-	-	-	-	-	-	-	-	1	-	2

CO5	3	3	1	-	-	-	-	-	-	-	-	2	1	1
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High-3, Medium-2, Low-1

Course Title	NETWORKS AND SYSTEM SECURITY	Semester	06
Course Code	MVJ19CS653	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

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

- Provide understanding of the main issues related to security in modern networked computer systems.
- Understand the foundations of computer security, basic knowledge about security–relevant decisions in designing IT infrastructures, techniques to secure complex systems;
- Discuss the different security tools used in network security
- Introduce practical skills in managing a range of systems, from personal laptop to large–scale infrastructures.
- Understand protective and recovery strategies.

Module–1	L1,L2, L3	Hours 8
<p>Building a Secure Organization: Obstacles to Security, Security Is Inconvenient, Computers Are Powerful and Complex, Computer Users Are Unsophisticated, Computers Created Without a Thought to Security, Current Trend Is to Share, Not Protect, Data Accessible from Anywhere, Security Isn't About Hardware and Software, The Management Sees Security as a Drain on the Bottom Line, Ten Steps to Building a Secure Organization.</p> <p>Applications: To verify and validate the banking application by Security vulnerabilities targeted to the confidentiality, integrity, and availability of an application. It cover various attack vectors such as injection attacks, authentication and session management, security misconfiguration, and sensitive data exposure.</p> <p>Video link / Additional online information :</p> <p>SQL Injection Tutorial : https://www.youtube.com/watch?v=3Axp3VDnf0I</p>		
Module–2	L2, L3	Hours 8
<p>Preventing System Intrusions: What Is an Intrusion, Sobering Numbers, Know Your Enemy: Hackers versus Crackers, Motives, Tools of the Trade, Bots, Symptoms of Intrusions, Know Today's Network Needs, Network Security Best Practices, Security Policies, Risk Analysis, Tools of Your Trade, Controlling User Access Traditional Reconnaissance and Attacks, Malicious Software, Defense in Depth, Preventive Measures, Intrusion Monitoring and Detection, Reactive Measures</p> <p>Laboratory Sessions/ Experimental learning:</p> <ul style="list-style-type: none"> • Installation and analyze of Solar Winds Security Event Manager and Manage Engine Event Log Analyzer. <p>Applications: Snort, Security Onion</p> <p>Video link / Additional online information :</p> <p>Automation TaskBots, MetaBots, and IQ Bots :https://www.youtube.com/watch?v=9-GYTX2O84k</p>		
Module–3	L2,L3, L4	Hours 8

Unix and Security: Basic Unix Security– Protecting User Accounts and Strengthening Authentication– Reducing Exposure to Threats by Limiting Superuser Privileges– Safeguarding Vital Data by Securing Local and Network File Systems– Introduction to Linux and Unix Hardening Linux and Unix– Proactive Defense for Linux and Unix– Internet Protocol Architecture– An Internet Threat Model– Defending Against Attacks on the Internet– Botnet Overview– Typical Bot Life – The Botnet Business Model – Botnet Defense– Botmaster Traceback

Laboratory Sessions/ Experimental learning:

Threat modeling in cyber security is a way of identifying, listing, prioritizing, and mitigating potential threats in order to protect systems and data. Threat analysis and modeling can be performed on education domain by brainstorming to rigorous formal frameworks

Applications: Honey pots and honey nets

Video link / Additional online information :

Threat Models : <https://www.youtube.com/watch?v=GqmOg-cszw4>

Module-4

L3,L4, L6

Hours 8

Intranet Security: Plugging the Gaps: Network Access Control and Access Control – Measuring Risk: Audits– Guardian at the Gate: Authentication and Encryption – Wireless Network Security – Shielding the Wire: Network Protection – Weakest Link in Security: User Training – Documenting the Network: Change Management – Rehearse the Inevitable: Disaster Recovery– Controlling Hazards: Physical and Environmental Protection – Know Your Users: Personnel Security– Protecting Data Flow: Information and System Integrity – Security Assessments – Risk Assessments– Local Area Network Security

Laboratory Sessions/ Experimental learning:

To make students aware of dictionary attacks, and to teach students how to defend systems against such attacks by proactively filtering weak passwords, salting passwords, and limiting authentication attempts. In the process of doing the experiment, students also learn about secure hash functions and their implementation in OpenSSL

Applications: Television remote control, Wi-Fi, Cell phones, wireless power transfer, computer interface devices

Video link / Additional online information :

Wireless network security : <https://www.youtube.com/watch?v=6pYZ2N9y2fQ>

Module-5

L4,L5, L6

Hours 8

Wireless Network Security: Cellular Networks– Wireless Ad Hoc Networks– Security Protocols– Secure Routing– Overview of Cellular Networks– The State of the Art of Cellular Network Security– Cellular Network Attack Taxonomy– Cellular Network Vulnerability Analysis– Radio Frequency Identification Introduction– RFID Challenges– RFID Protections

Laboratory Sessions/ Experimental learning:

Create an application using RFID and verify the various challenges occurred in the RFID application

Applications: The logistics and supply chain is the most common industry applying RFID.

Video link / Additional online information :

How does RFID & NFC work? : <https://www.youtube.com/watch?v=mzPb9QLJu8k>

Course Outcomes:

C01	Understand the concepts and foundations of computer security, and identify vulnerabilities of IT systems.
C02	Analyse a given network and carryout protective and recovery strategies.
C03	Analyse a given network and list possible threats to it.
C04	Use basic security tools to enhance system security and can develop basic security enhancements in stand-alone applications.
C05	Carryout survey on the implementation of security to a given organisation.

Text Books:

1	William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, edition, 2010.
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Reference Books:

1	John R. Vacca, Network and System Security, Springer Publication
2	Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.

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:

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

CO-PO/PSO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	1	1	2	-	-	-	-	-	2	-
CO2	3	3	3	3	2	-	-	-	-	-	-	-	3	2
CO3	1	-	-	1	1	-	2	3	3	3	3	-	3	2
CO4	3	3	2	2	2	-	-	-	-	-	-	3	-	1
CO5	3	3	3	3	3	2	-	-	3	3	3	3	-	2

High-3, Medium-2, Low-1

Course Title	MOBILE COMPUTING	Semester	06
Course Code	MVJ19CS654	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

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

- Understand the concept of mobile computing terminology and basics
- Understand the wireless protocols.
- Realize various routing mechanisms.

Module-1

L1,L2, L3

Hours 8

Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and

Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.

Global System for Mobile Communication(GSM): Services, System Architecture, Radio

Interfaces, Protocols, Localization, Calling, Handover, New Data Services, GPRS Architecture, GPRS Network Nodes.

Video link / Additional online information (related to module if any):

- https://www.youtube.com/watch?v=bur9hq_abog (NPTEL VIDEO)

Module-2

L1,L2, L3

Hours 8

Medium Access Control (MAC) : Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), Wireless LAN/(IEEE 802.11) architecture, key IEEE802.11 a/b/c/d/e/g/i/n/T/ac/ standards.

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML). **Wireless Local Loop(WLL):** Introduction to WLL Architecture, wireless Local Loop Technologies.

Video link / Additional online information (related to module if any):

- <https://www.youtube.com/watch?v=sx0UPzztC5o> (NPTEL VIDEO)

Module-3

L1,L2, L3

Hours 8

Mobile Network Layer : IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization using Soft computing techniques ANT Bee colony, Support Vector Machine, Particle Swarm Optimization and Genetic Algorithm.

Video link / Additional online information (related to module if any):

- <https://www.youtube.com/watch?v=0QLRULNfbFg>

Module-4

L1,L2, L3

Hours 8

Mobile Transport Layer : Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP.

Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W- CDMA) and CDMA 2000, Quality of services in 3G.

Video link / Additional online information (related to module if any):

- <https://www.youtube.com/watch?v=KCcdF4IVrQk>
- <https://www.youtube.com/watch?v=ymnQ5rpcYA&list=PLbMVogVj5nJSi8FUsvglRxLtN1TN9y4nx>

Module-5

L1,L2, L3

Hours 8

Mobile Ad hoc Networks (MANETs) : Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, etc. , Mobile Agents, Service Discovery ,case study using NS2 traffic analysis using CBR and VBR.

Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols.

Video link:

- <https://nptel.ac.in/courses/106/105/106105160/>
- <https://www.digimat.in/nptel/courses/video/106105160/L01.html>

Course Outcomes:

C01	Able to interpret GSM architecture and its services.
C02	Analyze the various wireless application protocols and its different concepts for various mobile applications.
C03	Learn the representation of mobile network layer protocols and its functionalities.
C04	Understand, analyze & develop any existing or new models of mobile environments for 3G networks.
C05	Understand, evaluate and create the platforms, protocols and related concepts along with along with mobile in mobile environment.

Text Books:

1	Jochen Schiller, Mobile Communications PHI, Second Edition, 2009.
2	Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772

Reference Books:

1	Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
2	Martin Sauter, "From GSM to LTE-Advanced: An Introduction to Mobile Networks and Mobile Broadband," Second Edition, Wiley.
3	William.C.Y.Lee, Mobile Cellular Telecommunications-Analog and Digital Systems Second Edition, TataMcGraw Hill Edition ,2006.
4	Prasant Kumar Pattnaik, Rajib Mall, Fundamentals of Mobile Computing , PHI Learning Pvt.Ltd, New Delhi 2012

High-3, Medium-2, Low-1

Course Title	PYTHON APPLICATION PROGRAMMING LABORATORY	Semester	06
Course Code	MVJ19CSL66	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3(L : T : P :: 0 : 2 : 2)	Total	100
Credits	2	Exam. Duration	3 Hours
<p>Course objective is to: <i>This course will enable students to</i></p> <p>Interpret the use of procedural statements like assignments, conditional statements, loops and function calls.</p> <p>Infer the supported data structures like lists, dictionaries and tuples in Python.</p> <p>Illustrate the application of matrices and regular expressions in building the Python programs.</p> <p>Discover the use of external modules in creating excel files and navigating the file systems.</p> <p>Describe the need for Object-oriented programming concepts in Python.</p>			
S No	Experiment Name	RBT Level	Hours
1	a) Write a Python program to print all the Disarium numbers between 1 and 100. b) Write a Python program to encrypt the text using Caesar Cipher technique. Display the encrypted text. Prompt the user for input and the shift pattern.	L3	3

2	Devise a Python program to implement the Rock–Paper–Scissor game.	L3	3
3	Write a Python program to perform Jump Search for a given key and report success or failure. Prompt the user to enter the key and a list of numbers.	L3	3
4	The celebrity problem is the problem of finding the celebrity among n people. A celebrity is someone who does not know anyone (including themselves) but is known by everyone. Write a Python program to solve the celebrity problem.	L3	3
5	Write a Python program to construct a linked list. Prompt the user for input. Remove any duplicate numbers from the linked list.	L3	3
6	Perform the following file operations using Python a) Traverse a path and display all the files and subdirectories in each level till the deepest level for a given path. Also, display the total number of files and subdirectories. b) Read a file content and copy only the contents at odd lines into a new file.	L3	3
7	Create a menu drive Python program with a dictionary for words and their meanings. Write functions to add a new entry (word: meaning), search for a particular word and retrieve meaning, given meaning find words with the same meaning, remove an entry, display all words sorted alphabetically.	L3	3
8	Using Regular Expressions, develop a Python program to a) Identify a word with a sequence of one upper case letter followed by lower case letters. b) Find all the patterns of “1(0+)1” in a given string. c) Match a word containing ‘z’ followed by one or more o’s. Prompt the user for input.	L3	3

9

Write a Python program to plot the Line chart in MS Excel Sheet using Xlsx. Writer module to display the annual net income of the companies mentioned below.

Year	Company	Profit
2010	Microsoft	18.76
2011	Microsoft	23.15
2012	Microsoft	16.98
2013	Microsoft	21.86
2014	Microsoft	22.07
2015	Microsoft	12.19
2016	Microsoft	16.8
2017	Microsoft	21.2
2010	Alphabet	8.372
2011	Alphabet	9.706
2012	Alphabet	10.179
2013	Alphabet	12.733
2014	Alphabet	14.136
2015	Alphabet	16.348
2016	Alphabet	19.478
2017	Alphabet	12.662
2010	Amazon	1.152
2011	Amazon	0.631
2012	Amazon	0.139
2013	Amazon	0.274
2014	Amazon	0.241
2015	Amazon	0.596
2016	Amazon	2.371
2017	Amazon	3.033

L3

3

10

Devise a Python program to implement the Hangman Game.

L3

3

OPEN ENDED EXPERIMENT

1. Write a program in PROLOG/python to solve water jug problem .
2. Write python program to implement factorial, fibonacci of a given number.

L3

3

Course Outcomes:	
CO1	Describe the Python language syntax including control statements, loops and functions to write programs for a wide variety problem in mathematics, science, and games.
CO2	Examine the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data.

CO3	Interpret the concepts of Object-oriented programming as used in Python using encapsulation, polymorphism and inheritance.
CO4	Discover the capabilities of Python regular expression for data verification and utilize matrices for building performance efficient Python programs.
CO5	Identify the external modules for creating and writing data to excel files and inspect the file operations to navigate the file systems

Reference Books:	
1	Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014
2	-13: 978-9350232873

Mark Lutz, "Programming Python", 4th Edition, O'Reilly Media, 2011. ISBN

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,

- i. Writeup : 20 marks
- ii. Conduction : 40 marks
- iii. Analysis of results : 20 marks
- iv. Viva : 20

CO-PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	-	-	-	-	-	-	1	1	3
CO2	3	2	2	3	3	-	-	-	-	-	-	1	2	3
CO3	3	3	3	2	3	-	-	-	-	-	-	1	2	3
CO4	2	1	2	2	3	-	-	-	-	-	-	1	1	2
CO5	2	1	2	1	3	-	-	-	-	-	-	1	1	1

High-3, Medium-2, Low-1

Course Title	CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY	Semester	06
Course Code	MVJ19CSL67	CIE	50

Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3(L : T : P :: 0 : 2 : 2)	Total	100
Credits	2	Exam. Duration	3 Hours

Course objective is to: This course will enable students to

- Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to various attacks.
- Learn the various number theory concepts and applications. Analyse the message digest algorithms and create digest values.

Develop and apply authentication, email security, web security services and mechanisms

Hello World'. The program should XOR each character in this string
Create java script for web applications for providing security.

S No	Experiment Name	RBT Level	Hours
1	Write a program that contains a string (char pointer) with a value \Hello World'. The program should AND or and XOR each character in with 0 and displays the result.	L3	3
2	Write a program that contains a string (char pointer) with a value \ this string with 127 and display the result.	L3	3
3	Write a Java program to perform encryption and decryption using the following algorithms: a) Ceaser Cipher b) Substitution Cipher c) Hill Cipher.	L3	3
4	Write a Java program to implement the DES algorithm logic.	L3	3
5	Write a C/JAVA program to implement the BlowFish algorithm logic.	L3	3
6	Write a C/JAVA program to implement the Rijndael algorithm logic.	L3	3
7	Using Java Cryptography, encrypt the text "Hello world" using BlowFish. Create your own key using Java key tool.	L3	3
8	Write a Java program to implement RSA Algorithm with p=3, q=11.	L3	3
9	Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).	L3	3
10	Calculate the message digest of a text using the MD5 algorithm in JAVA.	L3	3
11	Calculate the message digest of a text using the SHA-1 algorithm in JAVA.	L3	3
12	Using Java Cryptography, encrypt the text "Hello world" using	L3	3

	BlowFish. Create your own key using Java key tool.		
	<p>OPEN ENDED EXPERIMENT</p> <ol style="list-style-type: none"> Perform encryption and decryption using mono-alphabetic cipher. The program should support the following : <ul style="list-style-type: none"> Construct an input file named plaintext.txt (consisting of 1000 alphabets, without any space or special characters) Encrypt the characters of plaintext.txt and store the corresponding cipher text characters in ciphertext.txt Compute the frequency of occurrence of each alphabet in both plaintext.txt and ciphertext.txt and tabulate the results Write a program to perform the following using Playfair cipher technique <ul style="list-style-type: none"> Encrypt a given message M with different keys {k1,k2,...,kn}. Print key and cipher text pair Decrypt the cipher texts obtained in (i) to get back M 	L3	3

Course Outcomes:

C01	Identify the major types of threats to information security and the associated attacks, Services and Mechanisms
C02	Design and develop cryptographic algorithms using public key cryptography.
C03	Generate the own key for developing cryptography algorithms.
C04	Implement the key exchange algorithms using scripts.
C05	Design the various security protocols for web applications.

Reference Books:

1	William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.
2	Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.

