MVJCE CURRICULUM

FOR

COMPUTER SCIENCE & ENGINEERING(Scheme 2020)

VI SEMESTER

Course Title	**COMPILER DESIGN**	Semester	06
Course Code	MVJ20CS61	CIE	50
Total No. of Contact Hours	50	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 1 : 0)	Total	100
Credits	4	**Exam. Duration**	3 Hours

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

- Learn the various parsing techniques and different levels of translation.
- Learn how to obtain specific object code from source language.
- Learn how to optimize the code and schedule for optimal performance.

Module-1	L1, L2, L3, L4	Hours 10

FRONT END OF COMPILERS: The Structure of Compiler Lexical Analysis: Role of Lexical Analyzer, Specification and Recognition of Tokens, Syntax Analysis: Top Down Parsing, Bottom up Parsing, LR Parsers: SLR, CLR, and LALR.

Video Links : https://www.youtube.com/watch?v=yxnbvS2t_QA

Module-2	L1,L2,L3,L4	Hours 10

INTERMEDIATE CODE GENERATION: Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Syntax Directed Translation Schemes, Intermediate Languages: Syntax Tree, Three Address Code, Postfix Code, Declarations, Translation of Expressions, Type Checking, Back Patching.

Video Links: https://www.youtube.com/watch?v=EpAzj7zXrbk

Module-3	L1,L2,L3,L4	Hours 10

RUNTIME AND OBJECT CODE GENERATION: Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management – Issues in Code Generation – Design of Code Generator – Register Allocation and Assignment Instruction Selection by Tree Rewriting Optimal Code Generation for Expressions Dynamic Programming Code Generation.

Video Links: https://www.youtube.com/watch?v=lRvaRhPsqOo

Module-4	L1,L2,L3,L4	Hours 10

CODE OPTIMIZATION: Basic Blocks and Flow Graphs   Optimization of Basic Blocks Principal Sources of Optimizations   Data Flow Analysis   Constant Propagation   Partial Redundancy Elimination   Peephole Optimizations.

Video Links: https://nptel.ac.in/courses/106/108/106108113/

Module-5	L1,L2,L3,L4	Hours 10

SCHEDULING AND OPTIMIZING FOR PARALLELISM: Code Scheduling Constraints Basic Block Scheduling Global Code Scheduling – Basic Concepts in Parallelization   Parallelizing Matrix Multiplication Iteration Spaces Affine Array Indexes.

Video Links: https://www.youtube.com/watch?v=-yMWgtTeQgY

Course outcomes:	
CO1	Design compiler phases from language specification.
CO2	Design code generators for the specified machine.
CO3	Analyze Object Code Generation techniques.

CO4	Apply the various optimization techniques.
CO5	Understand the Optimizing for Parallelism

Text Books:	
1	Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, ‖Compilers: Principles, Techniques and Tools‖, Second Edition, Pearson Education, 2009.
2	Randy Allen, Ken Kennedy, ‖Optimizing Compilers for Modern Architectures: A Dependence based Approach‖, Morgan Kaufmann Publishers, 2002.

Reference Books:	
1	Keith D Cooper and Linda Torczon, ‖Engineering a Compiler‖, Morgan Kaufmann Publishers Elsevier Science, 2004
2	V. Raghavan, ‖Principles of Compiler Design‖, Tata McGraw Hill Education Publishers, 2010.
3	Allen I. Holub, ‖Compiler Design in C ‖, Prentice–Hall Software Series, 1993.
4	Steven S. Muchnick, ‖Advanced Compiler Design and Implementation‖, Morgan Kaufmann Publishers – Elsevier Science, India, Indian Reprint 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
 	
   - 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	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	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**

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   EI Gamal   Schnorr.

Applications: Cyber forensic

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

- https://www.educba.com/md5-alogrithm/
- 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**

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

Applications: Email and Banking applications

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

- 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	MVJ20CS631	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**

Introduction: Introduction to mobile application – Market values for mobile applications System requirements for mobile application Mobile application development architecture.

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

- https://www.tutorialspoint.com/android/ Online

Module–2	L2, L3	**Hours 8**

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):

- http://www.androidhive.info/

Module–3	L2,L3, L4	**Hours 8**

Multimedia & Services: Lifecycle of a Service – Managing Services GPS location API Playing audio, video.

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

- https://nptel.ac.in/courses/106/106/106106147/

Module–4	L3,L4 , L6	**Hours 8**

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):

- http://developer.android.com/develop/index.htm

Module–5	L4,L5, L6	**Hours 8**

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):

- 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
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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	MVJ20CS632	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**

'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**

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**

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**

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:	
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.

CO-PO/PSO Mapping

CIE Assessment:

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- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
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SEE Assessment:

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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.

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CO1	2	1	1	-	1	1	2	-	-	-	-	-	1	-
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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	MVJ20CS633	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:

- 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

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covering the whole syllabus.

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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	MVJ20CS634	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:
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	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	INFORMATION RETRIEVAL TECHNIQUES	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*		
- Understand the basics of Information Retrieval. - Understand machine learning techniques for text classification and clustering. - Understand various search engine system operations. - Learn different techniques of recommender system.		
Module–1	L1,L2	**Hours 8**
INTRODUCTION : Information Retrieval Early Developments The IR Problem The Users Task Information versus Data Retrieval The IR System The Software Architecture of the IR System The Retrieval and Ranking Processes The Web The e–Publishing Era How the web changed Search Practical Issues on the Web How People Search Search Interfaces Today Visualization in Search Interfaces. **Video Links:** https://www.youtube.com/watch?v=Y2OybHMjz6U		
Module–2	L1,L2 , L3	**Hours 8**
MODELING AND RETRIEVAL EVALUATION: Basic IR Models Boolean Model TF–IDF (Term Frequency/Inverse Document Frequency) Weighting Vector Model Probabilistic Model Latent Semantic Indexing Model Neural Network Model Retrieval Evaluation Retrieval Metrics Precision and Recall Reference Collection User–based Evaluation Relevance Feedback and Query Expansion Explicit Relevance Feedback. **Video Links:** https://www.youtube.com/watch?v=m0oiAOgSQFw		
Module–3	L1,L2 , L3	**Hours 8**
TEXT CLASSIFICATION AND CLUSTERING : A Characterization of Text Classification Unsupervised Algorithms: Clustering Naïve Text Classification Supervised Algorithms Decision Tree k–NN Classifier SVM Classifier Feature Selection or Dimensionality Reduction Evaluation metrics Accuracy and Error Organizing the classes Indexing and Searching Inverted Indexes Sequential Searching Multi–dimensional Indexing. **Video Links:** https://www.youtube.com/watch?v=CwjLMV52tzI		

Module-4	L1,L2 ,L3	**Hours 8**

WEB RETRIEVAL AND WEB CRAWLING : The Web   Search Engine Architectures   Cluster based Architecture   Distributed Architectures   Search Engine Ranking   Link based Ranking   Simple Ranking Functions   Learning to Rank   Evaluations   Search Engine Ranking   Search Engine User Interaction   Browsing   Applications of a Web Crawler   Taxonomy   Architecture and Implementation   Scheduling Algorithms   Evaluation.

Video Links:

- https://www.youtube.com/watch?v=JjywDlY1OJk

Module-5	L1,L2 ,L3	**Hours 8**

RECOMMENDER SYSTEM :Recommender Systems Functions   Data and Knowledge Sources Recommendation Techniques Basics of Content-based Recommender Systems High   Level Architecture Advantages and Drawbacks of Content-based Filtering Collaborative Filtering Matrix factorization models Neighborhood models.

Video Links:

- https://www.youtube.com/watch?v=1JRrCEgiyHM

Course Outcomes:	
CO1	Use an open source search engine framework and explore its capabilities
CO2	Apply appropriate method of classification or clustering.
CO3	Design and implement innovative features in a search engine.
CO4	Implement Web Crawling Algorithms.
CO5	Design and implement a recommender system.

Text Books:	
1	Ricardo Baeza-Yates and Berthier Ribeiro-Neto, Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
2	Ricci, F, Rokach, L. Shapira, B.Kantor, Recommender Systems Handbook, First Edition, 2011.

Reference Books:	
1	C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval, Cambridge University Press, 2008.
2	Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 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

- 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	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	MVJ20CS642	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=Vfo5le26IhY

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=Vfo5le26IhY

Module–**3**	L2, L3	**Hours 8**

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**

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**

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 analystics, 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:

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	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

CO-PO/PSO Mapping

High-3, Medium-2, Low-1

Course Title	**GAME THEORY**	Semester	06
Course Code	MVJ20CS643	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*

- Familiarize with the process of game design and development
- Understand the processes, mechanics, issues in game design
- Understand the architecture of game programming.
- Analyze game engine development, modeling, techniques and frameworks

Module–1	L1,L2, L3	**Hours 8**

Introduction: Elements of Game Play   Artificial Intelligence   Getting Input from the Player – Sprite Programming   Sprite Animation – Multithreading   Importance of Game Design   Game Loop.

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

- https://www.youtube.com/watch?v=a52BtWkyjl0

Module–2	L1,L2, L3	**Hours 8**

3D GRAPHICS FOR GAME PROGRAMMING: Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces

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

- https://www.youtube.com/watch?v=fwzYuhduME4

Module–3	L1,L2, L3	**Hours 8**

GAME DESIGN PRINCIPLES: Character Development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding, Case study : Tetris.

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

- https://www.youtube.com/watch?v=n7u1puLdP90

Module–4	L1,L2, L3	**Hours 8**

GAMING ENGINE DESIGN : Renderers, Software Rendering, Hardware Rendering, and Controller Based Animation, Spatial Sorting, Level of Detail, Collision Detection, Standard Objects, and Physics, Case study : The Sims

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

- https://www.youtube.com/watch?v=2pfdTSZ–GUM

Module–5	L1,L2, L3	**Hours 8**

GAME DEVELOPMENT : Developing 2D and 3D Interactive Games Using OpenGL, DirectX   Isometric and Tile Based Games, Puzzle Games, Single Player Games, Multi–Player Games. Case study: Mine craft.

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

- https://www.youtube.com/watch?v=h0bdo06qNVw

Course Outcomes:

CO1	Understand the elements of Game Play.
CO2	Understand the framework of 3D Graphics in Game Theory.

CO3	Demonstrate the Game Design Principles.
CO4	Develop and deploy Gaming Engine Design.
CO5	Develop game programming skills and create interactive games.

Text Books:	
1	David H. Eberly, 3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics , Second Edition, Morgan Kaufmann, 2010.
2	Jung Hyun Han, 3D Graphics for Game Programming , First Edition, Chapman and Hall/CRC, 2011.
3	Jonathan S. Harbour, Beginning Game Programming, Course Technology, Third Edition PTR, 2009.

Reference Books:	
1	Ernest Adams and Andrew Rollings, Fundamentals of Game Design, Third Edition, Pearson Education, 2014
2	Scott Rogers, Level Up: The Guide to Great Video Game Design, First Edition, Wiley, 2010.
3	Jim Thompson, Barnaby Berbank-Green, and Nic Cusworth, Game Design: Principles, Practice, and Techniques – The Ultimate Guide for the Aspiring Game Designer, First Edition, Wiley, 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:
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	USER INTERFACE DESIGN	Semester	06
Course Code	MVJ20CS644	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**

Introduction–Importance–Human–Computer interface–characteristics of graphics interface–Direct manipulation graphical system – web user interface–popularity characteristic & principles.

Case Study– Bright Colors in UI Design: Strong and Weak Sides

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–2	L1,L2 , L3	**Hours 8**

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.

Case Study – UnivCam – Album & Image sorting application

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–3	L2,L3,L4	**Hours 8**

Windows–Characteristics– components – presentation styles–types–managements organizations–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**

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**

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.

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	-
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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
Course Code	MVJ20CS651	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**

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.

Video links:

- https://nptel.ac.in/courses/106/105/106105153/
- https://www.youtube.com/watch?v=qiyMyyYqZVY

Module–2	L1,L2, L3	**Hours 8**

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.

Video links:

- https://nptel.ac.in/courses/106/105/106105224/

Module–3	L1,L2, L3	**Hours 8**

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.

Video links:

- 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**

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	MVJ20CS652	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=QEtWL4lWlL4
- 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:

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:

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_CFRAdbXfI&list=PL_RGaFnxSHWrjkpK2zD4TWKWMWVfe YK-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=HgvIox6ehkM

Course Outcomes:

CO1	Construct a basic website using HTML and Cascading Style Sheets.
CO2	Build dynamic web page with validation using Java Script objects and by applying different event handling mechanism.
CO3	Develop server side programs using Servlets and JSP.
CO4	Construct simple web pages in PHP and to represent data in XML format.
CO5	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", 1stEdition, 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

High-3, Medium-2, Low-1

Course Title	**NETWORKS AND SYSTEM SECURITY**	Semester	06
Course Code	MVJ20CS653	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**

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.

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.

Video link / Additional online information :

SQL Injection Tutorial : https://www.youtube.com/watch?v=3Axp3VDnf0I

Module–2	L2, L3	**Hours 8**

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

Laboratory Sessions/ Experimental learning:

- Installation and analyze of Solar Winds Security Event Manager and Manage Engine Event Log Analyzer.

Applications: Snort, Security Onion

Video link / Additional online information :

Automation TaskBots, MetaBots, and IQ Bots :https://www.youtube.com/watch?v=9-GYTX2O84k

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 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=GqmQg-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:

CO1	Understand the concepts and foundations of computer security, and identify vulnerabilities of IT systems.
CO2	Analyse a given network and carryout protective and recovery strategies.
CO3	Analyse a given network and list possible threats to it.
CO4	Use basic security tools to enhance system security and can develop basic security enhancements in stand−alone applications.
CO5	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.

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	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	MVJ20CS654	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

Text Books:

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

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Reference Books:

1	Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems",Thomson Asia Pvt Ltd, 2005.
2	–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

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:

CO1	Able to interpret GSM architecture and its services. Martin Sauter, "From GSM to LTE
CO2	Analyze the various wireless application protocols and its different concepts for various mobile applications.
CO3	Learn the representation of mobile network layer protocols and its functionalities.
CO4	Understand, analyze & develop any existing or new models of mobile environments for 3G networks.
CO5	Understand, evaluate and create the platforms, protocols and related concepts along with along with mobile in mobile environment.

High–3, Medium–2, Low–1

Course Title	COMPILER DESIGN LABORATORY	Semester	06

Course Code	MVJ20CSL66	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*		
Learning tools for compiler writing		
Designing the specification of language constructs		
Learning code generation and optimization		
S No	**Experiment Name**	**RBT Level**	Hours
1	Tokenizer with LEX for declarations in C language.	L3	3
2	Tokenizer with LEX for assignment statement.	L3	3

3	Parser with LEX and YACC to validate ‖for‖ statement.	L3	3
4	Evaluation of arithmetic expression with LEX and YACC.	L3	3
5	Symbol table creation from a list of declarations.	L3	3
6	Syntax tree creation from ‖if‖ statement.	L3	3
7	Three address code generation from assignment statement with array references.	L3	3
8	Three address code generation from ‖while‖ statement.	L3	3
9	Construction of flow graph from list of three address statements.	L3	3
10	Constant propagation in a flow graph.	L3	3
	OPEN ENDED EXPERIMENT 1. Translation of three address code to assembly language with fixed number of registers. 2. Stack and heap management at run time	L3	3

Course Outcomes:

CO1	Implement the token recognizer from token specification
CO2	Implement the parser from the syntax specification
CO3	Implement the intermediate code generator for the specified intermediate language
CO4	Implement simple optimizations
CO5	Implement translator with specific input and object language

Reference Books:	
1	Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, ‖Compilers: Principles, Techniques and Tools‖, Second Edition, Pearson Education, 2009.
2	Randy Allen, Ken Kennedy, ‖Optimizing Compilers for Modern Architectures: A Dependence based Approach‖, Morgan Kaufmann Publishers, 2002.

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

High-3, Medium-2, Low-1

Course Title	**CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY**	Semester	06
Course Code	MVJ20CSL67	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*

1. Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to various attacks.

2. Learn the various number theory concepts and applications.

3. Analyse the message digest algorithms and create digest values.

4. To develop and apply authentication, email security, web security services and mechanisms

5. 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 XOR each character in this string with 0 and displays the result.	L3	3

2	Write a program that contains a string (char pointer) with a value \Hello World'. The program should AND or and XOR each character in 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 BlowFish. Create your own key using Java key tool.	L3	3

	OPEN ENDED EXPERIMENT
	
	1. Perform encryption and decryption using mono–alphabetic cipher. The program should support the following :
	   o Construct an input file named plaintext.txt (consisting of 1000 alphabets, without any space or special characters)
	   o Encrypt the characters of plaintext.txt and store the corresponding ciphertext characters in ciphertext.txt
	   o Compute the frequency of occurrence of each alphabet in both plaintext.txt and ciphertext.txt and tabulate the results
	2. Write a program to perform the following using Playfair cipher technique
	   o Encrypt a given message M with different keys {k1,k2,...,kn}. Print key and cipher text pair
		L3	3

	o Decrypt the cipher texts obtained in (i) to get back M

Course Outcomes:

CO1	Identify the major types of threats to information security and the associated attacks, Services and Mechanisms
CO2	Design and develop cryptographic algorithms using public key cryptography.
CO3	Generate the own key for developing cryptography algorithms.
CO4	Implement the key exchange algorithms using scripts.
CO5	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.

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	2	2	1	-	-	-	-	-	-	1	-	1	-	-

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

High-3, Medium-2, Low-1