

Vidyavardhaka Sangha®, Mysore
VIDYAVARDHAKA COLLEGE OF ENGINEERING

Autonomous Institute, Affiliated to Visvesvaraya Technological University, Belagavi
 (Approved by AICTE, New Delhi & Government of Karnataka)

Accredited by NBA (CV, CS, EE, EC, IS & ME) | NAAC with 'A' Grade

P.B. No. 206, Gokulam III Stage, Mysuru-570 002, Karnataka, India

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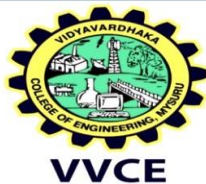
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Scheme of Teaching and Examination for M.Tech with effect from 2020 - 2021

I SEMESTER - Computer Science and Engineering

Sl. No.	Course Area	Course Code	Course Name	Teaching Department	Contact Hours / week			Examination				Credits
					L	T	P	Duration (Hrs.)	CIE Marks	SEE Marks	Total	
1	PC	20MCS11	Advanced Mathematics	Mathematics	4	0	0	3	50	50	100	4
2	PC	20MCS12	Advances in Operating Systems	Computer Science and Engineering	4	0	0	3	50	50	100	4
3	PC	20MCS13	Advanced DBMS	Computer Science and Engineering	4	0	0	3	50	50	100	4
4	PC	20MCS14	Cyber Security	Computer Science and Engineering	4	0	0	3	50	50	100	4
5	PC	20MCS15	Cloud Computing	Computer Science and Engineering	4	0	0	3	50	50	100	4
6	PC	20MCS16	Research Methodology	Computer Science and Engineering / NPTEL	2	0	0	3	50	50	100	2
7	PC	20MCS17	Cloud Computing Laboratory	Computer Science and Engineering	1	0	2	3	50	50	100	2
TOTAL					23	0	2	-	350	350	700	24



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II SEMESTER - Computer Science and Engineering

Sl. No.	Course Area	Course Code	Course Name	Teaching Department	Contact Hours / week			Examination				Credits
					L	T	P	Duration (Hrs.)	CIE Marks	SEE Marks	Total	
1	PC	20MCS21	Internet of Things	Computer Science and Engineering	4	0	0	3	50	50	100	4
2	PC	20MCS22	Data Science	Computer Science and Engineering	4	0	0	3	50	50	100	4
3	PC	20MCS23	Block Chain Technology	Computer Science and Engineering	4	0	0	3	50	50	100	4
4	PE	20MCS24X	Professional Elective – I	Computer Science and Engineering	4	0	0	3	50	50	100	4
5	PE	20MCS25X	Professional Elective – II	Computer Science and Engineering	4	0	0	3	50	50	100	4
6	PC	20MCS26	Data Science Laboratory	Computer Science and Engineering	1	0	2	3	50	50	100	2
7	PE	20MCS27	Career Elective – I	Computer Science and Engineering/ NPTEL	0	4	0	-	50	-	50	2
TOTAL					21	4	2	-	350	300	650	24

Professional Elective - I		Professional Elective - II		Career Elective - I
20MCS241	Web Application Development using Django and Flask	20MCS251	Big Data with Hadoop	Online course, Research Add on course, Foreign language, etc.
20MCS242	Mobile Application Development	20MCS252	Object Oriented Software Engineering	
20MCS243	Full Stack App. Development using MEAN	20MCS253	Web and Application Security	
20MCS244	Full Stack App. Development using MERN	20MCS254	iOS Application Development using Swift	



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III SEMESTER - Computer Science and Engineering

Sl. No.	Course Area	Course Code	Course Name	Teaching Department	Contact Hours / week			Examination				Credits
					L	T	P	Duration (Hrs.)	CIE Marks	SEE Marks	Total	
1	PC	20MCS31	Deep Learning	Computer Science and Engineering	4	0	0	3	50	50	100	4
2	PE	20MCS32X	Professional Elective – III	Computer Science and Engineering	4	0	0	3	50	50	100	4
3	PE	20MCS33X	Professional Elective – IV	Computer Science and Engineering	4	0	0	3	50	50	100	4
4	PRI	20MCS34	Internship	Computer Science and Engineering	0	0	12	3	50	50	100	6
5	PRI	20MCS35	Project Work (Phase – I)	Computer Science and Engineering	0	2	2	-	50	-	50	2
6	PE	20MCS36	Career Elective - II	Computer Science and Engineering/ NPTEL	0	4	0	-	50	-	50	2
TOTAL					12	6	14	-	300	200	500	22

Professional Elective – III		Professional Elective – IV		Career Elective – II
20MCS321	Advanced Algorithms	20MCS331	NLP using Python	Online course, Research Add on course, Foreign language, etc.
20MCS322	Advanced Java & J2EE	20MCS332	Agile Technologies	
20MCS323	Advances in SAN	20MCS333	Information and Network Security	
20MCS324	Advances in Digital Image Processing	20MCS334	Advances in Computer Graphics	



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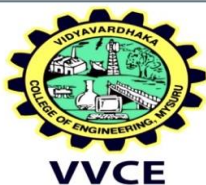


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IV SEMESTER - Computer Science and Engineering

Sl. No.	Course Area	Course Code	Course Name	Teaching Department	Contact Hours / week			Examination				Credits
					L	T	P	Duration (Hrs.)	CIE Marks	SEE Marks	Total	
1	PRI	20MCS41	Technical Seminar	Computer Science and Engineering	0	4	0	-	50	-	50	2
2	PRI	20MCS42	Project Work (Phase - II)	Computer Science and Engineering	0	16	16	3	50	50	100	16
TOTAL					0	20	16	-	100	50	150	18

NOTE:	PC : Professional Core	CREDIT Definition
BS : Basic Science	PE : Professional Electives	1 hour Lecture per week per semester = 1 credit
ES : Engineering Science	OE : Open Electives	2 hours Tutorials per week per semester = 1 credit
HS: Humanities & Social Science	PRI: Project & Internship	2 hours Practical / lab / drawing per week per semester = 1 credit



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SEMESTER – I

Course Name : Advanced Mathematics **Course Code** : 20MCS11

Number of Lecture Hours / Week : 04 **CIE Marks** : 50

Number of Tutorial / Practical Hours / Week : 00 **SEE Marks** : 50

Total No. of Lecture + Tutorial / Practical Hours : 50 + 00 = 50 **SEE Duration** : 03 Hrs.

L:T:P : 4:0:0 **CREDITS** : 04

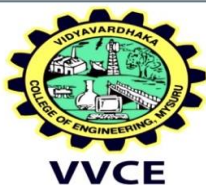
COURSE OVERVIEW: Linear algebra, numerical methods, probability Number Theory and sampling theory techniques are the more advanced areas of Mathematics which are intensively used engineering disciplines. A major focus of the course is linear algebra and probability theory which is most important tool for simulations and machine learning. Numerical methods play vital role in find most fitting and best approximate solutions. The course aims to show the relevance of Mathematics to engineering and applied sciences

COURSE LEARNING OBJECTIVES (CLO)

This course will enable students to

- Apply mathematics, science, and engineering principles
- Ability to design and conduct experiments, analyze and interpret data
- Ability to identify, formulate and solve engineering problems

MODULES	TEACHING HOURS
Module 1: Linear Algebra: vector space and basis, linear transformation, matrix representation rank-nullity theorem, inverse linear transformations. Eigen values and Eigen vectors, Gram-Schmidt orthogonalization, svd decomposition, Q-R decomposition	10
Module 2: Curve fitting and statistics : curve fitting of nonlinear curve, moments, skewness, Karl Pearson's coefficient of skewness, Bowley's method to find skewness using third moment, Kurtosis	10
Module 3: Random Process, Random Queuing Analysis and sampling theory: Random Variable-discrete, random processes, definitions, mean Random Variable of two variables -covariance, coefficient of correlation, single server Markov Queues Sampling Theory - T-test, Chi-Square test, Anova and Fisher's test	10
Module 4: Number Theory: Euclidian algorithm, Chinese remainder theorem, generalized Chinese remainder theorem, Fermat's little theorem, pseudo prime and Fermat's pseudo prime	10
Module 5: Advance Numerical Method: solving algebraic equation by Giraffes roots square method, Eigen values by Jacobi and given method, numerical solution of partial differential equation boundary and initial conditions	10



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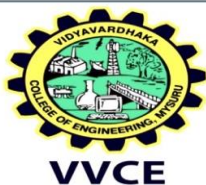
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Reference Books:

1. Numerical Methods by M.K. Jain, S.R.K. Iyengar, R.K. Jain, 6th edition, New Age International (P) Ltd, 2003.
2. Numerical Analysis for Scientists and Engineers, Madumangal Pal, Alpha Science, 2007.
3. Introduction to Linear Algebra by Gilbert Strong, 5th Edition, Wllesley Publishers, 2016.
4. David. C. Lay, Linear Algebra and its applications, 3rd edition, Pearson Education, 2002.
5. Probability, Queueing Theory and Reliability Engineering, G Haribhaskaran, 1st edition, Laxmi Publications, 2005.
6. Probability, statistics and Random Process, by T. Veerarajan, 3rd edition, Tata-McGraw-Hill
Elementary Number theory with application by Thomas Koshy ,2008, reed Elsevier , India.

COURSE OUTCOMES (COs):

CO1	Understand Linear Algebra, probability, Numerical Methods, Number Theory and Statistics
CO2	Apply the concept of Advance Mathematics to solve the problems in Engineering domain
CO3	Analyze the solutions of engineering problems using Advance Mathematics
CO4	Analyze and present the mathematics supporting a technical concept



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SEMESTER – I

Course Name : Advances in Operating Systems Course Code : 20MCS12

Number of Lecture Hours / Week : 04 CIE Marks : 50

Number of Tutorial / Practical Hours / Week : 00 SEE Marks : 50

Total No. of Lecture + Tutorial / Practical Hours : 50 + 00 = 50 SEE Duration : 03 Hrs.

L:T:P : 4:0:0 CREDITS : 04

COURSE OVERVIEW: This course enables the students to learn the fundamentals and identify the management aspects, applications of various operating systems.

COURSE LEARNING OBJECTIVES (CLO) :

This course will enable the students to

- Define the fundamentals of Operating Systems
- Explain operating system concepts which include architecture, Mutual exclusion and Deadlock detection
- Illustrate distributed resource management components viz. the algorithms for implementation of distributed shared memory concepts
- Identify the components and management aspects of Real time, Embedded Operating Systems

MODULES	TEACHING HOURS
MODULE 1: Introduction to Operating System and its Strategies Operating System Objectives functions, The evolution of Operating Systems, The Genesis of Modern Operating Systems, Virtual Machines, OS design considerations for multiprocessor and multicore, Process thread and resource management, The Hardware process. Text Book 1: Ch. 2: 2.1-2.2, 2.4-2.6 Text Book 2: Ch. 1: 1.2 Ch. 2 : 2.1 Ch. 3:3.2	10
MODULE 2: Threads, SMP and Memory management Processes and threads, Multicore and Multithreading, Solaris Thread and SMP Management, Address Space Abstraction, modern memory manager strategies, UNIX & Solaris Memory Management. Text Book 1: Ch. 4: 4.1, 4.3, 4.5 Ch. 8:8.3 Text Book 2: Ch. 8: 8.2, 8.5	10
MODULE 3: Processor Scheduling& Deadlock: Types of Processor Scheduling, Scheduling Mechanism, Linux Scheduling, Principles of Deadlock, Deadlock prevention, Deadlock avoidance, Deadlock detection. Text Book 1: Ch. 6:6.1-6.4 Ch. 9: 9.1 Ch. 10:10.3 Text Book 2: Ch. 4: 4.2	10
MODULE 4: Embedded Operating Systems & Computer Security Techniques Embedded Systems, Characteristics of Embedded Operating Systems, Computer Security Concepts, Authentication, Access Control, Intrusion Detection. Text Book 1: Ch. 13: 13.1 -13.3 Ch. 14:14.1 Ch.15:15.1-15.3	10



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MODULE 5: Kernel Organization and its design strategies

Design Considerations, Kernel Organization, Monolithic Kernels Extensible nucleus or micro kernel organization – The MACH operating System, Subsystems, Kernel local procedure calls and IPC, The native API.

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Text Book 2: Ch. 17: 17.1, 17.2 ,17.4 Ch. 19: 19.4-19.5

Text Books:

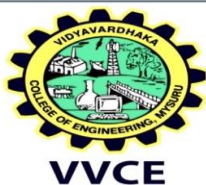
1. William Stallings: Operating Systems: Internals and Design Principles, 7th Edition, Prentice Hall, 2013.
2. Gary Nutt: Operating Systems, 3rd Edition, Pearson, 2014.

Reference Books:

1. Silberschatz, Galvin, Gagne: Operating System Concepts, 8th Edition, Wiley, 2008.
2. Andrew S. Tanenbaum, Albert S. Woodhull: Operating Systems, Design and Implementation, 3rd Edition, Prentice Hall, 2006.
3. Pradeep K Sinha: Distribute Operating Systems, Concept and Design, PHI, 2007.

COURSE OUTCOMES (COs):

CO1	Illustrate the Mutual exclusion, Deadlock detection of operating system
CO2	Apply the existing various resource management techniques for operating systems
CO3	Identify the different features of real time and embedded operating system
CO4	Apply the existing open source kernels in terms of functionality or features used
CO5	Analyze and present a substantial technical content as an individual



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SEMESTER – I

Course Name	: Advances in Database Management Systems	Course Code : 20MCS13
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Number of Lecture Hours / Week	: 04	CIE Marks : 50
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Number of Tutorial / Practical Hours / Week	: 00	SEE Marks : 50
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Total No. of Lecture + Tutorial / Practical Hours	: 50 + 00 = 50	SEE Duration : 03 Hrs.
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L:T:P	: 4:0:0	CREDITS : 04
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COURSE OVERVIEW :

The course reviews topics such as conceptual data modeling, relational data model, relational query languages, relational database design and transaction processing and current technologies such as semantic web, parallel and no SQL databases. It exposes the student to the fundamental concepts and techniques in database use and development as well provides a foundation for research in databases.

COURSE LEARNING OBJECTIVES (CLO) :

This course will enable students to

- Define parallel and distributed databases and its applications
- Show applications of Object Oriented database
- Explain basic concepts, principles of intelligent databases
- Utilize the advanced topics of data warehousing and mining
- Infer emerging and advanced data models
- Extend knowledge in research topics of databases

MODULES

TEACHING HOURS

MODULE 1: Review of Relational Data Model and Relational Database Constraints:

Relational model concepts; Relational model constraints and relational database schemas; Update operations, anomalies.

Object and Object-Relational Databases: Overview of OOP; Complex objects; Identity, structure etc. Object model of ODMG, Object definition Language ODL; Object Query Language OQL; Conceptual design of Object database.

Text Book 1: Ch. 5: 5.1-5.3 Text Book 1: Ch. 12: 12.1-12.6

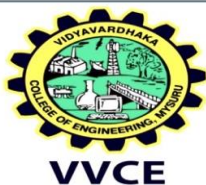
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MODULE 2: Database-System Architectures: Centralized and Client –Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems, Network Types.

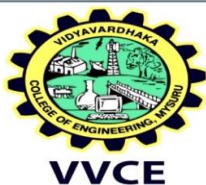
Parallel Databases: Introduction, I/O Parallelism, Inter-query Parallelism, Intra-query, Parallelism, Intra-operation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems.

Text Book 2 : Ch. 17,18

10



MODULE 3: Data Warehousing, Decision Support and Data Mining: Decision-Support Systems, Data Warehousing, Data Mining, Classification, Association Rules, Other Types of Associations, Clustering, Other Forms of Data Mining, Information Retrieval: Relevance Ranking Using Terms, Relevance Using Hyperlinks, Synonyms, Homonyms, and Ontologies, Indexing of Documents, Measuring Retrieval Effectiveness, Crawling and Indexing the Web. Text Book 1: Ch. 28 Text Book 2: Ch. 21	10
MODULE 4: NOSQL Databases and Big Data Storage Systems: Introduction to NOSQL Systems, The CAP Theorem, Document-Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases and Neo4j. Big Data Technologies Based on Map Reduce and Hadoop: What Is Big Data? Introduction to Map Reduce and Hadoop, Hadoop Distributed File System (HDFS) Text Book 1: Ch. 24, 25	10
MODULE 5: Data base Security: Introduction to data base security issues, Discretionary access control based on granting and revoking privileges, Mandatory access control and role based access control for multilevel security, SQL injection, introduction to statistical data base security, introduction to flow control, encryption and public key Infrastructure, privacy issues and preservation, challenges to maintaining database security. Text Book 1: Ch. 30	10
Text Books: 1. Elmasri and Navathe: Fundamentals of Database Systems, 7th Edition, Pearson Education, 2013. 2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan: Database System Concepts, 6th Edition, McGraw Hill, 2010.	
Reference Books: 1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2013.	
COURSE OUTCOMES (COs):	
C01	Apply the relational data model and object oriented concepts design relational and object oriented database
C02	Analyze the architecture of database systems and apply the fundamental algorithms for parallel database systems based on the relational data model
C03	Analyze the data to extract knowledge from the given data set using Data Mining and Data warehousing concepts
C04	Design and develop database for recent applications database for better interoperability
C05	Analyze the issues and challenges in database security



SEMESTER - I

Course Name : Cyber Security **Course Code** : 20MCS14

Number of Lecture Hours / Week : 04 **CIE Marks** : 50

Number of Tutorial / Practical Hours / Week : 00 **SEE Marks** : 50

Total No. of Lecture + Tutorial / Practical Hours : 50 + 00 = 50 **SEE Duration** : 03 Hrs.

L:T:P : 4:0:0 **CREDITS** : 04

COURSE OVERVIEW: Cyber Security is a computing paradigm, where a large pool of systems are connected in private or public platforms and the data are vulnerable, to provide dynamically scalable infrastructure for application, data and file storage. The main idea of cyber security and cyber law are to mitigate the cyber-attacks.

COURSE LEARNING OBJECTIVES (CLO) :

- Discover software bugs that pose cyber security threats, explain and recreate exploits of such bugs in realizing a cyber-attack on such software, and explain how to fix the bugs to mitigate such threats
- Discover and explain mobile software bugs posing cyber security threats, explain and recreate exploits, and explain mitigation techniques
- Articulate the urgent need for cyber security in critical computer systems, networks, and World Wide Web, and explain various threat scenarios
- Articulate the well-known cyber-attack incidents, explain the attack scenarios, and explain mitigation techniques
- Explain the difference between Systems Cyber Security, Network Cyber Security, and cryptography, crypto-protocols, etc.

MODULES	TEACHING HOURS
MODULE 1: Introduction to Cybercrime Introduction, Cybercrime: Definition and origin of the word, Cybercrime & information security, who are cyber criminals? Classification of cybercrimes, Cybercrime-Legal perspective & an Indian Perspective, ITA 2000, Global perspective on cybercrimes. Text Book 1: Ch. 1.1 - 1.9	10
MODULE 2: Cyber Offenses Introduction, how criminals plan the attacks, Social Engineering, Cyber Stalking, Cybercafe and Cybercrimes, Botnets, Attack vector, cloud computing Text Book 1: Ch. 2.1 - 2.8	10
MODULE 3: Cyber Crime: Mobile and Wireless devices Introduction, Proliferation of Mobile & Wireless devices, Trends in Mobility, Credit card frauds in Mobile and Wireless devices, Security challenges posed by Mobile devices, Registry settings in mobile devices, Authentication Service security, Attacks on mobile and cellphones, mobile devices: security implications for organization, organizational measures for handling mobile devices, organizational security policies and measures in	10



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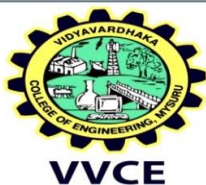
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mobile computing era, Laptops. Text Book 1: Ch. 3.1 - 3.12	
MODULE 4: Tools and Methods used in cybercrime Introduction, Proxy servers and anonymizers, Phishing, password cracking, key loggers and spywares, virus and worms trojan horse and backdoors, steganography, DoS & DDoS attacks, SQL Injection, Buffer overflow, attacks on wireless networks. Text Book 1: Ch. 4.1 - 4.12	10
MODULE 5: Cybercrime: Illustrations, Examples and Mini cases Introduction, Real-life examples, Mini cases, Illustration of financial frauds in cyber domain, Digital Signature- Related Crime scenarios, Digital forensics case Illustrations, Online scams. Text Book 1: Ch. 11.1 - 11.7	10
Text Books: 1. Nina Godbole, Sunit Belapure, "Cyber Security", Wiley Publishers, January 2012.	
Reference Books: 1. Shukla, Sandeep Kumar, Agrawal, Manindra, "Cyber Security in India-Education, Research and Training" Springer, 2020. 2. Andrew Honig and Michael Sikorski "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software", No starch press, san Francisco , 2012.	
COURSE OUTCOMES (COs):	
CO1	Illustrate and discuss the basic concepts of cyber space, cyber-attack and cyber law
CO2	Analyze the attacks on networks and web sites
CO3	Illustrate and analyze the security issues in mobile platforms
CO4	Discuss issues in Critical infrastructure security
CO5	Analyze a given problem and provide a suitable solution in a team



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SEMESTER – I

Course Name : CLOUD COMPUTING Course Code : 20MCS15

Number of Lecture Hours / Week : 04 CIE Marks : 50

Number of Tutorial / Practical Hours / Week : 00 SEE Marks : 50

Total No. of Lecture + Tutorial / Practical Hours : 50 + 00 = 50 SEE Duration : 03 Hrs.

L:T:P : 4:0:0 CREDITS : 04

COURSE OVERVIEW: The popular trend in today's technology driven world is 'Cloud Computing'. Cloud computing can be referred to as the storing and accessing of data over the internet rather than your computer's hard drive. This means you don't access the data from either your computer's hard drive or over a dedicated computer network (home or office network). Cloud computing means data is stored at a remote place and is synchronized with other web information.

COURSE LEARNING OBJECTIVES (CLO):

- Analyze Cloud computing, models and Services
- Compare and contrast different cloud services
- Build applications using google cloud platform
- Apply Cloud automation and management tools to build your own cloud

MODULES

TEACHING HOURS

MODULE 1: Introduction, Cloud Infrastructure: Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open source software platforms for private clouds, Cloud storage diversity and vendor lock-in, nergy use and ecological impact, Service level agreements, User experience and software licensing.

Textbook 1: Ch. 1, 3

10

MODULE 2: Google Cloud Infrastructure: IaaS, PaaS, and SaaS, Google Cloud Architecture The GCP Console. Understanding projects, billing in GCP, Install and configure Cloud SDK, Use Cloud Shell, GCP APIs, Cloud Console Mobile App.

Google Cloud Platform-Build Apps: Compute options in the cloud, Exploring IaaS with Compute Engine, configuring elastic apps with auto scaling, Exploring PaaS with App Engine, Event driven programs with Cloud Functions. Containerizing and orchestrating apps with Google Kubernetes Engine.

Google Materials

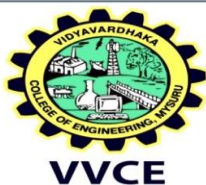
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MODULE 3: Implement a variety of structured and unstructured storage models: Storage options in the cloud, Structured and unstructured storage in the cloud, Unstructured storage using Cloud Storage, SQL managed services, Exploring Cloud SQL, Cloud Spanner as a managed service, NoSQL managed service options, Cloud Data store,

10



a NoSQL document store, Cloud Bitable as a NoSQL option Different application managed service options in the cloud: The purpose of APIs, Cloud Endpoints, Using Apogee Edge, Managed message services, Exploring Cloud SQL, Cloud Pub/Sub. Google Materials		
MODULE 4: Introduction to security in the cloud: Introduction to security in the cloud, the shared security model, Encryption options, Authentication and authorization with Cloud IAM, Identify Best Practices for Authorization using Cloud IAM. How to build secure networks in the cloud.: Introduction to networking in the cloud, defining a Virtual Private Cloud, Public and private IP address basics, Google's network architecture, Routes and firewall rules in the cloud, Multiple VPC networks, building hybrid clouds using VPNs, interconnecting, and direct peering, Different options for load balancing. Google Materials		10
MODULE 5: Cloud automation and management tools: Introduction to Infrastructure as Code, Cloud Deployment Manager, Public and private IP address basics, Monitoring and managing your services, applications, and infrastructure, Stack driver. Discover a variety of managed big data services in the cloud: Introduction to big data managed services in the cloud, Leverage big data operations with Cloud Dataproc, Build Extract, Transform, and Load pipelines using Cloud Dataflow, BigQuery, Google's Enterprise Data Warehouse. Google Materials		10
Text Books: 1. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier(MK) 2013. 2. Google Cloud Computing Foundations materials- https://cloud.google.com/training.		
Reference Books: 1. RajkumarBuyya, James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014. 2. John W Rittinghouse, James F Ransome: Cloud Computing Implementation, Management and Security, CRC Press 2013.		
COURSE OUTCOMES (COs):		
CO1	Compare the strengths and limitations of cloud computing	
CO2	Identify the architecture, infrastructure and delivery models of google cloud	
CO3	Apply suitable structured and unstructured storage models	
CO4	Choose the appropriate cloud security to build secure network	
CO5	Choose the appropriate cloud management tools for deploying and managing cloud services	
CO6	Address the core issues of cloud computing such as security, privacy and interoperability	



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SEMESTER – I

Course Name	: Research Methodology	Course Code :	20MCS16
Number of Lecture Hours / Week	: 02	CIE Marks :	50
Number of Tutorial / Practical Hours / Week	: 00	SEE Marks :	50
Total No. of Lecture + Tutorial / Practical Hours	: 25 + 00 = 25	SEE Duration :	03 Hrs.
L:T:P	: 2:0:0	CREDITS :	02

COURSE OVERVIEW :

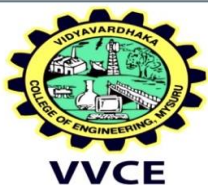
A research method is a systematic plan for conducting research. Researchers draw on a variety of both qualitative and quantitative research methods, including experiments, survey research, participant observation, and secondary data. A patent is a form of intellectual property that gives its owner the legal right to exclude others from making, using, selling, and importing an invention for a limited period of years, in exchange for publishing an enabling public disclosure of the invention.

The course aims at introducing the students to the basic concepts used in research and acquaints them with fundamentals of research methods. The students will also understand the importance of leading International Instruments concerning Intellectual Property Rights.

COURSE LEARNING OBJECTIVES (CLO):

- To give an overview of the research methodology and explain the technique of formulating a research problem
- To explain the functions of the literature review in research.
- To explain carrying out a literature search, its review, developing theoretical and conceptual frameworks and writing a review
- To explain various research designs and their characteristics
- To explain the details of sampling designs, and also different methods of data collections
- To explain the art of interpretation and the art of writing research reports
- To explain various forms of the intellectual property, its relevance and business impact in the changing global business environment

MODULES	TEACHING HOURS
MODULE 1: Introduction to Research Methodology: Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research. Formulating a research problem: The research problem, the importance of formulating a research problem, Sources of research problems, Considerations in selecting a research problem, steps in formulating a research problem, The formulation of research objectives. Text Book 1: Ch. 1 Text Book 2: Ch. 4	05



MODULE 2: Reviewing the literature: The place of the literature review in research, bringing clarity and focus to your research problem, improving your research methodology, broadening your knowledge base in your research area, enabling you to contextualize your findings, how to review the literature, searching for the existing literature, Reviewing the selected literature, developing a theoretical framework, developing a conceptual framework, writing about the literature reviewed. Text Book 2: Ch. 3	05
MODULE 3: Research Design: Meaning of Research Design, need for Research Design, features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-Sampling Errors, Sample Survey Vs. Census Survey, Types of Sampling Designs. Text Book 1: Ch. 3, 4	05
MODULE 4: Data Collection: Introduction, Experiments and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Interpretation and Report Writing: Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports. Text Book 1: Ch. 6, 19	05
MODULE 5: Intellectual Property Rights: The Concept of Intellectual Property, Intellectual Property System in India, Trade Related Aspects of Intellectual Property Rights(TRIPS) Agreement, Issues covered under TRIPS Agreement, Features of the Agreement, Protection of Intellectual Property under TRIPS, Copyright and Related Rights, Trademarks, Patents, Patentable Subject Matter, Rights Conferred, Exceptions, Term of protection, Conditions on Patent Applicants, Process Patents. Text Book 3: Ch. 1	05
Text Books: 1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg, New Age International 3rd Edition, 2014. 2. Research Methodology: A Step-by-Step Guide for Beginners, Ranjit Kumar , SAGE publications Ltd, 3rd Edition, 2011. 3. Study Material (For the topic Intellectual Property under module 5) Professional Programme Intellectual Property Rights-Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013.	
Reference Books: 1. Research Methods: The Concise Knowledge Base, William M. K. Trochim, Atomic Dog Publishing, 2005. 2. Conducting Research Literature Reviews: From the Internet to Paper, Arlene Fink, Sage Publications	



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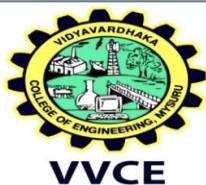
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2009.

3. B L Wadehra, Law relating to patents, trademarks, copyright designs and geographical Indications, Universal Law Publishing, 2000.

COURSE OUTCOMES (COs):

C01	Apply research methodologies for formulating research problems
C02	Discuss techniques and methods for data collection, literature review, interpretation and research report writing skills
C03	Identify the appropriate research design for a given problem
C04	Differentiate various forms of intellectual property and leading International Instruments concerning IPR
C05	Design and validate proposed models by research methodology



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SEMESTER – I

Course Name : Cloud Computing Laboratory **Course Code** : 20MCS17

Number of Lecture Hours / Week : 01 **CIE Marks** : 50

Number of Tutorial / Practical Hours / Week : 02 **SEE Marks** : 50

Total No. of Lecture + Tutorial / Practical Hours : 14 + 28 = 42 **SEE Duration** : 03 Hrs.

L:T:P : 1:0:2 **CREDITS** : 02

COURSE OVERVIEW:

Cloud computing can be referred to as the storing and accessing of data over the internet rather than your computer's hard drive. This means you don't access the data from either your computer's hard drive or over a dedicated computer network (home or office network). Cloud computing means data is stored at a remote place and is synchronized with other web information.

COURSE LEARNING OBJECTIVES (CLO):

- Compare and contrast different cloud services
- Build applications using google cloud platform
- Apply Cloud automation and management tools to build your own cloud

Laboratory Experiments

1. **Creating Virtual Machine:** Create a virtual machine with the Cloud Console, create a virtual machine with gcloud command line, deploy a web server and connect it to a virtual machine.
2. **Loading Data into Cloud SQL:** Demonstrate a wide range of data science concepts and techniques and is used in all of the labs in the Data Science on Google Cloud Platform.
3. **App Dev:** Storing Application Data in Cloud Data store – Python: - Use Data store to store application data for an online Quiz application.
4. **Cloud End points:** Deploy a sample API with Google Cloud Endpoints, which are a set of tools for generating APIs from within an App Engine application.
5. **User Authentication:** Cloud Identity-Aware Proxy: Build a minimal web application with Google App Engine, then explore various ways to use Identity-Aware Proxy (IAP) to restrict access to the application and provide user identity information to it.
6. **VPC Networking Fundamentals:** Create an auto mode VPC network with firewall rules and two VM instances.
7. **VPC Networks - Controlling Access:** Create two nix web servers and control external HTTP access to the web servers using tagged firewall rules.



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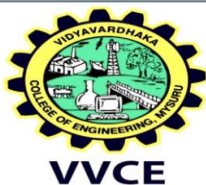
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8. **Create an Internal Load Balancer:** Create two managed instance groups in the same region, configure and test an Internal Load Balancer with the instances groups as the backends.
9. **Monitoring Multiple Cloud Projects with Stack driver:** Create a Cloud Monitoring account that has two Google Cloud projects.
10. **Classify Images of Clouds in the Cloud with Auto ML Vision:** Upload images to Cloud Storage and use them to train a custom model to recognize different types of clouds (cumulus, cumulonimbus, etc.).

COURSE OUTCOMES (COs):

CO1	Compare the strengths and limitations of cloud computing
CO2	Identify the architecture, infrastructure and delivery models of google cloud
CO3	Apply suitable structured and unstructured storage models
CO4	Choose the appropriate cloud security to build secure network
CO5	Choose the appropriate cloud management tools for deploying and managing cloud services
CO6	Address the core issues of cloud computing such as security, privacy and interoperability



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SEMESTER - II

Course Name : Internet of Things **Course Code** : 20MCS21

Number of Lecture Hours / Week : 04 **CIE Marks** : 50

Number of Tutorial / Practical Hours / Week : 00 **SEE Marks** : 50

Total No. of Lecture + Tutorial / Practical Hours : 50 + 00 = 50 **SEE Duration** : 03 Hrs.

L:T:P : 4:0:0 **CREDITS** : 04

COURSE OVERVIEW:

The course introduces basic issues, policy and challenges in the IoT, illustrate Mechanism and Key Technologies in IoT, Standard of the IoT, resources in the IoT and deploy of resources into business and demonstration of data analytics for IoT. Students will gain a thorough understanding of widely accepted IoT frameworks and standards.

COURSE LEARNING OBJECTIVES (CLO):

This course will enable students to

- Define and explain basic issues, policy and challenges in the IoT
- Illustrate Mechanism and Key Technologies in IoT
- Explain the Standard of the IoT
- Explain resources in the IoT and deploy of resources into business

MODULES

TEACHING HOURS

MODULE 1: Introduction to Internet of Things: Physical design of IOT, Logical Design of IOT, IOT enabling technologies, IOT Levels & Deployment Templates, Domain Specific IOTs, Introduction: Cities, Environment, Retail, Agriculture, Industry, Health & Lifestyle, Home Automation.

Text Book 1: Ch. 1,2

10

MODULE 2: IOT and M2M: Introduction: M2M, Difference between IoT and M2M, SDN and NFV for IOT, IOT System Management with NETCONF-YANG, Need for IOT Systems Management, Simple Network Management Protocol (SNMP), NETCONF, YANG, IoT Systems Management with NETCONF-YANG, Network operator requirements.

Text Book 1: Ch. 3,4

10

MODULE 3: Developing Internet of Things: Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring, Motivation for Using Python, IoT Systems - Logical Design using Python: Introduction, Installing python, Python Data Types and Data structures, Modules, Packages, File Handling, Operations, Classes, Python Packages of Interest for IoT, Python: Control flow Functions.

Text Book 1: Ch. 5,6

10

MODULE 4: IoT Physical Devices & End points: What is a IoT Device, Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi interfaces, Programming

10



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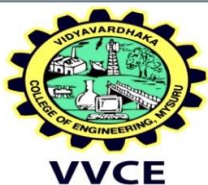
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Raspberry Pi with Python, Other IoT Devices, IoT Physical Services and Cloud Offerings: Introduction to cloud storage models and Communication APIs, WAMP-Autobahn for IoT, python Web Application framework – Django, designing a RESTful Web API, Amazon Web Services for IoT, SkyNetIoT Messaging platform, Xively Cloud for IoT. Text Book 1: Ch. 7,8	
MODULE 5: Applications of IoT: Introduction, Home Automation, Cities, Environment, Agriculture Applications, Productivity Applications. Text Book 1: Ch. 9	10
Text Books: 1. Arsheen Bahga, Vijay Madiseti, "Internet of Things: A Hands on Approach" Universities Press., 2015.	
Reference Books: 1. Michael Miller, "The Internet of Things", First Edition, Pearson, 2015. 2. Claire Rowland, Elizabeth Goodman, et. al., "Designing Connected Products", First Edition, O'Reilly, 2015.	
COURSE OUTCOMES (COs):	
CO1	Apply basic concepts of IoT in various domains
CO2	Illustrate IoT protocol layers, levels and architecture
CO3	Illustrate IoT devices using Raspberry Pi and python Programming language
CO4	Illustrate IoT physical servers and cloud offering for real time applications
CO5	Design and demonstrate the various IoT solutions
CO6	To analyze a given problem and provide a suitable solution in a team



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SEMESTER - II

Course Name : Data Science Course Code : 20MCS22

Number of Lecture Hours / Week : 04 CIE Marks : 50

Number of Tutorial / Practical Hours / Week : 00 SEE Marks : 50

Total No. of Lecture + Tutorial / Practical Hours : 50 + 50 = 50 SEE Duration : 03 Hrs.

L:T:P : 4:0:0 CREDITS : 04

COURSE OVERVIEW: Among interpreted languages Python is distinguished by its large and active scientific computing community. Adoption of Python for scientific computing in both industry applications and academic research has increased significantly since the early 2000s. In recent years, Python's improved library support (primarily pandas) has made it a strong alternative for data manipulation tasks. Combined with Python's strength in general purpose programming, it is an excellent choice as a single language for building data-centric applications.

COURSE LEARNING OBJECTIVES (CLO): This course will enable students to

- Introduce the NumPy, Pandas and Matplotlib packages available in python
- Demonstrate the data manipulation techniques using Pandas
- Demonstrate the data visualization techniques using Matplotlib and Seaborn
- Apply ML algorithms for data analysis

MODULES

TEACHING HOURS

MODULE 1: Introduction to NumPy: Understanding Data Types in Python, The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions, Aggregations: Min, Max, Computation on Arrays: Broadcasting, Comparisons, Masks, and Boolean Logic, Fancy Indexing, Sorting Arrays, Structured Data: NumPy's Structured Arrays.

Text Book 1: Ch. 2

10

MODULE 2: Data Manipulation with Pandas: Introducing Pandas Objects, Data Indexing and Selection, operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets, Aggregation and Grouping, Pivot Tables, Working with Time Series.

Text Book 1: Ch. 3

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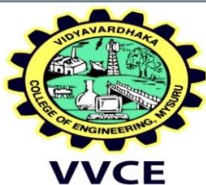
MODULE 3: Visualization with Matplotlib and Seaborn: Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density plots, Customizing plot legends, Multiple sub plots, visualizing with Seaborn, Seaborn vs Matplotlib, Exploring Seaborn plots.

Text Book 1: Ch. 4

10

MODULE 4: ML using Scikit Learn-1: Introduction to Scikit-Learn, Hyper parameters and model validation, Bayesian classification, Gaussian Naïve Bayes, Multinomial Naïve Bayes classification.

10



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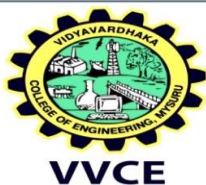
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Text Book 1: Ch. 5 Text Book 2: Ch. 6.9	
MODULE 5: ML using Scikit Learn-2: Introduction to Decision Trees and random forests, Appropriate problems for decision tree learning, Basic decision tree algorithm, Issues in decision tree learning, ensembles and estimators in random forests, Introduction to K-Means clustering, Expectation and maximization in clustering, weaknesses of k-means clustering Text Book 1: Ch. 5 Text Book 2: Ch. 3.1 - 3.4, 3.7	10
Text Books: 1. Jake VanderPlas: Python Data Science Hand Book. O'Reilly publication 2017. 2. Tom M. Mitchell, "Machine Learning", McGraw Hill publication, 1997.	
Reference Books: 1. Wes Mckenny: Python for Data Analysis, O'Reilly publication 2013. 2. Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", 1st Edition, CreateSpace Independent Publishing Platform, 2016.	
COURSE OUTCOMES (COs):	
C01	Illustrate data preprocessing and visualization techniques using Numpy, Pandas and Matplotlib modules
C02	Analyze dataset using exploratory data analysis techniques
C03	Illustrate the concept of machine learning for prediction and clustering tasks
C04	Apply machine learning models for prediction and clustering
C05	Analyze and present a substantial technical content



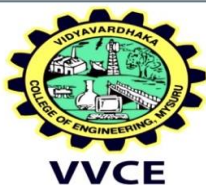
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SEMESTER - II

Course Name	: Block Chain Technology	Course Code :	20MCS23
Number of Lecture Hours / Week	: 04	CIE Marks :	50
Number of Tutorial / Practical Hours / Week	: 00	SEE Marks :	50
Total No. of Lecture + Tutorial / Practical Hours	: 50 + 00 = 50	SEE Duration :	03 Hrs.
L:T:P	: 4:0:0	CREDITS :	04
COURSE OVERVIEW: Learn more about the history, the most important blockchain concepts, the philosophy of decentralization behind blockchain, and the main discussions happening within the blockchain environment. In addition, applications of blockchain and the impact it could have on the business world.			
COURSE LEARNING OBJECTIVES (CLO): - To analyses the basic concepts of blockchain - To apply the knowledge of blockchain by using new technologies - To create hands-on experience with the concepts			
MODULES			TEACHING HOURS
MODULE 1: Blockchain: Distributed systems, CAP theorem, Byzantine Generals problems, Consensus. The history of blockchain, Introduction to blockchain, various technical definitions of block chains, Generic elements of a blockchain, Features of a blockchain, Applications of blockchain technology, Tiers of blockchain technology, Consensus in blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain. Text Book 1: Ch. 1			10
MODULE 2: Decentralization: Decentralization using blockchain, Methods of decentralization, Blockchain and full ecosystem decentralization, Smart contract, Decentralized organizations, decentralized autonomous organizations, decentralized autonomous corporations, Decentralized autonomous societies, Platforms for decentralization. Cryptographic primitives: Symmetric cryptography, Asymmetric cryptography, Public and private keys, Hash functions: Compression of arbitrary messages into fixed length digest, Easy to compute, Pre-image resistance, second pre-image resistance, Collision resistance, Message Digest(MD), Secure Hash Algorithms(SHAs), Merle trees, Patricia trees, Distributed hash tables(DHTs), Digital signatures, Elliptic Curve Digital signature algorithm(ECDSA), Decentralized applications. Text Book 1: Ch. 1-3			10
MODULE 3: Bitcoin: Bitcoin definition, Transactions, the transaction life cycle, the transaction structure, Types of transaction, the structure of a block, the structure of a			10



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block header, the genesis block, the bitcoin network, Wallets, Smart Contracts-History, Definition, Riparian contracts, Smart contract templates, Oracles, Smart Oracles, deploying smart contracts on a blockchain, The DAO, creating wallets and sending cryptocurrency.

Text Book 1: Ch. 5-6

MODULE 4:

Ethereal 101: Introduction, Ethereum clients and releases, The Ethereum stack, Ethereum blockchain, Currency (ETH and ETC), Forks, Gas, the consensus mechanism, the world state, Transactions, Contract creation transaction, Message call transaction, Elements of the Ethereum blockchain, Ethereum virtual machine(EVM), Accounts, Block, Ether, Messages, Mining, The Ethereum network.

Text Book 1: Ch. 10

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MODULE 5:

Hyperledger: Hyperledger as a protocol, Fabric, Hyperledger Fabric, Sawtooth lake, Corda.

Text Book 1: Ch 15

10

Text Books:

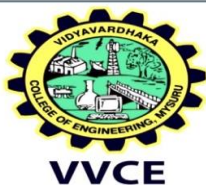
1. Imran Bashir "Mastering Blockchain", Second Edition, Packt Publishing , 2018.

Reference Books:

1. Mastering Bitcoin: Programing the Open Blockchain Paperback-2017 by Andreas M. O'rielly
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

COURSE OUTCOMES (COs):

C01	Illustrate the blockchain terminologies with its applications
C02	Analyze the working principles of blockchain
C03	Apply the methodologies used in Bitcoin
C04	Create Ethereum network, wallets, Nodes, Smart contract
C05	Analyze blockchain based application architecture using Hyperledger
C06	Investigate a given problem as a team



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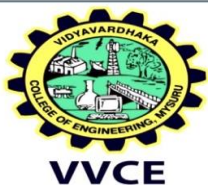
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SEMESTER -II

Course Name:	: Web Application Development using Django and Flask	Course Code :	20MCS241
Number of Lecture Hours / Week	: 04	CIE Marks :	50
Number of Tutorial / Practical Hours / Week	: 00	SEE Marks :	50
Total No. of Lecture + Tutorial / Practical Hours	: 50 + 00 = 50	SEE Duration :	03 Hrs.
L:T:P	: 4:0:0	CREDITS :	04
COURSE OVERVIEW: Django is a framework that is most recommended when it comes to building Python-based web applications. This high-level Python web framework fosters rapid development and creates clean, pragmatic design; allowing developers to create top-quality code. Django combined with Python facilitates in building better web apps swiftly with less coding. Big players in the industry like Instagram, Pinterest, The Washington Times, Mozilla, the Public Broadcasting Service, and many more are using the Django framework. Flask is an API of Python that allows us to build up web-applications. It's a great tool for learning web development fundamentals and best practices along with the core pieces of a web framework that are common to almost all frameworks.			
COURSE LEARNING OBJECTIVES (CLO): • Introduction to Django, Learn Django by building real-world web applications from scratch • Develop powerful web applications quickly using the best coding practices • Integrate other technologies into your application with clear, step-by-step explanations and comprehensive example code • Understanding Flask using python			
MODULES			TEACHING HOURS
MODULE 1: Introduction to Django: What Is a Web Framework? The MVC Design Pattern, Django's History, Installing Python, Installing Django, Setting Up a Database, Starting a Project. Textbook 1: Ch. 1, 2			10
MODULE 2: Views and URL confs: Your First View: Dynamic Content, Mapping URLs to Views, How Django Processes a Request, How Django Processes a Request: Complete Details, URL confs and Loose Coupling, 404 Errors. Textbook 1: Ch. 3			10
MODULE 3: The Django Template System: Template System Basics, Using the Template System, Creating Template Objects, rendering a Template, Multiple Contexts, Same Template, Context Variable Lookup, Playing with Context Objects, Basic Template Tags and Filters, Philosophies and Limitations. Textbook 1: Ch. 4.1 - 4.4			10
MODULE 4: Introduction to Flask: Using Virtual Environments 4 Installing Python			10



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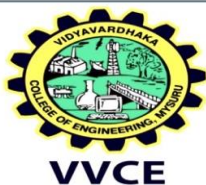
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Packages with pip, Initialization Routes and View Function, Server Startup, A Complete Application, The Request-Response Cycle Application and Request Contexts, Request Dispatching, Request Hooks, Responses, Flask Extensions. Textbook 2: Ch. 1,2	
MODULE 5: Example: A Social Blogging Application: User Authentication, Authentication Extensions for Flask, Password Security, Hashing Passwords with Werkzeug, creating an Authentication Blueprint, User Authentication with Flask-Login, Preparing the User Model for Logins, Protecting Routes, adding a Login Form, Signing Users in, Signing Users Out, Testing Logins Textbook 2: Ch. 8	10
Text Books: 1. Adrian Holovaty, Jacob K. Moss, The Definitive Guide to Django: Web Development Done Right 2 nd edition, 2009. 2. Miguel Grinberg, Flask Web Development: Developing Web Applications with Python 1st Edition, 2014.	
Reference Books: 1. William S Vincent, Django for Beginners: Build websites with Python and Django, 2018.	
COURSE OUTCOMES (COs):	
C01	Design and develop the Django application to solve real time problems
C02	Analyze the complete details of the Django request process
C03	Apply and implement Django template system
C04	Analyze and design web application using Flask
C05	Apply and analyze the complete authentication system for Flask



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SEMESTER - II

Course Name:	: Mobile Application Development	Course Code :	20MCS242
No. of Lecture Hours / Week	: 04	CIE Marks :	50
No. of Practical Hours / Week	: 00	SEE Marks :	50
Total No. of Lecture + Tutorial / Practical Hours	: 50+00 = 50	SEE Duration :	03 Hrs.
L:T:P	: 4:0:0	CREDITS :	04

COURSE OVERVIEW:

This course is concerned with the development of applications on mobile and wireless computing platforms. Android will be used as a basis for teaching programming techniques and design patterns related to the development of standalone applications and mobile portals to enterprise and m-commerce systems. Emphasis is placed on the processes, tools and frameworks required to develop applications for current and emerging mobile computing devices. Students will work at all stages of the software development life-cycle from inception through to implementation and testing.

COURSE LEARNING OBJECTIVES (CLO):

- Comprehend the basic features of android platform and the application development process. Acquire familiarity with basic building blocks of android application and its architecture
- Apply and explore the basic framework, usage of SDK to build android applications incorporating android features in developing mobile applications
- Develop the skills in designing and building mobile applications using android platform
- Create innovative apps, understand the economics and features of the app marketplace by offering the app for download

MODULES

TEACHING HOURS

MODULE 1: Getting started with Android Programming

What is Android? - Android Versions, Features of Android, Architecture of Android, Android Devices in the Market, The Android Developer Community, Obtaining the Required Tools - Android SDK Installing and Configuring the Android SDK Manager, Android Development Tools (ADT), Creating Android Virtual Devices (AVDs). Creating Your First Android Application, Anatomy of an Android Application. Understanding Activities - Applying Styles and Themes to an Activity, Hiding the Activity Title, displaying a Dialog Window, displaying a Progress Dialog, Displaying a More Sophisticated Progress Dialog.

Text Book 1: Ch. 1, 2(Understanding Activities).

10

MODULE 2: Intents and Android UI

Linking Activities Using Intents - Resolving Intent Filter Collision, Returning Results from an Intent, Passing Data Using an Intent Object. Fragments - Adding Fragments Dynamically, Life Cycle of a Fragment, Interactions between Fragments.

10



Understanding the Components of a Screen - Views and ViewGroups, LinearLayout, AbsoluteLayout, TableLayout, RelativeLayout, FrameLayout, ScrollView. Adapting to Display Orientation - Anchoring Views, Resizing and Repositioning. Utilizing the Action Bar - Adding Action Items to the Action Bar, Customizing the Action Items and Application Icon. Creating the User Interface Programmatically. Using Basic Views - TextView View, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup Views, ProgressBar View, AutoCompleteTextView View. Text Book 1: Ch. 2(Intents and Fragments), 3, 4 (Using Basic Views).	
MODULE 3: Menus, Views and Data Persistence Using Image Views to Display Pictures - Gallery and ImageView Views, ImageSwitcher, GridView. Using Menus with Views - Creating the Helper Methods, Options Menu, Context Menu. Additional Views - AnalogClock and DigitalClock Views, WebView. Saving and Loading User Preferences - Accessing Preferences Using an Activity, Programmatically Retrieving and Modifying the Preferences Values, Changing the Default Name of the Preferences File. Persisting Data to Files - Saving to Internal Storage, saving to External Storage (SD Card), Choosing the Best Storage Option, Using Static Resources. Creating and Using Databases - Creating the DBAdapter Helper Class, Using the Database Programmatically, Pre-Creating the Database. Text Book 1:Ch. 5,6	10
MODULE 4: Content Providers Sharing Data in Android, Using a Content Provider - Predefined Query String Constants, Projections, Filtering, Sorting. Creating Your Own Content Providers, Using the Content Provider. SMS Messaging - Sending SMS Messages Programmatically, Getting Feedback after Sending a Message, Sending SMS Messages Using Intent, Receiving SMS Messages, Caveats and Warnings. Sending E-mail. Text Book 1: Ch. 7, 8	10
MODULE 5: Networking and Developing Android Services Consuming Web Services Using HTTP - Downloading Binary Data, Downloading Text Content, Accessing Web Services Using the GET Method, Consuming JSON Services, Sockets Programming, Creating Your Own Services - Performing Long-Running Tasks in a Service, Performing Repeated Tasks in a Service, Executing Asynchronous Tasks on Separate Threads Using IntentService. Establishing Communication between a Service and an Activity, Binding Activities to Services, Understanding Threading. Preparing for Publishing - Versioning Your Application, Digitally Signing Your Android Applications. Deploying APK Files - Using the adb.exe Tool, Using a Web Server, Publishing on the Android Market. Text Book 1: Ch. 10, 11,12	10
Text Books: 1. Wei – Meng Lee, Beginning Android 4 Application Development, Wiley publications, 2nd Edition, 2012.	



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Reference Books:

1. Android Studio Development Essentials - Android 6, Neil Smyth, 2015, Createspace Independent Publishing Platform, ISBN: 9781519722089.
2. Android Programming – Pushing the limits, Eric Hellman, 2013, Wiley, ISBN-13: 978- 1118717370.
3. Professional Android 2 Application Development, Reto Meier, Wiley India Pvt. Ltd 1st Edition, 2012, ISBN-13: 9788126525898.
4. Beginning Android 3, Mark Murphy, Apress Springer India Pvt Ltd, 1st Edition, 2011, ISBN-13: 978-1-4302-3297-1.

Android Developer Training - <https://developers.google.com/training/android/>

Android Testing Support Library - <https://google.github.io/android-testing-support-library/>

COURSE OUTCOMES (COs):

C01	Analyze the basic features of android platform and the application development process
C02	Explore the basic framework with usage of SDK to build android application
C03	Develop mobile applications using databases and messaging services in android
C04	Demonstrate and publish innovative mobile applications using android Platform
C05	Analyze and present a substantial technical content on android application development



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SEMESTER –II

Course Name: : Full Stack Application Development using MEAN **Course Code :** 20MCS243

Number of Lecture Hours / Week : 04 **CIE Marks :** 50

Number of Tutorial / Practical Hours / Week : 00 **SEE Marks :** 50

Total No. of Lecture + Tutorial / Practical Hours : 50 + 00 = 50 **SEE Duration :** 03 Hrs.

L:T:P : 4:0:0 **CREDITS :** 04

COURSE OVERVIEW:

This course introduces development techniques that capitalize on the strengths of every layer in the MEAN stack, using a simple example application project that has a Backend server side API built with Node, Express and MongoDB and a Frontend client built with angular that will exchange with the backend API. Data will be exchanged between a browser based client and an API backend service. Student will learn the essential concepts of the MEAN stack.

COURSE LEARNING OBJECTIVES (CLO):

- Comprehend the knowledge to understand and build web applications with the help of JavaScript-based technologies
- Comprehend the knowledge to understanding Angular to master in front-end web development
- Demonstrate the basic and advanced features of MongoDB
- Create backend Application using Node.js and its framework ExpressJS

MODULES

TEACHING HOURS

MODULE 1: JavaScript: Client-Side Scripting, JavaScript Design Principles, Where Does JavaScript Go? Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, JavaScript Pseudo-Classes.

Textbook 1: Ch. 6,15

10

MODULE 2: Setting Up for Node.js Development, Understanding Node.js: Variables, Functions, Understanding Node.js Performance, More Node.js Internals, Core Node.js: Node.js File-Based Module System, Important Globals, Core Modules.

Textbook 2: Ch. 1,2,3

10

MODULE 3: Node.js Packages: Revisiting Node Modules, JSON, NPM, Popular Node.js Packages, Node.js Events, Getting Started with HTTP: Basics of Node.js HTTP, Creating Your Own File Web Server, Introducing Connect, Introducing Express.

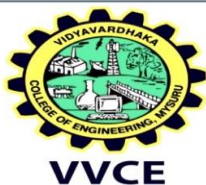
Textbook 2: Ch. 4, 5, 6,7

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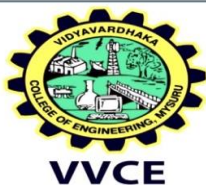
MODULE 4: The Basics of AngularJS: What Is AngularJS, Data Binding and Your First AngularJS Web Application, Modules, Scopes, Controllers, Expressions, Filters, Form Validation, Built-In Directives, AngularJS Life Cycle, Angular Module Loading Multiple, Views and Routing, Architecture, Core Modules.

Textbook 3: All relevant unit/topics

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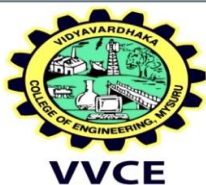


MODULE 5: Persisting Data: Introduction to NoSQL, Installing MongoDB, Important MongoDB Concepts, MongoDB Using Node.js, Mongoose ODM, using a MongoDB as a Distributed Session Store, Managing MongoDB. Textbook 2: Ch. 8	10
Text Books: 1. Randy Connolly, Ricardo Hoar, Fundamentals of Web Development, 1 st Edition, Pearson Education, 2015. 2. Basarat Ali Syed, Beginning Node.js, Apress 2014. 3. Ari Lerner, Ng-book, The complete book on Angular Js, Lightning Source Inc 2010.	
Reference Books: 1. Simon Holmes, Getting MEAN with Mongo, Express, Angular, and Node, Manning Publications 2015.	
COURSE OUTCOMES (COs):	
C01	Apply the concepts of client-side scripting and DOM to dynamically access and update the content of web document
C02	Apply syntax of Node.js in building effective application
C03	Design and develop simple web server and middlewares using Node.js with ExpressJS
C04	Apply the syntax of AngularJS to create dynamic web pages and communicate with server
C05	Design and develop database using MongoDB and integrate with NodeJS Application using Mongoose



SEMESTER -II

Course Name	: Full Stack Application Development using MERN	Course Code : 20MCS244
Number of Lecture Hours / Week	: 04	CIE Marks : 50
Number of Tutorial / Practical Hours / Week	: 00	SEE Marks : 50
Total No. of Lecture + Tutorial / Practical Hours	: 50 + 00 = 50	SEE Duration : 03 Hrs.
L:T:P	: 4:0:0	CREDITS : 04
COURSE OVERVIEW: This course gives the Detailed theory about the MERN stack and the different ways of combining the technologies. Brief refreshers on the core technologies React, Node, Express, MongoDB which are based on JavaScript. By the end of this course, students feel comfortable building their own MERN stack applications.		
COURSE LEARNING OBJECTIVES (CLO): • Comprehend the knowledge to understand and build web applications with the help of JavaScript-based technologies • Comprehend the knowledge to understanding ReactJS to master in front-end web development • Demonstrate the basic and advanced features of MongoDB • Create backend Application using Node.js its framework Express		
MODULES		TEACHING HOURS
MODULE 1: JavaScript: Client-Side Scripting, JavaScript Design Principles, Where Does JavaScript Go? Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, JavaScript Pseudo-Classes. Textbook 1: Ch. 6,15		10
MODULE 2: Setting Up for Node.js Development, Understanding Node.js: Variables, Functions, Understanding Node.js Performance, More Node.js Internals, Core Node.js: Node.js File-Based Module System, Important Globals, Core Modules. Textbook 2: Ch. 1,2,3		10
MODULE 3: Node.js Packages: Revisiting Node Modules, JSON, NPM, Popular Node.js Packages, Node.js Events, Getting Started with HTTP: Basics of Node.js HTTP, Creating Your Own File Web Server, Introducing Connect, Introducing Express. Textbook 2: Ch. 4,5, 6,7		10
MODULE 4: Welcome to React, Pure React, React with JSX, Props, State, and the Component Tree, React Redux, React Router, React and the Server. Textbook 3: Ch. 1, 4, 5, 6, 9, 11,12		10
MODULE 5: Persisting Data: Introduction to NoSQL, Installing MongoDB, Important MongoDB Concepts, MongoDB Using Node.js, Mongoose ODM, using a MongoDB as a Distributed Session Store, Managing MongoDB. Textbook 2: Ch. 8		10



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Text Books:

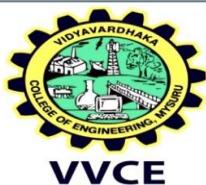
1. Randy Connolly, Ricardo Hoar, Fundamentals of Web Development, 1st Edition, Pearson Education, 2015.
2. Basarat Ali Syed, Beginning Node.js, Apress 2014.
3. Learning React: Functional Web Development with React and Redux 1st Edition O'Reilly Media, 2017.

Reference Books:

1. Simon Holmes, Getting MEAN with Mongo, Express, Angular, and Node, Manning Publications 2015.
2. Subramanian, Vasan, Pro MERN Stack, 2nd edition, Apress 2019.

COURSE OUTCOMES (COs):

C01	Apply the concepts of client-side scripting and DOM to dynamically access and update the content of web document
C02	Apply syntax of Node.js in building effective application
C03	Design and develop simple web server and middleware using Node.js with ExpressJS
C04	Apply the syntax of ReactJS to create dynamic web pages and communicate with server
C05	Design and develop the database using MongoDB and integrate with NodeJS Application using Mongoose



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SEMESTER - II

Course Name : Big Data with Hadoop **Course Code** : 20MCS251

Number of Lecture Hours / Week : 04 **CIE Marks** : 50

Number of Tutorial / Practical Hours / Week : 00 **SEE Marks** : 50

Total No. of Lecture + Tutorial / Practical Hours : 50 + 00 = 50 **SEE Duration** : 03 Hrs.

L:T:P : 4:0:0 **CREDITS** : 04

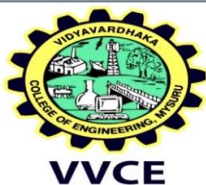
COURSE OVERVIEW:

The 'Introduction to Big Data and Hadoop' is an ideal course package for individuals who want to understand the basic concepts of Big Data and Hadoop. On completing this course, learners will be able to interpret what goes behind the processing of huge volumes of data as the industry switches over from excel-based analytics to real-time analytics. The course focuses on the basics of Big Data and Hadoop. It further provides an overview of the commercial distributions of Hadoop as well as the components of the Hadoop ecosystem.

COURSE LEARNING OBJECTIVES (CLO):

- Analyze the importance of big data technologies used for storage, analysis and manipulation of data
- Provide insights into Hadoop framework, virtualization and management functionalities
- Expose to Hadoop ecosystem tools and techniques for big data processing

MODULES	TEACHING HOURS
MODULE 1: Getting an Overview of Big Data: What is Big Data? History of Data Management – Evolution of Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Volume, Velocity, Variety, Veracity, Big Data Analytics, Advantages of Big Data Analytics, Use of Big Data in Social Networking, Use of Big Data in Preventing Fraudulent Activities, Use of Big Data in Retail Industry. Future of Big Data in Automation Industry. Text Book 1: Ch. 1, 2	10
MODULE 2: Introducing Technologies for Handling Big Data and Hadoop Ecosystem: Distributed and Parallel Computing for Big Data, Introducing Hadoop, How does Hadoop Function?, Cloud Computing and Big Data, Features of Cloud Computing, Cloud Deployment Models, Cloud Delivery Models, Cloud Services for Big Data, Cloud Providers in Big Data Market, In-Memory Computing Technology for Big Data, Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, Features of HDFS, MapReduce, Features of MapReduce, Hadoop YARN, Introducing HBase, Combining HBase and HDFS, Sqoop, Flume. Text Book 1: Ch. 3, 4	10
MODULE 3: Understanding MapReduce Fundamentals and HBase: The MapReduce Framework, Exploring the Features of MapReduce, Working of MapReduce, Exploring Map and Reduce Functions, Techniques to Optimize MapReduce Jobs, Hardware/	10



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Network Topology, Synchronization, File System, Uses of MapReduce, Role of HBase in Big Data Processing, Characteristics of HBase, Installation of HBase. Text Book 1: Ch. 5	
MODULE 4: Understanding Big Data Technology: Foundations and Processing your Data with MapReduce Exploring the Big Data Stack, Virtualization and Big Data, Virtualization Approaches, developing a Simple MapReduce Application, Points to Consider while designing MapReduce, Managing Virtualization with Hypervisor. Text Book 1: Ch. 6, 8	10
MODULE 5: Understanding Hadoop YARN Architecture and Mahout: Background of YARN, YARN Architecture, Working of YARN, YARN Schedulers, Backward Compatibility with YARN, YARN Configurations, YARN Commands, what is Mahout? Machine Learning, Collaborative Filtering, Clustering, Classification, Mahout Algorithms, Environment for Mahout, YARN Containers. Text Book 1: Ch. 11,12,17	10
Text Books: 1. Big Data: Black Book, DT Editorial Services, Wiley India Pvt Ltd, 2015 Edition.	
Reference Books: 1. Arvind Sathi, Big Data Analytics: Disruptive Technologies for Changing the Game, 1st Edition, IBM Corporation, 2012. 2. Big Data Analytics with R and Hadoop, Vignesh Prajapati, -Packt Publishing 2013. 3. Michael Minelli, Michehe Chambers, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013. 4. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, 1st Edition, Wiley and SAS Business Series, 2012. 5. Tom White, Hadoop: The Definitive Guide, 3rd Edition, O'reilly, 2012.	
COURSE OUTCOMES (COs):	
CO1	Illustrate Hadoop ecosystem for big data processing
CO2	Design MapReduce application for a given problem on Hadoop
CO3	Apply computing tools and techniques for big data analytics
CO4	Identify the challenges and opportunities with respect to data management and analysis



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SEMESTER - II

Course Name	: Object Oriented Software Engineering	Course Code : 20MCS252
Number of Lecture Hours / Week	: 04	CIE Marks : 50
Number of Tutorial / Practical Hours / Week	: 00	SEE Marks : 50
Total No. of Lecture + Tutorial / Practical Hours	: 50 + 00 = 50	SEE Duration : 03 Hrs.
L:T:P	: 4:0:0	CREDITS : 04

COURSE OVERVIEW: Design and construction of modular, reusable, extensible and portable software using statically typed object-oriented programming languages. Abstract data types; genericity; multiple inheritance; use and design of software libraries; persistence and object-oriented databases; impact of OOP on the software life cycle.

COURSE LEARNING OBJECTIVES (CLO):

- Analyze the concept of Software Engineering
- Apply the UML and model software projects using different modeling techniques
- Analyze the Requirement Elicitation
- Apply different design patterns

MODULES	TEACHING HOURS
MODULE 1: Introduction to Software Engineering, What Is Software Engineering? Software Engineering Concepts, Software Engineering Development Activities, Software Engineering Development Activities, Managing Software Development, ARENA Case Study. Text Book 1: Ch. 1	10
MODULE 2: Modeling with UML: Introduction, An Overview of UML, Modeling Concepts Systems, A Deeper View into UML, Project Organization and Communication: Introduction- A Rocket Example, An Overview of Projects, Project Organization Concepts, Project Communication Concepts, Organizational Activities. Text Book 1: Ch. 2-3	10
MODULE 3: Requirements Elicitation-Introduction: Usability Examples, An Overview of Requirements Elicitation, Requirements Elicitation Concepts, Requirements Elicitation Activities, Managing Requirements Elicitation, ARENA Case Study. Text Book 1: Ch. 4	10
MODULE 4: Object Design: Reusing Pattern Solutions, Introduction: Bloopers, An Overview of Object Design, Reuse Concepts: Solution Objects, Inheritance and Design Patterns, Reuse Activities: Selecting Design Patterns and Components, Managing Reuse, ARENA Case Study. Text Book 1: Ch. 8	10
MODULE 5: Object Design: Specifying Interfaces, Introduction: A Railroad Example, An	10



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Overview of Interface Specification, Interface Specification Concepts, Interface Specification Activities, Managing Object Design, ARENA Case Study.

Text Book 1: Ch. 9

Text Books:

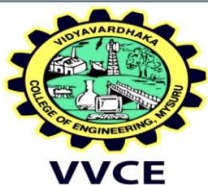
1. Oriented Software Engineering: Using UML, Patterns and Java, 3rd Edition Publisher: Prentice Hall, Upper Saddle River, NJ, 2009.

Reference Books:

1. Timothy C. Lethbridge, Robert Lavalier Object-Oriented Software Engineering – A practical software development using UML and Java, Tata McGraw-Hill, New Delhi.
2. Roger. S. Pressman, 2010, software engineering a practitioner's approach, Seventh edition, Tata McGraw-Hill, New Delhi.

COURSE OUTCOMES (COs):

C01	Analyze different software life cycle concepts
C02	Design SRS documents for software projects
C03	Design and model software projects using different modeling techniques
C04	Implement different techniques to map models to code
C05	Investigate the given problem as a team



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SEMESTER - II

Course Name : Web Application and Security Course Code : 20MCS253

Number of Lecture Hours / Week : 04 CIE Marks : 50

Number of Tutorial / Practical Hours / Week : 00 SEE Marks : 50

Total No. of Lecture + Tutorial / Practical Hours : 50+00 = 50 SEE Duration : 03 Hrs.

L:T:P : 4:0:0 CREDITS : 04

COURSE OVERVIEW: The course, Application and Web Security, provides an introduction to the Web Application hacking and its Applications. Introduces you to the field of web security: that is, how to build secure web applications. The course covers fundamental concepts web vulnerability exploitation, web browser design flaws, and a few advanced topics in web privacy.

COURSE LEARNING OBJECTIVES (CLO):

- Critically audit web applications for security flaws
- Design and implement exploits for real security bugs
- Develop secure web applications
- Get hands-on experience on web programming

MODULES

TEACHING HOURS

MODULE 1: Introduction to Web Application Hacking: Introduction, Web Application Architecture Components, Complex Web Application Software Components, putting it all Together, The Web Application Hacking Methodology, The History of Web Application Hacking and the Evolution of Tools, Example 1: Manipulating the URL Directly, Example 2: The POST Method, Example 3: Man in the Middle Sockets.

Text Book 1: Ch. 1

10

MODULE 2: Information Gathering Techniques: Introduction, The Principles of Automating Searches, The Original Search Term, Expanding Search Terms, Getting the Data from the Source, Parsing the Data, Post Processing, Applications of Data Mining, Collecting Search Terms.

Text Book 1: Ch. 2

10

MODULE 3: Introduction to Server Side Input Validation Issues: Introduction, Cross Site Scripting (XSS)- Presenting False Information, presenting a False Form, Exploiting Browser Based Vulnerabilities, Exploit Client/Server Trust Relationships.

Client-Side Exploit Frameworks: Introduction, Atakapa, Beef, CAL9000, Overview of XSS-Proxy- XSS-Proxy Hijacking, Using XSS-Proxy: Examples.

Text Book 1: Ch. 3,4

10

MODULE 4: Web-Based Malware: Attacks on the Web, hacking into Web Sites, Index Hijacking, DNS Poisoning (Pharming), Malware and the Web, Parsing and Emulating HTML, Browser Vulnerabilities, Testing HTTP-scanning Solutions, Tangled Legal Web.

10



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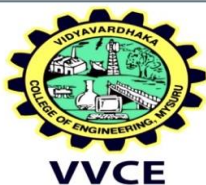
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Text Book 1: Ch. 5	
MODULE 5: Securing Web Based Services: Introduction, Web Security, Stopping Browser Exploits, SSL and HTTP/S, Instant Messaging, Web-based Vulnerabilities, CGI, FTP Security, Directory Services and LDAP Security. Text Book 1: Ch. 7	10
Text Books: 1. Web application vulnerabilities: detect, exploit, prevent, By Michael Cross, Steven Palme, Elsevier, 2007.	
Reference Books: 1. Improving Web application security: threats and countermeasures, By J. D. Meier, Microsoft Corporation, 2003. 2. Hacking Web services: Sriraj Shah, Thomson. Charles River Media, 2006.	
COURSE OUTCOMES (COs):	
C01	Recognize and implement techniques to deal with web client and server vulnerabilities
C02	Amplify solutions to potential problems with state-based attacks
C03	Implement techniques for testing web applications for security issues
C04	Design solutions to obtain secure computer networks and implement security policies
C05	Analyze logical and physical placement of security primitives and design architectures to enable complete framework to provide Internet Security
C06	Investigate a given practical problem as a team



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SEMESTER - II

Course Name	: iOS Application Development using Swift	Course Code : 20MCS254
Number of Lecture Hours / Week	: 04	CIE Marks : 50
Number of Tutorial / Practical Hours / Week	: 00	SEE Marks : 50
Total No. of Lecture + Tutorial / Practical Hours	: 50 + 00 = 50	SEE Duration : 03 Hrs.
L:T:P	: 4:0:0	CREDITS : 04

COURSE OVERVIEW:

The objective of the course is to enable to the student to build an iOS application using the standard Apple tool chain. Requirements for the course will be met by the student demonstrating an ability to develop an application which implements a coherent data model, a view with layout, drawing and touch handling, asynchronous network access, and proper View Controller design along with usage of a number of the standard Apple-provided View Controllers.

COURSE LEARNING OBJECTIVES (CLO):

- Introduction to Code and Interface Builder for iOS
- Develop powerful iOS applications quickly using the best coding practices
- Integrate other technologies into your application with clear, step-by-step explanations and comprehensive example code using Swift
- Understanding the concepts of Model View Controller

MODULES	TEACHING HOURS
MODULE 1: Introduction to Code and Interface Builder for iOS: Code Intro: Demo of a basic iOS App & Playgrounds; Navigating Code to create a real project: Storyboards, Source files, & wiring them together, The View hierarchy and view attributes, Auto layout using Constraints: Why and How, Size classes and designing an interface for multiple device classes, Swift language essentials: Arrays, Dictionaries, functions, Optional, Control Flow, Struts Enemas and Classes, Playgrounds. Elements of The Swift Foundation classes, Cocoa Touch Foundation Framework, Simple connections to the User Interface, Auto layout and stack views. Text Book 1: Ch. 1	10
MODULE 2: Model Development with Swift: Major emphasis will be on the Swift type system (base types, tuples, enemas, struts, classes, function, and protocols), generics, optional and closures. This will then be extended to include the closure passing style of functional programming as developed in the map/reduce functions of the Swift Standard Library, Creation of views and connections with objects. Text book1: Ch. 2, 3	10
MODULE 3: Drawing with Swift: The UIKit Framework, Essential debugging, Introduction to Model/View/Controller, Structure of an iOS App, the relationship	10



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between the backing code and the UI (References & Outlets); Basic custom drawing (2D Quartz library); Touches and Gestures, the responder chain, Color models, Alpha, Images, Text, Using Images, Animation and Videos. Text Book 2 : Ch. 2, 4	
MODULE 4: Model/View/Controller: Organizational concepts: separate model classes, observed properties, and notifications Basic interactive controls within UIKit, UIKit building blocks: Views and View Controllers; important UIKit interactive and display widgets, Basic custom drawing (2D Quartz library); Touches and Gestures, Navigation controller and Segues. Text book 2: Ch. 5, 6	10
MODULE 5: Introduction to Client Server Communication: vsdl, http, xml, soap, json, rest architecture and restful APIs, Social login integration. Text Book 2: Ch. 22, 23	10
Text Books: 1. Begeman Kyle, Application Development in iOS 7, 1st edition, Packt Publishing, 2014. 2. Matt Neuburg, Programming iOS 12: Dive Deep into Views, View Controllers, and Frameworks, 9th Edition, Oreilly, 2019.	
Reference Books: 1. Neil Smith, iOS 12 App Development Essentials: Learn to Develop IOS 12 Apps with Xcode 10 and Swift Book, 1st edition, Payload Media, 2018.	
COURSE OUTCOMES (COs):	
C01	Analyze Design Patterns for Developing iOS Application using swift
C02	Analyze and develop iOS Application using Model Development methods in Xcode Environment
C03	Design UI patterns using UIKit Frameworks
C04	Implement client server applications using Model View Controller
C05	Design and Develop a iOS application in a team for real time problem



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SEMESTER - II

Course Name : Data Science Laboratory Course Code : 20MCS26

Number of Lecture Hours / Week : 01 CIE Marks : 50

Number of Tutorial / Practical Hours / Week : 02 SEE Marks : 50

Total No. of Lecture + Tutorial / Practical Hours : 14 + 28 = 42 SEE Duration : 03 Hrs.

L:T:P : 1:0:2 CREDITS : 02

COURSE OVERVIEW: Among interpreted languages Python is distinguished by its large and active scientific computing community. Adoption of Python for scientific computing in both industry applications and academic research has increased significantly since the early 2000s. In recent years, Python's improved library support (primarily pandas) has made it a strong alternative for data manipulation tasks. Combined with Python's strength in general purpose programming, it is an excellent choice as a single language for building data-centric applications.

COURSE LEARNING OBJECTIVES (CLO): This course will enable students to

- Introduce the NumPy, Pandas and Matplotlib packages available in python
- Demonstrate the data manipulation techniques using Pandas
- Demonstrate the data visualization techniques using Matplotlib and Seaborn
- Apply ML algorithms for data analysis

Laboratory Experiments

1. Read the given data "churn.csv" and save it as a dataframe called churn. Find i) The no. of duplicate records in the churn dataframe based on the customerID column ii) The total no. of missing values for the variable TotalCharges iii) Average monthly charge paid by a customer for the services he/she has signed up for iv) Records having "1@#" under the variable Dependents. (Module 2)
(https://drive.google.com/file/d/1JSYGIIkIZr4jyheDEH0X1_TMSnQ2CzXc/view)
2. Using the data on births in the United States, provided by the Centers for Disease Control (CDC), Find i) Total number of US births by year and gender ii) Average daily births by day of week and decade iii) Average daily births by date. (Module 2, 3)
(<https://raw.githubusercontent.com/jakevdp/data-CDCbirths/master/births.csv>)
3. Explore the bicycle counts on Seattle's Fremont Bridge Data with respect to i) Hourly bicycle counts on Seattle's Fremont bridge ii) Weekly bicycle crossings of Seattle's Fremont bridge iii) Average daily bicycle counts iv) Average hourly bicycle counts by weekday and weekend. (Module 2, 3)
(<https://data.seattle.gov/api/views/65db-xm6k/rows.csv?accessType=DOWNLOAD>)
4. Visualize and understand finishing results from a marathon race with respect to distribution of split fractions, distribution of split fractions by gender and age, split fraction vs finishing time by gender. (Module 2, 3)
(<https://raw.githubusercontent.com/jakevdp/marathon-data/master/marathon-data.csv>)
5. Using the sparse word count features from the Newsgroups corpus data set, classify short



documents to different categories. (Module 4).

6. Identify similar handwritten without using the original label information using clustering technique. (Module 5).
7. Locate and identify characters in images of handwritten digits using a random forest classifier. (Module 5).
8. Using Labeled Faces in the Wild dataset, which consists of several thousand collated photos of various public figures, Train a classifier for facial recognition. Test the trained model and plot a confusion matrix for the same. (Module 4, 5).
9. For any dataset from UCI Machine repository, explore the relationship between the features using Pandas frame work and Seaborn visualization library. Summarize the inferences from the data. (Module 2, 3).
10. Select any dataset from UCI Machine repository which is suitable for classification task. Build a suitable classifier for the same. Test the model and summarize the inferences from the results obtained. (Module 2, 4, 5).

Text Books:

1. Jake VanderPlas: Python Data Science Hand Book. O'Reilly publication 2017.
2. Wes Mckenny: Python for Data Analysis, O'Reilly publication 2013.

Reference Books:

1. Allen B. Downey, "Think Stats: Probability and Statistics for Programmers", 2nd Edition, Green Tea Press, 2014.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015.

COURSE OUTCOMES (COs):

C01	Apply data preprocessing techniques using Numpy, Pandas modules
C02	Analyze dataset using exploratory data analysis techniques
C03	Apply machine learning models for prediction and clustering
C04	Design and develop data-driven solutions for a given problem
C05	Analyze and present a substantial technical content