Bharati Vidyapeeth

(Deemed To Be University), Pune (India)

Accredited 'A+' Grade (2017) By NAAC *
'Category -I' University Status by UGC *
*** 'A' Grade University Status by MHRD Govt. of India ***
*** Ranked '63rd' by NIRF-2020 under University Category ***

Faculty of Management Studies

Board of Studies in Computer Applications

School of Distance Education

Recognized by University Grants Commission- Distance Education Bureau (UGC-DEB), New Delhi

Master of Computer Applications Programme (MCA)

(2020 Course)

(Under Choice Based Credit System)

To be implemented from

2020-21

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(Under Choice Based Credit System)
To be effective from 2020-21 at Part I

1. INTRODUCTION:

The MCA Program under School of Distance Education is 72 credits programme offered by Bharati Vidyapeeth (Deemed to be University), Pune and is conducted at its Learner Support Centres in Pune, Delhi, Mumbai, Karad, Kolhapur, Sangli, and Solapur. All the Learner Support Centers have excellent teaching staff, laboratories, library, and other facilities to provide proper learning environment. The University is reaccredited by NAAC with an 'A+' grade (3rd cycle). The expectations and requirements of the software industry, immediately and in the near future, are visualized while designing the MCA programme. This effort is reflected in the Vision and Mission statements of the MCA programme. Of course, the statements also embody the spirit of the vision of Late Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth Deemed to be University which is to usher in ―Social Transformation Through Dynamic Education.‖

2. VISION STATEMENT OF MCA PROGRAMME:

Achieve excellence in Computer Applications with respect to teaching, learning and researching to meet the growing needs of the Industry and Society.

3. MISSION STATEMENT OF MCA PROGRAMME

- Promote outcome-based learning strategies in-order to meet Global Industry Standards.
- Encourage innovations and problem-solving capabilities in Students and theFaculty.
- Cultivate collaborative research in both students and faculty members through Industry Interactions and Collaborations.
- Enhance Entrepreneurship Skills among students.

4. PROGRAMME EDUCATION OBJECTIVES (PEO) :

PEO1: To build a strong foundation for students to become proficient in all academic concepts and technical skills necessary to become an IT Professional.

PEO2: To provide a conducive environment for designing, implementing and testing various software applications through Software Development Cell.

PEO3: To keep the students and faculty abreast with the emerging technologies in the field of computer applications.

PEO4: To bring professionalism amongst the students and promote holistic development.

PEO5: To involve students in sustainable IT practices and community services.

5. PROGRAMME OUTCOMES (PO) :

PO1: Computational Knowledge: Apply knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements.

PO2: Problem Analysis: Apply fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem.

PO3: Design/Development of Solutions: Design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.

PO4: Conduct researching in Information Systems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Use of modern tools for delivering milestones like problem analysis, design, development, testing and deployment.

PO6: Professional Ethics: Learn and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.

PO7: Lifelong Learning: Acknowledge the need for continuous professional development and practice it through self-motivated, independent learning.

PO8: Management Domain: Involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.

PO9: Communication Efficacy: Demonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.

PO10: Innovation and Entrepreneurship: Provide conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.

6. ELIGIBILITY FOR ADMISSION TO THIS PROGRAMME:

Admission to the programme is open to Any Candidate (Graduate) of any recognized University satisfying the following conditions.

1. Passed BCA/ Bachelor Degree in Computer Science or Engineering or equivalent Degree. OR Passed B.Sc. / B.Com. / B.A. with Mathematics at 10+2 Level or at Graduation Level (with additional bridge Courses as per the norms of the concerned University).
2. Obtained at least 50% marks (45% marks in case of candidates belonging to SC/ST category) in the qualifying Examination.

7. DURATION OF THE PROGRAMME:

The duration of this programme is two years divided in to four semesters. The medium of instruction and examination will be only in English.

8. Credits – 72

The definition of credits is based on the following parameters;

i) Learning hours put in by the learner
ii) Learning outcomes

iii) Contents of the syllabus prescribed for the course etc.

In this system each credit can be described as:

For 2 Credits Students Should Complete Following	
Assignments	2
Lab Practical Sessions through Virtual Lab Mode	2 Hrs per course as per syllabus
Synchronous Chat	3 Hrs
Asynchronous Discussion Forum	2- 10 Topics per course as per subject
Synchronous (Face-to-Face) Counselling Sessions (Theory)	6 Hrs
e-content (in terms of units)	6-8 units
Study Inputs	60 Hrs

9. SCHEME OF EXAMINATION:

For some courses, there is Internal Assessment (IA) conducted by the respective Learner Support Centres as well as a University Examination (UE) at the End-of-the Term. UE will be conducted out of 70 marksand IA will be conducted for 30 marks. Then these are converted to grade points and grades as per the Table I. For courses having only Continuous Assessment(CA), the respective Learner Support Centers will evaluate the students in varieties of ways during the term for a total of 100 marks. Then the marks will be converted to grade points and grades using the Table I.

10. STANDARD OF PASSING:

For all courses, both UE and IA constitute separate Heads of Passing (HoP). In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the Headsof Passing to secure the GPA required for passing.

The 10 point Grades and Grade Points are according to the following table:

Range of Marks (%)	**Grade**	**Grade Point**
80≤Marks≤100	O	10

70≤Marks<80	A+	9
60≤Marks<70	A	8
55≤Marks<60	B+	7
50≤Marks<55	B	6
40≤Marks<50	C	5
Marks < 40	D	0

Table I

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course. The weights for performance at UE and IA shall be 70% and 30% respectively.

GPA is calculated by adding the UE marks out of 70 and IA marks out of 30.The total marks out of 100 are converted to grade point, which will be the GPA.

11. AWARD OF HONOURS:

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	**Final Grade**	**Performance Descriptor**	**Equivalent Range of Marks (%)**
9.5≤CGPA ≤10	O	Outstanding	80≤Marks≤100
9.0≤CGPA ≤9.49	A+	Excellent	70≤Marks<80
8.0≤CGPA ≤8.99	A	Very Good	60≤Marks<70
7.0≤CGPA ≤7.99	B+	Good	55≤Marks<60
6.0≤CGPA ≤6.99	B	Average	50≤Marks<55
5.0≤CGPA ≤5.99	C	Satisfactory	40≤Marks<50
CGPA below 5.0	F	Fail	Marks below 40

SEMESTER WISE COURSE STRCTURE

	Semester I	**Credits**	**IA Marks**	**EoTE Marks**
101	Applied Database Management Systems	3	30	70
102	Computer Networks	3	30	70
103	Java Programming	3	30	70
104	Computational Statistics	3	30	70
105	Management Concepts and Applications	3	30	70
106	Lab on Applied Database Management Systems	2	30	70
107	Lab on Java Programming	2	30	70
108	MOOCS Based General Course 1 (Soft Sills) (GE-1)	1	50	00
		20	**260**	**490**

	Semester II	**Credits**	**IA Marks**	**EoTE Marks**
201	Object Oriented Software Engineering	3	30	70
202	Cloud Computing Concepts	3	30	70
203	Data structures using python	3	30	70
204	Data Warehousing and Data Mining	3	30	70
205	Web Supporting Technologies	3	30	70
206	Lab on Data Structures using Python	2	30	70
207	Minor Project – 1	2	00	100
208	MOOCS Based General Course 2 (GE-2)	1	50	00
		20	**230**	**520**

	Semester III	Credits	IA Marks	EoTE Marks
301	Software Design Patterns	3	30	70
302	Artificial Intelligence	3	30	70
303	Information Security	3	30	70
304	EL-GRP-1 (A)#	2	100	-
305	EL-GRP-2 (A) #	2	100	-
306	Lab on Software Testing	2	30	70
307	Minor Project – 2	2	00	100
308	MOOCS Based General Course 3 (GE-3)	1	50	00
		18	**370**	**380**

 # Departmental Papers: 304 EL-GRP-1 (A) and **305 EL-GRP-2 (A)**

304 EL-GRP-1 (A) and **305 EL-GRP-2 (A)** are departmental papers, the Internal Assessment (IA) of these papers will be done at learner Support Centres.

	Semester IV	Credits	IA Marks	EoTE Marks
401	Seminar on Recent Trends in IT[#]	3	-	100
402	El-GRP - 1 (B) #	2	100	-
403	El-GRP –2 (B) #	2	100	-
404	Major Internship Project	7	-	100
		14	200	200

***Seminar on Recent Trends in IT: (401)**

Student will select any topic of interest and study it thoroughly throughout the semester. At the end of the semester, student will give aOnline presentation on the topic before the panel appointed by the University and submit the seminar report to Learner Support Centre Coordinator.

 # Departmental Papers: 402 EL-GRP-1 (B) and **403 EL-GRP-2 (B)**

402 EL-GRP-1 (B) and **403 EL-GRP-2 (B)** are departmental papers, the Internal Assessment (IA) of these papers will be done at learner Support Centres.

List of Elective Groups:

Elective Code	Elective Group	Subject Code	Subjects
01	Cloud Computing	A	Virtualization
		B	AWS

02	Data Science	A	Statistical Programming in R
		B	Introduction to Data Science
03	Linux	A	Linux Desktop Environment, Shell Programming and System Administration
		B	Linux Internals and Network Administration
04	Open Source Technologies	A	Perl Scripting
		B	Ruby
05	Mobile Computing	A	Java Script
		B	Android
06	Dot Net Technologies	A	C# Programming and Applications
		B	ASP Dot Net with MVC
07	Net Centric Technologies	A	HTML 5
		B	AJAX Programming
08	Information Systems	A	Recommender System
		B	Knowledge Management
09	IOT	A	IoT Architecture Sensors and Fundamentals with Hands-on lab
		B	Internet Of Things: Sensing And Actuator Devices and Smart city use case
10	Big Data	A	Introduction to Big Data
		B	Business Intelligence Tools With Hadoop
11	Cyber Security	A	Introduction to Information Security
		B	Information Security Threats and Mitigation Strategies

Practical Examinations:
For courses 106, 107, 205, 206 and 306, University Practical Examination will be held and marks will be reported to the University.

MOOC'S based General Course (108, 208, 308):

Students will complete MOOCS course prescribed by Learner Support Centre from NPTEL / Swayam in respective semesters and will be evaluated at Learner Support Centre level based on the assignments submitted by the students and the Learner Support Centre level exam on that subjects. The respective Learner Support Centre will report the marks obtained by students in these courses at the end of the semester.

Project Guidelines:
Minor Project I (207) and Minor Project II (307)

Students are expected to choose a problem which will provide software solutions. The project should be based on the courses learntby the student in previous semester. The projects can be completed as individual project or if the scope of the project is comprehensive then project can be divided into modules by the Project Guideand Student can work on it. Every student must have meeting about progress of project with their project guide weekly as specified in time table or if required at a communicated by guide / Learner Support Centre Coordinator.
The project dissertation/document is expected to be created and it should have the following contents.

a. SRS – Problem Statement, BRD- Business Requirement Document
b. General Requirement
c. Requirement as per user Role
d. System design (RED/Class Diagrams, DFD/Activity diagrams)
e. User screen design and client side validation
f. Database Design
g. User interface design /user manual
h. Test cases
i. Scope and limitation
j. Conclusion
k. Bibliography

Major Internship Project (404)

The student is expected to get exposure of industry through _Major Internship Project‘. Guidelines about project are as bellow.

1. Every project will be evaluated by University appointed panel of examinersat the end of the semester.
2. Student must report about the progress of project to the internal project guide &Learner Support Centre Coordinator weekly as specified in time table or if required at a time given by guide / Learner Support Centre Coordinator.

Bridge Course:

This course of 30 hours duration is designed and compulsory for the students from Non-IT background. The course can be conducted concurrently with semester I courses. The Online evaluation of this course will be at Learner Support Centre level for 100 marks. The student must score minimum 40 marks to pass in this course. There will be no credits assigned to this Bridge Course. Learner Support Centre Coordinator will submit the evaluation report to the Bharati Vidyapeeth (Deemed to be University) School of Distance Education (SDE). Bharati Vidyapeeth (Deemed to be University) School of Distance Education (SDE) office will issue a separate course work completion certificate to students.

Subject Name	Course Work
No. of Credits	00
Pre Requisite	Basic Mathematics and MSCIT course
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Basic formula for finding areas, volumes, graphical representation of data is to be remembered.
Understanding	The calculations by using formulas, algorithm ,C program structure are to be understood
Applying	Application of basic knowledge of mathematics and computers is to be applied for calculations and for writing programming codes.
Analyzing	Programs which are to be written are analysed and put in a particular format such as graphs, trees for effective working
Evaluating	New programs or problems are to be evaluated through algorithms,logic
Creating	Creating proper program logic so as to reduce lines of codes is expected .
Syllabus	
	Unit 1: (4 Hours) Algorithm ,flow charts, integers, division, relations, relations and their types, representation of relation in computer memory, number conversion systems.
	Unit 2: (4 Hours) Set theory, predicate logic, Graph terminologies, types of graphs , representation of graph in computers, Paths, Eular and Hamilton graphs, graph colorings.
	Unit 3 : (3 Hours) Trees ,applications of trees, tree traversal algorithms, minimum spanning trees
	Unit 4 : (5 Hours) Fundamentals of C programming, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Declaration of variables as constant, Operators, Types of operators, Input and Output functions - printf(), scanf(), getchar(), putchar(), Formatted input and formatted output.

	Unit 5: (7 Hours) Control Statements- Sequential, Selection, Iteration Statements, Branching structure- if statement, if-else statement, Nested if-else statement, else if Ladder, Conditional operator, switch statement, Loop control structures- while loop, do-while loop, for loop, Nested for loop, Jump statements-break, continue, goto statements.
	Unit 6: (5 Hours) Function call, return statement, Function parameters, Types of functions, Arrays and functions
	Unit 7: (2 Hours) Introduction to OOP concepts.
Text Books	1.Discrete Structures by Kenneth Rosen 2.C programming by Yashwant Kanetkar 3.Object Oriented Programming by Balguruswamy
Reference Books	C Programming language by Brain W. Kernighan

SEMESTER I

Subject Name	**101 Applied Database Management Systems**
No. of Credits	3 Credits
Pre Requisite	Basics of Computing and Data Storage
Course Objectives	• To teach the fundamentals of the database systems at a master level. A variety of topics will be covered that are important for modern databases in order to prepare the students for real life applications of databases. • To impart knowledge of the concepts related to database and operations on databases. It also gives the idea how database is managed in various environments with emphasis on security measures as implemented in database management systems.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	• Remember the definitions of concepts
Understanding	• Understand the concept of database and techniques for its management • Understand data security standards and methods. • Understand the fundamentals of Distributed Database Systems
Applying	• Design different data models at conceptual and logical level and translate ER Diagrams to Relational Data Model. • Normalize the database.
Analyzing	• Identify and study thefile organization schemes forDBMS. • State and Describe features for Concurrencyand Recovery.
Evaluating	• Convert the relational algebra statements to the SQL statements.
Creating	• Write queries using Relational Algebra
Syllabus	**Unit 1. Introduction to DBMS** Difference between Data, Information, Data Processing & Data Management. File Oriented Approach, Database oriented approach to Data Management, Need for DBMS, Characteristic of Database, Database Architecture: Levels of Abstraction, Database schema and instances, 3 tier architecture of DBMS, Data Independence. Database users, Types of Database System. Database Languages, DBMS interfaces.
	Unit 2. Data Modeling in Database Data Models, Logical Data Modeling : Hierarchical Data Model, Network Data Model, Relational Data Model. Conceptual Data Modeling: Entity Relationship Model, Entities, Attributes, Types of Attributes, Relationships, Relationship set, Degree of relationship Set, Mapping Cardinalities, Keys, ER Diagram Notations, Roles Participation: Total and Partial, Strong and Weak

	Entity Set.The extended entity relationship (EER) model, Subclass, Superclass, generalization, specialization, Attribute Inheritance. Relational Data Model :Codd's Rules for RDBMS, Translating ER Diagram to Relational Database.
	Unit 3.Normalization and Relational Algebra: (7 Hours) **Normalization:** Normalization Vs De-Normalization, Decomposition, Lossy and Lossless Decomposition,FunctionalDependencies,Normal forms 1NF, 2NF, 3NF, BCNF, Case Studies on Normalization. **Relational Algebra:** Keys: Composite, Candidate, Primary, Secondary, Foreign,Relational Algebra Operators: Select, Project, Divide, Rename. Set Operations: Union, Intersect, Difference, And Product,Joins: Outer Joins, Inner Joins with example.
	Unit 4.File Structures and Data Administration: File Organization, Overview of Physical Storage Media, Magnetic Disk, RAID, Tertiary Storage, Storage Access, Data Dictionary Storage, Organization of File (Sequential, Clustering), Indexing and Hashing, Basic Concepts, indices, B+ Tree index file, B- tree index file, Static hashing, Dynamic Hashing.
	Unit 5.Concurrency Control And Recovery Techniques: **Concurrency Control:** Single User and Multiuser systems, Multiprogramming and Multiprocessing, Basic Database access operations, Concept of transaction, transaction state, ACID properties, Schedules, Serializability of schedules., Concurrency Control, Need for Concurrency control, lock based protocols, timestamp based protocols, Multiple granularity, Multiple Version Techniques, Deadlock and its handling, Wait-Die and Wound-Wait, Deadlock prevention without using timestamps, Deadlock detection and time outs, Starvation **Recovery Techniques:** Database Recovery, Types of Failures, Storage Structure: Volatile, Non Volatile and stable storage, Data access. Recovery and atomicity, Recovery Techniques / Algorithms: Log Based Recovery, Check points, Shadow Paging.
	Unit 6.Data Administration And Security: Data administration, Role and Responsibility of DBA, Creating/Deleting/Updating table space, Database Monitoring, User Management. Basic data security principles – user privileges, data masking, encryption and decryption. Data Security Implementation, revalidation of user, role, privileges. Data Quality Management, Basic quality principles, data quality audit, data quality improvement
	Unit 7.Introduction to Distributed Database, NOSQL and MongoDB

	Heterogeneous and Homogeneous Databases, Distributed database features and needs, Advantages and Disadvantages, Distributed DatabaseArchitecture. Levels of distribution, transparency, replication. Fragmentation. • Introduction to NoSQL – Architecture, Sharding , Replica sets • NoSQL Assumptions and the CAP Theorem • Strengths and weaknesses of NoSQL • MongoDB Functionality Examples
Text Books	1. ―Database System and Concepts‖ASilberschatz, H Korth, S Sudarshan, published by McGraw-Hill.
Reference Books	2. "Fundamentals of Database Systems" Global Edition By RamezElmasri, Shamkant B. Navathe 3. ―Practical MongoDB‖ by Shakuntala Gupta Edward, Navin Sabharwal published by APress.
Suggested MOOC	Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

Subject Name	**102. Computer Networks**
No. of Credits	3 Credits
Pre Requisite	Knowledge about hardware , network devices and data communication concepts
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some basic concepts of Computer Hardware and Network terminology for development of basic networks in the organization.
Understanding	By remembering students the basic concepts students will understand the concepts of Network topology, network operating systems and how the networks are developed ad per the need of the organization
Applying	Students will Have thorough knowledge about Computer Network and its use for the Information Sharing, device sharing and use of various new network technologies.
Analyzing	Students will acquire a good knowledge of the computer network, its architecture and operation. Student will be able to pursue his study in advanced networking courses (This knowledge will help them to create base for the Network Electives to be studied in the next semesters). Students will be able to follow trends of computer networks. So, students will get exposure to advanced network technologies like MANET, WSN, and 4G.
Evaluating	Ability to select proper method to design the network systems, selecting the proper tool to design the network protects the network from misuse.
Creating	Design and create their own procedure to protect the computer network and use the sharing proper resources.
Syllabus	**Unit 1: Introduction to Computer Networks** Basic concepts of computer hardware and network terminology, What is Computer Network? Network Goals and Motivations, Application of Networks, Network Topologies, Classification of Networks, **Network software in brief:** Network Protocols, Protocol Hierarchies, Design issues for the Layers, Connection Oriented and Connectionless Services, Service Primitives, Relation of services to Protocols, **Network Models:** The OSI Reference Model, The TCP/IP Reference Model, Comparison of OSI and TCP/IP Reference Model, A critique of OSI Model, A critique of TCP/IP Model, **Examples of some networks:** Internet, X.25, ISDN, Frame relay, ATM, Ethernet, Wireless LANs- (wi-fi)
	Unit 2: Data Transmission and Physical Layer: **Signals:** Analog and Digital Signals, Data Rate, Transmission

	Impairment, Signal Measurement: Throughput, Propagation Speed and Time, Wavelength, Frequency, Bandwidth, Spectrum **Transmission Media& its Characteristics:** Guided and Unguided Media, Synchronous and Asynchronous Transmission, Multiplexing**:** FDM, WDM, TDM, Switching**:** Circuit, Message and Packet Switching.
	Unit 3: Network Layer: **Network Layer Design Issues; Routing Algorithms:** Static/ Dynamic , Direct/ Indirect, Shortest Path Routing, Flooding, Distance Vector Routing , Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, **Congestion Control Algorithms:** General Principal of Congestion Control, congestion prevention polices, Load shedding, Jitter Control, **IP Addressing:** IP-Protocol, IP-Address Classes (A, B, C, D, E), Broadcast address, Multicast address, Network Mask.
	Unit 4: Transport and Application Support Protocols: Transport service, Service Primitives, Internet, and Transport Protocols: TCP/UDP, Remote Procedure Calls, RTP, **Session Layer:** Token Concept **Presentation Layer:** Data Encryption and Data Security, Message Authentication,
	Unit 5 : Advance Networks: Concept of 4G Networks, Introduction of 802.16, 802.20, Bluetooth, Infrared, MANET, Sensor Networks. Technical Issues of Advanced Networks, **Mobile Ad-hoc Networks:** Introductory concepts, Destination-Sequenced Distance Vector protocol, Ad Hoc On-Demand Distance Vector protocol, **Wireless Sensor Networks:** Sensor networks overview: Introduction, applications, design issues, requirements.
	Unit 6: Internet Basics: Concept and Characteristics of Internet , Intranet, Extranet . Structure of Internet through Client Sever . Domain name , Website Development formats for Business Applications. **Practical Application on:** Domain Name Service, Telnet, FTP, SMTP, SNMP, MIME, POP, IMAP, WWW,HTTP, TCP/IP, LAN, WAN Some basic Operations and commands.
	Unit 7 : Mobile Network: Mobile Telephone Systems: various generations mobile technology , Smart Mobile facilities and Apps on Mobile . Sub netting, Internet control Protocol-ICMP, IGMP, Mobile-IP, IPv6
Text Books	1.A.S. Tanenbaum, **Computer Networks** (4^{th} ed.), Prentice-Hall of India, Latest Edition 2.W.Behrouz Forouzan and S.C. Fegan, **Data Communication and Networking,** McGraw Hill, Latest Edition 3. William Stalling –Data and Computer Communication‖
Reference Books	1. Network Essential Notes GSW MCSE Study Notes 2. Internetworking Technology Handbook CISCO System 3. Introduction to Networking and Data Communications Eugene Blanchard

	4. Computer Networks and Internets with Internet Applications Douglas E. Comer. 5. Computer Network in Brief : - http://www.nripesheschool.com 6. Jyoti Biradar (Patil),Anil Gaikwad –Software Project Management -Made Easy‖ Lambert Academic Publishing House Dec.2019 .
MOOC on NPTEL	https://nptel.ac.in/courses, http://www.freetechbooks.com/computer network ,In house on www.bharatividyapeeth.edu , Computer Network in Brief : -http://www.nripesheschool.com/

Subject Name	**103. Java Programming**
No. of Credits	**3 Credits**
Pre Requisite	Any programming Language and Concepts of OOP
Cognitive Abilities	At the end of this course, student should be able to • Design interfaces, abstract and concrete classes needed, given a problem specification • Implement classes designed using object oriented programming language • Make them comfort to muse Java API for Input/output and Java Collections and utility classes • Able to achieve object persistence using object serialization and write modules to take advantages of concurrent programming
Remembering	▪ Java language Data Types, control structures, OOP concepts, ▪ Java API to handle numbers, strings ▪ Get knowledge about core Java API (Wrapper classes; String classes, Math class) ▪ Java API hierarchy for Input/output, collections and concurrent programming
Understanding	▪ Understanding how to write, compile and run a Java program. ▪ Structure of class and using Inheritance among them. ▪ How to create Arrays. ▪ Come to know need of inheritance, abstract class and interface and how to use them ▪ Get knowledge about core Java API, API hierarchy for Input/output, collections and concurrent programming
Applying	▪ Designclasses and interfaces for given problem statement by making use of OOP concepts. ▪ Using proper I/O classes and Collections classes for given problem statement.
Analyzing	▪ Analyze a given problem statement to identify classes and relationships among them and making use of Java API efficiently.
Evaluating	▪ Given a problem statement; students should able to decide/ best mechanism of class design using is_a or has_a relationships. ▪ Read/listen a problem statement and able to decide which I/O classes to be used.

	▪ Able to debate about when make to use of threads and which collection implementation should be used.
Creating	Writing Java Applications with use of classes, interfaces and taking advantages of polymorphism.
Syllabus	
	Unit 1:Introduction to Java: Java Basics: Features of Java, History of Java, Installations of JDK and eclipse as IDE Writing and executing first Java program. Understanding role Java compiler, JVM, Understanding how Java is platform independent and secure. Java data types, variables, operators, expressions, type conversion and casting in Java. Control structures in java: if, if-else and switch statements, using iterative/looping statements in Java: while, do-while and for. Writing functions: Need of functions/methods, Writing and using static method; concepts of passing values and returning
	Unit 2: Class and Object Concepts: Introduction to Object Oriented concepts, Defining a class, creating objects from class, adding attributes and methods to the class, using constructors, Java naming conventions for class, properties and methods/functions. Passing values to the functions – pass by value, pass by reference, Function overloading. Modifiers – public, private, protected, default, static, final Understanding use of Wrapper classes and Garbage collection in Java
	Unit 3: Arrays and Strings: One dimensional arrays, Multidimensional arrays, exploring String class and methods, String Buffer class. Packages - creating and accessing a package, importing, packages, creating user defined packages, Concept of package. Introduction to Exception Handling and user defined exceptions.
	Unit 4: Inheritance and Polymorphism: Concept and importance of inheritance, is-a relationship, types of inheritance, Polymorphism – function overriding, dynamic method dispatch. Overriding methods with throws clause. Using abstract and final keywords with class declaration, Concept of interface, Comparison of Interface and class. Access modifiers and data accessibility in derived classes, method access modifier and method overriding.
	Unit 5 :Concurrent Programming: Concept of threads, lifecycle of threads, creating threads, Thread class, Runnable interface, Thread synchronization, inter thread communication – wait(), notify(), notifyAll() methods .
	Unit 6: Java Input/Output: Concept of streams, types of streams – byte streams, character streams,

	The Console: System.out, System.in, and System.err Understanding File class, InputStream class, OutputStream class, FileInputStreams, FileOutputStream, Using character oriented Reader and Writer class, FileReader, FileWriter. Introduction to Buffered streams – DataInput and DataOutput Streams using BufferedReader, BufferedWriter. Making use of Object Streams for Serialization and deserialization
	Unit 7:Java Collections and Utility Classes: Introductions to generics: generic types and methods Collection Basics- A Collection Hierarchy, Using ArrayList and Vector, LinkedList, making use of Iterator to access collection elements. Set: HashSet, LinkedHashSet, TreeSet , Role of Comparable and Comparator interfaces, Introduction Map: Hashmap, HashTable, TreeMap, LinkedHashMap Understanding bounded types, erasures.
Text Books	Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media;
Reference Books	1. Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007 2. Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008 3. Bruce Eckel , Thinking In Java – Printice Hall, Fourth Edition

Subject Name	**104 Computational Statistics**
No. of Credits	3 Credits
Pre Requisite	
Course Objectives	• To build a strong foundation for students to become a proficient in all Statistics concepts and their Application. It is necessary to become a Data science Professional. • To provide a conducive environment for understanding, implementing and Prediction on various Historical data. • To keep the students and faculty abreast with the emerging technologies in the field of computer applications. • To bring professionalism amongst the students and promote holistic development.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	• Remember the definitions of concepts
Understanding	• Understand the concept of Statistics and their methods for its Data Analytics • Understand data engineering and standards and methods. • Understand the fundamentals of statistics and their Application
Applying	• Data engineering and their concept
Analyzing	• Identify and study thedata foranalytics purpose. • State and Describe features for Analytics
Evaluating	• Future Prediction for historical data
Creating	• Write programming of R for Data Analysis
Syllabus	
	Unit 1. Introduction to Statistics: Meaning of Statistics as a Science, Importance of Statistics Scope of Statistics, Types of data: Primary data, Secondary data , Cross-sectional data, time series data, directional data, classification data and its classification, ungrouped frequency distribution,, grouped frequency distribution, cumulative frequency distribution, and relative frequency distribution.
	Unit 2. Measures of Central Tendency: Concept of central tendency of statistical data, Statistical averages, characteristics of a good statistical average. Arithmetic Mean (A.M.): Definition, effect of change of origin and scale, combined mean of a number of groups, merits and demerits, trimmed arithmetic mean. Mode and Median: Definition, formulae (for ungrouped and grouped data), merits

	and demerits, Quartiles, Deciles and Percentiles (for ungrouped and grouped data), Geometric Mean (G.M.): Definition, formula, merits and demerits. Harmonic Mean (H.M.): Definition. Formula, merits and demerits. mean Weighted Mean: weighted A.M., G.M. and H.M. Measures of Dispersion :Concept of dispersion, characteristics of good measure of dispersion. Range, Quartile deviation Mean deviation: Definition, merits and demerits, Variance and standard deviation
	Unit 3. Moments, Skewness and Kurtosis : Concept of Raw and central moments, Formulae for ungrouped and grouped data (only first four moments), relation between central and raw moments upto fourth order. (without proof) , Measures of Skewness, Types of skewness, Pearson's and Bowley's coefficient of skewness, Measure of skewness based on moments, Measure of Kurtosis: Types of kurtosis, Measure of kurtosis based on moments
	Unit 4.Correlation: Bivariate data, Scatter diagram and interpretation, Concept of correlation between two variables, positive correlation, negative correlation, no correlation. variance between two variables , Karl Pearson's coefficient of correlation (r) , Spearman's rank correlation coefficient, compute Karl Pearson's correlation coefficient between ranks
	Unit 5. Regression: Meaning of regression, difference between correlation and regression, Concept of error in regression, error modeled as a continuous random variable. Simple linear regression model Estimation of a, b by the method of least squares. Interpretation of parameters.
	Unit 6. Time Series: Meaning and utility , Components of time series , Additive and multiplicative models , Methods of estimating trend : moving average method, least squares method and exponential smoothing method(with graph and interpretation)
	Unit 7. Introduction to R Programming: Concept of R, Installation of R, Data Types , Vector, List, Frame, Array, Matrix, Statistics Commands, Base graphics, Data manipulation with data table ,concept of cluster, Concept of Prediction Model ,Analysis of Real world Problem
Text Books	
Reference Books	1.Fundamental of Statistics by S.C.Gupta 2. Freedman, David, Robert Pisani, & Roger Pervis(2007).*Statistics.*New York: W. W. Norton. 3.James, Gareth, Daniela Witten, Trevor Hastie, & Robert Tibshirani(2013).*An Introduction to Statistical Learning: With Applications in R.* New York: Springer. **Suggested MOOC :** Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

Subject Name	**105. Management Concepts and Applications**
No. of Credits	3Credits
Pre Requisite	General awareness about the organization and atomization used
Remembering	Students are expected to recalling day to day management concepts that are unknowingly applied in real life situations
Understanding	Gathering information about management,its origin and the contributions of some of the management gurus is achieved.
Applying	Students will learn implementation of management functions in real life cases so as to justify decision being taken and through ERPs availability
Analyzing	Students will learn fact finding in a situation using the objectives of each functions‘ achievement and its effective utilization in e commerce environment
Evaluating	Generating or creating the ability amongst the students in fact finding techniques and evaluating the actual performance with the planned.
Creating	Students are expected to capture the new cases in real life situation and create a solution in the form of model so as to resolve the problem such as ERPs
Syllabus	**Unit 1: Management:** Definition and Meaning ,Nature and purpose ,Evolution of Management thoughts, Contributions of F.W Taylor ,Contributions of Henry Fayol, Human relations approach, System approach to management, Skills and Functions of a manager
	Unit 2: Planning: Definition and Importance ,Types of Plans, Types of Planning , Steps in Planning ,Limitations of Planning ,Planning Premises, Management by Objectives (MBO):Concept, Objective setting Process, Benefits and Weaknesses, concept of software project planning
	Unit 3 : Organization: Definition ,nature of organizing, importance , process of organizing ,organization chart ,structure of IT organization , New Organisational Designs – Project, Matrix, Organic Structure & Mechanistic Structure Challenge of Modern Organisation, Virtual Organisation,Case study
	Unit 4 : Staffing: Nature & Significance, A brief knowledge of Recruitment, Selection, Training & Development, Performance Appraisal in IT organisation. Case study (8)
	Unit 5: Directing and Controlling: Nature, Concept of Leadership, Leadership Styles, Theories of Leadership, Charismatic Leadership Theory, Role of Software Team

	Leader, case study , Concept and Importance of Control, Control Process, Types of Control Mechanism, Responsibility and authority , Management by Exceptions, case study.
	Unit 6:Decision making: Decision making and its process, Decision making conditions , need of computer based decision making , decision support system, expert system.
	Unit 7 :Introduction to E-commerce: E commerce types,E commerce spread in recent years ,E commerce importance ,Security measures under E commerce, introduction to Enterprise Resource Planning (ERP) ,ERP advantages, Introduction to SAP
Text Books	1.Principles of Management by L M Prasad, Sultan Chand Publications 2.E – Commerce: Strategy, Technologies and Applications‖ by David Whiteley
Reference Books	1. Principles of management by T Ramaswamy , Himalaya Publications 2. Principals of Management by Tripathi and Ready, 3. New Era of Management by Richard Daft ,South Western Sangage Learning 4.Management Principles and Practices by Lallan Prasad and SS Gulshan. Publications :Excel Books India. 5.Decision Support System , Janaki Raman ,PHI publications

Subject Name	**106 Lab on Applied Database Management Systems**
No. of Credits	2 Credits
Pre Requisite	Concept of Database Management Systems, Familiarity with data processing concepts and applications.
Course Objective	• To practice the application of the concepts related to database its techniques and Operations. • SQL (Structured Query Language) is introducedin this subject.Thishelpsto create strong foundation for application of database design.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	• Make use of different operators as per the questions
Understanding	• Understand the theoretical and physical aspect of a relational database.
Applying	• Implementation of RDBMS concepts through Oracle.
Analyzing	• Observe the performance of the query with different data sets.
Evaluating	• Test the results obtained from the different queries, PL/SQL blocks, functions
Creating	• Construct Simple and complex queries on sample datasets • Writing PL/SQL blocks
Syllabus	**Unit 1 Introduction to Oracle and SQL:** History, Features, Versions of Oracle, Database Structure: Logical Structure and Physical Structure, Oracle Architecture: System Global Area Processes: Server Processes, Background Processes, Tools of Oracle: SQL * Plus, PL/SQL, Forms, Reports, Pre Compilers:SQL Loader, Import, Export. **Introduction to SQL :** Keywords, Delimiters, Literals, Data Types, Components of SQL: **DDL Commands**– Defining a database in SQL, Creating table, changing table definition, removing table, Creating Tables with constraints on row level and column level, primary key, foreign key, check. Altering Constraints. **DML Commands**- Inserting, updating, deleting data, **DQL Commands**: Select Statement with all options. Renaming table, Describe Command, Distinct Clause, Sorting Data in a Table, Creating table from a table, Inserting data from other table, Table alias, and Column alias. **DCL commands**- Granting and Revoking Permissions

	Unit 2Operators and Functions: **Operators:**Arithmetic, Logical, Relational, Range Searching, Pattern Matching, IN & NOT IN Predicate, all, % any, exists, not exists clauses, Set Operations: Union, Union All, Minus, Intersect, Grouping data. **Functions :** Aggregate Functions, Numeric Functions, String Functions, Date Functions, Conversion Functions, MiscellaneousSub queries **Joins:**Relating data through join concept. Simple join, equi join, non equi join, Self join, Outer join
	Unit 3 Database Objects: **Views:**Introduction, Creating a View, Selecting data from a view, Updateable views, Views on multiple tables, Destroying a View. **Sequences:**Introduction, Creating a Sequence, Altering a Sequence, Referencing a Sequence, Dropping a Sequence. **Index:**Introduction, Creating Index, Simple Index, Unique Index, Reverse Key Index, Dropping Index.
	Unit 4Introduction To PL/SQL: Introduction, Advantages, PL/SQL Block, PL/SQL Execution Environment, PL/SQL Character set, Literals, Data types, PL/SQL Block: Attributes %type, %rowtype,Variables, Constants, Displaying User Message on screen, Conditional Control in PL/SQL, Iterative Control Structure: While Loop, For Loop, Goto Statement, Commit, Rollback, Savepoint
	Unit 5 : Cursor Management and Triggers: **Cursor**:Explicit& Implicit Cursor, Declaring Cursor Variables, Constrained & Unconstrained Cursor Variables, Opening Cursor, Fetching Cursor into Variables, Closing Cursor, Cursor For Loops, Parametric Cursors. **Triggers:**Definition, Syntax,Parts of triggers:statement, body, restricted, Types of triggers: Enabling& disabling triggers.
	Unit 6 : Stored Procedures / Functions and Exception Handling: Introduction, How oracle executes procedures/ functions, Advantages, How to createProcedures& Functions, Examples. **Error Handling in PL/SQL:** Exception Handling & Oracle Engine, Oracles Named Exception Handlers, User NamedException Handlers.
	Unit 7: MongoDB: Installation of MongoDB, Checking Shell, Creating Users and Enabling Authorization, Basic Querying Using Shell, sorting, indexing – single indexing and compound indexing, Using Conditional Operators in queries
Text Books	References (Books, Websites etc.): 1. Ivan Bayross SQL,PL/SQLThe Programming Language of Oracle 3rd Revised Edition BPB Publications 2.–Practical MongoDB‖ by Shakuntala Gupta Edward, NavinSabharwal by APress.
Reference Books	**Suggested MOOC :**

	Please refer these websites for MOOCS: NPTEL / Swayamwww. edx.com ; www.coursera.com

Subject Name	**107. Java Programming**
No. of Credits	**2 Credits**
Pre Requisite	Any programming Language and Concepts of OOP
Cognitive Abilities	At the end of this course, student should be able to • Design interfaces, abstract and concrete classes needed, given a problem specification • Implement classes designed using object oriented programming language • Make them comfort to muse Java API for Input/output and Java Collections and utility classes • Able to achieve object persistence using object serialization and write modules to take advantages of concurrent programming
Remembering	▪ Java language Data Types, control structures, OOP concepts, ▪ Java API to handle numbers, strings ▪ Get knowledge about core Java API (Wrapper classes; String classes, Math class) ▪ Java API hierarchy for Input/output, collections and concurrent programming
Understanding	▪ Understanding how to write, compile and run a Java program. ▪ Structure of class and using Inheritance among them. ▪ How to create Arrays. ▪ Come to know need of inheritance, abstract class and interface and how to use them ▪ Get knowledge about core Java API, API hierarchy for Input/output, collections and concurrent programming
Applying	▪ Designclasses and interfaces for given problem statement by making use of OOP concepts. ▪ Using proper I/O classes and Collections classes for given problem statement.
Analyzing	▪ Analyze a given problem statement to identify classes and relationships among them and making use of Java API efficiently.
Evaluating	▪ Given a problem statement; students should able to decide/ best mechanism of class design using is_a or has_a relationships. ▪ Read/listen a problem statement and able to decide which I/O classes

	to be used. ▪ Able to debate about when make to use of threads and which collection implementation should be used.
Creating	Writing Java Applications with use of classes, interfaces and taking advantages of polymorphism.
Syllabus	

	Programming Exercises
1	**Introduction to Java** Writing, compiling and Executing Java programs using basic language constructs as bellow - Using Operators : arithmetic, relational, logical and bitwise - Control structures (if, if-else, switch) - Iterative statements (while, do-while, for)
2	**Class and Object Concepts** - Wring a class, creating objects and using it - Using constructors to initialize object - Programs to demonstrate parameter passing - Making use of access modifiers
3	**Arrays and Strings** – Programs to work with single dimensional and multidimensional arrays – Searching and sorting – Programming with string and operations on it – Programs to understand and study string literal pool
4	**Inheritance and Polymorphism** – Defining classes as generic types ; using it to write new class/classes – Need and example of method overriding – Writing abstract class and interface – Using abstract classes to write concrete classes – Using interface as base type to write new interface and implementing it to write new concrete class/classes – Anonymous and inner classes
5	**Concurrent Programming** – Designing and using Thread class and Runnable interface – Thread synchronization – Program to demonstrate Thread priorities, thread join and making use of yield – Programs with classes making use of thread and inter communication between them.
6	**Java Input/Output** – Programs to make using InputStream and OutStream classes. – Reading and Writing data into files – Making use to console to read data. – Using readers and writers to write data into Files – Making use of Buffered Streams and reader and writer – Programs to take advantages of serialization

7	**Java Collections and Utility Classes** – Programs to make use collections (ArrayList, Vector, Set and Maps) – Writing user defined generic data types types – Programs to illustrate bounded types and erasures

SEMESTER II

Subject Name	**201. Object Oriented Software Engineering**
No. of Credits	3 Credits
Pre Requisite	Programming skills, Database Concepts.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Should be able to remember various steps carried out in development of software.
Understanding	Should be able to understand requirements of the user.
Applying	Should be able to apply object oriented concepts and UML diagrams to the defined problem.
Analyzing	Should be able to analyze requirements of the user and convert to functionalities of the software.
Evaluating	Should be able to Evaluate design of the existing software.
Creating	Should be able to de Design their own software.
Syllabus	**Unit 1 .Software and Software Engineering:** The nature of software, Software Engineering Concept, SDLC, Process Models: Waterfall Model, V Model, Prototyping Model, Spiral Model, RAD (Rapid Action Development) Model
	Unit 2 .Object Oriented Concepts, Modeling and UML: 2.1 What is Object Orientation? (Introduction to class, object, inheritance, polymorphism) 2.2 Modeling 2.2.1 Introduction of Modeling 2.2.2 Object Oriented Modeling 2.3 UML (Unified Modelling Language) 2.3.1 History of UML 2.3.2 UML Diagrams 2.4 Iterative Development with RUP and Phases of RUP
	Unit 3 : Requirement Understanding and Requirement Modelling with Use Case Diagram: 3.1 Requirement Engineering 3.2 Requirement Elicitation 3.3 Developing Use Cases 3.4 Use Case Diagram 3.4.1 Realization of Use Cases 3.4.2 Finding Actors 3.4.3 Defining Relations among Use case 3.4.4 Writing Use Cases 3.5 Activity Diagram
	Unit 4 : Basic and Advanced Structural Modeling: 4.1 Class Diagram 4.1.1 Identifying the elements of an object model

	4.1.1 Identifying classes and objects 4.1.2 Specifying the attributes 4.1.3 Defining operations 4.1.4 Finalizing the object definition 4.1.5 Advanced class Modelling 4.1.6 Interface, Types and Roles 4.2 State Chart Diagram 4.3 Package Diagram 4.4 Object Diagram
	Unit 5 : Interaction Modelling: 5.1 Introduction to Interaction Diagrams 5.2 Need of Interaction Diagrams 5.3 Interaction Diagrams 5.3.1 Collaboration Diagram 5.3.2 Sequence Diagram
	Unit 6 : Architectural Modeling: 6.1 Component Diagram 6.1.1 Need of Component Diagram 6.1.2 Realization of Components 6.1.3 Relating Components 6.2 Deployment Diagram 6.2.1 Software Architecture 6.2.2 Architectural Styles 6.2.3 Representing Architecture using Deployment Diagram
	Unit 7 : Case Studies: 7.4 Discussion on following case Studies- a. Library Management System b. Hospital Management System c. Online Shopping d. Nukari.com website e. Matrimonial website
Text Books	1. Software Engineering by Pressman Publisher BPB
Reference Books	1. The Unified Modeling Language User Guide by Grady Booch, James Raumbaugh, Ivar Jacobson. Publisher Addison-Wesley Professional 2. Object Oriented Software Engineering Use case driven approach by Ivar Jacobson Publisher Pearson 3. UML Distilled by Martin Fowler Publisher Addison-Wesley Professional 4. UML Toolkit 2 by Hans-Erik Eriksson Publisher Wiley.

Subject Name	**202. Cloud Computing Concepts**
No. of Credits	3 Credits
Pre Requisite	1. Knowledge of Web technologies 2. Knowledge of Web services andmultimedia 3. Knowledge of DBMS
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	How to provide Flexible and scalable infrastructures
Understanding	Increased availability of high-performance applications to small/ medium-sized businesses
Applying	Reduces implementation and maintenance costs
Analyzing	The case studies will help us to understandmore of practice of cloud computing in the market.
Evaluating	Comparison of cost-wise solution to the problem and selecting the best solution for the problem suggested to the organization
Creating	Creating flexible and scalable infrastructure suitable to the organizational need
Syllabus	**Unit 1: Cloud Computing Fundamentals:** Definition of Cloud Computing, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public Vs private clouds
	Unit 2: Virtualization And Cloud Computing: Role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications, Visualizing Virtualization, Managing Virtualization, Taking Virtualization into the Cloud
	Unit 3: Service Oriented Architecture And The Cloud : Defining Service Oriented Architecture, Understanding the Coupling, Implementation of Service Oriented Architecture (SOA), Understanding Services in the Cloud, Serving the Business with SOA and Cloud Computing.
	Unit 4: Cloud Applications : Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages.
	Unit 5: Management Of Cloud Services: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)
	Unit 6: Application Development:

	Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.
	Unit 7: Cloud It Model: Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO)
Text Books	1. Cloud Computing: Principles and Pardigms by RajkumarBuyya, jamesBroberg and Andrzej M.Goscinski, Wiley, 2011. 2. Distributed & Cloud computing, Kai Hwang, GeofferyC.Fox,jack Elsevierm,2012 3. Cloud Computing implementation,management and security by John W.Rittinghouse,James E Ransome,CRCPress,Taylor& Francis group,2010 4. Cloud Computing a practical approach by Anthony T.Velte,TobyJ.Velte Robert Elsenpeter,Tata Mc Graaw Hill edition,2010
Reference Books	1. Cloud Application Architecture by George Reese,Oreillypublishers 2. Cloud computing and SOA convergence in your enterprise,by DavidS.Linthicum,Addison- Wesley

Subject Name	**203. Data Structures and Algorithms using Python**
No. of Credits	3 Credits
Pre Requisite	School Level Mathematics. It does not assume any prior knowledge of programming.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some motivating examples to remember and quickly builds up basic concepts such as conditionals, loops, functions, lists, strings and tuples.
Understanding	Students will get acquainted built in data structures in python, understand features and programming constructs of python language. During this course, they will understand main control structures of procedural programming languages. understand the complexity of various algorithms
Applying	They will make of function to reduce problem into small modules, To familiarize with exceptions and mechanism to handle it , make use of python to read and write data into files, implement ADT for various user defined data structures, implement data structures like: Stack, Queue, Link List, Tree.
Analyzing	Compare efficiency of various data structures for solving a particular problem. Analyzing performance of a algorithm.
Evaluating	Ability to choose appropriate data structures for problem solving Ability to use combination of these data structures for problem solving. Evaluating the performance of various Algorithms and Data Structures.
Creating	Design and create their own data structure for solving a real life problem
Syllabus	**Unit 1:** **Basics of Python:** Python Installation, writing and executing first python script, using python editors to write and execute python scripts **Identifiers and Operators:** Writing get familiar with python variables and data types, variables and assignments, Operator understanding and its usage, **Python Control structures in Python:** Conditionals and Loops: if statement, else Statement, el-if Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, Working strings in python: String type, strings concatenations and comparing strings, using string functions
	Unit 2: **Working with functions and Built in data structures Functions:** Writing a simple function and using it, functions and parameters, functions retuning values, functions and variable scope, Variable number of arguments, passing objects and collections in function, understanding recursive functions, writing and using recursive functions.

	Variable number of arguments to functions **Python data Structures:** List: Crating and using list and tuples. Operations on list and tuples, Special Features of Lists and tuples, introduction to List comprehensions Dictionaries: Introduction to Dictionaries, Operators, Built-in Functions, Built-in Methods, Dictionary Keys, Using Set data structure, Arrays
	Unit 3: **Handling Exceptions and File Input/Output :** Need of exception Handling, Simple mechanism to handle exception, Using if exceptions to handle the code cracks, Using else clause while handling exceptions, Handling generic and specific exceptions, handling multiple exceptions, Raising exception, File Objects, creating a file object, reading File contents, Writing data into file, reading and writing CSV files, using with clause, Using Exception handling with file operations,
	Unit 4: **Introduction ADT :** Writing a simple Class in Python, creating object of class, Instance Methods, Class Variables and special methods. Understanding ADT, Defining ADT using pseudo-code, Defining ADT for Date, Stack and Queue, Implementation of Date, Stack and Queue ADT. Concepts of circular and double ended queue. Applications of Stack and Queue.
	Unit 5: **Linked Lists:** Defining List as ADT, Implementation of Singly Linked Lists, Circularly Linked Lists, Doubly Linked Lists, The Positional List ADT, Sorting a Positional List, Link-Based vs Array-Based Sequences. Implementation of Stack and Queue using Link List. Applications of Linked List (polynomial Equations)
	Unit 6: **Trees:** Concepts of tress and Binary Trees, Defining binary tree as ADT, Implementing Binary Trees, Tree Traversal Algorithms **Search Trees**: Binary Search Trees ,Balanced Search Trees ,Python Framework for Balancing Search Trees ,AVL Trees ,Splay Trees, Red-Black Trees **Heaps, Maps, Hash Tables, and Skip Lists**
	Unit 7: **Searching , Sorting and Analysis of Algorithms** Need of searching, linear search, using binary search for efficient search. Need of sorting and various sorting algorithms: insertion sort, bubble

	sort, selection sort; Merge sort and quick sort algorithms. Python‘s Built-In Sorting Functions, Selection Algorithms. Analysis of Algorithms: Measuring Algorithm Efficiency, Asymptotic Analysis, The Big-O Notation, Find the complexity of Algorithms: Linear Search, Binary Search, Sorting Algorithms. Compare complexity of various searching and sorting Algorithms.
Text Books	Data Structures and Algorithms in Python Paperback – 2016 by Michael T. Goodrich (Author), Roberto Tamassia (Author), Michael H. Goldwasser (Author) WILEY PUBLICATION Data Structure and Algorithmic Thinking with Python Paperback – 2015 by NarasimhaKarumanchi (Author)
Reference Books	Problem Solving in Data Structures & Algorithms Using Python: Programming Interview Guideby Hemant Jain
MOOC on NPTEL	https://nptel.ac.in/courses/106/106/106106145/#

Subject Name	**204. Data Warehousing and Data Mining**
No. of Credits	3 Credits
Pre Requisite	Thorough understanding of Relational database normalization techniques , Physical design of a database, Concepts of algorithm design and analysis, Basic understanding of: Software engineering principles and techniques, Probability and statistics
Course Objectives	This course will enable to expose the students to Study various design and implementation issues and techniques in data warehousing and data mining.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Remembering the fundamentals of Database technology and its application in data warehousing and data mining.
Creating	Creating multi dimensional data models using star, snowflake and fact constellation schemas.
Understanding	Understand the components, architecture and other important tools of data warehousing and data mining.
Applying	Apply the techniques of clustering, classification, association and other data mining algorithms to real world data.
Analyzing	Gather and analyze large sets of data to gain useful information using data mining techniques.
Evaluating	Producing and interpreting quantitative analysis using various data mining algorithms.
Syllabus	**Unit 1. Business Intelligence:** Business Environment and Computerized Decision Support, Managerial Decision Making, Computerized support for Decision Making, Decision Support System, Early Framework for Computerized Decision Support, Business Intelligence, Importance of BI, BI for Decision makers, The BI process, A framework for Business Intelligence.
	Unit 2: Data warehousing: OLTP and OLAP Systems, Introduction to Data Warehouse, Differences between OLTP Systems and Data Warehouse, Characteristics of Data Warehouse; Advantages of Data Warehouse; Data Warehouse Users, Metadata, Classification of Metadata, and Importance of Metadata. Data Marts, Reasons for creating Data Marts, Building Data Marts: Top down Approach & Bottom up Approach, Data Warehouse Architecture, Two tier Architecture, Three Tier Architecture. Data Warehouse Schema, Star, Snow Flake & Fact Constellation Schema. OLAP Operations, OLAP Models.
	Unit 3. Data Preprocessing: Need, Objectives and Techniques of data preprocessing. **Descriptive Data Summarization**: Measuring the Central Tendency, Measuring the Dispersion of Data, Graphic Displays of Basic Descriptive Data Summaries

	Data Cleaning: Handling of Missing values and Noisy Data, Data cleaning as a process **Data Integration and Transformation:** Data Integration: Schema integration, Controlling redundancies using correlation. Data Transformation: Smoothing, Aggregation, Generalization, Attribute construction, Normalization **Data Reduction:** Data Cube Aggregation; Attribute Subset Selection, Dimensionality Reduction, Numerosity Reduction, Discretization & Concept Hierarchy Generation for Numerical Data and for Categorical Data.
	Unit 4. Introduction Data Mining : Evolution of database system technology, introduction to data mining, architecture of a typical data mining system, Types of data that can be mined, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.
	Unit 5: Mining Association Rules : Introduction, Market Basket Analysis, Multi-Level and single level Mining, Mining Association Rules on Transactional database, Multi-Dimensional Association Rules From Relational Databases & Data Warehouses, From Association Mining To Correlation Analysis, Constraint Based Association Mining, Association Rule mining using Apriori Algorithm, and FP Growth algorithm. Generalized association rule.
	Unit 6: Classification & Prediction: Introduction to Classification and Prediction; Basics of Supervised & Unsupervised Learning; Preparing the Data for Classification and Prediction; Comparing Classification and Prediction Methods, Classification by Decision Tree Induction, Tree Pruning, Rule-based Classification Using IF-THEN Rules for Classification; Rule Extraction from a Decision Trees; Bayesian Classification: Bayes‘ Theorem, Naïve Bayesian Classification. Prediction using Regression analysis.
	Unit 7. Cluster Analysis: Introduction to Cluster Analysis; Types of Data in Cluster Analysis; Classification of clustering methods-Partitioning Method, Hierarchical Method, Density-based Method, Grid-Based Method, Model-Based Method, Constraint-based Method Partitioning Methods: K-Means and K-Medoids
Text Books	**References (Books, Websites etc.):** • Jiawei Han, MichelineKamber, Data Mining: Concepts and Techniques, Harcourt India Pvt., 2011.

Reference Books	• Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining and OLAP,McGrawHill, 2004 • D. Hand, H. Mannila, and P. Smyth, Principles of Data Mining, MIT Press, 2011

Subject Name	**205. Web Supporting Technologies**
No. of Credits	3 Credits
Pre Requisite	Any pre-requisite knowledge is not required.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	The students will get information of the basics of internet with the help of examples. It will help them to identify and remember Web supporting concepts.
Understanding	Remembering the definitions will help the students to understand basic concepts of HAML, JavaScript, CSS and PHP etc. In this subject, students will understand various tags, programming constructs of JavaScript, technical issues, cascading Style Sheets, forms and PHP concepts.
Applying	Students will Have thorough knowledge of HTML and JavaScript. They will be able to design various forms as per requirements. They will be able to apply CSS concepts in scripting. The students will also apply their creativity to display the output.
Analyzing	The students will relate real life problem with the JavaScript solution. They will analyze the problem and solve it.
Evaluating	Ability to use JavaScript construct for problem solving, handling technical issues etc.
Creating	Design and create their own forms for solving a real-life requirement.
Syllabus	**Unit 1: Basics of Internet:** Understanding internet and intranet, difference between internet and intranet, Introduction to WWW, Concept of client and server, Introduction to web server and web browser, using Apache as web server, Internet Service Providers (ISP)
	Unit 2: Introduction to HTML: Overview of HTML, concept of Tag, types of HTML tags, structure of HTML program, Text Formatting Through HTML: Emphasizing Material in a Web Page, Using Image tag, attributes of Image tag, Lists: Using unordered, ordered, definition lists, Handling Tables: To define header rows & data rows, use of caption tag, changing height & width of table, BGcolor, Handling Tables: cell padding, cell spacing, colspan, row span, handling table data, images in table, Frames: Introduction To frames, using frames & framesets, named frames, Concept of hyperlink, types of hyperlinks, linking to the beginning of document, linking to a particular location in a document, image as hyperlinks
	Unit 3: Cascading Style Sheets: Introducing CSS, Types of style sheets: inline, embedded and external style sheets, working with CSS properties: text properties, color and background properties, border and shading, box and block properties, positioning with CSS, various types of CSS selectors, Using class and span tag, External style sheets,

	Unit 4: Introduction to JavaScript (Client-Side Scripting): Introduction to scripting, overview of Java Script, advantages, client-side java Script, capturing user input, writing JavaScript into HTML,Advantages and limitations of JavaScript, **JavaScript Basics:** Data types, literals, variables and operators, Java Script arrays, dense array, operators, expressions, **JavaScript Programming Constructs:** Assignment, data declaration, if, switch, while, for, do while, label, break, continue, function call, return, with, delete, method of invocation **Dialog boxes** -Alert dialog box, prompt dialog box, confirm dialog box, window objects **JavaScript Functions-** Types of functions in Java Script- Built in functions, User defined functions, function declaration, passing parameters, variable scope, return values, recursive functions Arrays- Introduction to arrays, arrays with methods
	Unit 5: Forms: Interactive web pages concepts, difference between static & dynamic web pages, Concept of form, how form works, Different elements - text, password, button, submit, reset, checkbox, Radio, Text Area, select & option, properties of form elements, form object's Method, Other built-in Object: String object, math object, date object, Regular Expressions, Form validation
	Unit 6: JavaScript Events: What is an Event? Onclick Event Type, onsubmit Event Type, onmouseover and onmouseout, onchange, onload, onkeydown, working with DOM, Concept of Cookies and sessions, when and how to use cookies and sessions,
	Unit 7: Introduction to PHP: Server-side web scripting, Adding PHP to HTML, Syntax and Variables, PHP control structures, Establishing connectivity with MySQL database
Text Books	1. Ivan Bayross (2006) Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI, BPB Publications
Reference Books	1. Thomas Powell, Web Design The complete Reference, Tata McGrawHill 2. Thomas Powell and Fritz Schneider JavaScript 2.0 : The Complete Reference, Second Edition 3. PHP: The Complete Reference By Steven Holzner, Tata McGrawHil 4. Luke Welling, PHP and MySQL Web Development, Pearson Education; Fifth edition

MOOC on NPTEL	NPTEL / Swayam www.edx.com www.coursera.com www.w3schools.com

Subject Name	**206. Lab on Data Structures using Python**
No. of Credits	2 Credits
Pre Requisite	School Level Mathematics. It does not assume any prior knowledge of programming.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some motivating examples to remember and quickly builds up basic concepts such as conditionals, loops, functions, lists, strings and tuples.
Understanding	By remembering students the basing concepts students will understand the concepts of searching and sorting algorithms, dynamic programming and backtracking, as well as topics such as exception handling and using files. As far as data structures are concerned, the course covers Python dictionaries as well as classes and objects for defining user defined data types such as linked lists and binary search trees.
Applying	Students will Have thorough knowledge about data structures and will be able to design & develop program using linear data structures&non linear data structures for solving problems
Analyzing	Compare efficiency of various data structures for solving a particular problem.
Evaluating	Ability to choose appropriate data structures for problem solving Ability to use combination of these data structures for problem solving.
Creating	Design and create their own data structure for solving a real life problem
Syllabus	**Unit 1** Informal introduction to programming, algorithms and data structures via gcd, Downloading and installing Python,gcd in Python: variables, operations, control _flow - assignments, conditionals, loops, functions.
Suggested Programs	Installation of Python IDE, understand various platforms for Python (google collaborator, Jupitar notebook) • Basic program to understand Data Types • creating variables, accepting input variable from user and printing their datatype • Mathematical functions (apply various operations on data +, -, /, *) • Conditional Statements (if, else, , • Create functions to o Find average of marks of five subjects

	○ Find sum of first n prime numbers
	Unit 2 Python: types, expressions, strings, lists, tuples, arrays | Python memory model: names, mutable and immutable values | List operations: slices etc - Binary search | Inductive function denitions: numerical and structural induction | Elementary inductive sorting: selection and insertion sort | In-place sorting.
Suggested Programs	• Operations on Strings, Lists , tuples and arrays ○ Creating lists/tuple/array and accessing list elements using index ○ Access the list/tuple element using –ve index ○ Extract specific element from list/tuple/array ○ Use len(), del(), remove() and range functions on list/tuple • Applying different searching and sorting algorithm on data (list)
	Unit 3 Basic algorithmic analysis:inputsize,asymptotic,omplexity,O() notation | Arrays vs lists | Merge sort | Quicksort | Stable sorting. Dictionaries | More on Python functions: optional arguments, default values | Passing functions as arguments | Higher order functions on lists: map, lter, list comprehension.
Suggested Programs	• Write a program for sorting given list using Quick Sort • Fuction calling (passing the variables) ○ Find factorial of a number ○ Find fibbonacci series for a given number • Create Dictionaries with key,value pair, and access various elements of Dictioneries, Various operation using Dictionaries. • Usage of map, lter functions on list
	Unit 4 Exception handling | Basic input/output | Handling files | String processing.
Suggested Programs	• Read, write, search operations on File data structure • Write Programs based on exception handling • Write program for various operations on string variables
	Unit 5 Backtracking: N Queens, recording all solutions | Scope in Python: local, global, nonlocal names | Nested functions | Data structures: stack, queue | Heaps.
Suggested Programs	• Creation and various operations on Stack • Creation and various operations on queue

	• Creation and various operations on heap • Defining scope variables in Python
	Unit 6 Abstract datatypes | Classes and objects in Python | "Linked" lists: find, insert, delete | Binary search trees: find, insert, delete | Height-balanced binary search trees.
Suggested Programs	• Creation of class data structure ,Abstract classes • Creation of Link List and various operations on Link List • Implementation of tree data structure using class concept
	Unit 7 Efficient evaluation of recursive denitions: memoization | Dynamic programming: examples | Other programming languages: C and manual memory management | Other programming paradigms: functional programming.
Suggested Programs	Comparison of all discussed algorithm with their implementation in C and compare memory usage.
Text Books	Data Structures and Algorithms in Python Paperback – 2016 by Michael T. Goodrich (Author), Roberto Tamassia (Author), Michael H. Goldwasser (Author) WILEY PUBLICATION Data Structure and Algorithmic Thinking with Python Paperback – 2015 by NarasimhaKarumanchi (Author)
Reference Books	Problem Solving in Data Structures & Algorithms Using Python: Programming Interview Guide by Hemant Jain
MOOC on NPTEL	https://nptel.ac.in/courses/106/106/106106145/#

SEMESTER III

Subject Name	**301. Software Design Patterns**
No. of Credits	3Credits
Pre-Requisite	This course assumes students should have following knowledge: • OOAD and UML. • Software Engineering • Java Programming
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Ability to identify the structure, framework of Design Patterns for a given problem
Understanding	Ability to understand the meanings, concepts and types of Design Patterns
Applying	Ability to decide and suggest a design pattern for the given problem
Analyzing	Exploit the possibilities and limitations of basic design patterns for a given problem and ability to analyze a software development problem
Evaluating	Ability to evaluate, assess the design pattern that are appropriate for a given problem
Creating	Create software design that are scalable, robust and easily maintainable and consisting multiple modules
Syllabus	
	Unit 1: Introduction to Design Patterns: Reusable design Patterns: Meaning & Use of Design Patterns, Organizing the Patterns, describing pattern, how to use the patterns while solving the problem, Applications of different design patterns in various cases. Selection of a Design Pattern
	Unit 2: Creational Patterns: Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences and Implementation of following Creational Patterns: - Factory Method, Abstract Factory, Builder, Prototype, Singleton. Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Creational design pattern.
	Unit – 3: Structural Patterns: Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of Following Structural Patterns Adapter (class), Adapter (object), Bridge, Composite, Decorator. Façade, Flyweight, Proxy. Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Structural design patterns.
	Unit 4: Behavioral Patterns – I : Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of following Behavioral Pattern

	Interpreter, Template Method, Chain of Responsibility, Command, Iterator Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Behavioral Design Patterns – I
	Unit 5: Behavioral Patterns – II: Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of following Behavioral Pattern Mediator, Memento, Observer, State, Strategy, Visitor Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Behavioral Design Patterns – II
	Unit 6: JEE Patterns: Presentation Layer Design Pattern, Business Layer Design Pattern, Integration Layer Design Pattern Tutorial: Tutorials should be conducted in LAB using JAVA for implementing above Patterns
	Unit 7: Case Study: • Designing a parking lot • Designing Movie Ticket Booking System • Design Logistic System • Online Hotel Booking System OYO
Text Books	Head First Design Patterns, Eric Freeman, Elisabeth Freeman, Kathy Sierra, Bert Bates,
Reference Books	• Design Patterns Elements of Reusable Object-oriented Software- Erich Gama, Richard Helm, Ralph Jonson • Ben Schneiderman, Designing the User Interface, Pearson Education, 1998
MOOCs on NPTEL	https://nptel.ac.in/courses/106/105/106105224/
Web Resources	https://www.tutorialspoint.com/design_pattern/index.htm https://www.javatpoint.com/design-patterns-in-java

Subject Name	**302. Artificial Intelligence**
No. of Credits	3 Credits
Pre Requisite	The Student should be well aware with: Strong hold on Mathematics, Strong experience of programming languages, Writing algorithm for finding patterns and learning, Strong data analytics skills, Good knowledge of Discrete mathematics, Strong will to learn machine learning languages.
Expected Outcome	At the end of the course a student should be able: • Understand various search methods. • Use various knowledge representation methods. • Understand various Natural Language Processing techniques. • Use Python Programming language using Numpy and Pandas.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some motivating examples to remember and quickly builds up basic concepts such as visual perception, speech recognition, decision-making, and translation between languages
Understanding	By remembering the basic concepts students will understand the concepts of Natural-language understanding (NLU) or natural-language interpretation (NLI), as well as topics such as simulation process of human intelligence by machines and special computer systems. As far as artificial intelligence is concerned the course covers natural language processing, Knowledge Representation Issues, Symbolic Reasoning under Uncertainty as well as Machine Learning (ML) using Python.
Applying	Students will have thorough knowledge about various level of mathematics, including probability, statistics, algebra, calculus, logic and algorithms. Bayesian networking or graphical modeling, including neural nets. Physics, engineering and robotics, Computer science, programming languages and coding. Knowledge of Python is essential.
Analyzing	Compare efficiency of various Theories of Intelligence and learning from experience for solving a particular problem.
Evaluating	Ability to choose appropriate Knowledge based approach for problem solving. Ability to use combination of these artificial intelligence theories for problem solving.
Creating	Design and create their own artificial intelligence applications for solving a real life problem
Syllabus	
	Unit1:Introduction: What is AI? ,The AI Problems, Background/history, What Is An AI Techniques, The Level Of The Model, Criteria For Success, Some General References, High-level overview of field, State of the art.

	Unit 2 : Introduction and historical perspective, Hard and Soft AI: Disciplines and applications, Theories of Intelligence, Detecting and Measuring Intelligence, Knowledge based approach, Problems, State Space Search & Heuristic Search Techniques: Defining The Problems as A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, And Issues In The Design Of Search Programs, Additional Problems. Generate – And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.
	Unit 3: Knowledge Representation Issues: Representations And Mappings, Approaches To Knowledge Representation. Using Predicate Logic: Representation Simple Facts In Logic, Representing Instance And Isa Relationships, Computable Functions And Predicates, Resolution. Representing knowledge Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning
	Unit 4 : Symbolic Reasoning under Uncertainty: Introduction To Non-monotonic Reasoning, Logics For Non monotonic Reasoning. Statistical Reasoning: Probability And Bays' Theorem, Certainty Factors And Rule-Base Systems, Bayesian Networks, Dumpster-Shafer Theory, Fuzzy Logic.
	Unit 5:Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, Discourse And Pragmatic Processing, Spell Checking. Connectionist Models: Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI And Symbolic AI.
	Unit 6: Introduction to machine learning: IntroductionMachine Learning Concepts, methods and models, Supervised Learning, unsupervised and semi-supervised, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, , **Introduction to Numpybasics**, creatingnumpy arrays ,structure and content of arrays, subset, slice, index and iterate through arrays, multidimensional arrays, python lists vs numpy arrays, introduction to numpy operations on numpy arrays , operations on arrays basic linear algebra operations.
	Unit 7 : Introduction to pandas: Introduction, pandas basics, indexing and selecting data, merge and append, grouping and summarizing data frames, lambda function & pivot tables, reading delimited and relational databases, reading data from websites, getting data from apis, reading data from pdf files, cleaning datasets.

	Case study: For example, to explore a dataset stored in a CSV on your computer. Pandas will extract the data from that CSV into a Data Frame — a table, basically — then let you do things like: Calculate statistics and answer questions about the data, like 1) What's the average, median, max, or min of each column? 2) Does column A correlate with column B? 3) What does the distribution of data in column C look like? 4)Clean the data by doing things like removing missing values and filtering rows or columns by some criteria 5) Visualize the data with help from Matplotlib. Plot bars, lines, histograms, bubbles, and more. 6)Store the cleaned, transformed data back into a CSV, other file or database
Text Books	1) Artificial Intelligence : A Modern Approch, Stuart Russel, Peter Norvig 2) Artificial Intelligence and Machine Learning by Chandra S.S.V, PHI
Reference Books	• –Artificial Intelligence‖ -By Elaine Rich And Kevin Knight (2nd Edition) Tata McGraw-Hill • Artificial Intelligence A New Synthesis :Nilson, Elesevir • Introduction to Artificial Intelligence and Expert System-Patterson, Prentice Hall India. • Shai shalev-shwartz, Shai Ben-David: Understanding Machine Learning from Theory to algorithms, Cambridge University press.
Refer these websites for MOOC's	NPTEL / Swayam www.edx.com www.coursera.com

Subject Name	**303. Information Security**
No. of Credits	3 Credits
Pre Requisite	Basic Knowledge about Software Development Life Cycle, System Analysis
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some basic concepts of software development and software engineering Information can be understood and remembered .
Understanding	By remembering students the basing concepts students will understand the concepts of Information , Characteristics , Levels of Information, Information Security Measures and various stages in Information testing Life Cycle .
Applying	Students will Have thorough knowledge about Measures of Information Security and Cyber security at higher level , network security measures and various scanner and cleaners
Analyzing	To Measure the risk of Information loss or theft and over come the Information Security by scientific and proper methods .
Evaluating	Ability to select proper method to protect the information from misuse and make the organization full proof from various Information threats.
Creating	Design and create their own procedure to protect the important data and information at all the levels.
Syllabus	**Unit 1: Introduction and Background:** Basic concepts of Information, Information Characteristics, sources of Information, Types of Information, Generating Information in Organizations. Business Application of Information and Information System, What is Information security? Need for Information Security , Types of Organization , Functions of Business organization , Levels of Organization , How Organizations manage the information , flow of information.
	Unit 2: Basics of Networking for Security Purpose: Network Installations, Types of Networks and their security issues, Types of Network of OS. Functions of Information security officer. Different measures to safe guard the important information in the organization. Network policy for protecting important resources of the Network. Basic concept of MIS and Organization flow of Information.
	Unit 3:Importance of Information Security: Improvement in corporate reputation based on the height of the level of information security, threat to business continuity due to accidents related to information systems, cyber space, information assets, threats, and vulnerabilities. Information Security Measures. **Threats** :- Ty p e s of threats physical threats (accident, disaster, fault, destruction, theft, unauthorized intrusion, etc.), technical threats (unauthorized access, eave

	S dropping , spoofing, alteration, error, cracking, etc.), man-made threats (operational error, loss, damage, peep, unauthorized use, social engineering, etc.), cyber-attack, information leakage, intent, negligence, mistake, fraudulent behavior, sabotage, DoS attack, rumor, flaming, SPAM e-mail, file sharing software [Malware / malicious programs] computer virus, macro virus, worm, bot (botnet, remote operated virus), Trojan horse, spyware, ransom ware, key logger, root kit, backdoor, fake anti-virus software
	Unit 4: Information security technology (cryptography): **CRYPTREC** ciphers list, cryptography (encryption key), decryption (decryption key), decoding, symmetric cryptography (common key), public key cryptography (public key, private key)), AES (Advanced Encryption Standard), S/MIME (Secure MIME), PGP (Pretty Good Privacy), hybrid encryption, hash function (SHA-256, etc.), key management, disk encryption, file encryption, compromise. digital signature (signature key, verification key), timestamp (time authentication), message authentication, MAC (Message Authentication Code), challenge-response authentication. **Human assets** (people, and their qualifications, skills, and experience), intangible assets, service, risk management (JIS Q 31000), monitoring, information security events, information security incidents.
	Unit 5: Information security Management: Management of information based on the information security policy, information, information assets, physical assets, software assets **Risk analysis and evaluation (Information asset review / Classification)** information assets review, classification and management by importance of information assets, information assets ledger Risk analysis and evaluation (Risk type)loss of property, loss of responsibility, loss of net earnings, human cost, operational risk, supply chain risk,
	Unit 6: Information security regulations: (Company regulations including information) security policy) organizational operation according to the information security policy, information security policy, information security purpose, information security measures criteria, information management regulations, security control regulations, documentation control regulations, regulations on measures to be taken against computer virus infection, regulations on measures against accidents, information security education regulations, privacy policy (personal information protection policy), employment agreement, office regulations, penal provisions, outward explanation regulations, regulations for exceptions, regulations for updating rules, procedure for approving regulations
	Unit 7: Management of Information Asset: Security Incidents management, reducing risk in Information loss and keeping the information safe from unauthorized users and threats .

	Information Technology Act, Cyber Crimes and Cyber Laws. -What are cyber-crimes? Types of cyber-crimes. Categories of Cyber Crime, Online business threats , Online business frauds Safety tips for online business. , IT Policy for Information protecting. risk involved in usage of external service, risk involved in distribution of information by SNS, moral hazard, estimated annual loss, scoring method, cost factor .
Text Books	1. Information Security Management Handbook, Sixth Edition, Volume 5-2012 Amazon BooksEdited by - Micki Krause Nozaki, Harold F. Tipton. 2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives Nina Godbole and SunitBelpure, Publication Wiley. 3. Information Security: Principles and Practice 1st , Kindle Edition -2005 Amazon BooksAuthor - Mark Stamp 4. –Cryptography and information Security‖ V.K. Pachghare, PHI Learning Private Limited, Delhi India. 5. Analyzing Computer Security by Charles P. Pfleeger, Shari LawerancePfleeger, Pearson Education India 6. Anil Gaikwad , Jyoti Biradar (Patil) –Basic Concepts of System Analysis‖ Lambert Academic Publication Dec. 2019 .
Reference Books	1. Practical Information Security Management: A Complete Guide to Planning and Implementation-Dec-2016 Amazon Books . Tony Campbell 2. Managing Risk and Information Security :- Protect to Enable 3. Anil Gaikwad , Jyoti Biradar (Patil) Software Project Management Made Easy Lambert Academic Publication Dec 2019.
MOOC on NPTEL	https://nptel.ac.in/courses/, http://www.freetechbooks.com/managing-risk-and-information-security-protect-to-enable-t1150.html

Subject Name	**306. Lab on Software Testing**
No. of Credits	2 Credits
Pre Requisite	• Fundamental knowledge of computer. • Fundamental knowledge of Software Engineering, System Analysis and Design.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	The purpose of this course is to build the skills necessary to perform software testing at the function, class and application level.
Understanding	Concepts of developing test plan, test cases, execution of test cases etc.
Applying	Work on automated software testing tools like bugzilla, winrunner, selenium, test link etc.
Analyzing	Analyse the requirements for the given problem statement Find defects which may get created by the programmer while developing the software.
Evaluating	Gain confidence to write and execute test cases. To get the knowledge about automated testing and automated testing tools.
Creating	Design and implement the solution for given problem in any programming language. Derive test cases and execute test cases for any given problem.
Syllabus	**Unit 1: Introduction Software Testing** Basic testing vocabulary, Quality assurance versus Quality control, Cost of quality, Software quality factors, How quality is defined? Why do we test software? What is a defect?, defect life cycle. The Multiple roles of the software tester, Scope of testing, When should testing occur?, Testing constraints, Life cycle testing, Independent testing, Levels of testing, The –V‖ Concept of testing
	Unit 2: Testing Techniques Structural versus Functional Technique Categories, Verification versus Validation, static versus Dynamic Testing, Examples of Specific Testing Techniques like white box testing and black box testing, Test Planning, Customization of the Test Process, Budgeting, Scheduling, Different test phases, difference between retesting and regression testing.
	Unit 3: Test Plan and test management tool: Test Director Prerequisites to test planning, Understand the Characteristics of the Software Being Developed, Build the Test Plan, Write the Test Plan. Necessity of test management toot, understand test life cycle, defect life cycle. Demonstrate different test & defect life cycles through testing tool , Overview of Test management and bug tracking tools
	Unit 4: Test cases Test Cases, Test case Design, Building test cases, Test data mining, Test execution, Test Reporting, Defect Management, Test Coverage:

	Traceability matrix Test Metrics: Guidelines and usage, Test reporting: Guidelines for writing test report, Test Tools used to Build Test Reports Manual testing Case Study • Requirements / User Story Study Hands on • Test planning Hands on • Test design Hands on • Test execution Hands on
	Unit 5 : Performance Testing What is performance testing , why do we do performance testing, Types of performance testing , common performance problems, performance test metrics, performance testing tools.
	Unit 6:Automation Testing Basics of automation testing – why, when, how to perform automation testing, , Progression vs Regression test automation, Factors for choosing a particular tool, An overview for the major functional testing tools. Overview of Test management and bug tracking tools.
	Unit 7: Automation testing tools Study of bug tracking tool: Bugzilla. Study of winrunner, study of web testing tool selenium. Study of open source testing tool: test link, Case study for automation testing
Text Books	Hetzel, The Complete Guide to Software Testing, John Wiley & Sons. Software Testing by RenuRajani and Pradeep Oak
Reference Books	1. Testing in 30+ Open Source Tools, Rahul Shende, Shroff Publishers & Distributor Pvt. Ltd, ISBN 13: 9789350231005 (page numbers from 15 to 117) 2. http://seleniumhq.org/ 3. http://sourceforge.net/projects/sahi/ 4. http://testng.org/doc/index.html
MOOC on NPTEL	www.SWAYAM.com www.NPTEL.com www. edx.com www.coursera.com

ELECTIVES

ELECTIVE GROUP (01): CLOUD COMPUTING

Subject Name	**01(A) Virtualization**
No. of Credits	2 Credits
Pre Requisite	Knowledge of Cloud Computing Concepts Knowledge of Virtualization Knowledge of Cloud security Knowledge of Web technologies
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	How to provide Flexible and scalable infrastructures as per user requirement
Understanding	Understanding the components of Virtualization
Applying	Carrying out practical‘s through Virtualization
Analyzing	The case studies will help us to understand more of practice of cloud computing in the market.
Evaluating	Comparison of cost-wise solution to the problem and selecting the best solution for the problem suggested to the organization
Creating	Creating flexible and scalable infrastructure suitable to the organizational need
Syllabus	**Unit 1: Overview Of Virtualization :** Introduction to Virtualization, Virtualization Approaches, Virtualization for Server Consolidation and Containment, Hardware Support for Virtualization, Para-Virtualization, vmWare‘s Virtualization Solutions
	Unit 2: Understanding Virtualization: The Roots of Virtualization, Making Better Use of Your Systems with Virtualization, Approaches to Virtualization, Understanding the Virtualization Ecosystem, Reasons to Invest in Virtualization Hardware. **vmWare :** what is VmWare, Virtulization with Vmware, VmWareProducts,Data Center and Cloud Infrastructure, Networking and Security, SDDC Platform, Storage and Availability, The vmWare Approach to the Cloud, vmWare vSphere 4, Server Consolidation and Containment
	Unit 3: Hypervisor: What is Hypervisor, Type 1 Hypervisor, Type 2 Hypervisor, Types of Hardware Virtualization : Full Virtualization, Emulation Virtualization, Para virtualization., Installing Hyper-V In Windows Server 2012,
	Unit 4: Types Of Virtualization: Server Virtualization, Client & Desktop Virtualization Services and Applications Virtualization, Network Virtualization, StorageVirtualization
	Unit 5: Tools For Virtualization: Virtualization with Xen, Virtualization with Bochs and QEMU,

	Virtualization with Lguest, Virtualization with KVM
	Unit 6: Virtualization For Businesses: Need for Virtualization in a Business, Implementation of Virtualization in a Business, Cost-Benefit Analysis of Virtualization
	Unit 7: Openstack And Its Role In Virtualization: Understanding Openstack, nine Core key components of openstack. CASE STUDIES OF VIRTULIZATION : Xen Hypervisor, OpenVZ Hypervisor, MS Virtual Server 2005 R2, Oracle VM
Text Books	**References:** 1 –Virtulization‖ – A Manager‘s Guide, By Dan Kusnetzky, O‘reilley Publications, 2 –Virtulization for Dummies‖, 1st Edition, Kindle Edition, by Bernard Golden.
Reference	Please refer these websites for MOOC‘s: NPTEL / Swayam www.edx.com www.coursera.com

ELECTIVE GROUP (01): CLOUD COMPUTING

Subject Name	**(01) B Cloud Computing Services (Amazon Web Services)**
No. of Credits	2 Credits
Pre Requisite	Knowledge of Cloud Computing Concepts Knowledge of Virtualization Knowledge of Cloud secuity Knowledge of Web technologies Knowledge of Iaas, PaSS,SaSS&DaSS
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	How to provide Flexible and scalable infrastructures as per user requirement
Understanding	Understanding the components of AWS
Applying	Carrying out practical‘s through AWS
Analyzing	The case studies will help us to understandmore of practice of cloud computing in the market.
Evaluating	Comparison of cost-wise solution to the problem and selecting the best solution for the problem suggested to the organization
Creating	Creating flexible and scalable infrastructure suitable to the organizational need
Syllabus	**Unit 1: Cloud Computing Fundamentals:** Definition of Cloud Computing , private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public Vs private clouds
	Unit 2: Infrastructure &Networking: Introduction to Amazon Web Services AWS Global Infrastructure Introduction to Network Switches & Virtual Private Cloud VPC & Subnets Internet Gateways, VPC Peering & NAT Gateways IP Addressing in AWS Understanding AWS Security Groups Launching our first EC2 instance EC2 instance types & Pricing Models
	Unit 3: Storage: Introduction to Block & Object storage mechanism Introduction to Elastic Block Store - EBS EBS Snapshots EBS Volume Types Instance Store Volumes Introduction to Simple Storage Service (S3) Features of S3
	Unit 4: Elastic Load Balancers : Understanding High Availability Configuration ELB Configuration

	Elasticity Auto Scaling **Identity & Access Management** Understanding the IAM Policies IAM User, IAM Policy and IAM Role
	Unit 5: Relational Databases: Introduction to Relational Databases Creating our first database structure in MySQL Getting started with DynamoDB
	Unit 6: Domain Name System: Introduction to DNS Understanding DNS Records Introduction to Route53
	Unit 7: AWS Lambda and API: Getting started with AWS Lambda Introduction to API Understanding working of API Building our API with API Gateway
Text Books	1. Cloud Computing: Principles and Pardigms by RajkumarBuyya, jamesBroberg and Andrzej M.Goscinski, Wiley, 2011. 2. Amazon Web Services for Dummies – Wiley Brand. 3.Learning AWS – Design, Build and Deploy responsive applications using AWS cloud components by Aurobindo Sarkar, Amit Shah
Reference Books	1. Learn AWS – David Clinton 2. AWS Lab by Zoom Technologies

ELECTIVE GROUP (02): DATA SCIENCE

Subject Name	**(02) A - Statistical Programming in R**
No. of Credits	2 Credits
Pre Requisite	Statistical Knowledge required
Course Objectives	• To teach the Beginners of R Programming of the a master level. A variety of topics will be covered that are important for Data science in order to prepare the students for real life prediction of data engineering. • To impart knowledge of the concepts related to Probability and Application on data sets. It also gives the idea how data is managed in various environments with emphasis on Predictions measures as implemented in data sets.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	• Remember the definitions of concepts and their Implementation in R.
Understanding	• Understand the concept of data and techniques for its Implementation • Understand data data standards and methods. • Understand the fundamentals of Data science
Applying	• Design different data behaviors and their Predictions. • Predictions Model Develop.
Analyzing	• Analyzing Data set • Studying Historical Data.
Evaluating	• Convert the historical Data into Prediction Model.
Creating	• Write R coding for Prediction Model.
Syllabus	**Unit 1. Introduction of Probability:** Concept, Types of Probability, Permutation and Combination concept ,Addition and Multiplication Theorem, Condition Probability, Bayes's Theorem
	Unit 2. Random Variable: Concept, Discrete and Continuous Random Variable, Probability density function, Mathematical Expectation and their Theorem
	Unit 3. Data Distribution: Distribution, Types of Data distribution, Exponential distribution, Binomial distribution, Normal distribution, Poisson distribution, Random number generation, Monte Carlo Simulation.
	Unit 4. Testing of Hypothesis: Procedure of Testing Hypothesis, Standard Error and Sampling distribution, Estimation, Student's t-distribution, Chi-Square test and goodness of fit, F-test and analysis of variance. Factor analysis.
	Unit 5. Introduction to R programming language: Getting R, Managing R, Arithmetic and Matrix Operations, Introduction to Functions, Control Structures. Working with Objects and Data: Introduction to Objects, Manipulating Objects, Constructing Data Objects, types of Data items, Structure of Data items, Reading and Getting Data, Manipulating Data, Storing Data.

	Unit 6. Graphical Analysis using R: Basic Plotting, Manipulating the plotting window, BoxWhisker Plots, Scatter Plots, Pair Plots, Pie Charts, Bar Charts.
	Unit 7. Advanced R: Statistical models in R, Correlation and regression analysis, Analysis of Variance (ANOVA), creating data for complex analysis, Summarizing data, and case studies.
Text Books	"Fundamentals of Statistics" Seven Edition By S.C.Gupta
Reference Books	1. "Fundamentals of Statistics" Seven Edition By S.C.Gupta 2. –R Programming Fundamentals by KaelenMedeiras 3. — Reinforcement Learning e-book. 4. Learning R Programming Guide on line **Suggested MOOC :** Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

ELECTIVE GROUP (02): DATA SCIENCE

Subject Name	**(02) B - Introduction to Data Science**
No. of Credits	2 Credits
Pre Requisite	Statistical and Programming Knowledge required
Course Objectives	• To teach the Beginners of Data analysis through R /Python Programming of the a master level. A variety of topics will be covered that are important for Data science in order to prepare the students for real live Project Analysis • To impart knowledge of the concepts related to Machine Learning and implement and variety Application on data sets. It also gives the idea how data is managed in various environments with emphasis on Analysis measures as implemented .
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	• Remember the definitions of concepts and their Programming skills.
Understanding	• Understand the concept of coding and techniques for its Implementation • Understand data different Methods . • Understand the fundamentals of Data science
Applying	• Design different Model and their validity check. • Concept applying in other domain area.
Analyzing	• Analyzing Data set. • Comparing different Model .
Evaluating	• Convert the analysis in Modern approaches.
Creating	• Write R/Python coding for Analysis
Syllabus	**Unit 1. Association Rule (5 Hours):** Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and a Road Map, Association Rules, the Apriori Algorithm Classification and Prediction
	Unit 2.Classification: Classification, Issues Regarding Classification, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Metrics for Evaluating Classifier Performance, Holdout Method and Random Sub sampling
	Unit 3. Prediction: Prediction, Issues Regarding Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor. Clustering : Cluster Analysis, Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic, Evaluation of Clustering.
	Unit 4. Linear Regression: Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable, Linear Regression with multiple variables, Polynomial Regression, Feature Scaling/Selection.

	Unit 5. Logistic Regression: Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one variable and with multiple variables.
	Unit 6. Deep Learning: History, Scope and specification, why deep learning now, building block of neural network, neural networks, Deep learning hardware. Backward and forward neural networks, XOR model, cost function estimation (maximum likelihood), units, activation functions, layers, , normalization, hyper-parameter tuning, Convolution neural networks, architecture
	Unit 7. Case study: Iris Data set ,Loan Data set, Titanic survival Data set ,Share Market Data set, Covide -19 Data set etc.
Text Books	**An Introduction to Machine Learning Springer by GopinathRebala**
Reference Books	1. "Fundamentals of Statistics" Seven Edition By S.C.Gupta 2. An Introduction to Machine Learning Springer byGopinathRebala 3.Deep Learning MIT Press by John D.Kelleher. Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

ELECTIVE GROUP (03): LINUX

Subject Name	**(03) A- Linux Desktop Environment, Shell Programming and System Administration**
No. of Credits	2 Credits
Pre Requisite	Knowledge of any operating system
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Linux Architecture and Shell Commands
Understanding	Understanding of Linux operating system and environment
Applying	Use Linux operating system for configuring the environment.
Analyzing	
Evaluating	Writing shell scripts and evaluating them
Creating	Creating small applications for smart home/city using Arduino
Syllabus	**UNIT 1:** **Linux Installation** **Using Shell Interface:** **12.** Introduction to Linux **13.** Internal and external commands **14.** General purpose utilities **15.** Navigating the file system **16.** Handling ordinary files **Using GUI Environments:** **17.** GNOME desktop environment KDE desktop environment
	UNIT 2: **Using open source office suite** **18.** Word processor application **19.** Spreadsheet application **20.** Presentation application **21.** Desktop database application **Using the Internet** **22.** World wide web **23.** FTP **24.** Telnet **Using Multimedia** **25.** Graphics Audio Video
	UNIT 3: **Introduction to shell** **26.** Introduction to _bash‘ shell **27.** Redirection **28.** Pipes **29.** Tees **30.** Command substitution **31.** Introduction to other shells: Korn shell, C Shell etc. **Shell environment** **32.** Shell variables **33.** Handling the command line arguments

	34. Login scripts **35.** Terminal characteristics **36.** Aliases **Text editors** _vi‘ editor , _emacs‘ editor
	UNIT 4: **Shell commands** **37.** General purpose utilities **38.** File management **39.** Process management **40.** Communication management **Regular expressions** **41.** Pattern matching **42.** Wild cards **43.** Regular expressions **44.** Utilities: grep, egrep, fgrep etc. **Filters** **45.** Introduction to filters Utilities: pr, head, tail, cut, paste, sort, uniq, nl, tr etc.
	UNIT 5: **Shell scripting** **46.** Introduction to shell scripting **47.** Programming constructs **48.** Mathematical operators **49.** Logical operators **50.** String manipulation **51.** Interactive scripts Handling command line arguments
	UNIT 6: **Understanding system administration:** **52.** Introduction to the routine activities in system administration **53.** Shell commands for system administration **54.** Administrative tools Managing file systems and disk space
	UNIT 7: **Setting up and supporting users:** **55.** Managing user accounts **56.** Providing support to the users **Automating system tasks:** **57.** Aut System initialization **58.** System startup and shutdown **59.** Scheduling system tasks omating system tasks: **Backing up and restoring files:** **60.** Backup and restore strategy **61.** Backup and restore tools **Computer security issues:** **62.** Password protection FirewallsImplement one small project
Text Books	**Textbook:** ▪ Red Hat Linux Bible: Fedora and Enterprise Edition - by Christopher

	Negus
Reference Books	UNIX Concepts and Applications - by Sumitabha Das
MOOC on NPTEL	

ELECTIVE GROUP (03): LINUX

Subject Name	**(03)B -Linux**

	Linux Internals and Network Administration
No. of Credits	2 Credits
Pre Requisite	Basics of Operating System
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Remembering Linux Internal and Network Management commands
Understanding	Understanding of Linux operating system and Network administration.
Applying	Creating Proxy, server, File server, web server
Analyzing	Analyzing inter process communication
Evaluating	Performance of different servers
Creating	Use of Linux administration for creation of server and management
Syllabus	**UNIT 1:** **Setup And Manage a Local Area Network:** Basic Networking, Introduction to networking, OSI Model,IP addressing (IPV4, IPV6) & LAN establishment with Linux , Configuring internet in Linux through broadband, dial-up, data card & through mobile (gprs). **Setup And Manage Proxy Server :** Basics of proxy services, Configuring proxy services, Creating ACL's for controlling access to internet, SQUID: Proxy server setup, Blocking Websites, content filtering, Bandwidth Management
	UNIT 2 : **Setup And Manage FILE Server:** NFS: network file sharing & resource sharing across Linux environment. YUM server: Setting up local YUM, FTP YUM, HTTP YUM, EPEL, REMI &RPMForge like YUM configuration, DHCP:Dynamic Host Configuration Protocol setting up, Allocating IP, Subnet mask, default gateway and hostname, communication with DNS and other protocols. **Setup And Manage FTP Server**
	UNIT 3: **Setup And Manage Web Server :** Basics of Web Services, Introduction to Apache, Configuring Apache for main site, Configuring Apache for multiple sites using IP-based, port based and name-based, Web Server: Apache installation, configuring dedicated server, shared server, user based authentication, load balancing and apache tuning. NIS, LDAP: (user's liberty to sit into remote machine) MAIL Server: knowing MUA,MTA& MDA, setting up and configuring POSTFIX,PO3s v/sIMAPs, Squirrel mail, accessing via Outlook, Thunderbird and evolution. Multi/virtual domain management, email security. Postfix Administration.
	UNIT 4 : **Setup And Manage boot Server :** What is booting and boot process of Linux?, Init Process or Run levels **Setup And Manage DNS Server :** Basics of Internet, Basics of DNS and BIND 9, Configuring DNS primary server, DNS:master DNS, slave DNS with forward & reverse zone, one DNS resolving multiple domain, dynamic DNS etc

	UNIT 5: Architecture of Linux, User and Kernel Space, Introduction to System Calls, System Calls in Detail, trace – Tracing system calls. **Process management** Introduction to Process and process attributes, process vs. Program, Process States, Creating Process, Process termination, process commands Special case of processes. **Inter Process Communication** Introduction to IPC, Pipe, FIFO, Shared Memory, Advantages and Disadvantages of various IPC mechanisms, Application of IPC
	UNIT 6 : **Working with Signals and Threads** **Thread and Process Synchronization** Threads and resources management, Race condition in multi-threaded applications,writing thread safe code,Mutex, POSIX Semaphores, Usage of Binary semaphores and Mutex Race condition in multi-process applications, Limitations of shared memory, Semaphore Implementation.
	UNIT 7: **Linux Networking** OSI and TCP/IP models, Addressing in TCP/IP, IPv4 and IPv6 differences, TCP three-way handshake, Network packet analysis in Linux, Networking commands in Linux, Using socket API to implement client server communication, Working with TCP and UDP sockets, Synchronous I/O
Text Books	1. Linux Administration : A Beginner‘s Guide, Shah, TMH 2.LINUX: The Complete Reference, Petersen, TMH 3.LINUX Network Administrator‘s Guide, Kirch,SPD/O‘REILLY
MOOC on NPTEL	https://nptel.ac.in/courses/106/105/106105166/

ELECTIVE GROUP (04): OPEN SOURCE TECHNOLOGIES

Subject Name	**(04) A. Perl Scripting**
No. of Credits	2 Credits
Pre Requisite	
Course Objectives	**Course Objective :** To introduce basic concepts of Perl Programming and write, modify, and run simple Perl scripts and study working with files and using perl as an object oriented language
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some basic concepts of Perl scripting terminology for development of applications for organization.
Understanding	By remembering students will understand concepts of perl language and how to develop and implement various types of programs as per need of organization
Applying	Students will Have thorough knowledge about programming of Perl.
Analyzing	Students will acquire a good knowledge of programming with perl. Student will be able to pursue his study in object oriented concepts also using perl.
Evaluating	Ability to select proper programming concept to design applications to solve real world problem.
Creating	Design and create ir own applications using procedures, functions, file handling & OOP objects.

Course Plan

Unit	Contents
	Unit 1: Perl ─ Introduction : What is Perl? Perl features , Perl ─ Syntax Overview, Perl ─ Data Types , Numeric Literals String Literals , Perl ─ Variables , Creating Variables, Perl─ Scalars, Scalar Operations ,Perl ─ Arrays Perl ─ Hashes
	Unit 2: Control Flow and Looping Statement: if statement , if else statement, if elsif else statement, unless statement, switch statement, ? : Operator **Perl ─ Loops :** while loop , until loop, for loop, For each loop do while loop nested loops, next statement, last statement, continue statement, redo statement, go to statement, Infinite Loop
	Unit 3: Perl ─ Operators : What is an Operator? Perl Arithmetic Operators, Perl Equality Operators, Perl Assignment Operators, Perl Bitwise Operators, Perl Logical Operators, Quote-like Operators, Perl ─ Date and Time, GMT Time Format, Date & Time, Epoch time, POSIX Function strftime()
	Unit 4: Perl ─ Subroutines : Define and Call a Subroutine, Passing Arguments to a Subroutine, Passing Lists to Subroutines, Passing Hashes to Subroutines, Returning Value from a Subroutine, Private Variables in a Subroutine, Temporary Values via local(), State Variables via state() Subroutine, Call Context **Perl ─ References :** Create References Dereferencing Circular References,

	References to Functions Perl ─ Formats Define a Format Using Format, Define a Report Header Number of Lines on a Page, Define a Report Footer , String and Mamatical Functions
	Unit 5: Perl ─ File I/O : Opening and Closing Files, Open Function, Sysopen Function, Close Function, Operator getc Function, read Function, print Function, Copying Files Renaming a file, Deleting an Existing File Positioning inside a File **Perl ─ Directories :**Display all Files, Create new Directory, Remove a directory, Change a Directory
	Unit 6: Perl ─ Regular Expressions : Pattern Matching, Match Operator Match Operator Modifiers Matching Only Once Regular Expression Variables. Substitution Operator Substitution Operator Modifiers. Translation Operator Translation Operator Modifiers More Complex Regular Expressions Matching Boundaries Selecting Alternatives Grouping Matching. \G Assertion Regular-expression Examples
	Unit 7: Introduction to Object Oriented Programming in Perl : Object Basics, Defining a Class Creating and Using Objects, Defining Methods, Inheritance Method Overriding , Default Auto loading, Destructors and Garbage Collection, Object Oriented Perl Example
References (Books, Websites etc) : • Mastering Perl : Brian, O'Reilly • www.tutorialspoint.com/perl/index.htm	
Suggested MOOC : Swayam	

ELECTIVE GROUP (04): OPEN SOURCE TECHNOLOGIES

Subject Name	**(04)B- Ruby**
No. of Credits	2 Credits
Pre Requisite	
Course Objectives	**Course Objective :** Main objective of this paper is to learn, object-oriented programming with Ruby, Rails fundamentals and how to create basic online applications. How to work with HTML controls, use models in Rails applications, and work with sessions. Details on working with databases and creating, editing and deleting database records, Methods for handling cookies and filters and for caching pages.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some basic concepts of Ruby scripting for development of applications for organization .
Understanding	By remembering students will understand concepts of ruby rails and how to develop and implement various types of programs as per need of organization
Applying	Students will Have thorough knowledge about object-oriented programming with Ruby.
Analyzing	Students will acquire a good knowledge of programming with HTML controls, use models in Rails applications, and work with sessions. Student will be able to pursue his study in object oriented concepts for online application development..
Evaluating	Ability to select proper programming concept to design applications to solve real world problem.
Creating	Design and create ir own applications using OOP objects & rails application developement.

	Contents
	Unit 1:Introduction to Ruby : Creating a first web application, getting started with Ruby, Checking ruby documentation, working with numbers in ruby, working with strings in ruby.
	Unit 2:Variables and Constants in Ruby : Storing data in variables, creating constants, interpolating variables in Double-Quoted strings, reading text on command line, creating symbols in ruby, working with operators, Handling operator precedence, working with Arrays, using Two Array Indices, working with Hashes, working with ranges.
	Unit 3:Conditional Loops, Methods and Blocks: If Statement, Using case statement, using loops, creating and calling a method, making use of Scope, working with Blocks
	Unit 4: Classes: creating a class, creating an object Data Encapsulation, Data Abstraction, Polymorphism, Inheritance
	Unit 5: Objects: Understanding Ruby‘s object Access, overriding method, creating class variables, creating class methods, creating Modules, creating Mixins

	Unit 6: Rails: Putting Ruby to Rails, introducing Model View Controller Architecture, giving view something to do, mixing ruby code and HTML inside view, passing data from an action to a view, escaping sensitive text, adding a second action.
	Unit 7:Building Simple Rails Applications : Accessing data user provides, using rails shortcuts for HTML controls, working with models, tying controls to models, initializing data in controls, storing data in sessions
References (Books, Websites etc.): • Programming Ruby: Pragmatic Programmers' Guide, Second Edition • Agile Web Development with Rails, Third Edition • www.webtechlearning.com	
Suggested MOOC : SWAYAM	

ELECTIVE GROUP (05): MOBILE COMPUTING

Subject Name	**(05) A- JavaScript Programming**
No. of Credits	2 Credits
Pre Requisite	Basic Knowledge about website development.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some basic concepts of programming be understood and remembered .
Understanding	By remembering students the basing concepts students will understand the concepts of programming structure
Applying	Students will Have thorough knowledge about website working
Analyzing	To study the form elements and its working
Evaluating	Ability to select proper functionality of a page and form.
Creating	Design and create their own websites with proper validation
Syllabus	**Unit 1 Introduction to Javascript:** JavaScript Overview , JavaScript Programming Basics, **Variables and Operators** : Variables and Data Types , Operators , Array
	Unit 2 Control Statements: Controlling the Flow: JavaScript Control Statements, **Functions :** Parameters and working, **The Window Object** : The Window Object, Dialog Boxes ,Window function
	Unit 3: The Document Object: The Document Object, Writing to Documents, Document related functions**Forms and Forms-based Data :** The Form Object , Working with Form Elements and Their Properties ,Event related with form
	Unit 4: Form Validation: A Process, Testing Data , Preparing Data for Validation and Reporting Results, Validating Non-text Form.
	Unit 5 : Frames: HTML Frames Review, Scripting for Frames **The String and RegExp Objects** : The String Object, Properties and methods of String Object, Using String Object Methods to Correct Data Entry Errors, The RegExp Object **Dates and Math:** The Date Object, Properties and methods of Date Object, The Math Object , Properties and methods of Math Object
	Unit 6: AJAX: **Animation**: Frequently used Animation function, Manual and Automated animation. **AJAX**: Introduction to AJAX, Interacting with the Web Server using XMLHttpRequest Object, Need of Web server

	Unit 7: JS Frameworks & Libraries: Need of JSON , RESTful API with JSON, jQuery, Intro ,Effects and animations DOM/HTML Updates, jQuery and Ajax
Reference Books	1.JavaScript and JQuery: Interactive Front-End Web Development, by Jon Duckett 2.JavaScript: The Definitive Guide, by David Flanagan 3.Learn JavaScript VISUALLY, by IvelinDemirov
MOOC on NPTEL	https://nptel.ac.in/courses/106/105/106105084/ https://youtu.be/uUhOEj4z8Fo

ELECTIVE GROUP (05): MOBILE COMPUTING

Subject Name	**(05)B - Android**
No. of Credits	2 Credits
Pre Requisite	Basic Knowledge about Java language
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some basic concepts of programming with GUI .
Understanding	By remembering students the basing concepts students will understand the concepts of program structure with layout
Applying	Students will Have thorough knowledge how programming affects on layout, output design.
Analyzing	To see various parts of design and its elements
Evaluating	Ability to create effective layout.
Creating	Design and create their own screen with proper view.
Syllabus	**Unit 1 : Introduction to Android:** Evolution of Android ,Advantages of Android, SDK Tools for Android **Overview of Android Platform :** Android Development IDE Understand the Working of Android, The Android Application Framework, Screen Layout Design, User Interface Design, Introduction to Graphics and Animation Design, Interactivity, Introduction to Content Providers, Intent and Intent Filters
	Unit 2: Android Development Environment: **Setting up the Android Development Environment :** Installing Android Development Environment, Updating the Android SDK Setting up AVDs and Smartphone Connections **Introduction to the Android Software Development Platform :** Understanding Java SE and Dalvik Machine, The Directory Structure of an Android Project, Android XML, Android Application Resources ,Launching an Android Application, Creating first Hello Application
	Unit 3: Overview of Android Framework: Overview of Object Oriented Programming, Overview of XML The Anatomy of an Android Application, Components of an Android Application, Android Intent Objects, Android Manifest XML
	Unit 4: Screen Layout Design: Android View Hierarchies, Activity Lifecycle, Defining Screen Layouts (Screen size, pixel density) **User Interface Design:** Using Common UI Elements, Using Menus in Android ,

	Adding Dialogs(Date picker, Time picker, Custom Dialog, Alert Dialog
	Unit 5: Introduction to Graphics Resources: Introduction to Drawables, Using Bitmap Images, Using Transitions, Creating 9-Patch Custom Scalable Images, Playing Video in Android Apps **Handling User Interface Events:** An Overview of UI Events, Handling onClick Events for all Views, Android Touch-screen Events: onTouch Touch-screen's Right-Click Equivalent: onLongClick, Keyboard Event Listeners: onKeyUp, onKeyDown, Context Menus: onCreateContextMenu, Controlling the Focus
	Unit 6: **Understanding Content Providers:** An Overview of Android Content Providers, defining a Content Provider, Working with a Database **Intents and Intent Filters :** Understanding the Intents, Android Intent Messaging via Intent Objects, Intent Resolution, Using Intents with Activities, Android Services, Using Intents with Broadcast Receivers
	Unit 7 : Bars and Views : Action Bar, Toolbar, Navigation Drawer, TextView, EditView, Button, WebView, ImageView ,ListViewetc
Reference Books	1.Android Application Development All-in-One For Dummies- Barry A. Burd 2. Android Programming: The Big Nerd Ranch Guide Programming Android: 3. Java Programming for the New Generation of Mobile Devices- Authors: Zigurd R. Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura
MOOC on NPTEL	https://nptel.ac.in/courses/106/106/106106147/ https://youtu.be/bBt5sTXaOJA

ELECTIVE GROUP (06): DOT NET TECHNOLOGIES

Subject Name:	**(06) A- C# Programming and Applications**
No. of Credits:	2 Credits
Pre Requisite:	Basic Knowledge of Object-Oriented Programming, Event Driven Programming and Database Applications.
Cognitive Abilities:	Course Outcome as per Blooms Taxonomy
Remembering:	Using basic concepts of object-oriented programming, event driven programming and database application programming in C# can be understood and remembered.
Understanding:	By remembering basic concepts students can understand how to work with programming in C#. Students need to understand programming structures of OOP in C#. Needs to understand methods and properties of various controls of windows forms application along with database objects and their methods.
Applying:	Students will have detailed knowledge of Abstraction, Inheritance, Polymorphism, Encapsulation, Exception Handling, Windows forms applications and database applications
Evaluating:	Students will have ability to use proper methods of C# to solve object oriented problems.
Creating:	Students can apply the concepts of C# programming to create console based and windows based applications.
Syllabus:	**Unit 1: Introduction to C#:** Programming Features of C#, Keywords in C#, Namespaces, Data Types, Variables, Operators, Type Conversions, The _?:‘ Operator, Control Statements. Methods, Passing Method Parameters, Method Overloading, Array, ArrayList class, String Methods, foreach loop.
	Unit 2: Classes and Objects: Basic Principles of OOP, Define a Class, Member Access Modifiers, Constructors, Types of Constructors (Default Constructor, Overloaded Constructor, Static Constructor, Private Constructor and Copy Constructor),

	Destructors, _this‘ Reference, Constant Members, Properties, Auto Implemented Properties, Object Initializer, Collection Initializer, Anonymous Types, Extension Methods, Partial Class, Partial Methods, Indexers.
	Unit 3: Inheritance and Polymorphism: Define Inheritance, Types of Inheritance, Method Overriding, Abstract Class, Abstract Methods, Sealed Class and Methods, Define Polymorphism, Static Polymorphism: Function Overloading Operator Overloading, Overloadable and Nonoverloadable Operators, Dynamic Polymorphism, Defining Interface, Extending interface, Interface and Inheritance, Explicit Interface.
	Unit 4: Errors and Exception Handling: Types of Errors, Exceptions, Syntax for Exceptions Handling Code, Multiple catch Statements, finally Statement, Nested try Block, Throwing Our Own Exception.
	Unit 5: Working with Windows Form Controls: Properties, Events and Examples of: Button, Label, LinkLabel, TextBox, RichTextBox, ListBox, ListView, ComboBox, RadioButton, CheckBox, CheckedListBox, DateTimePicker, PictureBox, Timer, ProgressBar, TrackBar, HScrollBar, VScrollBar.
	Unit 6: Menus, MDI and Containers: ContextMenuStrip, MenuStrip, StatusStrip, ToolStrip, SDI and MDI, Visual Inheritance, GroupBox, Panel, TreeView, SplitContainer, TabControl Example.
	Unit 7: Data Access and Data Bindings: ADO.NET Overview, .NET Data Providers, ADO.Net Objects, Connections, Commands, Data Adapters, Data Readers , Data Sets , Data Tables , Data Views , Data Bindings, Reports.
References (Books, Websites etc)	• C#: The Complete Reference, McGraw-Hill Osborne Media- Herbert Schildt. • C # Programming- Wrox publication. • Programming in C# -A Primer. E. Balaguru
Suggested MOOC:	1) Coursera (www.coursera.org) 2) mymooc (www.my-mooc.com) 3) Class Central (www.class-central.com) *4)* edX *(*www.edx.org*)* 5) Mooc List (www.mooc-list.com

ELECTIVE GROUP (06): DOT NET TECHNOLOGIES

Subject Name:	**(06)B-ASP.Net with MVC**
No. of Credits:	2 Credits
Pre Requisite:	Basic Knowledge of Website Development, JavaScript, Validations, State Management etc.
Cognitive Abilities:	Course Outcome as per Blooms Taxonomy
Remembering:	Using basic concepts of website development, methods and properties ASP. Net in C# can be understood and remembered.
Understanding:	By remembering basic concepts students can understand how to work with web designing in C#. Students need to understand methods and properties of various client and server side controls. Working of state management is also needs to understand.
Applying:	Students will have detailed knowledge of Website design and development, validation, state management, use of web parts and Ajax controls.
Evaluating:	Students will have ability to use proper client side and server side controls of C# to design modern web design.
Creating:	Students can apply the concepts of C# programming for designing a programs for desktop or mobile, as well as web application.
Syllabus:	**Unit 1: Introduction to ASP.Net**: Introduction to ASP.Net, ASP.Net Architecture, ASP.Net Page Life Cycle, Page Life Cycle Events, ASP.Net Directives., FileUpload Control, Calendar Control, AdRotator Control, MultiView Control, and Wizard Control Examples, Validation Controls, Menu, SiteMapPath, TreeView Control.
	Unit 2: Master Pages, CSS, and JavaScript: Working With Master Pages, Nested Master Pages, CSS Overview, Adding Style Sheets into, Web Pages, Editing Styles, Applying Styles to Master Pages, Applying Styles to Web Page, JavaScript Overview, Adding JavaScript files into ASP.Net, Editing JavaScript Files, Applying JavaScripts to Master Pages, Applying JavaScripts to WebPage.

	Unit 3: State Management: View State, Hidden Field, Session State, Application State, QueryString, HttpContext, Cookies, Caching, Types of Caching.
	Unit 4: Data Access in ASP.Net: Data Source Controls, DataList, DataPager, GridView, DetailsView, FormView, Object Data Sources, ListView, DataPager, Repeater.
	Unit 5: ASP. Net Web Parts: Introduction, Advantages of Web Parts, WebPartsManager, CatalogPart, PageCatalogPart, EditorPart, WebPartZone,,EditorZone, CatalogZone Controls.
	Unit 6 : Ajax Controls: AJAX control toolkit, Building a ASP.NET Page with AjaxScriptManager Control, UpdatePanel Control, UpdateProgress Control, Timer Control
	Unit 7: Working with MVC: Introduction to .Net MVC Framework, MVC Framework Features, MVC Architecture, MVC Components, MVC Application Folders, Configuration files- global.asax, packages.config, web.config, Working with Views, Woking with Controls.
Reference Books:	• ASP.Net: The Complete Reference, Matthew MacDonald • Professional ASP.Net (4/4.5) in C #- Wrox publication
Suggested MOOC:	1) Coursera (www.coursera.org) 2) mymooc (www.my-mooc.com 3) Class Central (www.class-central.com) *4)* edX *(*www.edx.org*)* 5) Mooc List (www.mooc-list.com)

ELECTIVE GROUP (07): NET CENTRIC TECHNOLOGIES

Subject Name	**(07)-A HTML 5.0**
No. of Credits	2 Credits
Pre Requisite	Basic concepts of Languages and HTML tags with functions.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Understand the Concepts of HTML 5 & the Applications of HTML 5 to WebsiteDevelopment.
Understanding	By remembering students the basic concepts of HTML and the applications of advanced features of HTML 5. 0 for web development. .
Applying	Students will Have thorough knowledge about practical approach in designing website for various business applications..
Analyzing	To Measure the knowledge about website development and practical applications of advanced features to the web applications
Evaluating	Ability to select proper method to use better tools for website development using HTML 5.0 features and apply security measures to the websites also use useful functions of HTML 5.0
Creating	Design and Develop Websites for various BusinessApplications. Check information inputted into a Database and validateit.
Syllabus	**Unit-1 Introduction to HTML: (7 Hours)** MIME Types, Standards for the Internet, Evolution of HTML, Introduction to XHTML, Introduction to Working Group, W3C
	Unit-2 Features of HTML5: (6 Hours) Detection of HTML5 Support, Modernizr: An HTML5 Detection Library, Canvas, Canvas , Text, Video, Video Formats, Local Storage, Web Workers, Offline Web Applications, Geolocation, Input Types, Placeholder Text, Form Autofocus, Microdata
	Unit-3 Elements of HTML5: The Doctype, The Root Element, The <head> Element, New Semantic Elements in HTML5, Handling of Unknown Elements by the Browsers, Headers, Articles, Dates and Times, Navigation, Footers
	Unit-4 :Drawing Surface: Introduction to Canvas, Simple Shapes, Canvas Coordinates, Paths, Text, Gradients, Images
	Unit-5 :Video on the web: Video Containers, Video Codecs, Audio Codecs
	Unit-6 :Geolocation and Local Storage for Web Applications: Geolocation API, Handling Errors, geo.js Library, Evolution of Local Storage, Introduction to HTML5 Storage
	Unit-7 :Web Forms and Offline Web Application: Introduction to Web Forms, Placeholder Text, Autofocus Field, e-Mail, Addresses, Web Addresses, Numbers as Spinboxes, Numbers as

	Sliders, Date Pickers, Search Boxes, Color Pickers, Introduction to Offline Web application, The CacheManifest
Text Books	1. .Anil Gaikwad , Jyoti Biradar (Patil) Basic Concepts of System Analysis Lambert Academic Publication Dec. 2019 . 2. Brian Albers, Frank Salim, and Peter Lubbers –Pro HTML 5.0Programming
Reference Books	1. Bruce Lawson, Remy Sharp –Introducing HTML 5.0 –Google Books 2010. 2. Jeffrey Zeldman and Jeremy Keith –HTML 5 for Web designers – GoogleBooks-2010. 3. Christopher Murphy, DivyaManian, and Richard Clark :Beginning HTML5 andCSS3.2012. 4. Anil Gaikwad , Jyoti Biradar (Patil) Software Project Management Made Easy Lambert Academic Publication 2019 Dec .
MOOC on NPTEL	Please refer these websites for MOOC"s: NPTEL / Swayamwww.edx.comwww.coursera.com

ELECTIVE GROUP (07): NET CENTRIC TECHNOLOGIES

Subject Name	**(07) B - AJAX PROGRAMMING**
No. of Credits	2 Credits
Pre Requisite	Basic concepts of Languages and HTML tags with functions.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Understand the Concepts of Basic Programming skills and how to use AJAX Programming for software development .
Understanding	Understand the Concepts of AJAX Programming & the Applications of AJAX to WebsiteDevelopment. Design and Develop Websites for various Business Applications using AJAXProgramming. Check information and handle database inwebsites..
Applying	Students will Have thorough knowledge about practical approach in AJAX programming language for Software development .
Analyzing	Computer programming detail knowledge , An intermediate knowledge on Programming Languages and its structure for developing professional web applications for business organizations.
Evaluating	Ability to select proper method to use better tools for website development using AJAX programming language . Use maximum features of AJAX language and know the details about security features of the language .
Creating	Design and Develop Web applications or web sites for various BusinessApplications.
Syllabus –	**Unit-1 Introduction to AJAX:** Introduction to Web Architecture, Traditional Web Communication Processes and Technologies , Introduction to AJAX
	Unit-2 Interacting with the Web Server using XMLHttpRequest Object: Introduction to Interaction with Web Server, Create an XMLHttpRequest Object, Interact with the Web Server
	Unit-3 : Working with PHP and AJAX: Introduction to PHP , Process Client Requests , Accessing Files Using PHP
	Unit-4 Manipulating XML Data: Basics of XML , Create an XML Document Using DOM , Retrieve Data from XML
	Unit-5 : Working with XSLT and AJAX: Basics of XSLT , Transform Responses Using XSLT
	Unit-6 : Working with JSON: Introduction to JSON Format, Create Data in JSON Format , Implement JSON on the Server Side scripting.
	Unit-7: Using Frameworks in AJAX:

	Understand AJAX Frameworks , Use Prototype and Script.aculo.us , Use jQuery **Applying Basic AJAX Techniques** Download Images Using AJAX, Auto-Populate Select Boxes **Implementing Security and Accessibility in AJAX Applications** Create Secure AJAX Applications , Create Accessible Rich Internet Applications
Text Books	1. Anil Gaikwad , Jyoti Birada (Patil) Basic Concepts of System Analysis Lambert Academic Publication Dec. 2019 . 2. Brian Albers, Frank Salim, and Peter Lubbers –Pro HTML 5.0Programming.
Reference Books	1. Ajax: The Definitive Guide: Interactive Applications by Anthony T. Holdener-2014. 2 Kris Hadlock –Ajax for Web Developers Amazon Books2012. 3 Ajax: The Complete Reference by Thomas A. Powell-Amazon Books2013 4. Anil Gaikwad , Jyoti Biradar (Patil) Software Project Management Made Easy Lambert Academic Publication Dec. 2019
MOOC on NPTEL	Please refer these websites for MOOC‟s: NPTEL / Swayamwww.edx.comwww.coursera.com Website :-https://www.amazon.com/Learn-JavaScript-Ajax-w3Schools-W3Schools/dp/0470611944/

ELECTIVE GROUP (08): INFORMATION SYSTEMS

Subject Name	**(08) A -Recommender System**
No. of Credits	2 Credits
Pre Requisite	Basic Knowledge about Relational Database Management system and Software Development , Knowledge about Business Organizations and its functions , Theory of Recommender Systems and Decision Making process .
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some basic concepts of software databases ,development stages and software development also software engineering Information can be understood and remembered .
Understanding	By remembering students the basing concepts students will understand the concepts of Recommender system , Internet and database concepts .
Applying	Students will Have thorough knowledge about practical approach in database design and design the recommender systems for business applications
Analyzing	To Measure the Information systems applications with respect to business benefits . reduce the risk of decision making
Evaluating	Ability to select proper method to use proper recommender system for business applications and make it useful for business functions.
Creating	Design and create own recommender system as per the requirements of the business and functions of the business After going through this course a student should be able to understand : • Will be able to understand the concepts of Decision MakingProcess. • Can be able to design and develop Recommender for Businessapplications. Implementation of Recommender System for various areas of Interest in Business Organizations.
Syllabus –	**Unit-1 : Introduction to Basic Concepts:** Collaborative Recommendation: User Based Nearest Neighbor recommendation, Item Based Nearest Neighbor recommendation, model based and pre-processing based approaches. Recent practical approaches and systems. Content based Recommendation: content representation and content similarity, similarity based retrieval, other text classification methods, Knowledge Based Recommendation: Knowledge representation and reasoning, interacting with constraint based recommenders, interacting with case based recommenders,
	Unit-2 :Hybrid recommendation approaches: Opportunities for hybridization, Monolithic hybridization design, parallelized hybridization design, pipelined hybridization design,
	Unit 3:Evaluating recommender systems : General properties of Evaluation research, popular evaluation designs, evaluation on historical datasets, alternate evaluation design
	Unit 4: Recent developments: Attacks on collaborative recommender systems, Online consumer decision making
	Unit 5: Recommender systems and the next-generation web: Recommendations in ubiquitous environments.
	Unit 6: Explanations in recommender systems:

	Explanations in constraint-based recommenders, explanation in case based recommenders, explanation in collaborative filtering recommenders.
	Unit-7 :Case studies on Recommender System for various Business applications
Text Books	1 –Innovation Management A Business Development Approach - Anil Gaikwad , Rajesh Kanthe –Lambert Academic Publication Dec 2019. 2 –Recommender systems An Introduction‖ by DietmarJannach, Markus Zanker, AlexzanderFelfering, Gerhard friedrich by Cambridge university press2011 3 Recommender systems handbook [book] by francescoricci, liorRokach, Paul b. Kantorin books
Reference Books	1. Amazon books Recommender System Practical Approach Dec-2019 Amazon Books . 2. Tony Campbell Managing Risk and Information Security :- Protect to Enable. A-Press Open Access Book (Free). 3. Anil Gaikwad , Jyoti Biradar (Patil) Software Project Management made Easy Lambert Academic Publication 2019
MOOC on NPTEL	https://nptel.ac.in/courses/, NPTEL / Swayamwww.edx.comwww.coursera.com

ELECTIVE GROUP (08): INFORMATION SYSTEMS

Subject Name	**(08) B -Knowledge Management**
No. of Credits	2 Credits
Pre Requisite	Knowledge about Information System and MIS with Implementation of MIS
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Using some basic concepts of software development , information system and applications of databases o business problems The objective of the course is to provide the basic skills of managing knowledge in organizations. Knowledge is an asset for retaining the competitive advantage of the organization. This course develops the capabilities of towards managing students to manage knowledge in organizations.
Understanding	By remembering students the basic concepts of Knowledge management students will understand the concepts of applications of knowledge management to the business problems .
Applying	Students will Have thorough knowledge about practical approach in designing knowledge management systems for business functions and apply the various advanced tools of software development .
Analyzing	To Measure the knowledge management applications with respect to business benefits . reduce the risk of decision making
Evaluating	Ability to select proper method to use proper knowledge management system for business applications and make it useful for business functions.
Creating	Design and create own knowledge management After going through this course a student should be able to understand : Will be able to understand the concepts of Knowledge and knowledge management. Can be able to design and develop Knowledge management systems for Business applications. Implementation of KM to various areas of Interest in Business Organizations.
Syllabus	**Unit 1: Introduction:** Definition, Scope and Significance of Knowledge Management , Difficulties of Knowledge Management, Techniques of KM – Implementation of KM, Organizational knowledge, Characteristics and Components of Organizational Knowledge
	Unit 2: Drivers of knowledge Management: Pillars of knowledge Management, KM framework , Supply Chain of KM , Formulation of KMstrategy.
	Unit 3: Technology and KM: Technology components of KM – IT & KM , Ecommerce and KM
	Unit 4: Total Quality Management and KM: TQM and KM , Bench marking and KM.
	Unit 5: Implementation of KM: Discussion on Roadblocks to success, Implementing a KM programme , Critical Success Factors in KM , Implementation of KM
	Unit 6: KM and Organizational Restructuring: The Mystique of Learning, Organization:- Outcomes of learning, Learning and Change – Innovation, continuous Improvements,

	Corporate Transformation.
	Unit 7: Case studies in Knowledge Management: Knowledge management in Health Care, Knowledge Management in Human Resource Management and other areas of Business Applications.
Text Books	1. ‒Innovation Management A Business Development Approach - Anil Gaikwad , Rajesh Kanthe –Lambert Academic Publication Dec 2019. 2. Honey Cutt : ―Knowledge Management Strategies‖, PHI, NewDelhi.
Reference Books	**References (Books, Websites etc.):** 1Madhukar Shukla:Competing Through Knowledge-Building a learning Organization (Response Books, NewDelhi. 2.Awad, KM, Pearson Edn,2007. 3. Barnes, Knowledge Management Systems, 1/e, Thomson2006. IkudiroNonka&Hirotaka Takeuchi, ― The Knowledge – Creating Company‖, Oxford University Press, London. 4. Anil Gaikwad , Jyoti Biradar (Patil) Software Project Management made Easy Lambert Academic Publication 2019
MOOC on NPTEL	Please refer these websites for MOOC‟s: NPTEL / Swayamwww.edx.comwww.coursera.com

ELECTIVE GROUP (09): IOT

Subject Name	**(09) A - IoT Architecture Sensors and Fundamentals with Hands-on lab**
No. of Credits	2 Credits
Pre Requisite	School Level Mathematics. Basics of Programming and Networking
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Learning the concepts of IOT, Networking for IOT, Type of Sensor Network, Arduino Programming
Understanding	IOT Standards, connecting Technologies, Machine to Machine Communication
Applying	Implementing IOT with Arduino
Analyzing	Find the usability of IOT in various applications
Evaluating	Evaluate the performance of IOT solution and upgradation
Creating	Creating small applications for smart home/city using Arduino
Syllabus	**UNIT 1:** **IOT concepts:** • Technologies that led to evolution of IOT • IOT and SCADA • IOT and M2M • IOT and Big Data Relevance of IOT for the future • IOT in everyday life • Internet of Everything • IOT and Individual Privacy. **Sensing, Actuation, Basics of Networking:** layered architecture, important protocols (MQTT, CoAP, REST, XMPP, AMQP)
	UNIT 2: **IOT Standards** : Requirement of international standard (case study) IOT standards in practice. Operating platforms /systems **connectivity Technologies:** 802.15.4, Zigbee, 6LoWPANs, RFID, HART, Bluetooth, ZWAVE, ISA 100.11-A
	UNIT 3: **Sensor Networks:** components of sensor networks, deriving data from sensor nodes, different types of sensor networks and behavior of node in a sensor network, target tracking, wireless multimedia sensor network,nanonetworks, relationship between coverage and connectivity, stationary wireless sensor networks, mobile wireless sensor networks, UAV Networks
	UNIT 4 : **Machine-to-Machine Communications**: exchanging data between machines without human intervention, Low-end sensor nodes, mid-end sensor nodes, M2M ecosystem
	UNIT 5: **Interoperability in IoT**, syntactic and semantic interoperability

	Introduction to Arduino Programming: Features of Arduino Arduino IDE Sketch Structure Arduino Function Libraries: Example : blink LED Operators, control statements, arrays, string, random number, Interrupts
	UNIT 6 : Integration of Sensors and Actuators with Arduino: Sensor interface with Arduino, DTH Sensor Library, Type of Motor Actuators, integration of Actuator with Arduino
	UNIT 7: IOT Applications: Lighting as a service (case study) Intelligent Traffic systems (case study) Smart Parking (case study) Smart water management (case study) Implement one small project
Text Books	• Daniel Minoli, ―Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications‖, ISBN: 978-1-118-47347-4, Willy Publications • Vijay Madisetti and ArshdeepBahga, ―Internet of Things (A Hands-onApproach)‖, 1 st Edition, VPT, 2014.
Reference Books	1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, ―From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1 st Edition, Academic Press, 2014. 2. Peter Waher, ―Learning Internet of Things‖, PACKT publishing, BIRMINGHAM – MUMBAI 3. Bernd Scholz-Reiter, Florian Michahelles, ―Architecting the Internet of Things‖, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer 46. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm
MOOC on NPTEL	https://nptel.ac.in/courses/106/105/106105166/

ELECTIVE GROUP (09): IOT

Subject Name	**(09) B - Internet Of Things: implementation with Python and Raspberry Pi**
No. of Credits	2 Credits
Pre Requisite	School Level Mathematics. Basics of Programming and Networking
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Understand IoT sensors and technological challenges faced by IoT devices
Understanding	Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
Applying	Implementing IOT with Python and Raspberry Pi
Analyzing	Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi
Evaluating	Evaluate the performance of IOT solution and upgradation
Creating	Creating small applications for smart home/city using Python and Raspberry Pi
Syllabus	**UNIT 1: Introduction to Python Programming:** Pyton IDE (Spider, Anaconda), Data Types in Python, control statements, functions, file read/write operations, image read/write operations, Networking in Pyton,
	UNIT 2 : Introduction to Rasberry Pi: Basic architecture, installation, Rasberry Pi GPIO, OS setup, using GPIO pins, Taking Pictures using PiCam using Python on Rasberry Pi
	UNIT 3:Implementation of IOT with Rasberry Pi, integration of sensors for data collection, dissemination of data for processing, visualization of data
	UNIT 4 :Software Defined Networking: Origin of SDN SDN Architecture Rule Placement OpenFlow Protocol APIs in SDN Controller Placement Integration of SDN with IoT
	UNIT 5 :Cloud Computing: Introduction, Service Model Service Management Sensor-cloud Fog Computing
	UNIT 6: Smart Cites, Smart Homes, connected vehicles, Industrial IOT
	UNIT 7: Data Handling and Analytics Implement one small project
Text Books	• Daniel Minoli, ―Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications‖, ISBN: 978-1-118-47347-4, Willy Publications • Vijay Madisetti and ArshdeepBahga, ―Internet of Things (A Hands-onApproach)‖, 1 st Edition, VPT, 2014.
Reference Books	1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand,

	StamatisKarnouskos, David Boyle, ―From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1 st Edition, Academic Press, 2014. 2. Peter Waher, ―Learning Internet of Things‖, PACKT publishing, BIRMINGHAM – MUMBAI 3. Bernd Scholz-Reiter, Florian Michahelles, ―Architecting the Internet of Things‖, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer 46. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm
MOOC on NPTEL	https://nptel.ac.in/courses/106/105/106105166/

ELECTIVE GROUP (10): BIG DATA

Subject Name	**(10) A - Introduction to Big Data**
No. of Credits	2 Credits
Pre Requisite	Preliminary knowledge of computer, Data Mining, Data Warehousing Concepts.
Course Objectives	To introduce learner with Big Data Concept, decision making by doing analysis on the data and managing the data using Big Data Concept like Business Intelligence Concept, decision making by Business Intelligence Tools on Applications such as Finance, Marketing, Education etc.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	• Remember the definitions of concepts of Big Data and Business Intelligence Tools.
Understanding	• Understand the concept of Big Data and Business Intelligence Tools. • Understand decision making Theory and Strategies for Big Data. • Understand different Business Intelligence Applications. • Understanding the use of Business Intelligence for AI and Security.
Applying	• Knowledge of Decision making using analysis on the Big Data • Applying on different Big Data Applications in Industries
Analyzing	• Identify and study the Big Data Analysis by Decision Theory and Strategy. • User experience on Big Data and Business Intelligence Tools.
Evaluating	• Applying Decision Making Theory on Big Data.
Creating	• Case Studies: Knowledge about different applications used in industries. • Using Business Intelligence in AI. • Using Business Intelligence for Security
Syllabus	**Unit 1. Introduction:** Big Data History, The Big Data Business Opportunity- Business Transformation Imperative, Big Data Business Model, Business Impact of Big Data, **Big Data In Organization:** Data Analytics Lifecycle, **Data Scientist Roles and Responsibilities** – Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize, New Organizational Roles, Liberating Organizational Creativity.
	Unit 2. Decision Theory And Strategy: Business Intelligence Challenge, Big Data User Interface Ramifications, Human Challenge of Decision Making, **Strategy for Decision Making**- Big Data Strategy Document, Case Study. **Value Creation Process:** Understanding Big Data Value Creation, **Michael Porter's Value Creation Models:** Michael Porter's Value Chain Analysis, Case Study.
	Unit 3. Big Data User Experience: The Unintelligent User Experience, Understanding the Key Decisions to Build a Relevant User Experience, Using Big Data Analytics to Improve Customer Engagement, Uncovering and Leveraging Customer Insights, Big Data can Power a New Customer Experience, **Big Data Use Cases:** 1. Research Business Intiatives, 2. Acquire and Analyze your Data, 3. Brainstorm New Ideas, 4. Prioritize Big Data Use Cases, 5. Document Next Steps, The Prioritization Process.

	Unit 4. Introduction To Business Intelligence Applications: Introduction to Big Data, Business Intelligence Data Mining, and Data Warehousing, What are Business Intelligence Applications (BIA). Features of BIA. **Sales, Finance And Marketing:** Introduction to Sales, Finance and Marketing Concept, **Education And Learning:** Introduction to Education System, Learning Concept.
	Unit 5. Vertical AI Applications: Overview of AI, What is Vertical AI, Features of Vertical AI, Use of Business Intelligence in Vertical AI, Case Study.
	Unit 6. Security: Define Security, Security in Big Data, Problems with Security, Business Intelligence for Security, Case Study.
	Unit 7. Lifescience: Introduction to Life Science, Life Science Intelligence, Features of Life Science Intelligence, Use of Life Science Intelligence in Decision Making, Case Study.
Text Books	
Reference Books	1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo 2. Edureka lectures **Link:-**https://www.youtube.com/watch?v=A02SRdyoshM 3. Business Intelligence Strategy -By John Boyer, Bill Frank, Brain Green, Tracy Harris **Suggested MOOC :** Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

ELECTIVE GROUP (10): BIG DATA

Subject Name	**(10) B -Business Intelligence Tools with HADOOP**
No. of Credits	2 Credits
Pre Requisite	Preliminary knowledge of computer, Big Data Analysis and Business Intelligence.
Course Objectives	To introduce learner with Big Data Concept and HADOOP tool for Business Intelligence. Using different Advance Excel Functions (like Optimization) and implementing it on Big Data for decision making. By solving Case Studies the students will get real example of using BI Tools in industry. It will also introduce learner with decision making by doing analysis on the data using HADOOP Tool and also managing the Big Data using HADOOP.
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	• Remember the concepts of Business Intelligence Tools and HADOOP.
Understanding	• Understand the Excel Tools for Business Intelligence. • Understand working with Macros. • Understand HDSF, Mapping and Reducing in HADOOP Environment. • Understanding the Clusters and Nodes in HADOOP Environment.
Applying	• Knowledge of Decision making using analysis on the Big Data using Excel Tools. • Knowledge of Decision making using HADOOP analysis on the Big Data
Analyzing	• Applying the Excel Tools or Mapping and Reducing on Big Data. • Implementing Environment Setup of HADOOP.
Evaluating	• Applying HADOOP Environment for Analysis on Big Data.
Creating	• Case Studies: for Big Data Analysis using Excel tools or HADOOP • Using features of Macros.
Syllabus	**Unit 1. Introduction To Big Data and Business Intelligence:** Overview of - Data Mining, Data Warehousing, Big Data, How Business Intelligence is useful for Big Data, Big Data Problems. Introduction to BI, **Data Cleaning**-Editing a Workbook, Data Cleaning Using Text Functions, Using Validation To Keep Data Clean, **Working with Multidimensional Data-** Pivot Tables, Pivot Charts.
	Unit 2. Applications Of Business Intelligence and Excel Tools: CRM Domain, Banking Domain, Health Care Domain, Mobile Industry Domain, Creation of a New Product, Providing Personalized Services, **Optimization Modeling With Solver:** Introduction to MS-Excel and MS-Excel Formulas,Understanding Optimization Modeling, Setting Up a Solver Worksheet, Solving an Optimization Modeling Problem, Reviewing the Solver Reports, **Working With Solver:** Working With the Solver Options, Setting a Limit on Solver, Understanding the Solver Error Messages, Case Studies (Solver Problems).
	Unit 3. Advance Excel Tools: **Using Shared Work Books-** Sharing a workbook, Opening and editing a shared workbook, Tracking changes, Resolving conflict in a shared

	workbook, Multiple workbooks- Linking workbooks, Editing the Link, Consolidating the workbook.
	Unit 4. Working With Macros: Introduction to Macros? Where are Macros, Features of Macros, **Working with Macros-** Display the developer Tab, Changing Macro security Settings, Recording and running a Macro.
	Unit 5. Introduction To HADOOP: Hadoop Architecture, MapReduce, Hadoop Distributed File System, How Does Hadoop Work?,Advantages of Hadoop. **HDFS Overview:** Features of HDFS, HDFS Architecture, Starting HDFS, Listing Files in HDFS, Inserting Data into HDFS, Retrieving Data from HDFS, Shutting Down the HDFS.
	Unit 6. MAPREDUCE: What is MapReduce?, The Algorithm for MapReduce, Inputs and Outputs (Java a Perspective), Analyze different use-cases where MapReduce is used, Differentiate between traditional way and MapReduce way. **Introduction To Hadoop Features:** New Big Data Architecture, Introducing HADOOP Features – Apache Hive, Apache HBase, Pig.
	Unit 7. Multi Node Cluster: Multi Node Cluster, Install Java, Creating User Account, Mapping the Nodes, Installing Hadoop, Configuring Hadoop, Start Hadoop Services, Adding New Data Node in the Hadoop Cluster, Removing New Data Node from the Hadoop Cluster. **Environment Setup:** Pre-installation Setup, Installing Java Downloading Hadoop Hadoop Operation Modes Installing Hadoop in Standalone Mode Installing Hadoop in Pseudo Distributed Mode Verifying Hadoop Installation, Implement basic Hadoop commands on terminal.
Text Books	
Reference Books	▪ Tutorials Point for advance Excel Tools. ▪ Excel 2010 Bible by John Walkenbach, John Wiley & Sons, 2010 Edition. ▪ *https://office.live.com/start/Excel.aspx* ▪ *https://www.talend.com/* ▪ www.tutorialspoint.com **Suggested MOOC :** Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

ELECTIVE GROUP (11): CYBER SECURITY

Title of the Course	**(11) A -Introduction to Information Security**
Number of Credits	2 Credits
Pre-Requisites	Information about computer hardware, system and application software, and networking
Course Outcomes as per Bloom's Taxonomy	
Remember	Concepts involved in information systems
Understand	Security concerns involving information systems
Apply	Understanding of concerns to improve information security
Analyze	Real-life scenarios with respect to information systems
Evaluate	Scenarios involving information systems and security concerns
Create	Information security awareness to address real-world scenarios
Syllabus (45 Hours)	**Unit-1: Information Security Concepts:** **63.** Confidentiality, Integrity and Availability of Information **64.** Identification, Authentication and Authorization **65.** Security Principles and Models
	Unit-2: Physical Security: **66.** Facility Requirement **67.** Perimeter Security **68.** Fire Protection **69.** Fire Suppression **70.** Power Protection **71.** General Environmental Protection **72.** Equipment Failure Protection
	Unit-3: Network Security: **73.** Secure Network design **74.** Firewalls **75.** WLAN Security **76.** VPNs **77.** Types and Sources of Network Threats
	Unit-4: Operating System Security: **78.** Windows **79.** Linux/UNIX
	Unit-5: Database Security: **80.** MS SQL
	Unit-6: Web Application Security: **81.** Web Application Vulnerabilities

	82. Secure Coding Techniques **83.** Continuous Security Testing and Assessments
	Unit-7: Compliance Standards: **84.** IT Act **85.** ISO 27001 **86.** ITIL Framework
Text Book	Shimonski R., *Certified Ethical Hacker - Study Guide*, Sybex
Reference Book	Lammle T., *CCNA - Routing and Switching - Complete Study Guide*, Sybex
Supplementary SWAYAM Course	Cyber Security (https://swayam.gov.in/nd2_cec20_cs15/preview)

Title of the Course	**(11) B - Information Security Threats and Mitigation Strategies**
Number of Credits	2 Credits
Pre-Requisites	Information about computer hardware, system and application software, and networking
Remember	Concepts involved information security domain
Understand	Security vulnerabilities and threats
Apply	Understanding of security threats to mitigate them
Analyze	Real-life scenarios with respect to information security
Evaluate	Scenarios involving information security threats
Create	Awareness about mitigation of information security threats in real-world scenarios
Course Outcomes as per Bloom's Taxonomy	
Syllabus (45 Hours)	**Unit-1: Introduction to Information Security Threats:** **87.** TCP/IP Fundamentals **88.** Operating System Fundamentals **89.** Web Application and Database Fundamentals **90.** Introduction to Ethical Hacking **91.** Advanced Persistent Threats
	Unit-2: Information Gathering: **92.** Footprinting **93.** Advanced Google Hacking **94.** Nmapping the network **95.** Fingerprinting
	Unit-3: Exploitation: **96.** Hacking Networks **97.** Hacking Servers **98.** Hacking Databases **99.** Password Cracking
	Unit-4: Advanced Exploitation: **100.** Hacking WLANs **101.** Evading IDS, Firewalls **102.** Web Application Hacking **103.** Advanced Web Hacking **104.** Hacking Web Browsers
	Unit-5: Social Engineering: **105.** Introduction to Social Engineering **106.** Common Types of Attacks **107.** Online Social Engineering
	Unit-6: Cryptography: **108.** Introduction to Cryptography

	109. Encryption and Decryption **110.** Cryptographic Algorithms **111.** Digital Signature **112.** Cryptography Tools **113.** Cryptography Attacks
	Unit-7: Malware Attacks: **114.** Viruses **115.** Worms **116.** Trojans
Text Book	Shimonski R., *Certified Ethical Hacker - Study Guide*, Sybex
Reference Book	Howard M., *Writing Secure Code*, Microsoft Press
Supplementary SWAYAM Course	Introduction to Cyber Security (https://swayam.gov.in/nd2_nou20_cs02/preview)