Rajarshi Shahu Mahavidyalaya (Autonomous), Latur
Department of Computer Science
B. Voc. in Computer Technology
B. Voc. S. Y. (Semester III + Semester IV)
(With effect from 2019-20)
Syllabus (2023-24)

	Course Code	Course Title	Credits	Hrs / Week	Marks ESE	Marks CE	Total Marks
Semester III	CT.GE.301	Soft Skills and Communication Skills I (General Education)	4	4	60	40	100
	CT.GE.302	Operating System (General Education)	4	4	60	40	100
	CT.GE.303	Business Communication (General Education)	4	4	60	40	100
		Total Credit (A)	**12**		**Total Marks (A)**		**300**
	CT.SC.301	PHP , BootStrap and JQery (Skill Component)	4	4	60	40	100
	CT.SC.302	Object Oriented Programming through C++ (Skill Component)	4	4	60	40	100
	CT.SC.303	Data Base Management System (Skill Component)	4	4	60	40	100
	CT.SC.PR.1	LAB Course 7 Boot Strap(Skill Component)	2	4	30	20	50
	CT.SC.PR.2	LAB Course 8 C++(Skill Component)	2	4	30	20	50
	CT.SC.PR.3	LAB Course 9 MySQL (Skill Component)	2	4	30	20	50
		Total Credit (B)	**18**		**Total Marks (B)**		**450**
		Total Credit (Sem – III) (A + B)	**30**		**Total Marks(A+B)**		**750**

	Course Code	Course Title	Credits	Hrs / Week	Marks ESE	Marks CE	Total Marks
Semester-IV	CT.GE.401	Soft Skills and Communication Skills II (General Education)	4	4	60	40	100
	CT.GE.402	Basics of Networking (General Education)	4	4	60	40	100
	CT.GE.403	Aptitude and Logical Reasoning (General Education)	4	4	60	40	100
		Total Credit (A)	**12**		**Total Marks (A)**		**300**
	CT.SC.401	Programming in Java(Skill Component)	4	4	60	40	100
	CT.SC.402	Introduction to Python Programming (Skill Component)	4	4	60	40	100
	CT.SC.403	Data Structure and Algorithms (Skill Component)	4	4	60	40	100
	CT.SC.PR.1	LAB Course 10: Java (Skill Component)	2	4	30	20	50
	CT.SC.PR.2	LAB course 11: Python (Skill Component)	2	4	30	20	50
	CT.SC.PR.3	Micro Project (Skill Component)	2	4	30	20	50
		Total Credit (B)	**18**		**Total Marks (B)**		**450**
		Total Credit (Sem-IV) (A + B)	**30**		**Total**		**750**
		Total Credit (Sem III + Sem IV)	**60**	Total Marks (Sem III + Sem IV)			**1500**

ESE- End Semester Examination CE-Continuous Evaluation

Split-up of Continuous evaluation marks

Total Marks: 40

Unit Test 1	Unit Test II	Total Marks	Converted Marks	Marks for Attendance	Total Marks
30	30	60	**30**	**10**	**40**

B. Voc. –Computer
TechnologySemester: III
General Education-VII

Soft Skills and Communication Skills I (CT.GE.301)

Credit: 04 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- To enhance learner's communication skills by giving adequate exposure (use of language lab) in listening and speaking skills and the related sub-skills.
- To create learner's confidence in oral and interpersonal communication by reinforcing the basics of pronunciation.
- To help learners to recognize and make use of sentence structures in English

Course Outcomes:

- Students will be aware of listening and speaking skills and the related sub-skills.
- They can focus a lot on listening style to be the better speaker of English language
- Students can realize the proper style of English for oral communication and can use words and sentences with proper accent and intonation.
- Students will speak English by using proper sentence structures

UNIT I Speaking and Listening Skills (Activity Based)	NOS	Hours
1) Introduction (self, friends, guest and colleagues) 2) Making Request 3) Oral Presentation 4) Interviews practice Listening- Interview, Radio Talk and Story To be assessed through MCQ, short /long answer questions.		15
UNIT-II: Effective Writing Skill		15
1) Work place Instructions and guidelines (10 samples collection) 2) Notice, Agenda and Minutes (10 samples collection) 3) Business letter, Memo, Resume and Curriculum Vitae (10 samples) 4) Conducting Meeting To be assessed through MCQ, short /long answer questions.		
UNIT-3: Introduction to Soft Skills		15

1) Definition of Soft skills 2) Need of soft skills 3) Nature and scope of Soft skills 4) Acquiring and Advantages of soft skills. To be assessed through MCQ, short /long answer questions.		
UNIT-4: Soft Skills		15
1) Critical, Creative and Positive thinking 2) Self-Management 3) Problem-solving Skills 4) Effective teamwork Skills To be assessed through MCQ, short /long answer questions.		

Reference Books:

1) Seven habits of highly effective peoples – Stephen Covey
2) You can heal your life – Dr. Lueis Hey
3) How to win and influence people – Dell Karnogi
4) Granthawali - Swami Vivekananda

B. Voc. –Computer Technology
Semester: III
General Education-VIII

Operating System (CT.GE.302)

Credit: 04 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- To learn the fundamentals of Operating Systems.
- To learn the mechanisms of OS to handle processes and threads and their communication
- To learn the mechanisms involved in memory management in contemporary OS
- To know the components and management aspects of concurrency management
- To learn programmatically to implement simple OS mechanisms

Course Outcomes:

After successful completion of this course student will be able to

- Analyze the structure of OS and basic architectural components involved in OS design
- Analyze and design the applications to run in parallel either using process or thread
- Models of different OS.
- Understand the Mutual exclusion, Deadlock detection.
- Conceptualize the components involved in designing OS.

Unit I Introduction to Operating System	**NOS**	**Hours**
What is an operating system? History of operating system, Computer hardware & software, Different operating systems, Various System Software associated with Operating Systems, Shell and Kernel, Systems Calls and their types and implementation		10
Unit II Process & Thread Management	**NOS**	**Hours**
Processes, PCB, Process States, Threads & TCB, difference and Similarities in Threads and Process, Inter-process communication, CPU scheduling, IPC problems. Process Synchronization & deadlocks Critical Section Problems &Semaphores, Classical Problems of process Synchronization, Introduction to deadlocks, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention, issues.		20
Unit III Memory Management	**NOS**	**Hours**
Address Spaces and Address Translation, Swapping & memory allocation, Paging & Segmentation, Virtual Memory & Demand Paging, Page Replacement Algorithm, Thrashing		**15**

Unit IV File and Disk Management		
File Systems: Files, directories, file system & Directories implementation, file-system management and optimization, File Allocation Methods, MS-DOS file system, UNIX V7 file system Disk Structure, Disk Scheduling Algorithm (FCFS, RAID, Network Operating System, Real Time Operating System, Distributed Operating System		15
	Total	60

Reference Books:

1. Operating System Principles, Silberschatz, Galvin, Gagne-Wiley William Stalling
2. Operating System-Internal and Design Principles, Andrews Tanenbaum, Pearson Education India
3. Operating System, Achyut Godbole & Atul Kahat, McGraw Hill Education

B. Voc. –Computer Technology

Semester: III

General Education-IX

Business Communication (CT.GE.303)

Credit: 04 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- The meaning and objectives of business communication, effective principles of business communication.
- To make students familiar with various forms of communication.
- The central idea of group communication and soft skills like personality traits, interpersonal skills and leadership.

Course Outcomes:

After completion of this course students will be able to

- Learn about the concept of Business communication process, Objectives and principles.
- Create awareness of the importance of the soft skills and assist the learners to improve them and develop personality traits, leadership, negotiating, consensus building, and emotional intelligence quotient among the students.
- Prepare various types of business letters such as enquiry, adjustment, complaint and job application etc. and get familiarize with legal deed, gift deed power of attorney etc.

Unit 1: I Introduction to Business Communication	NOS	Hours
Definition and objectives of business communication. Process of communication Barriers to communication. Effective communication. SWOC Analysis.		12
Unit II Forms of Business Communication	NOS	Hours
Introduction – Classification of communication Verbal Communication – written and oral. Non-Verbal communication – Kinesics, Para-language, space		15

Dimensions/ Directions of communication Formal and Informal communication. Modern forms of communication- E-mail, Video conferencing, and Social media.		
Unit III: Business Correspondence	NOS	Hours
Introduction, Principles of Business Writing Business Correspondence-format. Letter of Enquiry and Letter of Responding to an order. Complaint letters and Adjustment letters. Job Application. Curriculum vitae/Bio-data.		15
Unit IV: Basic understanding of Legal Deeds and Documents	NOS	Hours
Partnership Deed & Lease Deed Power of Attorney, Affidavit Indemnity Bond, Gift Deed. Memorandum & Articles of Association of a Company. Annual Report of a Company.		18

Reference Books:

1) Business Communication by Dr. V.K. Jain & Dr. Omprakash Biyani, S.Chand & Company Ltd, New Delhi
2) Business Communication by H.S. Patange, Nikita Publication.
3) Business Communication – IPCC- Group by ICAI
4) Effective Business Communication by Asha Kaul, Second Edition, PHI Publication.
5) Essentials of Business Communication by C.B. Gupta, Cengage Learning India Pvt. Ltd.

B. Voc. –Computer
TechnologySemester: III
Skill Component-VII

PHP, BootStrap and JQery (CT.SC.301)

Credit: 04 Periods:60

(To be implemented from the Academic year 2019-2020)

SSC NASSCOM - NOS-501

Learning Objectives

i. Understand how server-side programming works on the web.
ii. PHP Basic syntax for variable types and calculations.
iii. Understanding POST and GET in form submission
iv. The purpose of jQuery is to make it much easier to use JavaScript on your website.
v. Bootstrap is easy to use and allows a designer to specify exactly how the site will look and behave on a number of different displays, including mobile, desktop, and tablet.

Course Outcomes:

After Completion of this course Students should be able to

i. Build dynamic Web sites with PHP framework, syntax and important techniques.
ii. Learn how to connect to any modern database.
iii. Perform hands on practice with a MySQL database to create database-driven HTML forms and reports.

UNIT I: PHP	NOS	Hours
Introduction, Syntax, Variables, Print/Echo, Datatypes, Strings, Constants, Operators, If……Else…. Elseif, Switch, While Loops, For Loops, Function, Arrays, Forms		15
UNIT II: Introduction to BootStrap	NOS	Hours
Bootstrap- GetStarted , What is Bootstrap? ,Bootstrap CDN Bootstrap is Mobile–First, Containers, Basic Bootstrap Pages, Bootstrap Grids, Bootstrap Grid System, Grid Classes, and Basic Structure of a Bootstrap Grid, Equal Columns, and Unequal Columns. Typography, Table, Images, Wells, Alerts.		20
UNIT III: BootStrap UI	NOS	Hours
Button, Button groups , Badges/Labels Progress Bars , Pagination, pager, List groups, Panels, Drop Down, Collapse, Tabs/Pills, Navbars		10
Unit IV JQuery		
What is jQuery?, Downloading and installing jQuery Creating a simple jQuery, enabled page Overview of jQuery's		15

Retrieving Page Content - Using basic jQuery selectors, filters, attribute filters, Child, visibility, and content filters, Form selectors and filters. Traversing documents, Understanding jQuery statement, Binding and unbinding events, Convenient event helper methods, Using the jQuery event object, jQuery Animations and Effects . Using the jQuery UI Plug In Manipulating Page, Working with Events.		

Reference Books:

1) Programming PHP- RasmusLerdorf and Kevin Tatroe O'Reilly publication
2) PHP: The Complete Reference-Steven Holzner.
3) Step by Step Bootstrap -RiwantoMegosinarso
4) JQuery Pocket Reference –David Flanagan.

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B. Voc. –Computer

TechnologySemester: III

Skill Component-VIII

Object Oriented Programming through C++ (CT.SC.302)

Credit: 04 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- Understand the features of C++ supporting object-oriented programming
- Understand how to apply the major object-oriented concepts to implement object-oriented programs in C++, encapsulation and polymorphism
- Understand advanced features of C++ specifically stream I/O, templates, operator overloading, Inheritance paradigm.
- Ability to handle possible errors during program execution.

Course Outcomes:

- Upon successful completion of this course, students should be able to:
- Understand in-depth coverage of object-oriented programming principles and techniques.
- Use concepts of classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, templates, exceptions, container classes for programming.
- Also, student will learn data structures and arrays.

Unit I: Introduction to OOPs and Basics of C++	NOS	Hours
Need object-oriented programming, comparison of procedural and object-oriented approach, object, classes, polymorphism, inheritance, reusability, data hiding and abstraction, applications of OOPs, Character Set, identifiers and keywords, data types, constants, variables and arrays, Operators and Expressions, Conditional Statements and Loops, Switch Statement		15
Unit II Functions, Classes and Objects	NOS	Hours
Defining a function, accessing a function, Passing arguments to a function, specifying argument data types, function, prototypes, recursion, Class declaration, constructors constructor initialization lists, access functions, private, member functions, copy constructor, class destructor, pointers to object, static data members, static function, members, friend function, Operator Overloading		

overloading the assignment operator, this pointer, overloading arithmetic operators, overloading the arithmetic, assignment operators, overloading the relational operators, overloading the increment and decrement operators, overloading the subscript operator		
Unit III Inheritance and File Handling	NOS	Hours
Inheritance, Protected Class Members, Overriding, , Private Access Verses Protected Access, Virtual Functions and Polymorphism, Virtual Destructors, Abstract Base Classes, File Handling, Classes for File Stream Operations, Opening and, Closing A File, Detecting End of File, File Modes, File Pointers and Their Manipulations, Sequential Input and Output, Operations, Random Access, File Operations Error Handling, Command Line Arguments		15
Unit IV Templates and Exception Handling	NOS	Hours
Function Templates, Class Templates, Container Classes, Subclass Templates, Passing Template Classes to Template, Parameters, Exception Handling, Introduction, Exception, Handling Mechanism, Concept of Throw & Catch With Example		15

Reference Books:

Object Oriented Analysis and Design,Timothy Budd(2012).: Tata McGraw Hill
Object Oriented Programming with C++, E. Balagurusamy.: Tata McGraw Hill

B. Voc. –Computer
TechnologySemester: III
Skill Component-IX

Data Base Management System (CT.SC.303)

Credit: 04 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- To implement the design of the tables in DBMS
- To write queries to get optimized outputs
- To store, retrieve and view the contents
- To generate report based on customized need

Learning Outcomes:

At the end of this course, student should be able to-

- Identify the information that is needed to design a database management system for a business information problem.
- Create conceptual and logical database designs for a business information problem.
- Construct a database management system that satisfies relational theory and provides users with business queries, business forms, and business reports.
- Analyze the core terms, concepts, and tools of relational database management systems.
- Demonstrate skills to work in teams and utilize effective group techniques to manage a project.

Unit-I Introduction to Databases and Data Models	NOS	Hours
What is database system? Purpose of database system, View of data, Relational databases, Database architecture, Transaction management, The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction		15
Unit-II Database Design,ER-Diagram and Unified Modeling Language	NOS	Hours
Database design and ER Model: Overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, weak entity sets, Codd's rules, Relational Schemas, Introduction to UML Relational database model:Logical		15

view of data, keys, Integrity rules. Relational Database design, features of good relational database design, Atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).		
Unit- III Relational Algebra and Calculus	NOS	Hours
Relational algebra: Introduction, Selection and projection, Set operations, Renaming, Joins, Division, Syntax, semantics, Operators, Grouping and ungrouping, Relational comparison. **Calculus:** Tuple relational calculus, Domain relational Calculus, Calculus vs algebra, Computational Capabilities.		15
Unit- IV Constraints, Views and SQL		
What are constraints? Types of constrains, Integrity constraints, **Views:** Introduction to views, Data independence, security, Updates on views, Comparison between tables and views SQL, data definition, Aggregate function, Null Values, nested sub queries, Joined relations, Triggers.		15
	Total	60

Reference Books:

1) Database System and Concepts-A Silberschatz, H Korth, S Sudarshan, Fifth Edition McGraw-Hill
2) Database Systems- Rob, Coronel, Seventh Edition, Cengage Learning.

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TechnologySemester: III
Skill Component
Lab Course VII

Credit: 02 Periods:60

Experiments based on Skill Component-VII

1) Write a Php program using Different types of datatypes.
2) Write a Php program using String Functions.
3) Write a Php program which displays the working of control statements.
4) Write a Php program which displays the working of Operators.
5) Write a Php program which displays the working of Arrays().
6) Write a program for tables using Bootstrap.
7) Write a program for different styles of buttons using Bootstrap.
8) Write a program for different progress bars using Bootstrap.
9) Write a program for dropdowns using Bootstrap.
10) Write a program for navbar using Bootstrap.
11) Write a program for Jquery Selectors.
12) Write a program for Jquery Event Methods.
13) Write a program for Jquery Effects
14) Write a program for Jquery HTML Elements & attributes.

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TechnologySemester: III
Skill Component
Lab Course-VIII

Credit: 02 Periods: 60

(To be implemented from the Academic year 2019-2020)

Experiments based on Skill Component-VIII

1. Program to Demonstrate Classes and methods
   a. Design an employee class for reading and displaying the employee information, the get Info() and display Info() methods will be used respectively. Where get Info() will be private method
   b. Design the class student containing get Data() and display Data() as two of its methods which will be used for reading and displaying the student information respectively. Where get Data() will be private method.
   c. Design the class Demo which will contain the following methods: read No() ,factorial() for calculating the factorial of a number, reverse No() will reverse the given number, is Palindrome() will check the given number is palindrome, is Armstrong() which will calculate the given number is arm Strong or not. Where read No() will be private method.
2. Program to Demonstrate Friend functions
   a. Write a friend function for adding the two different distances and display its sum, using two classes.
   b. Design a class Complex for adding the two complex numbers and also show the use of constructor.
3. Program to Demonstrate Constructor and method overloading
   a. Design a class Complex for adding the two complex numbers and also show the use of constructor.
   b. Design a class Geometry containing the methods area() and volume() and also overload the area() function
   c. Design a class Static Demo to show the implementation of static variable and static function.
4. Program to Demonstrate Operator overloading
   a. Overload the operator unary (-) for demonstrating operator overloading

b. Overload the operator + for adding the timings of two clocks, And also pass objects as an argument
c. Overload the + for concatenating the two strings. For e.g “c” + “++” = c++

5.Program to Demonstrate Inheritance
a. Design a class for single level inheritance using public and private type derivation.
b. Design a class for multiple inheritances.
c. Implement the hierarchical inheritance.

6. Program to Demonstrate Virtual function and abstract class
a. Implement the concept of method overriding.
b. Show the use of virtual function
c. Show the implementation of abstract class

7. Program to Demonstrate Exception handling
a. Show the implementation of exception handling
b. Show the implementation for exception handling for strings
c. Show the implementation of exception handling for using the pointers.

8. Program to Demonstrate File handling
a. Design a class File Demo opens a file in read mode and display the total number of words and lines in the file.
b. Design a class to handle multiple files and file
c. Design a editor for appending and editing the files

9. Program to Demonstrate Templates
a. Show the implementation of template class library for swap function.
b. Design the template class library for sorting ascending to descending and vice-versa
c. Design the template class library for concatenating two strings

B. Voc. –Computer
TechnologySemester: III
Skill Component
Lab Course-IX

Credit: 02 Periods: 60

(To be implemented from the Academic year 2019-2020)

Experiments based on Skill Component-VII

1) Design a Database and create required tables. For e.g. Bank, College Database
2) Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3) Write a sql statement for implementing ALTER, UPDATE and DELETE
4) Write the queries to implement the joins
5) Write the query for implementing the following functions:
   MAX(), MIN(),AVG(),COUNT()
6) Write the query to implement the concept of Intergrity constrains
7) Write the query to create the views
8) Perform the queries for triggers
9) Perform the following operation for demonstrating the insertion, updation and deletion using the referential integrity constraints
10) Write the query for creating the users and their role

B. Voc. –Computer Technology
Semester: IV
General Education-X

Soft Skills and Communication Skills II (CT.GE.401)

Credit: 04 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- This course helps students to select their professional career as per their inborn qualities and potential, and also this course develops many soft skills in students which are essential in all types of career.

Learning Outcomes:

After successful completion of this course, students will be able to:

- By giving adequate exposure in Soft skills and the related sub-skills the students enhanced the entrepreneur skills.
- The learners increased their confidence in written and interpersonal communication.
- The learners recognized and used the sentence structures in English in written communication.
- The learners understand and use good qualities in their life.

Unit I Career Selection	**NOS**	**Hours**
1. Skill of selection career 2. Finding out inborn qualities and interest. 3. Interest- attraction or love 4. Entrepreneurship: definition, definition of entrepreneur, qualities of entrepreneur, scope and limitations of entrepreneurship 5. Business:- definition of business, definition of businessman, qualities of businessman, scope and limitations of businessman. 6. Service: definition of service, service sectors in India and Abroad, scope and limitation of service	SSC/N 9002	15
Unit II Spoken English	**NOS**	**Hours**
1. Vocabulary building -Listening, Reading, Writing, Speaking 2. Basic pattern of Sentence- Present tense, Past tense, Future tense 3.Art of asking questions - Question starting with helping verb.	SSC/N 9002	15
Unit III Leadership and Team Management	**NOS**	**Hours**
1. Definition of leader 2. Qualities of leader 3. Duties of leader 4. Definition of team 5. Importance of team 6. Formation of team	SSC/N 9002	15

7. Management of team.		
Unit IV Personality Development	**NOS**	**Hours**
1. Definition of personality 2. External factors affecting personality 3. Internal factors affecting personality 4. Meditation 5. Use of meditation as a tool to achieve health and wealth.	SSC/N 9002	15
	Total	60

Reference Books:

1. Seven habits of highly effective peoples – Stephen Covey
2. You can heal your life – Dr. Lueis Hey
3. How to win and influence people – Dell Karnogi
4. Granthawali- Swami Vivekananda
5. Rich Dad Poor Dad – Robert Kiwasoki
6. Marketing Management – Philip otler
7. You can win – Shiv khera
8. Body language – Dr. UjwalPatani
9. How I raised my self from failure to success – Frank Betgar
10. Agnipankh – Dr. A.P.J. Abdul Kalam.
11. Soft Skills- Ajay R.Tengse.

B. Voc. –Computer
TechnologySemester: IV
General Education-XI

Basics of Computer Networks (CT.GE.402)

Credit: 04 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- To understand the basics of computer network.
- To be aware about the network topologies, network protocols, and networking devices.
- To be able to know the data communication schemes.

Learning Outcomes:

After successful completion of this course, students will be able to:

- Describe the general principles of data communication.
- Describe how computer networks are organized with the concept of layered approach.
- Have a good understanding of the OSI Reference Model and in particular have a good knowledge of all the Layers of the model.
- Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
- Establish the simple LAN.

Unit I Introduction to Communication and Networks	NOS	Hours
Concept of communication system, Analog and Digital Communication, Data communication modes, Synchronous and Asynchronous transmission, Simplex, half-duplex, full-duplex communication, Networking Protocols and Standards, Layering, encapsulation, End-to-end argument. Protocol design issues, Network Applications. What is a computer Network? Components of a computer network, Use of Computer networks, network terminologies, Classification of networks, Network topologies: Bus, Ring, Mesh, Star, Tree. Switching; Circuit switching, Message switching, Packet switching, Multiplexing; FDM – Frequency division multiplexing, WDM – Wavelength division multiplexing, TDM – Time division multiplexing.	SSC/N	20

The OSI Reference Model, The TCP/IP Reference Model, Comparison of the OSI & the TCP/IP Reference Models.		
Unit II Communication Mediums and Network devices	**NOS**	**Hours**
Transmission medium; Guided & Unguided Transmission medium, Twisted pair, Coaxial cable, Optical fiber, Wireless transmission; Electromagnetic spectrum, Radio transmission, Microwave transmission. **Networking devices:** Repeaters, Hubs, Switches, Bridges, Routers, Gateways . **Other Devices:** Modems, Proxy Server, Wireless router.		10
Unit III Physical and Data Link Layer	**NOS**	**Hours**
Design issues of Physical layer and data link layer, Error detection and correction, CRC, Framing, Retransmission strategies, Multi-access communication, CSMA/CD, Ethernet, Addressing, ARP and RARP. Protocols for Physical and data link layer.		10
Unit IV Network, Transport and Application layer	**NOS**	**Hours**
Network Layer Circuit and packet switching, Routing, Congestion control, Routing protocols: distance vector vs link-state routing, DV problems, Network Addressing, Forwarding, Fragmentation, Error Messaging Services. **Transport Layer** Addressing and multiplexing, Flow control, Congestion control, Data transport, Port numbers, service models, Intro to reliability, QoS. **Application Layer** DNS, Remote Logging, File transfer, Network Management, client-server applications, WWW, E-mail, MIME		20
	Total	60

Reference Books:

1) Behrouz A. Forouzan. *Data Communications and Networking*. 5th edition. McGraw-Hill 2013.
2) Andrew S. Tanenbaum & David J. Wetherall. *Computer Networks*. 5th edition. Pearson Education, Inc.

B. Voc. –Computer
TechnologySemester: IV
General Education-XII

Aptitude and Logical Reasoning (CT.GE.403)

Credit: 04 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- To understand the basics of number theory.
- To enhance the numerical abilities.
- To be able to work with mathematical operations.

Learning Outcomes:

After successful completion of this course, students will be able to:

- Compute HCF and LCM of a given number.
- Describe how to compute Fractions and how-to interpreter data.
- Draw Venn Diagram and execute data arrangement and logic test.
- endeavor aptitude test of different multinational companies

Unit I Numerical Abilities / Quantitative Aptitude 1	**NOS**	**Hours**
Number Theory, Square Roots, HCF and LCM, Data Sufficiency Test, Profit and Loss, Surds and Indices, Simplification, Percentage, Approximation, Quantitative Comparison, Average	SSC/NO506	15
Unit II Numerical Abilities / Quantitative Aptitude2	**NOS**	**Hours**
Logarithms, Fraction and Decimals, Commercial Math, Ratio and Proportion, Data Interpretation Compound and Simple Interest, Partnership, Mensuration Area, Volume, Data Comparison, Discounts	SSC/NO506	15
Unit III Logical Reasoning 1	**NOS**	**Hours**
Number Test, Logical Diagram (Venn Diagram), Analogy Test, Relationship Test, Insert Missing Sequence Test, Alpha Numeric Symbol Sequence, Direction and Distance Test, Alphabet Test, Classification (Odd Man Out) Test	SSC/NO506	15
Unit IV Logical Reasoning 2	**NOS**	**Hours**
Cubes and Cubical Dice Test, Logical Word Sequence Test, Time Sequence Test, Coding & Decoding Test, Statement Arguments, Mathematical Operations, Statement Conclusion, Series Test, Data Sufficiency Test, Data Arrangement Test, Logic Test	SSC/NO506	15

Reference Books:

- Quantitative Aptitude by **Dr. R. S. Agrawal**, S. Chand Publisher, Revised Edition.
- How to Prepare for Quantitative Aptitude for CAT by Arun Sharma
- How to Prepare for Logical Reasoning for CAT by Arun Sharma

B. Voc. –Computer Technology

Semester: IV

Skill Component-XIII

Java Programming (CT.SC. 401)

Credit: 04 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- To understand the concepts of object-oriented programming.
- To be aware about the data types, looping structure available in java.
- To know the use of array, exception.
- To understand the concepts of event handling, applets, inheritance, interfaces and abstract classes.
- To obtain the knowledge of java database connectivity and swing components.

Learning Outcomes:

After successful completion of this course, students will be able to:

- Demonstrate the concepts of object-oriented programming.
- Write simple java applications that uses arrays, control structures, variables and constants.
- Use inheritance and able to handle common exceptions.
- Write small applets, event handling programs.
- Implement java application that uses database connectivity.

Unit 1: Introduction to Java programming	**NOS**	**Hours**
History of Java, Features of Java, Java Development Kit (JDK), Keywords, Comments, Data Types in Java, Primitive Data Types; Variables in Java; The main() Method of java, Saving, Compiling and Executing Java Programs. **Operators**: Arithmetic Operators, Increment and Decrement Operators, Comparison Operators, Logical Operators, Operator Precedence. **Control Flow Statements:** if-else Statement, Switch Statement, for Loop, and while Loop, do…while loop, break Statement continue Statement. **Arrays and Strings** Arrays; Strings, String Operations, String Buffer.	SSC/N 0507	20

Unit 2 : Object Oriented Concepts	NOS	Hours
Class and Objects Class Fundamentals, Creating objects, Assigning object reference variables, Introducing Methods, Static methods, Constructors, Overloading constructors, this Keyword, Using Objects as Parameters, Argument passing, Returning objects, Method Overloading, Garbage Collection, The Finalize() Method **Inheritance and Polymorphism:** Inheritance Basics, Access Control, Multilevel Inheritance, Method Overriding, Abstract Classes, Polymorphism, Final Keyword	SSC/N 0507	15
Unit 3: Package, Interface and Exception Handling	**NOS**	**Hours**
Packages Packages, Defining and using a Package **Interface** Interface, Defining an Interface, Uses of Interfaces, Interfaces versus Abstract Classes **Exception Handling** Definition of an Exception, Exception Classes, Common Exceptions, Exception Handling Techniques	SSC/N 0507	10
Unit 4: Applets, Event Handling, Swing, JDBC	**NOS**	**Hours**
Applets What are Applets? The Applet Class, Life Cycle of an Applet **Event Handling** Components of an Event, Event Classes, Event Listener, Event-Handling, Adapter Classes, Inner Classes **Swing** Concepts of Swing, Swing Packages and Classes, Working with Swing- An Example, Swing Components **Java Data Base Connectivity**	SSC/N 0507	**15**

Reference Books:

- Core Java Volume I & II (11th Edition) by Cay S. Horstmann and Gary Cornell, Prentice Hall Publisher.
- Java: The Complete Reference (Ninth Edition) by Herbert Schildt, Oracle Press.
- Programming with Java(5th Edition) by E Balgurusamy

B. Voc. –Computer Technology

Semester: IV

Skill Component-XI

Introduction to Python Programming (CT.SC.402)

Credit: 04 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- To understand the concepts of object-oriented programming.
- To be aware about the data types, looping structure.
- To be able to know the use of string, list, dictionary and tuples.
- To learn the concepts of exception handling and file handling.

Learning Outcomes:

After successful completion of this course, students will be able to:

- Write python programs that use strings, lists, tuples and dictionaries.
- Demonstrate the concepts of object oriented programming using python programs.
- Write python programs that stores and manipulates data using file.
- Implement python program that uses regular expressions and exception handling.

Unit I : Introduction	**NOS**	**Hours**
Introduction to Python Programming Language, Python Data, Variables, Expressions and Statements, Values and Data Types, Type Conversion Functions, Operators and Operands, Input Functions, Boolean Expressions, Logical operators, Conditional Execution, Unary Selection, Nested conditionals, Chained conditionals, Boolean Functions, Iteration, The for loop, The while Statement.	SSC/N 0507	15
Unit II: Strings, Lists and Tuples in Python	**NOS**	**Hours**
Strings, Operations on Strings, Index Operator, String Methods, Length, The Slice Operator, Lists, Accessing Elements, List Membership, Concatenation and Repetition, List Slices, List Deletion, List Methods, Tuples, Tuple operators and built-in functions, Tuples and Mutability, Tuple Assignment, Tuples as Return Values.	SSC/N 0507	15
Unit III: Dictionary and File handling and OOP's	**NOS**	**Hours**
Dictionaries, Dictionary Operations, Dictionary Methods, Dictionary Keys, Aliasing and Copying, Sparse Matrices,	SSC/N 0507	20

Working with Data Files, Finding a File on your Disk, Reading a File, Iterating over lines in a file, Writing Text Files. **Object oriented Programming and Classes in Python:** Creating Classes, Instance Objects Accessing Members, Constructor, Method Overloading , Inheritance,		
Unit IV: Regular Expression and Exception Handling	**NOS**	**Hours**
Regular Expressions, Exceptions, Standard Exceptions, Exceptions Syntax, The try/except/else Statement, The try/finally Statement, Unified try/except/finally, The raise Statement, The assert Statement, with/as Context Managers String-Based Exceptions, Class-Based Exceptions, General raise Statement Forms, Catch All Exceptions, Catch A Specific Exception, Catch Multiple Specific Exceptions, Clean-up After Exceptions.	SSC/N 0507	10

Reference Books:

- John V Guttag (2013), Introduction to Computation and Programming Using Python, PrenticeHall of India, 2013, ISBN: 9780262525008
- R. Nageswara Rao(2016), Core Python Programming, Dreamtech Press, 2016, ISBN-13:9789351199427
- Wesley J. Chun(2006), Core Python Programming-Second Edition, Prentice Hall, ISBN-13:978-0132269933, ISBN-10: 0132269937
- Learning Python 2nd Edition by Mark Lutz and David Ascber

B. Voc. –Computer
TechnologySemester: IV
Skill Component-XII

Data Structure and Algorithms (CT.SC.403)

Credit: 04 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- To gain the basic knowledge about data structures and algorithms.
- To write simple algorithms for various problems and calculate the time and space complexity.
- To modify the algorithm.

Learning Outcomes:

At the end of the course, the students should be able to:

- Design algorithms for various computing problems.
- Analyze the time and space complexity of algorithms.
- Critically analyze the different algorithm design techniques for a given problem.
- Modify existing algorithms to improve efficiency.

Unit I – Introduction to Algorithms and Data Structures	NOS	Hours
Analysis of Algorithms Mathematical Background, Process of Analysis, Calculation of Storage Complexity, Calculation of Run Time Complexity **Arrays** Arrays and Pointers, Sparse Matrices, Polynomials, Representation of Arrays, Row Major Representation, Column Major Representation, Applications, Array operations.	**SSC/No 0506**	**15**
Unit II – Link List, Stack and Queue	**NOS**	**Hours**
Lists Abstract Data Type-List, Array Implementation of Lists, Linked Lists-Implementation, Doubly Linked Lists-Implementation, Circularly Linked Lists-Implementation, Applications **Stacks** Abstract Data Type-Stack, Implementation of Stack, Implementation of Stack using Arrays, Implementation of Stack using Linked Lists, Algorithmic Implementation of Multiple Stacks, Applications	**SSC/No 0506**	**15**

Queues Abstract Data Type-Queue, Implementation of Queue, Array Implementation, Linked List Implementation, Implementation of Multiple Queues, Implementation of Circular Queues, Array Implementation, Linked List Implementation of a circular queue, Implementation of Deque, Array Implementation of a Deque		
Unit III – Trees and Graph	**NOS**	**Hours**
Trees Abstract Data Type-Tree, Implementation of Tree, Tree Traversals, Binary Trees, Implementation of Binary Tree, Binary Tree Traversals, Recursive Implementation of Binary Tree Traversals, Non Recursive Implementations of Binary Tree Traversals, Applications **Graphs** Definitions, Shortest Path Algorithms, Dijkstra's Algorithm, Graphs with Negative Edge costs, Acyclic Graphs, All Pairs Shortest Paths Algorithm, Minimum cost Spanning Trees, Kruskal's Algorithm, Prims's Algorithm, Applications, Breadth First Search, Depth First Search, Finding Strongly Connected Components	**SSC/No 0506**	**20**
Unit IV – Searching and Sorting	**NOS**	**Hours**
Searching Linear Search, Binary Search, Applications **Sorting** Selection Sort, Insertion Sort, Bubble Sort, Quick Sort, 2-way Merge Sort, Heap Sort.	**SSC/No 0506**	10

Reference Books:

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, —Data Structures and Algorithms, Pearson Education, Reprint 2006.
2. Harsh Bhasin, —Algorithms Design and Analysis, Oxford university press, 2016.
3. Fundamentals of Computer Algorithms by Horowitz and Sahani

B. Voc. –Computer Technology

Semester: IV

Skill Laboratory Course X

LAB Course- Java

Credit: 02 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- To be able understand the concepts of object-oriented programming.
- To be aware about the data types, looping structure available in java.
- To be able to know the use of array, exception.
- To learn the concepts of event handling, applets, inheritance, interfaces and abstract classes.
- To obtain the knowledge of java database connectivity and swing components.

Learning Outcomes:

After successful completion of this course, students will be able to:

- Demonstrate the concepts of object oriented programming.
- Write simple java applications that uses arrays, control structures, variables and constants.
- Use inheritance and able to handle common exceptions.
- Write small applets, event handling programs.
- Implement java applications that use database connectivity.

Practical List

1. Write a program that demonstrates program structure of java.
2. Write a program that demonstrate Operators & Expressions.
3. Write a program that demonstrate Looping Statement.
4. Write a program that demonstrate Decision Making Statement
5. Write a program that demonstrates string operations.
6. Write a program that demonstrates inner class.
7. Write a program that demonstrates inheritance.
8. Write a program for defining an Interface.
9. Write a program for defining Package.
10. Write a program that demonstrates event handling for various types of events.
11. Write a program to illustrate use of various swing components.
12. Write a program to implement file handlings.
13. Write a program that demonstrates Applet programming.
14. Write a program that demonstrates JDBC on applet/application.

B. Voc. –Computer Technology

Semester: IV

Skill Laboratory Course-XI

LAB Course- Python programming

Credit: 02 Periods:60

(To be implemented from the Academic year 2019-2020)

Learning Objectives:

- To be aware about the data types, looping structure.
- To be able to know the use of string, list, dictionary and tuples.
- To be able understand the concepts of object-oriented programming.
- To learn the concepts of exception handling and file handling.

Learning Outcomes:

After successful completion of this course, students will be able to:

- Write simple python applications that use strings, lists, tuples and dictionaries.
- Write python programs that stores and manipulates data in file.
- Write Programs using the concepts of object oriented programming.
- Implement python programs that use regular expressions and exception handling.

List of Practical

1. Installation of Python.
2. Develop programs to understand the control structures of python.
3. Develop programs to understand the loops in python.
4. Program to demonstrate control and looping statement.
5. Develop python programs using dictionary.
6. Develop python program that uses tuples.
7. Develop programs to learn concept of list in python.
8. Develop programs to learn concept of string handling in python.
9. Develop programs to learn regular expressions using python.
10. Develop programs to learn concept of Classes and Objects in python.
11. Develop programs to learn concept of Method overloading in python.
12. Develop programs to learn concept of Method overriding in python.
13. Demonstrate the concept of exception handling using try/except/else Statement, Unified try/except/finally, try/finally Statement, raise Statement.
14. Demonstrate the concept of String-Based Exceptions and Class-Based Exceptions.

B. Voc. –Computer
TechnologySemester: IV
Skill Laboratory Course-XII
(CT.SC. PR3 Mini Project)

Credit: 02 Periods:60

(To be implemented from the Academic year 2019-2020)

Prerequisite: HTML5, CSS3, Bootstrap4, JavaScript, jQuery, Any Programming Language, Database (MYSQL/MongoDB/Oracle/Access etc).

Mini Project should contain minimum 5 pages of your website.

User Interface should be in HTML5, CSS3, Bootstrap4 or any latest UI framework.

Website may contain JavaScript, jQuery for more attractiveness.

Establish Database connectivity with backend.

Website must have admin panel.

All DDL, DML commands should be fulfill.