



शैक्षणिक वर्ष २०२४-२५ पासून राष्ट्रीय  
॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड - ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'B++' grade

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Academic-1 (BOS) Section

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विज्ञान व तंत्रज्ञान विद्याशाखेतील  
**CBCS** पॅटर्न नुसारच्या पदवी  
स्तरावरील तृतीय वर्षाच्या सुधारित  
(दुरुस्ती) अभ्यासक्रमा बाबत....

## प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, विज्ञान व तंत्रज्ञान विद्याशाखेतील शैक्षणिक वर्ष २०२१-२२ मध्ये **CBCS** पॅटर्न नुसार लागू केलेल्या पदवी स्तरावरील तृतीय वर्षाचे अभ्यासक्रम दुरुस्ती करण्यास मा. विद्यापरिषदेच्या दिनांक ३१ जुलै २०२५ रोजीच्या बैठकीतील विषय क्रमांक ०३/६२-२०२५ अन्वये मान्यता प्रदान केली आहे. त्यानुसार दुरुस्तीसह खालील अभ्यासक्रम शैक्षणिक वर्ष २०२५-२६ पासून लागू करण्यात येत आहेत.

01	B.Sc. III rd Year Computer Science
02	B.Sc. III rd Year Software Engineering
03	B.Sc. III rd Year Information Technology
04	B.Sc. III rd Year Computer Management
05	B.Sc. III rd Year Network Technology
06	B.C.A. (Bachelor of Computer Application) III rd Year

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या [www.srtmun.ac.in](http://www.srtmun.ac.in) या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,

विष्णुपुरी, नांदेड - ४३१ ६०६.

जा.क्र.:शैक्षणिक-१/परिपत्रक/बी.एस्सी/ दुरुस्ती/S&T/

२०२५-२६/ २२२

दिनांक : ०८.०९.२०२५



सहाय्यक कुलसचिव

शैक्षणिक अभ्यासमंडळ विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव.

०१. मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
०२. मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
०३. मा. संचालक, सर्व संबंधित संकुले, प्रस्तुत विद्यापीठ.
०४. मा. प्राचार्य, सर्व संबंधित महाविद्यालये, प्रस्तुत विद्यापीठ.
०५. सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. यानां देवून कळविण्यात येते की, सदरील परिपत्रक विद्यापीठाच्या संकेतस्थळावर प्रसिध्द करण्यात यावे.



॥ सा विद्या या विमुक्तये ॥  
स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड - ४३१ ६०६ (महाराष्ट्र राज्य) भारत

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विज्ञान व तंत्रज्ञान विद्याशाखेतील  
पदवी स्तरावरील खालील विषयाचे  
CBCS Pattern नुसारचे सुधारित  
अभ्यासक्रम शैक्षणिक वर्ष  
२०२३-२०२४ पासून लागू  
करण्याबाबत.

## प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, प्रस्तुत विद्यापीठाच्या संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील C.B.C.S. (Choice Based Credit System) Pattern नुसारचे खालील सुधारित अभ्यासक्रम शैक्षणिक वर्ष २०२३-२४ पासून लागू करण्याच्या दृष्टीने मा. कुलगुरू महोदयानी मा. विद्या परिषदेच्या मान्यतेच्या अधीन राहून मान्यता दिलेली आहे.

1. B.Sc. Computer Management ( I,II & III Year)
2. B. Sc. Information Technology ( I,II & III Year)
3. BCA (Bachelor of Computer application) ( II Year)

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या [www.srtmun.ac.in](http://www.srtmun.ac.in) या संकेतस्थळावर उपलब्ध आहे. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

विष्णुपुरी, नांदेड - ४३१ ६०६.

जा.क्र.:शैक्षणिक- /०१/परिपत्रक/UG/

पदवी-सीबीसीएस अभ्यासक्रम/२०२३-२४/346

दिनांक : २५.१०.२०२३

आपली विश्वासू

*Chane*

डॉ. सरिता लोसरवार

सहाय्यक कुलसचिव

प्रत माहिती व पुढील कार्यवाहीस्तव :

- १) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
- २) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- ४) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
- ७) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. यांना देवून कळविण्यात येते की, सदरील परिपत्रक विद्यापीठाच्या संकेतस्थळावर प्रसिध्द करण्यात यावे.



**Swami  
RamanandTeerthMarathwadaUniversi  
ty,Nanded  
(NAACRe-accreditedwith‘B++’Grade)**



**Syllabus of  
RevisedCBCS pattern B.Sc. Computer  
Management (I, II and IIIrd Year)**

**Introduced from Academic Year 2023-2024**

# B.Sc.Computer Management

**B.Sc. Computer Management**(3years) program / degree is a specialized program in computersciences.It builds the student on studies in Computer Science and to become competent inthe current race and development of new computational sciences. The duration of the study isofsixsemesters, whichis normallycompleted inthreeyears.

**The B.Sc. Computer Management**program as per CBCS CM (Choice based credit system) pattern, inwhich choices are given to the students under open electives and subject electives. Thestudentscan chooseopenelectives from the widerangeofoptions to them.

## **EligibilityandFees**

The eligibility of a candidate to take admission to **B.Sc. Computer Management**program is as per the eligibility criteria is as follows.

**12<sup>th</sup> Arts, Commerce, Science and MCVC passed students are eligible** to take admission to **B.Sc. Computer Management**.

More details on admission procedure and feestructure can be seen from the prospectus of the college / institution as well as on website oftheUniversity.

## **CreditPattern**

Every course has corresponding grades marked in the syllabus structure. There are 24 creditsper semester.A total of 144 credits are essential to complete this program successfully. TheGradingpattern toevaluatetheperformanceofastudentis aspertheUniversityrules.

Every semester has a combination of Theory (core or elective) courses and Lab courses. Eachtheory course has 04 credits which are split as 03 external credits and 01 internal credit. Theuniversity shall conduct the end semester examination for 03 external credits. For theoryinternal credit, student has to appear for 01 class test (15 marks) and 01 assignments (10marks).Every lab course has 02 credits which are split as 01 external credit and 01 internalcredit. For lab internal credit, the student has to submit Laboratory Book (05 marks) andremaining 20 marks are for the Lab activities carried out by the student throughout thesemester. For lab external credit, 20 marks are reserved for the examinational experiment and05marks arefortheoral/ vivaexaminations.

The open elective has 04 credits which are purely internal.If students are opting for MOOCsas open elective, then, there must be a Faculty designed as MOOCs course coordinator whoshall supervise learning through MOOCS. This is intentionally needed as the MOOCs coursecoordinator shall verify the MOOC details including its duration, staring date, ending date,syllabus contents, modeof conduction, infrastructure feasibility,and financialfeasibilityduring start of each semester. This is precautionary as the offering of the MOOCs throughonline platforms are time specific and there must be proper synchronization of semesterduration with the MOOCs duration. Students must opt for either institutional / college levelopenelectiveoracourse fromUniversityrecognizedMOOCsplatformsasopenelectives.

The number of hours needed for completion of theory and practical courses as well as

the passing rules, grading patterns, question paper pattern, number of students in practical batches, etc shall be as per the recommendations, norms, guidelines and policies of the UGC, State Government and the SRTM University currently operational. The course structure is supplemented with split up in units and minimum numbers of hours needed for completion of the course, wherever possible.

Under the CB.SC CM pattern, students would graduate **B.Sc. Computer Management** with a minimum number of required credits which includes compulsory credits from core courses, open electives and program specific elective course. All students have to undergo lab / practical activities leading to specific credits and project development activity as a part of professional UG program.

1. **B.Sc. Computer Management** Degree / program would be of 144 Credits. Total credits per semester = 24
2. Each semester shall consist of three core courses, one elective course, one open elective course and two practical courses. Four theory courses (core + elective) = 16 Credits
3. Two practical / Lab courses = 4 Credits in total (02 credits each), One Open elective = 4 credit
4. One Credit = 25 marks, Two Credits = 50 Marks, Four Credits = 100 Marks

#### PEO, PO and CO Mappings

1. **Program Name:** B.Sc. (Computer Science)
2. **Program Educational Objectives:** After completion of this program, the graduates/students would

PEOI: Technical Expertise	Implement fundamental domain knowledge of core courses for developing effective computing solutions by incorporating creativity and logical reasoning.
PEOII: Successful Career	Deliver professional services with updated technologies in <b>Computer Management</b> based career.
PEOIII: Hands on Technology and Professional experience	Develop leadership skills and incorporate ethics, teamwork with effective communication & time management in the profession.
PEOIV: Interdisciplinary and Life Long Learning	Undergo higher studies, certifications and research programs as per market needs.

3. **Program Outcome(s):** Students/graduates will be able to

**PO1:** Apply knowledge of mathematics, science and algorithm in solving Computer problems.

**PO2:** Generate solutions by conducting experiments and applying techniques to analyze and interpret data

**PO3:** Design component, or processes to meet the needs within realistic constraints.

**PO4:** Identify, formulate, and solve problems using computational

temperaments. **PO5:** Comprehend professional and ethical responsibility in

computing profession. **PO6:** Express effective communication skills.

**PO7:** Recognize the need for interdisciplinary, and an ability to engage in life-long learning.

**PO8:** Actual hands on technology to understand it's working.

**PO9:** Knowledge of contemporary issues and emerging developments in computing profession.

**PO10:** Utilize the techniques, skills and modern tools, for actual development process

**PO11:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings in actual development work

**PO12:** Research insights and conduct research in computing environment.

4. **Course Outcome(s):** Every individual course under this program has course objectives and course outcomes (CO). The course objectives rationally match with program educational objectives. The mapping of PEO, PO and CO is as illustrated below

**5. Mapping of PEO & PO and CO**

Program Educational Objectives	Thrust Area	Program Outcome	Course Outcome
PEOI	Technical Expertise	PO1, PO2, PO3, PO6	All core courses
PEOII	Successful Career	PO4, PO5, PO11,	All discipline specific electives courses
PEOIII	Hands on Technology and Professional experience	PO8, PO10	All Lab courses
PEOIV	Interdisciplinary and Life Long Learning	PO7, PO9, PO12	All open electives and discipline specific electives

**SWAMIRAMANANDTEERTHMARATHWADAUNIVERSITY,NANDED**  
**CHOICEBASED CREDITSYSTEM(CBCS CM)**  
**SEMESTER PATTERN**  
**Faculty of Science &**  
**Technology Under Graduate(UG) Programme**  
**Program: B.Sc. Computer Management w.e.f AY 2023-2024**

Year	Semester	Course category	Course Code	Course Title	Credits* *(split up will be given separately)	
First	First	Core Course	B.SC CM-101	Fundamental of IT	04	
		Core Course	B.SC CM-102	HTML and CSS	04	
		Core Course	B.SC CM-103	C Programming	04	
		Choose anyone from the below Elective courses				
		Elective Subject	B.SC CM-104A	Logical Reasoning	04	
			B.SC CM-104B	Digital Marketing		
		Choose anyone Open Elective courses				
		Open Elective	B.SC CM-105A	University recognized MOOC(NPTEL / SWAYAM / others)OR Intra/Inter Departmental coursesOR	04	
			B.SC CM-105B	Communication Skills		
		Lab/Practical	B.SC CM-106	HTML and CSS	02	
			B.SC CM-107	C Programming	02	
Total					24	
First	Second	Core Course	B.SC CM-201	OOPS with JAVA	04	
		Core Course	B.SC CM-202	RDBMS through ORACLE	04	
		Core Course	B.SC CM-203	Computer Network	04	
		Choose anyone from the below Elective courses				
		Elective Subject	B.SC CM-204A	Numerical Ability	04	
			B.SC CM-204B	8085 Microprocessor		
		Choose anyone Open Elective courses				
		Open Elective	B.SC CM-205A	University recognized MOOC(NPTEL / SWAYAM / others)OR Intra/Inter Departmental coursesOR	04	
			B.SC CM-205B	Functional English		
		Lab/Practical	B.SC CM-206	OOPS with JAVA	02	
			B.SC CM-207	RDBMS through ORACLE	02	

<b>Total</b>	<b>24</b>
Forskill enhancement, if any, in all semesters, online course with internal credits is Mandatory	



Year	Semester	Course category	Course Code	Course Title	Credits* *(split up will be given separately)	
Second	Third	Core Course	B.SC CM-301	Advanced Java	04	
		Core Course	B.SC CM-302	Analyzing data with SQL	04	
		Core Course	B.SC CM-303	Data Structure	04	
		Choose anyone from the below Elective courses				
		Elective Subject	B.SC CM-304A	JavaScript	04	
			B.SC CM-304B	Operating System		
		Choose anyone Open Elective courses				
		Open Elective	B.SC CM-305A	University recognized MOOC(NPTEL / SWAYAM / others)OR Intra/Inter Departmental coursesOR	04	
			B.SC CM-305B	Software Engineering		
		Lab/Practical	B.SC CM-306	Advanced Java	02	
			B.SC CM-307	Analyzing data with SQL	02	
Total					24	
Second	Fourth	Core Course	B.SC CM-401	PHP and MySQL	04	
		Core Course	B.SC CM-402	Hibernate and Spring Framework	04	
		Core Course	B.SC CM-403	Software Testing	04	
		Choose anyone from the below Elective courses				
		Elective Subject	B.SC CM-404A	Linux Fundamental	04	
			B.SC CM-404B	Cloud Computing		
		Choose anyone Open Elective courses				
		Open Elective	B.SC CM-405A	University recognized MOOC(NPTEL / SWAYAM / others)OR Intra/Inter Departmental coursesOR	04	
			B.SC CM-405B	Content Management System		
		Lab/Practical	B.SC CM-406	PHP and MySQL	02	
			B.SC CM-407	Hibernate and Spring Framework	02	
Total					24	
For skill enhancement, if any, in all semesters, online course with internal credits is mandatory						

Year	Semester	Course category	Course Code	CourseTitle	Credits* *(split up will begiven separately)	
Third	Fifth	CoreC ourse	B.SC CM-501	Python Programming	04	
		CoreC ourse	B.SC CM-502	Data Analysis with PowerBI	04	
		CoreC ourse	B.SC CM-503	Programming in C#	04	
		Chooseanyonefromthebelow Electivecourses				
		Elective Subject	B.SC CM-504A	Introduction to AI and ML	04	
			B.SC CM-504B	ReactJS		
			B.SC CM-504 C	Enterprise Infrastructure and Cloud Technologies Part I		
		Chooseanyone OpenElectivecourses				
		OpenEl ective	B.SC CM-505A	University recognized MOOC(NPTEL / SWAYAM / others)ORIntra/Inter Departmental coursesOR	04	
			B.SC CM-505B	Cyber Security		
		Lab/Pra ctical	B.SC CM-506	Python Programming	02	
			B.SC CM-507	Data Analysis with PowerBI	02	
Total					24	
Third	Sixth	Core Course	B.SC CM-601	Mobile App Development with Kotlin	04	
		Core Course	B.SC CM-602	ASP.Net Core	04	
		Core Course	B.SC CM-603	Project	04	
		Chooseanyonefromthebelow Electivecourses				
		Elective Subject	B.SC CM-604A	Python for Data Science	04	
			B.SC CM-604B	Introduction to IOT		
			B.SC CM-604C	Enterprise Infrastructure and Cloud Technologies Part II		
		Chooseanyone OpenElectivecourses				
		OpenEl ective	B.SC CM-605A	University recognized MOOC(NPTEL / SWAYAM / others)ORIntra/Inter Departmental coursesOR	04	
			B.SC CM-605B	MongoDB		
		Lab/ Practical	B.SC CM-606	Kotlin	02	
			B.SC CM-607	ASP.Net Core	02	
Total					24	

Forskill enhancement,if any,in all semesters,online course with internal credits is mandatory	
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<b>Name of Course</b>	<b>Bachelor of Science (Computer Management)</b>
<b>Semester</b>	<b>I</b>
<b>Name of Subject</b>	<b>Fundamentals of IT</b>
<b>Subject Code</b>	<b>B.Sc. CM-101</b>
<b>Lectures</b>	<b>50 Lectures</b>

### **Course Objectives**

Through this paper, students should learn basic principles of computer. The paper is designed to aim at imparting basic level of Computer.

### **Course Outcome**

To learn basic functions of devices like I/O, HDD etc. to understand the fundamentals of software and hardware. Understand the concept of operating system and network.

## **Unit I**

- 1. Introduction to Computer and History** **15 Lectures**
  - 1.1 Definition of Computer
  - 1.2 Basic Computer Organization
  - 1.3 Characteristics of Computer
  - 1.4 Generations of Computer
  - 1.5 Types of Computer: - Personal Computer, Microcomputer, Minicomputer, Mainframe Computer, Workstations, Client and Server

## **Unit II**

- 2. Computer Peripherals & Memory** **10 Lectures**
  - 2.1 Input Devices: - Keyboard, Mouse, Trackball, Joystick, Light pen, Speech Recognition Devices
  - 2.2 Output Devices: - Monitor, Printer, Projector, Biometric Devices
  - 2.3 Computer Memory: - RAM, ROM, Cache Memory

## **Unit III**

- 3. Storage Devices and Operating System** **15 Lectures**
  - 3.1 Compact Disk, Digital Versatile Disk
  - 3.2 Hard Disk Drive
  - 3.3 USB Flash Drive
  - 3.4 Memory Card
  - 3.5 Definition of operating System
  - 3.6 Types of Operating System
  - 3.7 Disk Operating System
  - 3.8 Windows Operating System
  - 3.9 Linux Operating System
  - 3.10 Android Operating System

<b>UnitIV</b>
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**4. Introduction to Computer Network & Internet****10 Lectures**

- 4.1 Definition of Network
- 4.2 Types of Network: -LAN, MAN, WAN
- 4.3 Data Transmission Modes
- 4.4 OSI Model
- 4.5 E-Mail
- 4.6 File Transfer Protocol
- 4.7 Web Browser
- 4.8 Types of Web Browser
- 4.9 Internet and Intranet

**References: -**

- 1 Fundamental of Computer – 5th & 6th Edition, P.K. Sinha, BPB Publication
- 2 Fundamental of Computer - V. Raja Raman, PHI Publication



<b>Name of Course</b>	<b>Bachelor of Science (Computer Management)</b>
<b>Semester</b>	<b>I</b>
<b>Name of Subject</b>	<b>HTML and CSS</b>
<b>Subject Code</b>	<b>B.Sc. CM- 102</b>
<b>Lectures</b>	<b>50 Lectures</b>

### **Objectives:**

To improve the skill to create the static webpage.

To develop the ability to create the dynamic webpages.

To enhance the ability of Insert a graphic within a webpage.

To improve the skill to Create, validate and publish a webpage.

### **Outcome:**

At the end of the course, students should be able to: Design and implement dynamic website with good aesthetic sense of designing

## **UNIT-I**

### **1. Introduction of HTML Documents**

**15 Lectures**

- 1.1 Overview of HTML and WWW
- 1.2 Concept of Webpage and Website,
- 1.3 Structure of HTML documents
- 1.4 Formatting Tags: Headings Tags, Paragraph Tags, Break, Bold & strong, small, Italic, Underline, subscript, Superscript, strikethrough, center tags.
- 1.5 Types of List tags, HRTag, FONTTag,
- 1.6 DIVtag, SPANtag, ADDRESS tag,
- 1.7 MARQUEE tag.
- 1.8 Meta Tag.

## **UNIT-II**

### **2. Technologies for Web Application**

**10 Lectures**

- 2.1 Web browser, Web server
- 2.2 Web protocols: HTTP, FTP.
- 2.3 Hyperlink (Anchor) Tag & its attributes,
- 2.4 Images in HTML.
- 2.5 Tables in HTML.

## **UNIT-III**

### **3. Basic Interactivity and DHTML**

**15**

#### **Lectures**

- 3.1 Frames in HTML: - Rows, Cols,

- 3.2   Iframe: - Embed PDF Document and Google Map in webpage.
- 3.3   Formcontrols:TextControls,PasswordField, Number, Date and Time Control, TextareaInput,
  - 1.   Email, URL, CheckBox, RadioButtons, Select control,
  - 2.   ResetButton, Submitbutton and Button control.

<b>UNIT-IV</b>
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**4. CSS andJavaScript**

**10Lectures**

- 4.1   IntroductiontoCascadingStyleSheets
- 4.2   EmbeddedStyles: - Inline, Internal, ExternalStyles.
- 4.3   IntroductionofJAVAScript
- 4.4   Addingscripttodocumentswithexample.Variables.
- 4.5   InputandOutputstatementsofJAVAScript
- 4.6   Roll Over Button.

**ReferenceBooks:**

- 1.   HTMLThecompleteReference(2nd EditionThomasaPowelTataMcGrawHillpublication)
- 2.   ThecompleteReference (HTML&XHTML)- 5thEditionThomasaPowelTataMcGrawHill publication

<b>Name of Course</b>	<b>Bachelor of Science (Computer Management)</b>
<b>Semester</b>	<b>I</b>
<b>Name of Subject</b>	<b>C Programming</b>
<b>Subject Code</b>	<b>B.Sc. CM-103</b>
<b>Lectures</b>	<b>50 Lectures</b>

### **Course Objective**

- Programming basics and the fundamentals of C
- Data types in C
- Mathematical and logical operations
- Using if statement and loops
- Arranging data in arrays
- Implementing pointers

### **Course Outcome**

- Develop a C program
- Control the sequence of the program and give logical outputs
- Implement strings in your C program
- Store different data types in the same memory

### **Unit I: Basics of C Programming**

- Computer Languages (Low Level, High Level, Language Translators.)
- Algorithm, Flowchart.
- Features and History and Application areas of C Language.
- Tokens, Character set.
- Structure of a 'C' program.
- Variables, Constants, Data Types.
- Operators and Its types, (Operator precedence and Order of evaluation.)
- Formatted input and output (Character, String)

### **Unit II: Control Structures & Functions**

- Control Structures
  - Decision making structures: - if, if-else, else-if ladder, switch -case
  - Loop control structures: - while, do while, for.
  - Use of break and continue.
  - Unconditional branching (goto statement).
- Functions
  - Functions and its advantages
  - declaration, definition, function call, parameter passing (by value), passing by references,
  - return statement.
  - Types of Function.
  - Recursive functions.
  - Scope of variables

### **Unit III Arrays & String**

- Arrays
- Concept of array.
- Types of Arrays – One, Two and Multidimensional array.
- Array Operations - declaration, initialization, accessing array elements.
- String
- Declaration and initialization of String.
- Standard library functions.
- Array of strings.

#### **Unit IV Structure & Pointer**

- Creating structures.
- Accessing structure members (dot Operator)
- Array of structures.
- Pointers and structures.
- What is Pointer?
  
- Pointer declaration,
- initialization Pointer to pointer
- Arrays and pointers
- Functions and pointers

#### **References:**

1. Structured Programming approach using C – Forouzan and Gilberg, Thomson learning publications
2. The C Programming language – Kernighan and Ritchie
3. Complete C Reference – Herbert Schildt
4. Pointer in C – Yeshwant Kanetkar

<b>Name of Course</b>	<b>Bachelor of Science (Computer Management)</b>
<b>Semester</b>	<b>I</b>
<b>Name of Subject</b>	<b>Logical Reasoning</b>
<b>Subject Code</b>	<b>B. ScCM-104A</b>
<b>Lectures</b>	<b>50 Lectures</b>

**Objectives:**

- The objectives of the course are to:
- Explore and apply key concepts in logical thinking to business problems.
- Enable students to critically analyze material (information) in order to evaluate evidence, construct reasoned arguments, and communicate inferences and conclusions.
- Solve and devise solutions to a range of elementary real-world problems in mathematics

**Outcomes:**

- Identify and re-construct arguments in articles, news, editorials, advertisements etc.
- Evaluate both deductive and inductive arguments, and identify fallacies in argumentative discourse
- Make sound arguments based on mathematical reasoning and/or careful analysis of data.
- Effectively communicate the substance and meaning of mathematical problems and solutions.

Unit I : Series and Analogy	Hours
A. Series: Types of series, Alphabet series, Number Series, Alpha numeric series, Examples on continues pattern series. B. Analogy: Completing the Analogous Pair, Direct/Simple Analogy, Choosing the Analogous Pair, Double Analogy, Number analogy, Alphabet analogy, Correlation between letters/numbers.	10
Unit II : Coding-Decoding	
A. Coding-Decoding: Letter coding, Direct Letter Coding, Number/Symbol Coding. B. Substitution: Concept of substitution, Problem solving by using substitution. C. Deciphering: Deciphering messages word codes, Deciphering numbers/symbol codes for messages	10
Unit III: Direction Sense Test	6
A. Introduction B. Problems based on angular changes in direction C. Problems on Shadows D. General Problems based on Pythagoras Theorem	
Unit IV: Seating or Placing Arrangement	6
A. Problems based on linear and circular based arrangement.	



<b>Name of Course</b>	<b>Bachelor of Science (Computer Management)</b>
<b>Semester</b>	<b>I</b>
<b>Name of Subject</b>	<b>Digital Marketing</b>
<b>Subject Code</b>	<b>B. Sc CM-104B</b>
<b>Lectures</b>	<b>50 Lectures</b>

Unit.No.	Particulars
1	<p>Introduction to Digital Marketing</p> <ul style="list-style-type: none"> <li>• Digital Marketing: Introduction and meaning,</li> <li>• Advantages of digital marketing,</li> <li>• Difference between digital marketing and traditional marketing</li> <li>• Discussion on E-Commerce</li> <li>• ROI Between Digital and traditional Marketing</li> </ul>
2	<p>E-Marketing</p> <ul style="list-style-type: none"> <li>• E-Marketing: Concept of E-marketing</li> <li>• History of E-marketing,</li> <li>• Objectives of E-marketing,</li> <li>• Limitations of E-marketing</li> <li>• What is Website?</li> <li>• Understanding Website</li> <li>• Difference Between Blog, Portal and Website</li> <li>• Difference Between Website either Static or Dynamic</li> </ul>
3	<p>Social Media Marketing</p> <ul style="list-style-type: none"> <li>• Social Media Marketing: Concept of social media</li> <li>• Facebook, Twitter, WhatsApp, Instagram, LinkedIn Marketing</li> <li>• Advantages of social media and use to business.</li> <li>• Additional Module : E-Mail Marketing, Affiliate Marketing</li> </ul>
4	<p>Methods and Techniques of E-Marketing</p> <ul style="list-style-type: none"> <li>• Methods and Techniques of E-Marketing: Introduction and Objectives</li> <li>• Sponsorship Techniques</li> <li>• Direct Marketing Techniques</li> <li>• Merchandising Techniques</li> <li>• Online Seminar Techniques</li> <li>• Word-of-Mouth Marketing Techniques.</li> </ul>

**Reference Books:**

1. Digital Marketing- Kamat and Kamat –Himalaya
2. Digital Marketing – S.Gupta McGraw-Hill
3. Marketing Strategies for engaging the Digital Generation, D.Ryan
- 4 Digital Marketing- V.Ahuja, Oxford University Press

<b>Name of Course</b>	<b>Bachelor of Science (Computer Management)</b>
<b>Semester</b>	<b>I</b>
<b>Name of Subject</b>	<b>Communication Skills</b>
<b>Subject Code</b>	<b>B.SC CM-105 B</b>

**Course Objectives:**

1. To develop communicative skills of the learners in listening, speaking, writing and reading.
2. To develop fluency in conversation and efficiency in interactional skills
3. To learn to use grammar communicatively so that they become effective and efficient communicators in English.

**Course Outcomes:**

**By the end of this course students should be able to:**

1. Understand and demonstrate Basic English usages for their different purposes.
2. Clear entrance examination and aptitude tests.
3. Write various letters, reports required for professional life.

**Unit-I- Morphology**

**10 Lectures**

- 1.1 Morphology: Free & Bound Morpheme
- 1.2 Word Formation Processes
- 1.3 Morphological Analysis of words

**Unit- II- A. Grammar in day-to-day use:**

**15 Lectures**

- 2.1 Word Classes: Open and Closed Word Classes
- 2.2 Phrase: Types and functions of the phrases
- 2.3 Basic sentence structures

**Unit-III- Communication**

**10 Lectures**

- 3.1 Concept
- 3.2 Methods (verbal & non-verbal)
- 3.3 Barriers to communication

**Unit-IV- Career Skills**

**10 Lecture**

- 4.1 Group Discussion
- 4.2 Resume Building
- 4.3 Personal Interview

**Reference Books:**

1. Developing of Communication Skills -Krishna Mohan & Meera Banerji
2. A Practical English Grammar A.J. Thomson -Oxford
3. Mastering English Grammar – S.H.Burton
4. Technical Communication- Raman Sharma- Oxford

5. Written Communication in English – Sarah Freeman Orient Longman Pvt. Ltd.
6. A Course in Phonetics & Spoken English -J.Sethi& P.V.Dhamija

<b>Nameof Course</b>	<b>Bachelorof Science(Computer Management)</b>
<b>Semester</b>	<b>I</b>
<b>Nameof Subject</b>	<b>HTML and CSS (Lab/Practical)</b>
<b>SubjectCode</b>	<b>B.SC CM-106</b>

Note - Any 15 practical from the syllabus

<b>Nameof Course</b>	<b>Bachelorof Science(Computer Management)</b>
<b>Semester</b>	<b>I</b>
<b>Nameof Subject</b>	<b>C Programming(Lab/Practical)</b>
<b>SubjectCode</b>	<b>B.Sc.CM- 107</b>

Note - Any 15 practical from the syllabus

<b>Name of Course</b>	<b>Bachelor of Science (Computer Management)</b>
<b>Semester</b>	<b>II</b>
<b>Name of Subject</b>	<b>OOPs with JAVA</b>
<b>Subject Code</b>	<b>B.Sc CM-201</b>
<b>Lectures</b>	<b>50 Lectures</b>

### Learning Objectives:

- To understand the basic concepts and fundamentals of platform independent object oriented language.
- To demonstrate skills in writing programs using exception handling techniques and java 8 features.
- To understand streams and efficient user interface design techniques.

### Course Outcomes:

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

- Use the syntax and semantics of java programming language and basic concepts of OOP.
  - Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages
  - Apply the concepts of Exception handling to develop efficient and error free codes.
- i. Use java standard API library to write complex programs

<b>Unit I: Java Fundamentals</b>	<b>Hours</b>
Java History, Java Architecture, Java Vs. C++, Java Program Structure, Command Line Arguments, Data Types, Variables, Operators, Flow Control Statements, Arrays	10
<b>Unit II OOPS</b>	12
Classes and Objects, static members, Constructors, Encapsulation, Inheritance, this and super keyword, Polymorphism, Garbage Collection	
<b>Unit III: Abstraction and Packages</b>	10
Abstract class and Abstract Methods, Interfaces, Final Keyword, System Packages, User defined Packages, static import	
<b>Unit IV Exception Handling and Strings</b>	10
Introduction to Exception Handling, Exception Types, Try and catch block, finally clause, throws and throw clause, user defined exceptions, String and StringBuffer class ArrayList, Generics, Iterator, Comparable, TreeSet, HashSet, HashMap, TreeMap, Introduction to IO streams, Byte Stream Classes, Character Stream Classes, IO operations, Object Serialization	



**References:**

1. Java The Complete Reference 9th Edition, Herbert Schildt, McGraw Hill Education (India) Private Limited, New Delhi.
2. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI
3. Introduction to Java programming, By Y.DanielLiang,Pearson Publication
4. An introduction to Java programming and object oriented application development, R. A. Johnson-Thomson
5. Understanding OOP with Java, up dated edition, T.Budd, Pearson education.

<b>Name of Course</b>	<b>Bachelor of Science (Computer Management)</b>
<b>Semester</b>	<b>II</b>
<b>Name of Subject</b>	<b>RDBMS through Oracle</b>
<b>Subject Code</b>	<b>B.Sc CM- 202</b>
<b>Lectures</b>	<b>50 Lectures</b>

**Course Objectives:**

1. To understand the features of Relational database.
2. To describe data models and schemas in DBMS.
3. To use SQL- the standard language of relational databases for database operations.
4. To understand the functional dependencies and design of the databases.

**Course Outcome:**

1. To study the basic concepts of relational databases
2. Learn and practice data modeling using the entity-relationship and developing database designs.
3. Understand the use of Structured Query Language (SQL) and learn SQL syntax for writing queries.
4. Apply normalization techniques to normalize the databases.

**Unit – I Introduction and Basic Concepts (Lectures – 7)**

- 1.1 Structure of DBMS
- 1.2 Advantages and Disadvantages of DBMS
- 1.3 Users of DBMS
- 1.4 Relational Database: Entities, Attributes and Domains
- 1.5 Tuples, Relations and their schemes.

**Unit – II SQL Statements & Working with Tables (Lectures – 10)**

- 2.1 What is SQL?
- 2.2 Types of SQL Commands (DDL, DML, DQL, DCL, TCL)
- 2.3 Data types in SQL
- 2.4 Creating Tables
- 2.5 WHERE Clause, DISTINCT Clause
- 2.6 Column aliasing
- 2.7 Manipulation Table data
- 2.8 Altering Table structure
- 2.9 Data Constraints

**Unit – III. Operators & SQL Functions & Views (Lectures – 7)**

- 3.1 Arithmetic Operators, Relational Operators
- 3.2 Comparison Operators
- 3.3 LOGICAL Operators
- 3.4 SQL Functions: Single Row Functions, Multiple Row Functions
- 3.5 Views

**Unit – IV. Sorting & Grouping Data and Joining Tables & Sub queries in ORACLE (Lectures – 7)**

- 4.1 What is sorting?
- 4.2 ORDER BY & GROUP BY & GROUP BY HAVING Clauses

- 4.3 What is Join? Join Styles: Theta, ANSI, Using clause
- 4.4 Types of Joins: Equi Joins, Non Equi Join, Outer Join: Left, Right, Full, Self-Join, Cross Join
- 4.5 Joining three tables
- 4.6 Sub queries
- 4.7 PL/SQL Overview
- 4.8 Declarations Section
- 4.9 Executable Commands Section
- 4.10 Exception Handling Section

## **References-**

1. “Oracle Database 10g PL/SQL Programming” by Scott Urman , Ron Hardman, MichaleMc Laughlin, Oracle Press, TMH, ISBN-0-07-059779-0.
2. “Oracle Database 10g The Complete Reference” By Kevin Loney, Bob Bryla Oracle
3. SQL, PL/SQL the programming language of ORACLE 4th Edition by Ivan Bayross

<b>Name of Course</b>	<b>Bachelor of Science(Computer Management)</b>
<b>Semester</b>	<b>II</b>
<b>Name of Subject</b>	<b>Computer Network</b>
<b>Subject Code</b>	<b>B. Sc CM-203</b>
<b>Lectures</b>	<b>50 Lectures</b>

Course objective:- • Introduction fundamental concepts of computer networking.

- Introduce students with various concepts used in network.
- Introduce various technologies and standards.
- Allow the student to gain expertise in areas of networking.

Course outcome: - After completing this course the student get the knowledge and ability to:

- Understand basic computer network technology.
  - Students can identify the different types of network topologies and protocols.
  - Students can identify the different types of network standards.

### Unit I

#### **Introduction to Computer Networks**

**12 Lectures**

Definition & Applications of Computer Network  
 Network topologies- star, bus, mesh, ring  
 Data Transmission Media  
 Network Types LAN, MAN, WAN  
 Connection Oriented & Connectionless services

### Unit II

#### **Network Models and Devices**

**14 Lectures**

Network Models – OSI/ISO Reference Model & TCP/IP Model  
 Network Devices - NIC Cards, Hub, Switch, Bridges, Gateways, Repeaters Router.  
 Service Primitives - listen, connect, receive, send, disconnect

### Unit III

#### **Multiplexing, Switching and Protocols**

**12 Lectures**

Multiplexing – Time division and Frequency division  
 Switching - Circuit Switching, Packet Switching, Message Switching  
 Transmission Modes-Parallel Transmission, Serial Transmission – Asynchronous and Synchronous  
 Network Protocols- IP protocol, SMTP, FTP, HTTP

### Unit IV

#### **Internet and Network Standards**

**12 Lectures**

Internet versus Intranet  
 Internet Service Providers  
 E-mail – Architecture

IP-addresses

Network Standards – Ethernet10Base2, 10Base5, 10BaseT

**ReferenceBooks:**

- 1) AndrewS.Tannenbaum,” ComputerNetworks”,(ThirdEdition),Prentice-HallofIndiaPvt.Ltd, New Delhi.
- 2) DataCommunicationandNetworkingbyBehrouzForouzan,TATAMcGrawHill.
- 3) GerdE.Keiser”,LocalAreaNetworks”,TataMcGrawHillEdition,NewDelhi.



<b>Name of Course</b>	<b>Bachelor of Science (Computer Management)</b>
<b>Semester</b>	<b>II</b>
<b>Name of Subject</b>	<b>Numerical Ability</b>
<b>Subject Code</b>	<b>B.ScCM- 204A</b>

**Course Objective: -**

To enhance the problem solving skills, to improve the basic mathematical skills and to help students who are preparing for any type of campus placements and competitive examinations.

**Course Outcomes: -**

1. Solve mathematical problems using analytical methods;
2. Solve mathematical problems using computational methods;

<b>Unit I :Introduction of Number system</b>	<b>Hours</b>
<ol style="list-style-type: none"> <li>1. <b>Numbers:</b> Types of numbers, Divisibility tests of numbers, Formulas for sum of natural numbers, arithmetic progression, Examples for practice.</li> <li>2. <b>HCF and LCM :</b> Methods of calculating highest common factor and greatest common divisor, factorization method, Division method, Finding HCF and LCM more than two numbers, LCM factorization method, Division method, Finding HCF and LCM more than two numbers, LCM and HCF of fractions and decimal numbers, Applications of LCM and HCF.</li> </ol>	10
<b>Unit II :Average &amp; Problem on ages</b>	10
<ol style="list-style-type: none"> <li>1. <b>Average:</b> Definition of average, Formulae and theoretical problem on average.</li> <li>2. <b>Problem on ages:</b> simultaneous equations and their applications, Theoretical problems on ages, Theoretical problems on numbers.</li> </ol>	
<b>Unit III:Percentage, Profit &amp; Loss</b>	10
<ol style="list-style-type: none"> <li>1. <b>Percentage:</b> Concept of percentage, Application of percentage, Results on populations, Result on depreciations, Theoretical problem on percentage.</li> <li>2. <b>Profit and Loss:</b> Definition of cost price, selling price and profit, Formulae of profit and loss, Theoretical problems on profit and loss.</li> </ol>	
<b>Unit IV: Time-Speed-Distance, Problems on Trains</b>	10
<ol style="list-style-type: none"> <li>1. <b>Time and Distance:</b> Concept of time and distance, Formulae of time and distance, Theoretical problems on time and distance.</li> <li>2. <b>Problems on Train:</b> Formulae of problems on train, Theoretical problems on train.</li> </ol>	

3. Students can develop design and analyze numerical techniques to approximate solutions to problems.

<b>Name of Course</b>	<b>Bachelor of Science (Computer Management)</b>
<b>Semester</b>	<b>II</b>
<b>Name of Subject</b>	<b>8085 Microprocessor</b>
<b>Subject Code</b>	<b>B. Sc CM-204B</b>
<b>Lectures</b>	<b>50 Lectures</b>

### **COURSE OBJECTIVES:**

1. Outline the history of computing devices.
2. Describe the architecture of 8086 microprocessors.
3. Develop programs for microprocessor and microcontrollers
4. Compare microprocessors and microcontrollers
5. Understand 8051 microcontroller concepts, architecture and programming

### **COURSE OUTCOMES:**

1. Define the history of microprocessors
2. Describe the architectures of 8085 and 8086 microprocessors.
3. Draw timing diagram
4. Write programs using 8086 and 8051

## **UNIT I**

### **Microprocessor Architecture**

**10**

- 1.1 Introduction to 8085 Microprocessor
  - 1.1.1 Features of 8085 Microprocessor
- 1.2 Block diagram of 8085 Microprocessor
  - 1.2.1 ALU
  - 1.2.2 Address/Data Bus
  - 1.2.3 Timing and control unit
  - 1.2.4 Registers
- 1.3 Pin configuration of 8085 Microprocessor
- 1.4 Opcode and Operand
- 1.5 Instruction Formats

## **UNIT II**

### **Addressing Modes and Instruction Cycle**

**10**

- 2.1 Addressing modes:
  - 2.1.1 Register Addressing
  - 2.1.2 Direct Addressing
  - 2.1.3 Indirect Addressing
  - 2.1.4 Immediate Addressing
  - 2.1.5 Implicit Addressing
- 2.2 Instruction Cycle
  - 2.2.1 Fetch cycle
  - 2.2.2 Execute cycle
  - 2.2.3 Machine cycle

## **UNIT III**

### **Instruction Set of 8085 Microprocessor**

**15**

- 3.1 Introduction to instruction set of 8085
- 3.2 Data Transfer Group of instruction
- 3.3 Arithmetic Group of instruction
- 3.4 Logical group of instruction

- 3.5 Branch Control Group of instruction
- 3.6 Machine and I/O Control Group of instruction

#### **UNIT IV**

#### **Programming of 8085 Microprocessor**

**15**

- 4.1 Introduction
- 4.2 Assembly Language Programming

#### **References:**

1. Fundamentals of MICROPROCESSOR and Microcomputer -by B. Ram publication 5th Edition

<b>Name of Course</b>	<b>Bachelor of Science (Computer Management)</b>
<b>Semester</b>	<b>II</b>
<b>Name of Subject</b>	<b>Functional English</b>
<b>Subject Code</b>	<b>B.Sc CM- 205 B</b>

**Course Objectives:**

1. To develop communicative skills of the learners in listening, speaking, writing and reading.
3. To develop fluency in conversation and efficiency in interactional skills
4. To learn to use grammar communicatively so that they become effective and efficient communicators in English.

**Course Outcomes:**

**By the end of this course students should be able to:**

1. Understand and demonstrate Basic English usages for their different purposes.
2. Clear entrance examination and aptitude tests.
3. Write various letters, reports required for professional life.

**Unit-I- Day-to-Day-English**

**10 Lectures**

- 1.1 Giving Self-Introduction
- 1.2 Narrating Pictures/events
- 1.3 Giving Opinions- Agreeing and Disagreeing

**Unit-II- Presentation Skills**

**15 Lectures**

- 2.1 Concept
- 2.2 Elements of Presentation
- 2.3 Effective Presentation

**Unit-III- Writing Skills**

**15 Lectures**

- 3.1 Curriculum Vitae
- 3.2 Email Writing
- 3.4 Essay Writing

**Unit-IV- Phonetics**

**10 Lectures**

- 4.1 Phonemes-
- 4.2 English Vowels and Consonants
- 4.3 Phonetic Transcription of the words

**Reference Books:**

- 1) Better English Pronunciation-J. D. O'connor (Cambridge Publication)
- 2) Business Communication-Urmila Rai And S. M. Rai (Himalaya Pub House)

- 3) Business Communication-Dr. V .K .Jain (S Chand Publication)
- 4) EnglishForPracticalPurposes-Z.N.Patil(MacmillanIndiaLtd.)

<b>Nameof Course</b>	<b>Bachelorof Science(Computer Management)</b>
<b>Semester</b>	<b>II</b>
<b>Nameof Subject</b>	<b>OOPs with Java</b>
<b>SubjectCode</b>	<b>B.Sc CM- 206</b>

Note - Any 15 practical from the syllabus

<b>Nameof Course</b>	<b>Bachelorof Science(Computer Management)</b>
<b>Semester</b>	<b>II</b>
<b>Nameof Subject</b>	<b>RDBMS through ORACLE (Lab/Practical)</b>
<b>SubjectCode</b>	<b>B.Sc CM- 207</b>
<b>Note - Any 15 practical from the syllabus</b>	

Name of Course	Bachelor of Science (Computer Management)
Semester	Third
Name of Subject	<b>Advanced Java</b>
Subject Code	BSc CM- 301
Marks Credit Points	75 Marks
Credit Points	4 Points
Lectures	50 Lectures

### Learning Objectives:

- i To Design and build robust and maintainable web applications.
- ii To create dynamic HTML content with Servlets and Java Server Pages, using the JSP Standard Tag Library (JSTL).
- iii To Make Servlets and JSP work together cleanly.

### Course Outcomes:

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

- i. Create dynamic and interactive web sites and interaction with client and server.
- ii. Do server side programming with java Servlets and JSP.
- iii. Implement different data structure using collection framework.

<b>Unit I: Multithreading</b>	Hours
Introduction to multithreading, Creating Threads, Thread Life Cycle, Thread Priorities, Thread Synchronization	10
<b>Unit II: Collection Framework</b>	12
Collection interface, ArrayList, Vector, Generics, Iterator, Comparable, TreeSet, HashSet, HashMap, Hashtable, TreeMap	
<b>Unit III Java Database Connectivity</b>	8
JDBC Introduction, JDBC Architecture, JDBC Drivers, Establishing Connection, Executing Query and Processing Results, Metadata, Prepared Statement, Callable Statement	
<b>Unit IV Introduction to Servlets</b>	Hours
Introduction to Servlets, Deploying Simple Servlet, Servlet Life Cycle, Get and Post Requests, Request Object	8
<b>Unit V: Handling Form Data</b>	Hours
Accessing Data from HTML Form, Using JDBC in Servlet, Servlet Chaining, Cookies and Sessions	10
<b>Unit VI JSP</b>	Hours
Introduction to JSP, Scripting Elements- Expressions, Scriptlets, Declarations, Directives, Sessions in JSP, Using JDBC in JSP, JavaBeans in JSP	12

### References:

- 1 Java The Complete Reference 9th Edition, Herbert Schildt, McGraw Hill Education
- 2 (India) Private Limited, New Delhi.
- 3 Java Servlet & JSP Cookbook, Bruce W. Perry, O'Reilly Publication.

Name of Course	Bachelor of Computer Management
Semester	Third
Name of Subject	<b>Analyzing data with SQL</b>
Subject Code	BSc CM- 302
Marks Credit Points	75 Marks
Credit Points	4 Points
Lectures	50 Lectures

### **UNIT I :Retrieving Data Using the SQL SELECT Statement**

- 1.1 Basic SELECT Statement
- 1.2 Selecting All Columns,Selecting Specific Columns
- 1.3 Arithmetic Expressions,Using Arithmetic Operators
- 1.4 Operator Precedence
- 1.5 Defining a Null Value,Null Values in Arithmetic Expressions
- 1.6 Displaying the Table Structure
- 1.7 Using the DESCRIBE Command

### **Unit II:Restricting and Sorting Data**

- 2.1 Limiting Rows Using a Selection,Using the WHERE Clause
- 2.2 Comparison Operators: - BETWEEN Operator,IN Operator,LIKE Operator,Using the NULL Conditions.
- 2.3 Defining Conditions Using the Logical Operators: AND, OR, NOT.
- 2.4 What is sorting
- 2.5 Using the ORDER BY Clause,Sorting
- 2.6 Substitution Variables
- 2.7 Using the DEFINE Command,Using the VERIFY Command.

### **UNIT III:Using Single-Row Functions to Customize Output**

- 3.1 Single Row Function, Character Functions
- 3.2 Case-Conversion Functions,Character-Manipulation Functions
- 3.3 Using the Character-Manipulation Functions,Number Functions
- 3.4 Using the ROUND Function,Using the TRUNC Function
- 3.5 Using the MOD Function
- 3.6 Working with Dates:- RR Date Format,Using the SYSDATE Function
- 3.7 Date-Manipulation Functions,Using Date Functions
- 3.8 Using ROUND and TRUNC Functions with Dates

### **Unit IV:Using Conversion Functions and Conditional Expressions**

- 4.1 Conversion Functions,Implicit Data Type Conversion,Explicit Data Type Conversion
- 4.2 Using the TO\_CHAR Function with Dates
- 4.3 Elements of the Date Format Model,
- 4.4 Using the TO\_CHAR Function with Numbers,Using the TO\_NUMBER and TO\_DATE Functions
- 4.5 General Functions: - NVL Function,Using the NULLIF Function,Using the

COALESCE Function

4.6 Conditional Expressions,CASE Expression,DECODE Function.

**UNIT V:Reporting Aggregated Data Using the Group Functions**

5.1 What Are Group Functions?

5.2 Using the AVG and SUM Functions

5.3 Using the MIN and MAX Functions,

5.4 Using the COUNT Function

5.5 Using the DISTINCT Keyword

5.6 Creating Groups of Data: GROUP BY Clause Syntax,Using the GROUP BY Clause on Multiple Columns

5.7 Illegal Queries Using Group Functions

5.8 Restricting Group Results with the HAVING Clause.

**UNIT VI: Retrieving Data by Using Subqueries**

6.1 Writing a multiple-column subquery

6.2 Multiple-column comparisons involving subqueries can be: Nonpairwise comparisons, Pairwise comparisons

6.3 Solving problems with correlated subqueries

6.4 Using the EXISTS and NOT EXISTS operators

6.5 Using the WITH clause



Name of Course	Bachelor of Science (Computer Management)
Semester	Third
Name of Subject	<b>Data Structure</b>
Subject Code	BSc CM- 303
Marks Credit Points	75 Marks
Credit Points	4 Points
Lectures	50 Lectures

### Course Objectives

- To teach the basic concepts of data structures and algorithms
- To understand concepts about searching and sorting techniques
- To understand basic concepts about stacks, queues, lists, trees and graphs
- To understand about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

### Course Outcome

- Ability to analyze algorithms and algorithm correctness.
- Ability to summarize searching and sorting techniques
- Ability to describe stack, queue and linked list operation.
- Ability to have knowledge of tree and graphs concepts.

## Unit I

### 1. Introductions and Overview:

- 1.1 Introduction
- 1.2 Basic terminology: elementary data organization
- 1.3 Data structure and its types
- 1.4 Data structure operations
- 1.5 Notation and Concept of algorithm
- 1.6 Complexity, time space tradeoff

## Unit II

### 2. Array, Searching and Sorting:

- 2.1 Linear array

- 2.2 Representation of linear array in memory
- 2.3 Traversing linear array
- 2.4 Inserting and Deleting
- 2.5 Searching methods (Binary and linear search)
- 2.6 Sorting Methods ((Bubble Sort, Selection Sort, and Insertion sort)

<b>Unit III</b>
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**3. Linked list:**

- 3.1 Introduction to Linked list
- 3.2 Representation of Linked list in memory
- 3.3 Traversing a linked list ,
- 3.4 Searching a linked list
- 3.5 Memory allocation, Garbage collection
- 3.6 Insertion and deletion in linked list
- 3.7 Two way linked list

<b>Unit IV</b>
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**4. Stacks, Recursion:**

**Lectures**

- 4.1 Introduction
- 4.2 Stacks
- 4.3 Array representation of stacks
- 4.4 Operations on Stack
- 4.5 Arithmetic expression: Polish Notation
- 4.6 Infix, Prefix and Postfix
- 4.7 Evaluation of postfix expression
- 4.8 Recursion: Factorial, Fibonacci

<b>Unit V</b>
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**5. Queue**

- 5.1 Introduction
- 5.2 Queues

- 5.3 Linked Representation of Queue
- 5.4 Insertion & Deletion on Queue
- 5.5 Dqueue
- 5.6 Priority Queue.

<b>UnitVI</b>
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**6. Tree and Graph:**

- 6.1 Introduction
- 6.2 Terminology of Binary tree
- 6.3 Types of Binary tree
- 6.4 Traversing of binary tree
- 6.5 Header Nodes, Threads
- 6.6** General Tree Introduction
- 6.7** Graph Theory Terminology
- 6.8** Sequential representation of graph

**References:-**

1. Data Structure, By Seymour Lipschutz (Schaum's Outline Series In computers) – McGraw Hill.
2. An Introduction To Data Structure with Application By Jeanpaul, Tremblay Paul, G. Sorenson (Tata McGraw Hill)

Name of Course	Bachelor of Science (Computer Management)
Semester	Third
Name of Subject	<b>JavaScript (Elective)</b>
Subject Code	BSc CM- 304 A
Marks Credit Points	75 Marks
Credit Points	4 Points
Lectures	50 Lectures

### Course Objectives:

- I. Understand the JavaScript language & the Document Object Model.
- II. Alter, show, hide and move objects on a web page.
- III. Check information inputted into a form.
- IV. JavaScript allows programming to be performed without server interaction.
- V. JavaScript can respond to events, such as button clicks.
- VI. JavaScript can validate data before sending out a request.
- VII. JavaScript can adjust an HTML document for special effects.
- VIII. JavaScript can create cookies! Cookies can be used to store and retrieve information from the user's computer

### Course Outcomes:

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

- I. Students will be a Front-End website developer.
- II. JavaScript ensures student to have a responsive, mobile-first website.
- III. It paces up the development process by offering resources such as templates and themes, which can be customized according to the project needs.

<b>Unit I: Overview to Javascript</b>	Hours
What is JavaScript? The development workflow Selecting the right tools for the job Just enough HTML and CSS Understanding objects Understanding variables Making comparisons Understanding events	10
<b>Unit II Introduction to JavaScript</b>	12
Writing your first script Internal vs. external scripts Using comments in scripts Using the NoScript	

Creating alert dialogs Understanding conditional statements Getting confirmations from users Creating prompts for users Understanding functions Making links smarter Using switch/case statements Handling errors	
<b>Unit III: JavaScript Language Essentials</b>	10
Getting started Creating loops Passing values to functions Detecting objects Reading arrays Returning values from functions Writing arrays Building do and while loops Re-using functions	
<b>Unit IV: Creating Rollovers and More</b>	Hours
Creating a basic image rollover How to write a better rollover? Creating a three-state rollover Making rollovers accessible and 508 compliant Making disjointed rollovers Creating slideshows Displaying random images	10
<b>Unit V: Building Smarter Forms</b>	Hours
Getting started Creating jump menus Creating dynamic menus Requiring fields Cross-checking fields Displaying more informative errors Verifying radio button selections Setting one field with another field Verifying email addresses	10
<b>Unit VI: Handling Events and Cookies</b>	Hours
Responding to window events Responding to mouse movements Responding to mouse clicks Responding to onBlur form events Responding to onFocus form events Responding to keyboard events The DOM, Nodes, and Objects Working with Dates and Times	8

**References:**

- 1 JavaScript: The Definitive Guide, David Flanagan, O'Reilly Media; 7th edition (14 May 2020), ASIN : .BB6Q9P088B
- 2 Eloquent JavaScript, Marijin Haverbake, 3rd Edition, ISBN-13: 978-1593279509
- 3 JavaScript: The Good Parts, Douglas Crockford, Shroff; First edition, ISBN-10 : 8184045220

Name of Course	Bachelor of Science (Computer Management)
Semester	Third
Name of Subject	<b>Operating System (Elective)</b>
Subject Code	BSc CM- 304B
Marks Credit Points	75 Marks
Credit Points	4 Points
Lectures	50 Lectures

**Operating System Objectives**

Through this paper Student should learn fundamentals of OS design, including memory, processor, device, and data management with lots of discussion on the pros and cons of design choices and problem/question sets to make the reader think through design alternatives

**Operating System Outcome**

To understand the different Concept of Operating System.

**Unit I Introduction****14 Lectures**

- 1.1 What operating system do?
  - 1.1.1 User view, System view, defining OS.
- 1.2 An Operating System Resource manager
- 1.3 An Operating system- Process view point
- 1.4 Operating system– Hierarchical and Extended machine view
- 1.5 Multiprocessor Systems
- 1.6 Operating-System Services

**Unit II: Memory Management****12 Lectures**

- 2.1 Single Contiguous Allocation
- 2.2 Introduction to Multiprogramming
- 2.3 Partitioned Allocation
- 2.4 Relocatable Partitioned Memory Management
- 2.5 Paged Memory Management
- 2.6 Demand- Paged Memory Management
- 2.7 Segmented Memory management

**Unit III: Process Management****12 Lectures**

- 3.1 The Process Concept,
- 3.2 State Model
- 3.3 Job Scheduling
- 3.4 Process Scheduling technique-
  - 3.4.1 FCFS,

- 3.4.2 SJF,
- 3.4.3 Priority scheduling,
- 3.4.4 Round Robin scheduling
- 3.5 Multiprocessor System, Context switch

#### **Unit IV: Process Deadlocks**

**6 Lectures**

- 4.1 Introduction, Deadlock Characterization, Preemptable and Non-preemptable Resources
- 4.2 Resource – Allocation Graph, Conditions for Deadlock
- 4.3 Handling Deadlocks: Ostrich Algorithm, Deadlock prevention, Deadlock Avoidance, Deadlock Detection (For Single and Multiple Resource Instances), Recovery From Deadlock (Through Preemption and Rollback)

#### **Unit V: Device Management**

**6 Lectures**

- 5.1 Techniques for Device Management
- 5.2 Device characteristics- Hardware Consideration
- 5.3 Channels and Control Units
- 5.4 Device Allocation Consideration
- 5.5 I/O Traffic controller, I/O Scheduler, I/O Device Handlers
- 5.6 A Simple File System
- 5.7 General Model of a File System

#### **Unit VI: File Management**

**6 Lectures**

- 6.1. File Overview: File Naming, File Structure, File Types, File Access, File Attributes, File Operations, Single Level, two Level and Hierarchical Directory Systems, File System Layout.
- 6.2. Implementing Files: Contiguous allocation, Linked List Allocation, Linked List Allocation using Table in Memory, Inodes.
- 6.3. Directory Operations, Path Names, Directory Implementation, Shared Files
- 6.4. Free Space Management: Bitmaps, Linked List

#### **References:**

- 1. Operating Systems By William Stallings Publication
- 2. Operating Systems By Godbole

Name of Course	Bachelor of Science(Computer Management)
Semester	Third
Name of Subject	<b>Software Engineering (Open Elective)</b>
Subject Code	BSc CM- 305 B
Marks Credit Points	75 Marks
Credit Points	4 Points
Lectures	50 Lectures

**Course Objectives:**

- To develop software engineering skills and testing plans.
- To understand system concepts and its application in Software development.
- To enhance skills of designing and testing software.
- To learn technical skills to assure production of quality software.

**Course Outcomes:**

- Ability to learn various methods of software development.
- Ability to apply various software testing techniques.

Unit-I Introduction to Software Engineering	<b>10</b>
<ul style="list-style-type: none"> <li>• The Evolving Role of Software</li> <li>• Software</li> <li>• Software Characteristics</li> <li>• Software Applications</li> <li>• Software Evolution</li> <li>• Software Crisis &amp; Horizon</li> <li>• Software Myths</li> </ul>	
Unit-II Process Of Software	<b>9</b>
<ul style="list-style-type: none"> <li>• Software Engineering</li> <li>• Software Process</li> <li>• The Waterfall Model</li> <li>• Incremental Process Models</li> <li>• Evolutionary Process Models</li> <li>• Spiral Model</li> </ul>	
Unit-III A Generic View of Process	<b>8</b>
<ul style="list-style-type: none"> <li>• Software Engineering – A Layered Technology</li> <li>• Process Framework</li> <li>• Personal and Team Process Models</li> <li>• Personal Software Process (PSP)</li> <li>• Team Software Process (TSP)</li> <li>• Process Technology</li> <li>• Product and process</li> </ul>	
Unit-IV AGILE DEVELOPMENT	<b>9</b>
<ul style="list-style-type: none"> <li>• What Is Agility?</li> <li>• What Is an Agile Process?</li> <li>• The Politics of Agile Development</li> <li>• Agile Process Models</li> <li>• Feature Driven Development (FDD)</li> </ul>	



Unit-V Software Engineering Practice	10
<ul style="list-style-type: none"> <li>• Software Engineering Practice</li> <li>• The Essence of Practice</li> <li>• Core Principles</li> <li>• Communication Practices</li> <li>• Planning Practices</li> <li>• Modeling Practices</li> <li>• Analysis Modeling Principles</li> <li>• Design Modeling Principles</li> </ul>	
Unit-VISystem Engineering	6
<ul style="list-style-type: none"> <li>• Computer-Based Systems</li> <li>• The System Engineering Hierarchy</li> <li>• System Modeling</li> <li>• System Simulation</li> </ul>	

**References:**

1. Software Engineering -A Practitioner's approach, Sixth Edition, Roger S. Pressman, McGraw-Hill Higher Education; (1 August 2007),ISBN-10: 0077227808
2. Software Engineering -A Practitioner's approach, Fifth Edition, Roger S. Pressman, McGraw-Hill Higher Education; (1 August 2005)
3. Software Engineering 7th / 8th Edition, IAN Sommerville, Pearson Edition

Name of Course	Bachelor of Science (Computer Management)
Semester	Third
Name of Subject	Lab 1: Advanced Java
Subject Code	BSc CM- 306

Marks Credit Points	75 Marks
Credit Points	2 Points

### Learning Objectives:

- i. To Design and build robust and maintainable web applications
- ii. To Create dynamic HTML content with Servlets and JavaServer Pages, using the JSP Standard Tag Library (JSTL)
- iii. To Make Servlets and JSP work together cleanly

### Course Outcomes:

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

- i. Create dynamic and interactive web sites and interaction with client and server.
- ii. Do server side programming with java Servlets and JSP
- iii. Implement different data structure using collection framework

### Lab Work/ Practical List

Programs for the demonstration of all the concepts in Advanced Java.

1. Write a program to create multiple threads.
2. Write a program to demonstrate thread synchronization.
3. Write a java program to represent ArrayList class.
4. Write a program to demonstrate TreeSet.
5. Write a program to store user id and password using HashMap.
6. Write a java program that connects to a database using JDBC and does add, deletes, modify and retrieve operations using Statement.
7. Write a java program that connects to a database using JDBC and does add, deletes, modify and retrieve operations using PreparedStatement.
8. Write a java program that connects to a database using JDBC and does add, deletes, modify and retrieve operations using CallableStatement.
9. Write a JDBC application which will interact with Database and perform the following task. 1) Create a store procedure which will insert one record into employee table. 2) Create a store procedure which will retrieve salary for given employee id. 3) Write a java application which will call the above procedure and display appropriate information on screen.
10. Write a java program that prints the meta-data of a given table.
11. Write down the program for testing the forward action for servlet collaboration.
12. Develop Real Time Login Application using Servlet and JDBC.
13. Create Servlet file which contains following functions: 1. Connect 2. Create Database 3. Create Table 4. Insert Records into respective table 5. Update records of particular table of database 6. Delete Records from table.
14. Write down the program in which input the two numbers in an html file and then display the addition in JSP file.
15. Write down the Program for testing the include action tag in jsp.
16. Develop Student Registration Application using Servlet, JSP and JDBC.
17. Develop Custom CRUD Application using Servlet, JSP and JDBC.

Name of Course	Bachelor of Science (Computer Management)
Semester	Third
Name of Subject	Lab 2: Analysing data with SQL
Subject Code	BSc CM- 307
Marks Credit Points	75 Marks
Credit Points	2 Points
<b>Note:- Any 15 practical's should be provide on given syllabus</b>	

Nameof Course	B.Sc. Computer Management
Semester	IV
NameofSubject	PHP and MySQL
SubjectCode	B.Sc. IT -401
Marks	75
Lectures	50

**Course Objectives:**

- Learn Core-PHP, Server Side Scripting Language.
- Learn to design dynamic and interactive Web pages.
- Learn PHP-Database handling.

**Course Outcomes:**

- Able to design dynamic and interactive web pages, websites.
- Able to run PHP scripts on server and retrieve results.
- Able to handle databases like MySQL using PHP in web sites.

<b>1. Introduction to PHP</b>	<b>10</b>
a) Basic Syntax, Lexical Structure of PHP	
b) Sending Data to the Web Browser	
c) Understanding PHP, HTML, and White Space	
d) Writing Comments, What Are Variables?	
e) About Constants	
f) Data types	
<b>2. Programming with PHP</b>	<b>08</b>
a) Creating an HTML Form	
b) Handling an HTML Form	
c) Managing Magic Quotes	
d) Conditionals and Operators	
e) Validating Form Data	
f) Looping statements	
g) What Are Arrays?	
<b>3 String Manipulation and Regular Expression</b>	<b>08</b>
a) Creating and accessing String, Searching & Replacing String	
b) Formatting, joining and splitting String, String Related Library functions	
c) Use and advantage of regular expression over Inbuilt function	
<b>4. Creating Dynamic Web Sites</b>	<b>08</b>
a) Including Multiple Files	
b) Handling HTML Forms with PHP Redux	
c) Making Sticky Forms	
d) Creating and Calling Your Own Functions	
e) Variable Scope	
f) Date and Time Functions	
<b>5. Using PHP with MySQL</b>	<b>08</b>
a) Connecting to MySQL and Selecting the Database	
b) Executing Simple Queries	
c) Retrieving Query Results	
d) Ensuring Secure SQL	
e) Counting Returned Records	
f) Updating Records with PHP	

## 6. Cookies and Sessions

08

- a) Using Sessions
- b) Sessions and Cookies
- c) Improving Session Security

### References:

1. PHP and MySQL for Dynamic Web Sites: Visual Quickpro Guide Larry Ullman
2. Programming PHP RasmusLerdorf, Kevin Tatroe, Peter MacIntyre

Name of Course	Bachelor of Science (Computer Management)
Semester	Four
Name of Subject	Hibernate and Spring Framework
Subject Code	BSc CM- 402

Marks Credit Points	75 Marks
Credit Points	4 Points
Lectures	50 Lectures

### Learning Objectives:

- To Access databases with JDBC and Hibernate.
- To Acquire knowledge on creation of software components using Spring Framework.
- To Learn safe and maintainable techniques for programming with AOP.
- To Understand REST, and use Spring MVC to build RESTful services.
- To learn the creation of pure Dynamic Web Application using Spring MVC.
- To understand how to build complex UIs using Spring Boot.
- To be familiar with using Spring Boot starters and start.spring.io to easily create new applications.

### Course Outcomes:

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

- Implement the web based applications using JDBC and Hibernate.
- Implement web based applications using features of Spring Framework.
- Apply the concepts of server side technologies for dynamic web applications using Spring MVC.
- Use the core principles of Spring, and of Dependency Injection (DI) / Inversion of Control.
- Integrate Spring MVC with technologies such as Hibernate.
- Learn how to build a simple MVC application using Spring Boot
- Configure database connectivity via Spring Boot

<b>Unit I: ORM and Hibernate</b>	Hours
Introduction to ORM Framework, ORM advantages, Hibernate Introduction, Hibernate Architecture, Hibernate Session, Hibernate SessionFactory, Hibernate Configuration, Mapping, Mapping with Annotations, Hibernate Aggregation, Hibernate Named Queries, Hibernate Native SQL, HQL- Hibernate Query Language	10
<b>Unit II: Working with Hibernate Objects</b>	12
Hibernate Object States, Insert Object, Retrive Object, CURD Operations, Hibernate with annotations, Hibernate Query Language, Criteria Query, Native SQL, Hibernate Mapping	
<b>Unit III Introduction to Spring</b>	8
Spring Features, Spring Architecture, Spring Core, Bean Configuration file, Inversion of Control, Dependency Injection, Auto Wiring	
<b>Unit IV Spring MVC</b>	Hours

MVC Overview, Introduction to Spring MVC, Work flow in Spring MVC, Components of Spring MVC, Spring Annotations, First Spring MVC Application	8
<b>Unit V: Spring MVC and Hibernate</b>	Hours
Spring MVC Form Handling, Spring MVC Application with Form Handling, Spring-Hibernate Application	6
<b>Unit VI Introduction to Spring Boot</b>	Hours
Overview of Spring Boot, Spring Boot Layers, Spring Boot Flow Architecture, Hello World example, Spring Boot Dependency Injection, Singleton Scope, Prototype Scope, Autowiring, Spring Boot Web App, Spring Boot MVC and JPA H2	12

### References:

6. Beginning Hibernate: For Hibernate 5, Fourth Edition, Joseph B. Ottinger Jeff Linwood Dave Minter, APress Publication
7. Spring Framework Cookbook, Java Code Geeks.
8. Introducing Spring Framework, Felipe Gutierrez, APress Publication
9. Spring MVC: A Tutorial, Second Edition, Paul Deck, Brainy Software.
10. Spring MVC Beginner's Guide, Second Edition, AmuthanGaneshan, Packt Publishing Ltd

Name of Course	Bachelor of Science (Computer Management)
Semester	Fourth
Name of Subject	Software Testing
Subject Code	BSc CM- 403
Marks Credit Points	75 Marks
Credit Points	4 Points
Lectures	50 Lectures

#### 1. Course Objectives:

- To learn detection of bugs and performance issues in software.
- Understanding to develop and run test plans.
- Learn testing tools to detecting quickly bugs and error to smarter testing.
- To work with various software testing methods.

#### 2. Course Outcomes:

- Determines the correctness, completeness and quality of software being developed.
- Technical documentation is well organized using testing.

<b><i>Unit-I Quality concepts</i></b>	<b>8</b>
<ul style="list-style-type: none"> <li>• Quality</li> <li>• Software Quality</li> <li>• McCall's Quality Factors</li> <li>• ISO 9126 Quality Factors</li> <li>• Targeted Quality Factors</li> <li>• The Cost of Quality</li> <li>• Quality and Security</li> <li>• Quality Control</li> <li>• Quality Assurance</li> </ul>	
<b><i>Unit-II Software Quality Assurance</i></b>	<b>8</b>
<ul style="list-style-type: none"> <li>• Software Quality Assurance</li> <li>• Software Reviews</li> <li>• Formal Technical Reviews</li> <li>• Software Reliability</li> <li>• The SQA Plan</li> </ul>	
<b><i>Unit-III Software Testing Strategies</i></b>	<b>8</b>
<ul style="list-style-type: none"> <li>• A Strategic Approach to Software Testing</li> <li>• Unit Testing</li> <li>• Integration Testing</li> <li>• Validation Testing</li> <li>• System Testing</li> <li>• The Art Of Debugging</li> </ul>	
<b><i>Unit-IV TESTING APPLICATION</i></b>	<b>12</b>
<ul style="list-style-type: none"> <li>• Software Testing Fundamentals</li> <li>• Internal and External Views of Testing</li> <li>• White-Box Testing</li> <li>• Basic Path Testing</li> <li>• Control Structural Testing</li> <li>• Black Box Testing</li> </ul>	
<b><i>Unit-V Webapps For Testing</i></b>	<b>10</b>
<ul style="list-style-type: none"> <li>• Testing Concepts for WebApps</li> <li>• The Testing Process-An Overview</li> <li>• Content Testing</li> <li>• User interface Testing</li> <li>• Navigation Testing</li> <li>• Security Testing</li> </ul>	
<b><i>Unit-VI Product Metrics</i></b>	<b>5</b>
<ul style="list-style-type: none"> <li>• A frame work for product metrics</li> <li>• Metrics for the requirements model</li> <li>• Metrics for design model</li> <li>• Metrics for source code</li> <li>• Metrics for testing</li> </ul>	

#### **References:**

1. Software Engineering -A Practitioner's approach, Sixth Edition, Roger S. Pressman, McGraw-Hill Higher Education; (1 August 2007),ISBN-10: 0077227808
2. Software Engineering -A Practitioner's approach, Fifth Edition, Roger S. Pressman, McGraw-Hill Higher Education; (1 August 2005)



### 3. Software Testing Concepts and Tools NageswaraRooDreamtech Publication

Name of Course	Bachelor of Science (Computer Management)
Semester	Fourth
Name of Subject	Linux Fundamental <b>(Elective)</b>
Subject Code	BSc CM- <b>404A</b>
Marks Credit Points	75 Marks
Credit Points	4 Points
Lectures	50 Lectures

#### **Course Objectives:**

- This course shall build a platform for students to start their own enterprise
- For Making Student Job Ready
- To become familiar with open source software and user interface.
- To securely handle OS without any viruses and malwares.
- For easily use free software available on internet.
- To understand the basic operating system command.
- To understand the basic concept of Linux operating system

#### **Course Outcomes:**

- Awareness of existing demanding trends in IT industry in order to get placement & Research in open source market.
- Understand the Linux OS architecture.
- Install and use different types of distributions available in market.
- Understand the different Linux basic commands

#### **Unit I – Introduction**

What is Linux, Advantages of Linux, Disadvantages of Linux, Distributions of Linux Functions of Operating system , History and development of Linux, Features of Linux, Installation steps of Linux, Difference between Linux and Windows, Difference between Linux and Unix

#### **Unit II – Linux Environment**

Linux standard directories, Hardware requirement for Linux, Basic Commands, Commands for files and directories, File processing commands, Mathematical Commands, Login & Logout, Virtual consoles, Viewing and changing user information.

#### **Unit III - Managing Editors and Shell**

Working with Text Editors, Vi editor, features of vi, Working with emacs, Managing user accounts, Managing groups, Using the Shell, Working with permissions.

## **Unit IV- Linux boot process and System Services**

Linux boot process, Boot Loaders (LILO and GRUB), System Initialization, inittab, System services, controlling services with – Text-Based Tool and GUI-Based Tool, top command, ps and kill commands.

## **Unit-V – Backup and Recovery**

Background – Why data loss occurs, Choosing a backup strategy, backup hardware and media, backup and recovery software – tar, cpio, dd, alternative backup software.

## **Unit-VI – Printing with Linux**

Overview of Linux printing, Managing print services, Creating and configuring local printers, Creating and configuring network printers, Using basic printing commands, Introduction to Common Unix Printing System(CUPS).

\*\*\*

### **Reference Books:-**

- 1) LINUX complete reference by Richard Peterson
- 2) Red Hat Linux 718 by Bill Ball, David Pitts
- 3) Unix concept and applications by Sumitabha Das
- 4) Fedora 7 Unleashed by Andrew Hudson and Paul Hudson (SAMS publication)

Name of Course	Bachelor of Science (Computer Management)
Semester	IV
Name of Subject	Cloud Computing
Subject Code	B. Sc IT-404B (Elective)
Lectures	50 Lectures

#### Course Objectives:

- To provide students with the fundamentals and essentials of Cloud Computing.
- To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
- To enable students exploring some important cloud computing driven commercial systems and applications.
- To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

#### Course Outcomes:

- After successful completion of this course, student will be able to
- Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- Apply the fundamental concepts in data centers
- Identify resource management fundamentals and outline their role in managing infrastructure in cloud computing.
- Analyze various cloud programming models and apply them to solve problems on the cloud.

### Unit I

#### Enterprise computing: a retrospective

07 Lectures

Introduction  
Mainframe architecture  
Client-server architecture  
3-tier architectures with TP monitors

### Unit II

#### Internet as a platform and Software as a service

10 Lectures

Internet technology and web-enabled applications  
Web application servers  
Internet of services  
Emergence of software as a service  
Successful SaaS architectures  
Dev2.0 platforms  
Cloud computing  
Dev2.0 in the Cloud for Enterprises

### Unit III

**Cloud computing platforms**  
Infrastructure as a service: Amazon EC2  
Platform as a service: Google App Engine  
Microsoft Azure

**08 Lectures**

Unit IV
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<b>Webservices, AJAX and mashups</b> Webservices: SOAP and REST SOAP versus REST AJAX: asynchronous 'rich' interfaces Mashups: user interface services
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**07 Lectures**

Unit V
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<b>Webservices, AJAX and mashups</b> Relational databases Cloud file systems: GFS and HDFS BigTable, HBase and Dynamo Cloud data stores: DataStore and SimpleDB
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**08 Lectures**

Unit VI
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<b>Dev2.0 Platforms</b> Salesforce.com's Force.com Platform TCS Instant App on Amazon Cloud More Dev2.0 platforms & related efforts Advantages, applicability and limits of Dev2.0
--

**10 Lectures**

**Reference Books:**

1. Enterprise Cloud Computing: Technology, Architecture, Application By  
Gautam Shroff at Cambridge University

Name of Course	Bachelor of Science (Computer Management)
Semester	Fourth
Name of Subject	Content Management System
Subject Code	BSc CM- <b>405 B (Open Elective)</b>
Marks Credit Points	75 Marks
Credit Points	4 Points
Lectures	50 Lectures

### Learning Objectives:

- Provide the skills to effectively create and operate WordPress sites.

### Course Outcomes:

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

- Plan website by choosing colour schemes, fonts, layouts, and more.
- Select, install, and activate a theme in word press.
- Design e-commerce site using woo commerce plugin.

<b>Unit I: Website Development using WordPress</b>	NOS	Hours
Installing WordPress, Installing Themes, Creating a Child Theme, Modifying a Theme, Setting Up a WordPress Site, Starting the MRP Theme, The WordPress Loop, Continuing with the Loop,	SSC/ N0503	8
<b>Unit II Customizing Page and Form</b>	NOS	Hours
Splitting the Page into Templates, Creating a Page for Single Posts, Creating Pages, Customizing the Navigation Menu, Customizing the Sidebar, Creating a Custom Page Template, Adding a Contact Form, Uploading a WordPress Site	SSC/ N0503	12
<b>Unit III: Installing plugins</b>	NOS	Hours
What are plugins? Finding plugins, Installing plugins, Activating and deactivating plugins, Editing plugin settings, Deleting plugins,	SSC/ N0501	10
<b>Unit IV: Adding, editing, and deleting users</b>	NOS	Hours
Adding, editing, and deleting users, User roles and permissions, Importing content from another site, Exporting your WordPress data, WordPress General settings.	SSC/ N0501	10

<b>Unit V: Advanced WordPress Concepts</b>	NOS	Hours
Changing the site title and tagline, Changing your URL, Using a different homepage, Updating the admin email address, Changing time zones Date/Time formats	SSC/ N0501	10
<b>Unit VI: Woo Commerce Plugin</b>	NOS	Hours
Introduction to Woo Commerce, Woo Commerce installation, Convert HTML to Woo commerce using [short-code], Recent Products, Featured Products, Variable Products, Woo commerce Settings, Payment Gateway Integration, Moving woo commerce site from Local Server to Live Server	SSC/ N0501	10

#### References:

##### Reference Books:

1. Professional WordPress: Design and Development by Brad Williams, David Damstra, Hal Stern
2. WordPress To Go by Sarah McHarry.
3. WooCommerce Explained by Stephen Burge

Name of Course	Bachelor of Science (Computer Management)
Semester	Fourth
Name of Subject	Lab 1: PHP and MySQL
Subject Code	BSc CM- 406
Marks Credit Points	75 Marks
Credit Points	2 Points

1. Creating HTML FORM (Registration)
2. Write PHP Code to demonstrate variable in php
3. Write php code to Handling an HTML Form
4. Write php code to study of Operators used in PHP.
5. Write php code to Validating Form Data.
6. Write php code to demonstrate Array php
7. Write php code to demonstrate String Manipulation
8. Write php code to include() and required() function
9. Write php code to demonstrate concept of Forms with PHP Redux
10. Write php code to demonstrate creating Sticky Forms
11. Write php code to demo state Creating and Calling Your Own Functions
12. Write php code to demonstrate Connecting to MySQL and Selecting the Database
13. Write php code to demonstrate Retrieving Query Results
14. Write php code to demonstrate Updating Records with PHP
15. Write php code to demonstrate Cookies
16. Write php code to demonstrate Session

Name of Course	Bachelor of Science (Computer Management)
Semester	Fourth
Name of Subject	<b>Lab 2:</b> Hibernate and Spring Framework
Subject Code	BSc CM- <b>407</b>
Marks Credit Points	75 Marks
Credit Points	2 Points

### Learning Objectives:

- i. To Access databases with JDBC and Hibernate.
- ii. To Acquire knowledge on creation of software components using Spring Framework.
- iii. To Learn safe and maintainable techniques for programming with AOP.
- iv. To Understand REST, and use Spring MVC to build RESTful services.
- v. To learn the creation of pure Dynamic Web Application using Spring MVC.
- vi. To understand how to build complex UIs using Spring Boot.
- vii. To be familiar with using Spring Boot starters and start.spring.io to easily create new applications.

### Course Outcomes:

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

- i. Implement the web based applications using JDBC and Hibernate.
- ii. Implement web based applications using features of Spring Framework.
- iii. Apply the concepts of server side technologies for dynamic web applications using Spring MVC.
- iv. Use the core principles of Spring, and of Dependency Injection (DI) / Inversion of Control.
- v. Integrate Spring MVC with technologies such as Hibernate.
- vi. Learn how to build a simple MVC application using Spring Boot
- vii. Configure database connectivity via Spring Boot

### Lab Work/ Practical List

Programs for the demonstration of all the concepts in Hibernate and Spring Framework.

1. Write a program to implement inversion of control.
2. Write a program to demonstrate dependency injection.
3. Write a program for the demonstration of auto wiring.
4. Write a program to demonstrate Spring Tag Libraries.
5. Write a program to demonstrate View Resolver.



6. Develop Custom CRUD Application using Spring MVC and JDBC.
7. Develop Login Application using Spring MVC and Hibernate.
8. Write a program for CURD operations using Spring MVC and Hibernate.
9. Develop Spring MVC Application for following operations.
  - Customer Login
  - Add Customer
  - Edit Customer Information
  - Delete Customer
  - View Customer List
10. Write a program that demonstrate simple spring boot application.
11. Write a program for demonstration of auto configuration in spring boot.
12. Write a program for developing web application using spring boot.
13. Write a program for demonstration of Spring Data JPA.

**References:**

1. Beginning Hibernate: For Hibernate 5, Fourth Edition, Joseph B. Ottinger Jeff Linwood Dave Minter, APress Publication
2. Spring Framework Cookbook, Java Code Geeks.
3. Introducing Spring Framework, Felipe Gutierrez, APress Publication
4. Spring MVC: A Tutorial, Second Edition, Paul Deck, Brainy Software.
5. Spring MVC Beginner's Guide, Second Edition, AmuthanGaneshan, Packt Publishing Ltd

<b>Name of Course</b>	<b>Bachelor of Science(Computer Management)</b>
<b>Semester</b>	<b>V</b>
<b>Name of Subject</b>	<b>Python Programming</b>
<b>Subject Code</b>	<b>B.Sc CM-501</b>
<b>Lectures</b>	<b>50 Lectures</b>

#### **Course Objectives:**

- To develop background knowledge as well as core expertise in Python
- To understand the console based application and provide the knowledge creating web based applications.
- To learn the object oriented concepts.

#### **Course Outcomes:**

- To impart the knowledge on basics concepts of object oriented programming.
- To outline the various characteristics of Python.
- To provide the familiarity in the concept of developing web based & game application.
- To converse an idea of creating application using Database Handling.
- To convey the idea of Python Machine learning concept.

#### **UNIT-I:Introduction**

- 1.1 Introduction to Python
- 1.2 Features of python
- 1.3 Python Interpreter
- 1.4 Python installation

#### **UNIT-II:Data types and control structures**

- 2.1 Operators (unary, arithmetic, etc.)
- 2.2 Data types, variables, expressions, and statements
- 2.3 Assignment statements
- 2.4 Strings and string operations
- 2.5 Control Structures: loops and decision

#### **UNIT-III:Modularization and Classes**

- 3.1 Standard modules
- 3.2 Packages 1
- 3.3 Defining Classes
- 3.4 Defining functions
- 3.5 Functions and arguments (signature)

#### **UNIT-IV:Exceptions and data structures**

- 4.1 Data Structures (array, List, Dictionary)
- 4.2 Exception Raising
- 4.3 Exception Handling
- 4.4 Error processing

#### **UNIT-V:Object Oriented Design**

- 5.1 Programming types
- 5.2 Object Oriented Programming

- 5.3 Inheritance
- 5.4 Polymorphism

**UNIT-VI:**  
**Database Connectivity and Networking**

- 6.1 Getting MySQL for python
- 6.2 Connecting with database
- 6.3 Passing Query to MySQL
- 6.4 Networking

**References:**

Sr. No Name of Book Writer Publication

1. Starting Out with Python plus, MyProgramming Lab, Tony Gaddis Pearson eText --Access Card Package  
3rd edition
2. Learning Python, Mark Lutz, O'Reilly 5th edition
3. MySQL for Python, Albert Lukaszewski, Packt publication 1st Edition

<b>Nameof Course</b>	Bachelor of Science (Computer Management)
<b>Semester</b>	<b>VSemester</b>
<b>NameofSubject</b>	<b>Data Analysis with Power BI</b>
<b>SubjectCode</b>	<b>B.Sc CM-502</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>

**Course Objectives:**

- To learn the concept of Data Analysis with Power BI.
- To understand the concepts of BI Desktop, Data from Analysis Services and Data Model
- To understand the applications of Power BI.

**Course Outcomes:**

- Learn the distinction between data managing Vs Data Analysis.
- Learn different Data Analysis techniques.

**UNIT I: Introducing Power BI**

Why Use Power BI?, The xVelocity In-Memory Analytics Engine, Setting Up the Power BI Environment, Exploring the Power BI Desktop Interface, Importing Data into Power BI Desktop, Importing Data from Relational Databases, Importing Data from Text Files, Importing Data from a Data Feed, Importing Data from Analysis Services

**UNIT II: Data Munging with Power Query**

Discovering and Importing Data, Transforming, Cleansing, and Filtering Data, Merging Data Appending Data, Splitting Data, Unpivoting Data, Inserting Calculated Columns,

**UNIT III: Data Model**

Creating the Data Model, What Is a Data Model?, Creating Table Relations, Creating a Star Schema, Understanding When to Denormalize the Data, Making a User-Friendly Model

**UNIT IV: Creating Calculations with DAX**

What Is DAX?, Implementing DAX Operators, Working with Text Functions , Using DAX Date and Time Functions, Using Informational and Logical Functions, Getting Data from Related Tables, Using Math, Trig, and Statistical Functions, Tips for Creating Calculations in Power BI, Creating Measures with DAX, Measures vs. Attributes, Creating Common Aggregates, Mastering Data Context, Altering the Query Context, Using Filter Functions, Using Variables in DAX

**UNIT V: Incorporating Time Intelligence**

Date-Based Analysis, Creating a Date Table Time Period–Based Evaluations, Shifting the Date Context, Using Single Date Functions, Creating Semi-additive Measures

**UNIT VI:Creating Reports with Power BI Desktop**

Creating Tables and Matrices, Constructing Bar, Column, and Pie Charts, Building Line and Scatter Charts, Creating Map-Based Visualizations, Linking Visualizations in Power BI, Drilling Through Visualizations, Publishing Reports and Creating Dashboards in the Power, BI Portal, Publishing Power BI Desktop Files to the Power BI Service, Adding Tiles to a Dashboard, Sharing Dashboards, Refreshing Data in Published Reports

**Reference:**

1. Mastering Microsoft Power BI: Expert techniques for effective data analytics and business intelligence by Brett Powell, Packt Publishing Ltd

<b>Name of Course</b>	Bachelor of Science (Computer Management)
<b>Semester</b>	<b>V Semester</b>
<b>Name of Subject</b>	<b>Programming in C#</b>
<b>Subject Code</b>	<b>B.SC CM-503</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>

#### **Course Objectives:**

- To learn the concept of .NET architecture.
- To understand the concepts of The Common Language Runtime(CLR) & Visual Studio
- To understand the applications of C#.

#### **Course Outcomes:**

- Learn the distinction between programming language Vs .NET.
- Learn different programming representation techniques.

#### **UNIT I: Introducing C#**

What is c#, Why C# & Evolution of C#, Characteristics of C#, How C# differs from C++ & Java, Introduction to .Net Technology & Framework, Exploring Some Key Benefits of the .NET Platform, Understanding the .NET Support Lifecycle, The Common Language Runtime(CLR), Overview of .NET Assemblies, Installing .NET 6, Visual Studio .Net & .Net languages, Integrated Development environment, Building .NET Core Applications with Visual Studio

#### **UNIT II: Languages Basics**

Breaking Down a Simple C# Program, Using the System.Console Class, Working with System, Data Types and Corresponding C# Keywords, Data Types, Operators, Control Statements, Looping Statements, Arrays, Jagged Arrays, Array List class, String class, and String Manipulations, Understanding Method Parameters, Understanding the enum Type, Understanding Value Types and Reference Types, Boxing & Unboxing variable, Understanding C# Nullable Types, Understanding the Structure

#### **UNIT II: Custom Classes and OOPS**

Creating Custom Classes and Objects, Understanding Constructors, Understanding the static Keyword, Understanding C# Access Modifiers, Understanding Partial Classes, Polymorphism, Abstraction class, Interfaces- Creating & using interface, Inheritances, Properties, Indexers, Delegates & Multicast Delegates, Events

#### **UNIT III: Lambda Expressions, Namespace, Exception handling**

Understanding Lambda Expressions, Processing Arguments Within Multiple Statements, Lambda Expressions with Multiple (or Zero) Parameters, Using static with Lambda Expressions, Discards with Lambda Expressions, Creating & using Namespace (DLL library), Exception

#### **UNIT IV: Multithreading**

Understanding System. Threading Namespace, Creating & starting Thread, Threading synchronization & Pooling

**UNIT V:Windows Application**

Event Driven Programming Model, Important classes used in windows application, TextBox& Label Control, Button, CheckBox, RadioButton&GroupBox Control, ListBox&ComboBox control, Month Calendar Control, Docking Control, Tree View Control, Menu & Toolbar control, Dialog Boxes

**UNIT VI:Database Connectivity, XML & Entity Framework Core**

Advantages of ADO.NET, Managed Data providers, developing a Simple ADO.NET Based Application, Retrieving & Updating Data From Tables, XML, Introducing Entity Framework Core, Object-Relational Mappers, Understanding the Role of the Entity Framework Core, The Building Blocks of the Entity Framework, The DbContext Class, The DbSet<T> Class, The ChangeTracker, Entities, Owned Entity Types, Query Types, Query Execution, Mixed Client-Server Evaluation, Tracking vs. NoTracking Queries, Code First vs. Database First, The EF Core Global Tool CLI Commands, The Migrations Commands, The Database Commands, The DbContext Commands, Creating Records, Querying Data

**References:**

1. Programming in C#, E Balagurusamy, McGraw Hill
2. Visual C#.Net, C Muthu, McGraw Hill

<b>Name of Course</b>	Bachelor of Science (Computer Management)
<b>Semester</b>	V Semester
<b>Name of Subject</b>	Introduction to AI and ML
<b>Subject Code</b>	B.Sc CM – 504 A
<b>Marks</b>	75
<b>Lectures</b>	50

#### **Learning Objectives:**

- To learn the distinction between optimal reasoning Vs. human like reasoning.
- To understand the concepts of state space representation, exhaustive search, heuristic
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

#### **Course Outcomes:**

- Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
- Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
- Learn different knowledge representation techniques.

#### **UNIT – I: Introduction to AI**

Definitions – Foundation and History of AI, Evolution of AI - Applications of AI, Classification of AI systems with respect to environment. Artificial Intelligence vs Machine learning, Relationship between attributes: Covariance, Correlation Coefficient, Chi Square. Intelligent Agent: Concept of Rationality, nature of environment, structure of agents.

#### **UNIT - II: Problem Solving**

Heuristic Search Techniques: Generate-and-Test; Hill Climbing; Properties of A\* algorithm, Bestfirst Search; Problem Reduction. Constraint Satisfaction problem: Interference in CSPs; Back tracking search for CSPs; Local Search for CSPs; structure of CSP Problem. Beyond Classical Search: Local search algorithms and optimization problem, local search in continuous spaces, searching with nondeterministic action and partial observation, online search agent and unknown environments.

#### **UNIT - III: Knowledge and Reasoning**

Knowledge and Reasoning: Building a Knowledge Base: Propositional logic, first order Logic, situation calculus. Theorem Proving in First Order Logic, Planning, partial order planning. Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks. Probabilistic reasoning over time: time and uncertainty, hidden Markova models, Kalman filter, dynamic bayesian network, keeping track of many objects.

#### **UNIT – IV: Introduction to Machine Learning**

Introduction to Machine Learning, Examples of Machine Learning Applications, Learning Types Supervised Learning -Learning a Class from Examples, Vapnik-Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm Dimensionality Reduction- Introduction, Subset Selection, Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis, Isomap, Locally Linear Embedding

#### **UNIT – V: Linear Methods for Regression**

Introduction, Linear Regression Models and Least Squares, Subset Selection, Shrinkage Methods- Ridge Regression, Lasso Regression, Least Angle Regression, Methods Using Derived Input Directions-Principal Components Regression, Partial Least Squares, A Comparison of the Selection



and Shrinkage Methods , Multiple Outcome Shrinkage and Selection, More on the Lasso and Related Path Algorithms, Logistic Regression-Fitting Logistic Regression Models, Quadratic Approximations and Inference, L1 Regularized Logistic Regression

#### **UNIT – VI Support Vector Machines and Tree-Based Models**

SVM-Introduction to SVM, The Support Vector Classifier, Support Vector Machines and Kernels-Computing the SVM for Classification, The SVM as a Penalization Method, Function Estimation and Reproducing Kernels, SVMs and the Curse of Dimensionality, A Path Algorithm for the SVM Classifier, Support Vector Machines for Regression, Regression and Kernels. Tree Based Methods-Regression Trees, Classification Trees, Random Forests- Definition of Random Forests, Details of Random Forests- Out of Bag Samples, Variable Importance, Proximity Plots, Random Forests and Overfitting, Analysis of Random Forests-Variance and the De-Correlation Effect, Bias, Adaptive Nearest Neighbors.

#### **References:**

- 1) Russell, S. and Norvig, P. 2015. Artificial Intelligence - A Modern Approach, 3rd edition, Prentice Hall
- 2) J. Gabriel, Artificial Intelligence: Artificial Intelligence for Humans (Artificial Intelligence, Machine Learning), Create Space Independent Publishing Platform, First edition , 2016
- 3) Introduction to Machine Learning Edition 2, by Ethem Alpaydin
- 4) The Elements of Statistical Learning. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Second Edition. 2009.
- 5) Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.

<b>Name of Course</b>	Bachelor of Science (Computer Management)
<b>Semester</b>	V Semester
<b>Name of Subject</b>	ReactJS
<b>Subject Code</b>	B.Sc CM – 504 B
<b>Marks</b>	75
<b>Lectures</b>	50

#### **Learning Objectives:**

1. React JS course would enable the students in understanding Basics of front end
2. Design & write the simple web development using React JS programming.
3. Learn how to design forms, web applications.
4. Learn fundamental concepts of React JS such as. State, Props, Operators, conditional and looping statements, Arrays, Arrow functions etc.

#### **Course Outcomes:**

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

1. To design front end applications.
2. To write web application to solve the given problem
3. To design program using java script.

#### **Unit I: Introduction to JavaScript Hours**

Variables, Arrow functions, Rest and spread, Object and array, destructuring, Template, literals, Classes, Callbacks, Promises, Async/Await ES Modules

#### **Unit II: Basics of React Concepts Hours**

What is react? benefits of using react, first react code, creating component classes, working with properties, what is JSX, benefits, understanding JSX, React and JSX gotchas, React component states, working with states, states and properties, stateless components, Hooks

#### **Unit III: Styling and Hooks**

CSS in React, Inline Styling, SAAS, What is HOOK?, useState, useEffect, useContext, useRef, useReducer, useCallback, useMemo, Custom Hooks

#### **Unit IV: Working with forms and Menus Hours**

Defining a form and its events, form elements, form validations, building menu with JSX,

#### **Unit V: React Architecture Hours**

Adding webpack to project, React router, router features, React Memo

#### **Unit VI: Redux Hours**

flux data architecture, redux data library, GraphQL

#### **References:**

1. React Quickly- AZAT MARDAN, ISBN 9781617293344, ©2017 by Manning Publications, Edition First.
2. Learning React Functional Web Development with React and Redux, Alex Banks and Eve Porcello First Edition, O'Reilly.

<b>Name of Course</b>	Bachelor of Science (Computer Management)
<b>Semester</b>	V Semester
<b>Name of Subject</b>	<b>Enterprise Infrastructure and Cloud Technologies Part I</b>
<b>Subject Code</b>	<b>B.Sc CM – 504 C</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>

### Course Objectives

1. To provide a foundational understanding of networking devices, data centers, and enterprise storage technologies.
2. To introduce various server and client operating systems and their configuration and security.
3. To impart practical knowledge on Windows Server administration, storage management, and deployment techniques.
4. To enable learners to work with Active Directory, domain services, and secure authentication mechanisms.
5. To equip students with the ability to monitor, troubleshoot, and manage enterprise-level infrastructure.

### Course Outcomes

After completing this course, the student will be able to:

1. Understand the structure and functioning of networking devices, server form factors, and RAID-based storage solutions.
2. Install and configure client and server operating systems, including handling file systems and firewall settings.
3. Manage and administer Windows Server environments, perform patching, clustering, and automated deployment.
4. Implement and secure Active Directory services, group policies, and authentication mechanisms.
5. Demonstrate the ability to monitor system performance and use tools to ensure availability and fault tolerance in enterprise IT infrastructure.

### Unit I: Networking and Server Infrastructure

Introduction to Networking Devices and LAN/WAN - IPv4 and IPv6. Routers and Switches Overview. Datacenter Overview and Server Form Factors - Server Management Portals (IPMI/iLO/iDrac) and Events - Introduction to Storage: NAS, DAS, SAN - RAID Levels and Comparisons (Fibre Channel, iSCSI, FCoE)

### Unit II: Operating Systems Overview (Server & Client)

Operating Systems Overview (Server & Client), Domain vs. Workgroup - File Systems: FAT, NTFS, ReFS, EXT3, EXT4 - Installing and Managing OS (Windows Server, Linux) - Firewall Fundamentals (Hardware/Software)

### Unit III: Windows Server Administration

Windows Server Core Installation, Upgrades, Patch Management & Migrations - Storage Spaces, iSNS, DCB, and MPIO - Data Deduplication and Disk Management - High Availability: Failover Clustering, NLB - Deployment Images using MDT and WSUS - PowerShell DSC and Monitoring Tools - Performance Monitoring and Event Logs

### Unit IV: Active Directory & Security

AD DS DNS Server Role, Zones, and Transfers - AD DS Replication and Sites - Group Policy Management and Templates - Securing Domain Controllers and Accounts - Audit Authentication and Managed Service Accounts - Certificate Services (CAs, Templates, Revocation, Recovery) - AD FS, AD RMS, and Smart Cards - Backup & Restore of Active Directory

### Textbooks

Sara Perrott, "Windows Server 2019 & PowerShell All-in-One For Dummies", Wiley, 2021.  
 Sander van Vugt, "Red Hat RHCSA 8 Cert Guide: EX200", Pearson IT Certification, 2021.  
 Computer Networks" by Andrew S. Tanenbaum and David J. Wetherall, 5th Edition, Pearson Education, 2011

## **Core Practical: Enterprise Infrastructure and Cloud Technologies Lab Part I**

**Course Code: BCA-504-C (Elective)**

1. **Windows Server Installation & Configuration**, Install Windows Server (GUI).
2. Install Windows Server Core
3. **Install & Configure Active Directory Domain Services (AD DS)**
  - Promote server to DC, join clients to the domain.
4. Enforce password policy,
5. Restrict drives,
6. desktop configuration.
7. **Implement Failover Cluster and Network Load Balancing (NLB)**
  - Build a high-availability cluster for file share service.
8. **PowerShell Scripting for Automation Tasks**
  - Write scripts for backup, log rotation, monitoring, Patching, Checking Stale Records

<b>Name of Course</b>	Bachelor of Science (Computer Management)
<b>Semester</b>	V Semester
<b>Name of Subject</b>	Cyber Security
<b>Subject Code</b>	B. Sc CM – 505 B
<b>Marks</b>	75
<b>Lectures</b>	50

**Objectives:**

1. Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization.
2. Practice with an expertise in academic to design and implement security solutions.
3. Understand key terms and concepts in Cryptography, Governance and Compliance.
4. Develop cyber security strategies and policies
5. Understand principles of web security and to guarantee a secure network by monitoring and analyzing the nature of attacks through cyber/computer forensics software/tools.

**Outcomes:**

1. Analyze and evaluate the cyber security needs of an organization.
2. Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.
3. Measure the performance and troubleshoot cyber security systems.
4. Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.

	<b>Unit-I</b>
	<b>IT Act and Encryption</b>
1.1	Object of the Act
1.2	Scope of the Act
1.3	Symmetric Cryptography
1.4	Asymmetric Cryptography
1.5	RSA Algorithm
1.6	Public Key Encryption
	<b>Unit-II</b>
2.1	Authentication of Electronic records
2.2	Digital Signature
2.3	RSA Digital Signature
2.4	Hash Function
2.5	Working of Digital Signature
2.6	Electronic Governance
	<b>Unit-III</b>
	<b>Certifying Authorities</b>
3.1	Need of Certifying Authorities
3.2	Functioning of Certifying Authorities
3.3	Types of Certificates
3.4	Identification, Authorizing, Transactional certificate
3.5	Appointment of Controller
3.6	Functions of Controller

<b>Unit-IV</b>	
<b>Domain Name Disputes</b>	
4.1	Background of Domain Names
4.2	Where lies the dispute?
4.3	Insertion of Internet Domain Names and the trademark Law
4.4	Classification of Cyber Crime, Target of computer crime
<b>Unit-V</b>	
<b>Cyber Crimes and Computer Virus</b>	
5.1	Damage to computer system: Unauthorized Access, Packet Sniffing, Tempest attack, Password Cracking, Buffer overflow
5.2	Computer virus: Viruses, Logic Bomb, Worms, Trojan Horse Programme, Denial of Service, Tampering with Computer Source Documents.
<b>Unit-VI</b>	
<b>Digital Devices Security , Tools and Technologies for Cyber Security</b>	
6.1	End Point device and Mobile phone security, Password policy, Security patch management, Data backup,
6.2	Downloading and management of third party software, Device security policy, Cyber Security best practices,
6.3	Significance of host firewall and Anti-virus, Management of host firewall and Anti-virus, Wi-Fi security,
6.4	Configuration of basic security policy and permissions.

#### **References:**

1. Cyber Law in India by Farooq Ahmad–Pioneer Books
2. Handbook of Cyber & E-commerce Laws by P.M. Bakshi & R.K. Suri– Bharat Lawhouse New Delhi
3. The Indian Cyber Law by Suresh T. Vishwanathan–Bharat Lawhouse New Delhi.
4. Guide to Cyber Laws by Rodney D. Ryder–Wadhwa and Company Nagpur

<b>Nameof Course</b>	<b>B.Sc (Computer Management)</b>
<b>Semester</b>	<b>VSemester</b>
<b>NameofSubject</b>	<b>Lab 1: Python Programming</b>
<b>SubjectCode</b>	<b>B. Sc CM – 506</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>
<b>Note: - 15- Practical's Based on Syllabus</b>	

<b>Nameof Course</b>	<b>B.Sc (Computer Management)</b>
<b>Semester</b>	<b>VSemester</b>
<b>NameofSubject</b>	<b>2: Data Analysis with Power BI</b>
<b>SubjectCode</b>	<b>B. ScCM – 507</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>
<b>Note: - 15- Practical's Based on Syllabus</b>	

<b>Name of Course</b>	<b>B. Sc. ( Computer Management)</b>
<b>Semester</b>	<b>VI Semester</b>
<b>Name of Subject</b>	<b>Mobile Application Development with Kotlin</b>
<b>Subject Code</b>	<b>B.SC CM – 601</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>

## Course Objectives

In this course, student will learn about:

- Creating robust mobile applications and learn how to integrate them with other services
- Creating intuitive, reliable mobile apps using the android services and components
- Create a seamless user interface that works with different mobile screens

## Course Outcome

After completing this course, student will be able to:

- Build enterprise level mobile applications with Kotlin on Android
- Understand both the basic and advanced concepts of Kotlin
- Understand why use Kotlin over Java
- Install and configure Android Studio
- Explain and use key Android programming concepts
- Deploy the application on Google Play
- Become a certified Android developer

## UNIT I. Fundamentals of Kotlin Programming

Introduction to Kotlin and Its Features

Program Structure

Variables, Data Types, Type Conversion, Operators, Input /Output

Control Statements, When Expression

Looping Statements, Break, Continue and Return

Enum, Nullable Non Nullable Types, Smart cast, Unsafe and Safe Cast, Elvis Operator

## UNIT II Functions, Array, String and Object Oriented Programming

Functions

Recursion

Default and Named Arguments

Arrays,

String

Object Oriented Concepts

Classes and Objects

Constructor

Visibility Modifiers.

Inheritance

Abstract Class

Interface

Data Classes

Basic Lambdas

Inline Functions



### **UNIT III Exception Handling and Collections Framework**

Exception Handling.  
Try Catch  
Multiple Try Block  
Finally, Block  
Kotlin Throw Keyword  
Collections  
List ->ArrayList, Vector, LinkedList  
Set ->HashSet  
Map ->HashMap

### **UNIT IV Introduction to Android Programming**

Android Its Features, API Levels and Versions  
Android Architecture  
JVM, DVM, ART, DEX  
Creating First Android Application,  
Android Project Structure  
AndroidManifest.XML  
Activity and Activity Life Cycle

### **UNIT V User Interface Design**

LinearLayout  
RelativeLayout  
ConstraintLayout  
TextView  
EditText  
Button, Switch  
RadioButton, and RadioGroup Views, Progress Bar View  
CheckBox  
ImageView  
Spinner and Adapter  
TimePicker View, DatePicker View  
WebView  
Toast  
ScrollView  
CardView  
List View Custom List View and RecyclerView

### **UNIT VI. Intents, Fragments, Dialog, Menus, and Storage Media**

Implicit Intent  
Explicit Intents  
Fragments (Navigation Drawer)  
Alert Dialog  
Custom Dialog  
Menus  
Shared Preferences  
Internal Storage  
SQLite Database  
Notifications  
Publishing to the Android Market

**References:**

1. Kotlin in Action Paperback – 19 February 2017 by Dmitry Jemerov (Author), Svetlana Isakova (Author)
2. Kotlin Programming Paperback – 6 September 2018 by Josh Skeen (Author), David Greenhalgh (Author)
3. Head First Kotlin: A Brain-Friendly Guide 1st Edition, Kindle Edition by Dawn Griffiths (Author), David Griffiths (Author)

<b>Name of Course</b>	<b>B. Sc ( Computer Management)</b>
<b>Semester</b>	<b>VI Semester</b>
<b>Name of Subject</b>	<b>ASP.Net Core</b>
<b>Subject Code</b>	<b>B.SC CM – 602</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>

#### **Course Objectives:**

1. Understand the benefit of MVC design over traditional ASP.NET Web Forms.
2. Acquiring sufficient knowledge on role of Model, View and Controller in integrating them to develop complete web application
3. Understand how Routing API maps request to action methods in controller.
4. Learn how to reuse code rendering HTML using custom HTML Helper methods and Tag Helpers.
5. Building Custom Model Binders for typical conditions in which built-in default binders are not usable.

#### **Course Outcomes:**

1. Understanding and applying validation framework for both client and server validations.
2. Access databases and performing CRUD operations using LINQ and Entity Framework
3. Implement security in ASP.NET Core applications.
4. Develop Service Oriented RESTful services using Web API feature of ASP.NET Core.
5. Build and deploy ASP.NET Core application to the production server.

#### **UNIT I: Introduction to ASP.NET Core**

Introduction  
 What is ASP.NET Core?  
 ASP.NET Core Features  
 Advantages of ASP.NET Core  
 MVC Pattern  
 Understanding ASP.NET Core MVC  
 ASP.NET Core vs. ASP.NET MVC vs. ASP.NET Web Forms  
 ASP.NET Core Environment Setup  
 ASP.NET Core First Application  
 Project Layout  
 Understanding Life Cycle of ASP.NET Core Request

#### **UNIT II: Controllers Action Methods and View**

Controllers Overview  
 Action Methods and IActionResult object  
 Passing data from Controller to View  
 Understanding Action Selectors  
 Action Filters  
 Building Custom Action Filters  
 Middleware  
 Asynchronous Action Methods  
 Introducing Razor View

- Advantages of Razor View
- Razor Syntax
- Types of Views
- Partial Views
- Layout Pages
- Special Views
- View Categorization based on Model

### **UNIT III: Helpers and Model Binding**

- Html Helpers
- Built-In Html Helpers
- URL helpers
- Tag Helpers
- Custom Tag Helpers
- HtmlForm behavior
- ModelBinder Overview
- DefaultModelBinder
- Binding to Complex Classes
- IFormCollection Model Binding
- IFormFileModelBinder
- BindAttribute
- TryUpdateModelAsync

### **UNIT IV: Validations & Data Annotations, State Management Techniques**

- Data Annotations and Validations Overview
- Validations with Data Annotation
- Server Side and Client Side Validation
- Custom Server side validation
- Model level validation using IValidatableObject
- Custom unobtrusive Client side Validation
- Remote Validation
- Cookies
- Sessions

### **UNIT V: Security, MVC and Entity Framework Core, Web Caching**

- Authentication and Authorization
- Implementing Security using ASP.NET Core Identity
- Basic CRUD Operations using Entity Framework
- Separation of work using BOC classes
- Writing Generic Class/ Repository
- Caching in Repository
- Cache Tag Helpers
- Memory Caching Introduction
- In-Memory Caching
- Response Cache
- Distributed Cache

### **UNIT VI: Routing, Module Development, Web API and JQuery Ajax**

- Url Routing Overview
- Custom Routes
- Attribute Routing
- Routing Constraints
- Understanding Areas
- Adding Areas
- Defining Area Routes

- Linking between Areas
- Introduction to Web API

## References

1. PROGRAMMING ASP.NET CORE Paperback – 1 January 2019 by Dino Esposito (Author)
2. ASP.NET Core in Action, Second Edition , Andrew Lock, March 2021

<b>Name of Course</b>	<b>B. Sc (Computer Management)</b>
<b>Semester</b>	<b>VI Semester</b>
<b>Name of Subject</b>	<b>Python for Data Science</b>
<b>Subject Code</b>	<b>B.SC CM– 604A</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>

### Course Objectives:

1. To learn data collection and preprocessing techniques for data science
2. To Understand and practice analytical methods for solving real life problems.
3. To study data exploration techniques
4. To learn different types of data and its visualization
5. To study different data visualization techniques and tool

### Course Outcomes:

1. Apply data preprocessing methods on open access data and generate quality data for analysis  
Apply and analyze classification and regression data analytical methods for real life problems.  
Implement analytical methods using Python
2. Apply different data visualization techniques to understand the data.
3. Analyze the data using suitable method; visualize using the open source tool.
4. Model multidimensional data and visualize it using appropriate tool

### UNIT I: Introduction to Data Science

Defining data science, Data Science Jobs, Recognizing the different types of data, Gaining insight into the data science process, Data Science Process: Overview, Different steps. Data Preparation, Model Planning, Model Building, Communicating Results, Operationalization

Basic terminologies of Data Science

a. Data science b. Data scientist c. Data set d. Data mining e. Data visualization f. Data modeling g. Data wrangling h. Big data i. Machine learning j. Algorithms k. Deep learning

### UNIT II: Basics of Data Visualization

Introduction to data visualization, challenges of data visualization, Definition of Dashboard, Their type, Evolution of dashboard, dashboard design and principles, display media for dashboard. Types of Data visualization: Basic charts scatter plots, Histogram, advanced visualization Techniques like streamline and statistical measures, Plots, Graphs, Networks, Hierarchies, Reports. Data Science with MS-Excel, Data Science with Google Data Studio.

### UNIT III: Modules and Exception Handling in Python

Importing a Module  
Importing an Entire Module  
Importing a Module Under an Alias  
Importing Specific Module Entities  
Reloading a Module  
Module Search Path  
Module Loading and Compilation  
Tricks for Importing Modules

Using import in a Script  
Trapping import Statements  
Identifying a Module or a Script  
Packages  
Creating a Module  
Standard Modules, Packages, Exception raising, Exception Handling, Error Processing.

#### **UNIT IV: Working with Files**

File Processing  
Reading  
Writing to a File  
Changing Position  
Controlling File I / O  
File Locking  
Getting File Lists  
Basic File / Directory Management  
Access and Ownership  
Checking Access  
Getting File Information  
Setting File Permissions  
Manipulating File Paths

#### **UNIT V: Pandas Data Analysis library [Data Processing]**

Why Pandas? Features of Pandas, Data structures in Pandas a. Series b. DataFrame c. Panel d. Panel4D  
Series creation a. Using ndarray b. Using dict c. Using scalar values d. Using list, Accessing elements of Series a. Using indexing b. Using slicing c. Using ranging d. Using iloc method e. Using loc method  
Vectorising operations a. Vector operations using same index values b. Vector operations using different index values, DataFrame creation a. Using list b. Using dict c. Using ndarray d. Using series e. Using DataFrame  
Viewing DataFrame elements a. Using describe function b. Using column name c. Using iloc method d. Using iat method e. Using head() f. Using tail() g. Using index method

#### **UNIT VI: Numpy, Matplotlib**

Handling missing values, Statistical functions in data operations, SQL operations in pandas,  
Numpy – Mathematical Computation Why numpy? Powerful properties of numpy  
Types of arrays, Attributes of ndarray , Basic operations, Creating functions for array, Copy and view, Shape manipulation, Matplotlib library, Chart properties, Styling the char, Types of presentation styles, Why and How Data to be distributed?, Types of distribution, Advanced Data Visualization using SEABORN

#### **Reference Books: -**

1. Learning Python-Mark Lutz-O'Reilly 5th edition
2. Data Mining: Concepts and Techniques Jiawei Han, MichelineKamber, Jian Pei Data Science from Scratch Joel Grus O'Reilly Media Inc
3. MySQL for Python-Albert Lukaszewski-Packet publication 1st edition
4. Django 2 by Example (Build powerful and reliable Python web applications from scratch)-Antonio Mele

<b>Name of Course</b>	<b>B.Sc. (Computer Management)</b>
<b>Semester</b>	<b>VI Semester</b>
<b>Name of Subject</b>	<b>Introduction to IoT</b>
<b>Subject Code</b>	<b>B.SC CM – 604 B</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>

### **Course Objectives:**

To study the fundamentals about IoT

1. To study about IoT Access technologies
2. To study the design methodology and different IoT hardware platforms.
3. To study the basics of IoT supporting services.
4. To study about various IoT case studies and industrial applications.

### **Course Outcomes:**

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

1. Understand the basics of IoT.
2. Implement the state of the Architecture of an IoT.
3. Understand design methodology and hardware platforms involved in IoT.
4. Understand how to analyse and organize the data.
5. Compare IOT Applications in Industrial & real-world.

### **Unit I: Basics of IoT Networking**

Overview of Internet of Things

Wireless Sensor Networks

Machine-to-Machine Communications

Cyber Physical Systems

### **Unit II: Introduction to Internet of Things**

Evolution of IoT

Enabling IoT and the Complex Interdependence of Technologies

IoT Networking Components

Addressing Strategies in IoT

### **Unit III: IoT Sensors, Actuators and Microcontroller devices**

Sensors

Sensor Characteristics

Sensing Types.

Actuators

Actuator Characteristics

Actuator Types.

Arduino

Raspberry Pi



#### **Unit IV: Processing in IoT**

Data Format

Importance of Processing in IoT

Processing Topologies

IoT Device Design and Selection Considerations

#### **Unit V: IoT Connectivity Technologies**

IEEE 802.15.4, Zigbee, RFID, DASH7, NFC, Z-Wave

Cloud Computing

Virtualization

Cloud Models

Sensor-Cloud: Sensors-as-a-Service

Fog Computing and Its Applications

#### **Unit VI: Application Areas and Futures of IoT**

Agricultural IoT

Components of an agricultural IoT

Advantages of IoT in agriculture

Smart irrigation management system

Vehicular IoT

Components of vehicular IoT

Advantages of vehicular IoT

Healthcare IoT

Components of healthcare IoT

Advantages and risk of healthcare IoT

Evolution of New IoT Paradigms

Challenges Associated with IoT

Emerging Pillars of IoT

#### **References:**

1. Introduction to IoT by SudipMisra, Anandarup Mukherjee, Arijit Roy | Publication Cambridge University Press | ISBN 9781108842952, ISBN 9781108959742.
1. The Internet of things\_ do-it-yourself projects with Arduino, Raspberry Pi, and BeagleBone Black | ISBN: 978-0-07-183521-3
2. he Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012.| ISBN 978-1-11999435-0

<b>Name of Course</b>	<b>B.Sc. (Computer Management)</b>
<b>Semester</b>	<b>VI Semester</b>
<b>Name of Subject</b>	<b>Enterprise Infrastructure and Cloud Technologies Part II</b>
<b>Subject Code</b>	<b>B.SC CM – 604 C</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>

### Course Objectives

1. To develop hands-on skills in Linux server administration, including file systems, package management, and backup.
2. To introduce virtualization concepts and tools like Hyper-V, VMware vSphere/vCenter, and resource management.
3. To provide in-depth knowledge of cloud computing models, services (IaaS, PaaS, SaaS), and platforms like AWS and Azure.
4. To enable learners to understand and apply cloud security principles and resource provisioning techniques.
5. To familiarize students with enterprise backup solutions and infrastructure monitoring tools.

### Course Outcomes

After completing this course, the student will be able to:

1. Configure and manage Linux servers, handle user permissions, backups, and system logging.
2. Deploy and operate virtual machines and manage virtual infrastructure using Hyper-V and VMware.
3. Understand and differentiate between various cloud service models and providers, and utilize core services on AWS and Azure.
4. Implement basic cloud security practices, manage virtual resources, and perform cloud-based deployments.
5. Use backup technologies and monitoring tools to ensure system availability and troubleshoot issues effectively.

### Unit I: Linux Server Administration

RHEL/ Cent OS Overview, Boot Process, and GRUB2 - Filesystem Hierarchy, Shell Environment, Text Editors - User and Group Management, File Permissions, ACLs - RPM, YUM, Dependency Management, Patching - System Logging, Snapshots, Backup/Restore.

Basic Linux Command, Linux Administration command

### UNIT II Virtualization

Hypervisors, Hyper-V, VMware vSphere/vCenter - Configuring VMs, Networking, Storage, HA/DRS - vMotion, Templates, Resource Pools, dvSwitches

### Unit III: Cloud Computing

Cloud Computing Fundamentals, Deployment Models - SaaS, PaaS, IaaS and Key Providers (AWS, Azure, GCP) - Cloud Security, Navigation, and Resource Management- AWS EC2, S3, VPC, IAM; Azure VM, Storage, Networking.

### UNIT IIV Backup, and Monitoring

Backup Technologies: Disk, Tape, Veeam, TSM, NetBackup - VM Backups, Restoration, Deduplication, Troubleshooting- Infra Monitoring Tools: Nagios.

## Textbooks

1. Sander van Vugt, "**Red Hat RHCSA 8 Cert Guide: EX200**", Pearson IT Certification, 2021.
2. Nick Marshall, "**Mastering VMware vSphere 7**", Wiley, 2021.
3. Mustafa Toroman , "**Hands-On Cloud Administration in Azure**" , Packt, 2020.

## Core Practical: Enterprise Infrastructure and Cloud Technologies Lab Part II

Course Code: BCA-604-C (Elective)

1. **Install Linux (RHEL/CentOS) and Set Up Users & ACLs**
  - Partitioning, user creation, chmod, setfacl, etc.
  - Patching
  - Configuring Network interfaces – NUMTUI/NUMCLI
  - Server Troubleshooting- Boot, Package, Services, Discover Services
2. **Service Monitoring and Patch Management using YUM**
  - Enable repo, install updates, monitor with top, systemctl.
3. **Create and Manage VMs in VMware vSphere or Hyper-V**
  - Install hypervisor, create VM, snapshot, clone
4. **Launch and Access EC2 Instances on AWS**
  - Key pair creation, EC2 instance launch, inbound rules, remote access.
5. **Configure S3 Bucket and Lifecycle Policies**
  - Create bucket, enable versioning, lifecycle rule to archive/delete.
6. **Create and Manage VPC with Subnets and Security Groups (AWS)**
  - Design private/public subnets, attach IGW, and route tables.
7. **Azure VM Deployment and Storage Blob Configuration**
  - Create VM, configure VNet, attach a blob container for backup.
8. **IAM Role and Policy Creation in AWS**
  - Create custom IAM roles and attach to EC2 instance for access control.
9. **Configure Cloud Backup using AWS/Azure Services**
  - Snapshot of EC2 instance / Azure VM backup vault.

<b>Name of Course</b>	<b>B.Sc (Computer Management)</b>
<b>Semester</b>	<b>VI Semester</b>
<b>Name of Subject</b>	<b>MongoDB</b>
<b>Subject Code</b>	<b>B.SC CM – 605 B</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>

**Learning Objectives:**

1. MongoDB course would enable the students in understanding Basics of NoSQL Databases to design the queries.
2. Learn how to design Queries.
3. Learn fundamental concepts of MongoDB such as secondary indexes, range queries, sorting, aggregations, and geospatial indexes etc.

**Course Outcomes:**

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

1. To covers aspects on Big Data, NOSQL and details on architecture and development on MongoDB.
2. To write Database application to solve the given problem
3. To use sorting, aggregations, geospatial indexes and server-side rendering.
4. To design program using MongoDB.

**UNIT I: Introduction to MongoDB**

Ease of Use,  
Easy Scaling,  
Tons of Features

**UNIT II: Getting Started**

Documents Collections Dynamic Schemas Naming Databases  
Getting and Starting MongoDB Introduction to the MongoDB Shell Running the Shell  
A MongoDB Client  
Basic Operations with the Shell Data Types  
Basic Data Types Dates  
Arrays  
Embedded Documents id and ObjectIds

**UNIT III:**

Creating, Updating, and Deleting Documents  
Inserting and Saving Documents Batch Insert

Insert Validation Removing  
Documents Remove Speed Updating  
Documents Document Replacement  
Using Modifiers Upserts  
Updating Multiple Documents  
Returning Updated Documents

**UNIT IV: Querying**

Introduction to find Specifying Which Keys to Return Limitations  
Query Criteria Query Conditionals OR Queries  
\$not Conditional Semantics Type-Specific Queries null  
Regular Expressions Querying Arrays  
Querying on Embedded Documents  
\$where Queries Server-Side Scripting Cursors  
Limits, Skips, and Sorts Avoiding Large Skips  
Advanced Query Options

## **UNIT V: Indexing**

Introduction to Indexing Introduction to Compound Indexes Using Compound Indexes  
How \$-Operators Use Indexes Indexing Objects and Arrays Index Cardinality  
Using explain() and hint() The Query Optimizer When Not to Index  
Types of Indexes  
Unique Indexes  
Sparse Indexes  
Index Administration  
Identifying Indexes Changing Indexes

## **UNIT VI: Aggregation**

The Aggregation Framework Pipeline Operations  
\$match  
\$project  
\$group  
\$unwind  
\$sort  
\$limit  
\$skip  
Using Pipelines MapReduce  
Example 1: Finding All Keys in a Collection Example 2: Categorizing Web Pages MongoDBand  
MapReduce  
Aggregation Commands count  
distinct  
group

### **References:**

1. MongoDB: The Definitive Guide, Second Edition  
by Kristina Chodorow, Published by O'Reilly Media, Inc., isbn=9781449344689.
2. Practical MongoDB: Architecting, Developing, and Administering  
MongoDB Shakuntala Gupta Edward Navin Sabharwal, ISBN-13(pbk):978-1-4842-0648-5, Published by Apress, First Edition.

<b>Nameof Course</b>	<b>B.Sc. (Computer Management)</b>
<b>Semester</b>	<b>VI Semester</b>
<b>NameofSubject</b>	<b>Lab 1: Kotlin</b>
<b>SubjectCode</b>	<b>B. Sc. CM – 606</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>
<b>Note: - 15- Practical's Based on Syllabus</b>	

<b>Nameof Course</b>	<b>B.Sc. (Computer Management)</b>
<b>Semester</b>	<b>VI Semester</b>
<b>NameofSubject</b>	<b>Lab 2: ASP.Net Core</b>
<b>SubjectCode</b>	<b>B. Sc. CM – 607</b>
<b>Marks</b>	<b>75</b>
<b>Lectures</b>	<b>50</b>
<b>Note: - 15- Practical's Based on Syllabus</b>	