UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A' GRADE' UNIVERSITY)
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

Academic Section
Email: academicsectionju14@gmail.com

NOTIFICATION
(23/July/Adp./56)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the Syllabi and Courses of Studies in the subject of **Computer Science** of Semester **IIIrd** and **IVth** for **Four Year Under Graduate Programme** of **Bachelor of Computer Applications (FYUGP-BCA)** under the **Choice Based Credit System** as per **NEP-2020 (as given in the annexure)** for the examinations to be held in the years as per the details given below:

S. No.	Branch of BCA	Semester	For the examinations to be held in the year
1.	Web Technology (WT)	Semester-III	Dec. 2023, 2024 and 2025
		Semester-IV	May 2024, 2025 and 2026
2.	Data Science (DS)	Semester-III	Dec. 2023, 2024 and 2025
		Semester-IV	May 2024, 2025 and 2026
3.	Software Development (SD)	Semester-III	Dec. 2023, 2024 and 2025
		Semester-IV	May 2024, 2025 and 2026

The Syllabi of the courses is also available on the University website: www.jammuuniversity.ac.in

Sd/-
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/23/6286-6296
Dated: 11.7.2023
Copy for information and necessary action to:

1 Dean, Faculty of Mathematical Science
2 HOD/Convener, Board of Studies in **Computer Science & IT**
3 Sr. P.A.to the Controller of Examinations
4 All members of the Board of Studies
5 Confidential Assistant to the Controller of Examinations
6 I/C Director, Computer Centre, University of Jammu
7 Deputy Registrar/Asst. Registrar (Conf. /Exams. UG)
8 Incharge, University Website for Uploading of the notification.

Deputy Registrar (Academic)

10/7/23 10/7/23

Bachelor of Computer Applications (BCA)

SYLLABUS

Four Year Undergraduate Programme

As per NEP 2020 guidelines

Under Choice based Credit System

FOR THE STUDENTS TO BE ADMITTED IN THE SESSIONS 2022-23, 2023-24, 2024-25

Course Details for Four-Year UG Programme

S. NO.	COURSES	DISCIPLINES
1	Computer Applications (CA)- Arts & Science	Natural Science and Arts & Humanities
2	Information Technology (IT)- Arts & Science	Natural Science and Arts & Humanities
3	**Bachelor of Computer Applications (BCA)**	Computer Applications (for BCA degree)
	BCA (Web Technology)	
	BCA (Data Science)	
	BCA (Software Development)	

Bachelor of Computer Applications (BCA)

WEB TECHNOLOGY

SCHEME

Four Year Undergraduate Programme

As per NEP 2020 guidelines

Under Choice based Credit System

FOR THE STUDENTS TO BE ADMITTED IN THE SESSIONS 2022-23, 2023-24, 2024-25

COURSES OF STUDY

Semester–I

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST101	Web Designing	4(3L+1P)	15	60	10	15	100
2	Minor	UMICST102	Computer Fundamentals	4(3L+1P)	15	60	10	15	100
3	MD	UMDCST103	World Wide Web and Internet	3	15	60	NA	NA	75
4	SEC	USECST104	PC Software: Installation and Troubleshooting	2	10	40	NA	NA	50

Semester–II

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST201	Scripting Languages	4(3L+1P)	15	60	10	15	100
2	Minor	UMICST202	Web Programming using PHP	4(3L+1P)	15	60	10	15	100
3	MD	UMDCST203	Introduction to Web Designing	3	15	60	NA	NA	75
4	SEC	USECST204	Cyber Security	2	10	40	NA	NA	50

Semester–III

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST301	Fundamentals of Operating System	4(3L+1P)	15	60	10	15	100
2	Major	UMJCST302	Database Management System	4(3L+1P)	15	60	10	15	100
3	Minor	UMICST303	Object Oriented Programming using C++	4(3L+1T)	15	60	10	15	100
4	MD	UMDCST304	World Wide Web and Internet	3	15	60	NA	NA	75
5	SEC	USECST305	System Analysis and Design	2	10	40	NA	NA	50

Semester–IV

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST401	Express Frameworks	4(3L+1P)	15	60	10	15	100
2	Major	UMJCST402	Data Structures using C	4(3L+1T)	15	60	10	15	100
3	Major	UMJCST403	Mathematical Foundation of Computer Science	4(3L+1T)	15	60	10	15	100
4	Major	UMJCST404	Python Programming	4(3L+1T)	15	60	10	15	100
5	Minor	UMICST405	Internet of Things	4(3L+1T)	15	60	10	15	100

SCHEME OF EXAMINATION

Each course shall be comprised of Mid Semester Assessment Test and End-Semester Examination. The responsibility of conduct and evaluation of the Mid Semester Assessment test lies with the Course Coordinator. The End Semester Examination shall be conducted by the University and question papers shall got set by the Controller of Examinations. The Mid Semester Assessment marks awarded to the students in each course shall be displayed on the notice board well in advance, at least one week before the commencement of End Semester examination. The 03/04 and 02 credits paper shall have 04 and 03 units, respectively.

Practicals /Tutorials as applicable in a course (Major/Minor) are extension of the theory programme in an inbuilt (3+1) credits course i.e. 03 credits of theory and 01 credit of practical/tutorial. However, 02 credits major course of 5th semester will have only theory component. Each four credits paper will have 75 Marks for theory and 25 Marks for practical/tutorial. The break-up for 75 Marks for theory paper shall contain 15 Marks for Mid Semester Assessment Test and 60 Marks for End Semester Examination. There will be continuous assessment of 10 Marks and final examination of 15 Marks for Practical/Tutorial component in each course.

The 03 credits paper shall be of 75 Marks consisting of 60 Marks for external examination and 15 Marks for Mid Semester Assessment test. All 02 credits courses shall be of 50 marks comprising 40 marks for External examination and 10 Marks for Mid Semester Assessment Test.

THEORY DESCRIPTION	TIME ALLOTTED	MARKS
Mid Semester Assessment Test shall be conducted by the course coordinator after completion of the syllabus up to 50% and the pattern of the examination shall be decided by the respective Board of Studies.	1½ hours	15 Marks for 03/04 Credits 10 Marks for 02 Credits

End Semester University Examination shall be conducted for entire syllabus. The break up is as under:		
1. <u>03 and 04 credits papers</u> **Section A** shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.	03 hours for 03/04 credits	60 Marks for 03/04 Credits
Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.	2½ hours for 02 credits	40 Marks for 02 Credits
2. <u>02 credits papers</u> **Section A** shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 2½ Marks.		
Section B shall consist Six (6) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 10 Marks.		
Note: Convener, BOS, can make minor modification in the scheme Skill course, if required. However, it must be clearly reflected in the syllabus.		
PRACTICAL/TUTORIAL		
i. Daily evaluation of practical's/tutorials/Viva voce/Records etc.	10 Marks for Continuous assessment	
ii. Final Examination **Note: The BOS shall device the mechanism of Final examination.**	15 Marks for Final examination	

Instructions for paper setter

1. **<u>3 / 4 Credits Paper</u>**

Total marks: 60
Time allotted: 3 hours
The question paper will be divided into the following two sections. No question shall be repeated in the question paper.

Section A

Total of Four (4) short answer questions (one from each unit) shall be set. The candidates are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B

Total of Eight (8) long answer questions (two from each unit) shall be set. The candidates are required to attempt four questions. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

2. **2 Credits Paper**

Total marks: 40
Time allotted: 2½ hours
The question paper will be divided into the following two sections. No question shall be repeated in the question paper.

Section A

Total of Four (4) short answer questions (at least one from each unit) shall be set. The candidates are required to attempt all questions. Each question shall be of 2½ Marks.

(4 x 2½ = 10 marks)

Section B

Total of Six (6) long answer questions (two from each unit) shall be set. The candidates are required to attempt three questions. Each question shall be of 10 Marks.

(3 x 10 = 30 marks)

Note: The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

BCA (Web Technology) -THIRD SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-1-0)
Total marks: 100

Course Title: Fundamentals of Operating System
Course Code: UMJCST301
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. To learn the fundamentals of Operating System.
2. To understand different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
3. To gain knowledge on memory management concepts.
4. To brief the students about different file handling techniques.

UNIT – I

Introduction to Operating System: Definition, Types of Operating Systems: Batch Systems, Concepts of Multiprogramming and Time Sharing, and Real Time Systems. Operating System Structures and Services.

15 Hours

UNIT - II

Process Management: Process Concepts, Process States and Process Control Block.
CPU Scheduling: Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, Priority, and Round Robin.
Deadlocks: Deadlock Characterization, Resource allocation graph, Deadlock Prevention and Avoidance.

15 Hours

UNIT - III

Memory Management: Logical and Physical Address Space, Swapping, Contiguous and Non- Contiguous Allocation, Paging, Segmentation, Demand Paging
Page Replacement Algorithms: FIFO, Optimal, LRU, Thrashing,

15 Hours

UNIT – IV

File System and Management: File Concepts, Access Methods, Directory Structure, Protection and Consistency, File System Structure, Allocation Methods: Continuous Allocation, Chained Allocation and Indexed Allocation.
Introduction to LINUX/UNIX: Various Parts of Operating System, Kernel, Important Parts of Kernel, Commands: pwd, mkdir, rmdir, 1s, cat, more, less, mv, cp, rm, pwd, who, write, who am i, passwd, ps, kill, date. cal, man, banner, Regular Expression: grep, fgrep

15 Hours

Suggested readings/ references:

1. Operating Systems Concepts – Silberschatz, Galvin and Gagne, Wiley Publications
2. Operating Systems: A Concept based Approach – D M Dhamdhere, 2nd Edition.
3. Sumitabha Das, "Unix concept and Programming", McGraw Hill education, 4th Edition, 2015.

BCA (Web Technology) - THIRD SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-1-0)
Total marks: 100

Course Title: Fundamentals of Operating System
Course Code: UMJCST301
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

Final Examination

15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Web Technology) -THIRD SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-1-0)
Total marks: 100

Course Title: Database Management System
Course Code: UMJCST302
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. To learn the fundamentals of DBMS
2. To understand the relational database design principles.
3. To gain knowledge on basic issues of transaction processing and concurrency control
4. To brief the students about SQL programming.

UNIT – I

Introduction: Basic Concept and Definitions, Data and Information, Data Dictionary, Data Item or Field, Entity & attributes, Record, Applications of DBMS, File Processing System versus DBMS, Advantages and Disadvantages of DBMS, Architecture of DBMS, Users of DBMS, Views of Data

15 Hours

UNIT - II

Relational DBMS: Definition, Concept of Table, Relation, Tuple, Attribute, Various keys, Role of Database administrator, Data Models, Entity Relationship Diagram (ERD), Relational Algebra Operations.

15 Hours

UNIT - III

Normalization: Anomalies and data redundancies in Database, Dependencies [functional, fully functional and minimal/irreducible set], Normal forms [1st, 2nd, 3rd, BCNF]

15 Hours

UNIT – IV

Overview of SQL: Introduction of SQL, History of SQL, Data types in SQL, Table creation, insertion, deletion, alteration and retrieval of data from table, Table deletion, simple & nested queries using DDL, DML and DCL commands, SQL queries using conditions like where, where-like, order by, greater than, less than, if-then, if-then-else, if-then else if, data integrity constraints, views, joins.

15 Hours

Suggested readings/ references:

1. Elmsari and Navathe, "Fundamental of Database System", Addison Wesley. New York.
2. H.Korth & A. Silberschatz, "Database System Concepts", TMH.
3. Date. CJ, "An Introduction to Database System", Narosa Publishing House. New Delhi.
4. Desai, B, "An Introduction to Database Concepts", Galgotia Publications. New Delhi

BCA (Web Technology) - THIRD SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-1-0)
Total marks: 100

Course Title: Database Management System
Course Code: UMJCST302
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

Final Examination

15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Web Technology) - THIRD SEMESTER

Course: Minor
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Object Oriented Programming using C++
Course Code: UMICST303
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. To learn the fundamentals of Object oriented programming.
2. To learn basic object oriented concepts like data abstraction, encapsulation etc.
3. To gain knowledge on object and class concepts.
4. To brief the students about Inheritance and its types.

UNIT – I

The Object Oriented Methodology: Paradigms of Programming Languages, Basic Concepts of OO Approach, Comparison of Object Oriented and Procedure Oriented Approaches, Benefits of OOPs, Applications of OOPs.

15 Hours

UNIT - II

Language Basics: Basic program construction, data types: integer, character, float, double, long double and Boolean. Input output statements: cin, cout, comments, escape sequence, manipulators, type conversion, arithmetic, logical and relational operators. For loop, while loop & do loop and if, if...else, switch control statements. Structures, Functions: passing arguments to functions, returning values from functions, reference arguments, overloaded functions, inline functions, default arguments, variables and storage class and returning by reference.

15 Hours

UNIT – III

Objects And Classes: A simple class, C++ objects as physical objects, object as function argument, constructors as function argument, overloaded constructors, copy constructors, returning objects from functions, structures and classes, static class data, const and classes, Arrays and Strings.

15 Hours

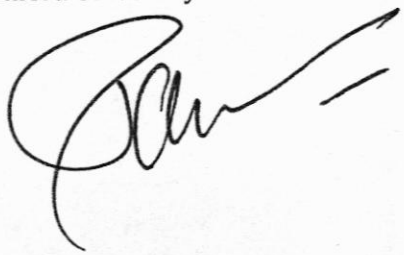
UNIT – IV

Inheritance: derived class and base class, derived class constructors, overloading member functions, class hierarchies, public and private inheritance, level of inheritance, multiple inheritance, new and delete operator.

15 Hours

Suggested readings/ references:

1. Robert Lafore, " Object Oriented Programming in C++" Techmedia Publication.
2. Herbert Shieldt, " The complete reference C" Tata McGraw Hill Publication.
3. Saurav Sahay, "Object Oriented Programming in C++", Oxford University Press.



BCA (Web Technology) - THIRD SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Object Oriented Programming using C++
Course Code: UMICST303
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

Final Examination

15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Web Technology) - THIRD SEMESTER

Course: Multidisciplinary (MD)
Course Credits: (L-P-T)
(3-0-0)
Total marks: 75

Course Title: World Wide Web and Internet
Course Code: UMDCST304
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. To understand basic web fundamentals.
2. To understand concepts of mailing protocols.
3. To gain knowledge on network protocols and their applications.
4. To brief the students about web designing concepts.

UNIT - I

Web Browser, Installing and setting up Web Browsers, Client -Side Scripting Languages-VBScript and Java Script, Server-Side Scripting languages, ActiveX Controls and Plug-ins, Web Server Architecture.

10 Hours

UNIT - II

The basics of Internet, World Wide Web, Web page, Home page, Web site, Static, Dynamic and Active web page, Overview of Protocols – Simple Mail Transfer Protocol, Gopher, Telnet, Emails, TFTP, Simple Network Management Protocol, Hyper Text Transfer Protocol, Client server computing concepts.

10 Hours

UNIT – III

Electronic mail (E-mail), Usenet and newsgroup, File Transfer Protocol (FTP), Telnet, Finger, Internet Chat (IRC), Frequently asked questions (FAQ), The World Wide Web Consortium (W3C) – Origin and evolution, Standardizing the Web, W3C members, W3C recommendations, Browsing and searching, Browsing and information retrieval, Exploring the World Wide Web, Architecture of World Wide Web, Hyperlink, Hypertext Transfer Protocol (HTTP), URL.

10 Hours

UNIT – IV

WWW operations, Web standards, HTML – concept and version, Naming scheme for HTML Documents, HTML editor, Elements in HTML documents, XHTML, CSS, Extensible Stylesheet Language (XSL), Tips for designing Web pages, Web Authoring Tools and types.

15 Hours

Suggested readings/ references:

1. Burdman, "Collaborative Web Development", Addison Wesley.
2. Deitel, "Internet and World Wide Web: How to program", Pearson Publications.
3. Sharma &Sharma, "Developing E-Commerce Sites", Addison Wesley
4. Ivan Bayross, "Web Technologies Part II", BPB Publications.

BCA (Web Technology)–THIRD SEMESTER

Course: Multidisciplinary (MD)
Course Credits: (L-P-T)
(3-0-0)
Total marks: 75

Course Title: World Wide Web and Internet
Course Code: UMDCST304
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration

For examinations to be held in Dec 2023, 2024 and 2025

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

BCA (Web Technology) - THIRD SEMESTER

Course: Skill Enhancement Course (SEC)
Course Credits: (L-P-T)
(2-0-0)
Total marks: 50

Course Title: System Analysis and Design
Course Code: USECST305
Mid Semester assessment: 10 Marks of 1.5 hours duration
End Semester assessment: 40 Marks of 2.5 hours duration

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. To learn the basics of Software and system development life cycle.
2. To learn different SRS and feasibility study.
3. To gain knowledge on DFDs, ER diagrams and tools.

Unit-1

Software Systems Analysis and Design Life Cycle: Requirements determination, requirements specifications, feasibility analysis, final specifications, hardware and software study, Software system design, Software system implementation, Software system evaluation, Software system modification.

15 Hours

Unit-II

Role of Software systems analyst, tools used in Software system analysis Information gathering: strategies, methods, case study Software system requirements specification: classification of requirements as strategic, tactical, operational and statutory. Feasibility analysis: deciding project goals, examining alternative solutions, cost – benefit analysis.

15 Hours

Unit-III

Tools for systems analysts: data flow diagrams, case study for use of DFD, leveling of DFDs, leveling rules, logical and physical DFDs, software tools to create DFDs. Data oriented Software systems design: entity relationship model, E-R diagrams, relationships, cardinality and participation, data base design.

15 Hours

Suggested Readings:

1. Software Engineering by Roger S. Pressman- Tata McGraw Hill.
2. Software Project Management by Bob Hughes and Mike Cotterell- Tata McGraw Hill.
3. Software Project Management by S. Kelkar- PHI.
4. Information Technology Project Management by Kathey and Schwalbe Thomson Learning
5. An Integrated Approach to Software Engineering by P. Jalote- PHI.

BCA (Web Technology) - THIRD SEMESTER

Course: Skill Enhancement Course (SEC)
Course Credits: (L-P-T)
(2-0-0)
Total marks: 50

Course Title: System Analysis and Design
Course Code: USECST305
Mid Semester assessment: 10 Marks of 1.5 hours duration
End Semester assessment: 40 Marks of 2.5 hours duration

For examinations to be held in Dec 2023, 2024 and 2025

NOTE FOR PAPER SETTERS FOR EXAMINATIONS -

The question paper will be divided into the following two sections. No question shall be repeated in the question paper.

Section A shall consist Four (4) short answer questions (at least one from each unit). The students are required to attempt all questions. Each question shall be of 2½ Marks.

(4 x 2½ = 10 marks)

Section B shall consist Six (6) long answer questions (two from each unit). The students are required to attempt three questions. Each question shall be of 10 Marks.

(3 x 10 = 30 marks)

Note: The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

BCA (Web Technology)–FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-1-0)
Total marks: 100

Course Title: Express Frameworks
Course Code: UMJCST401
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

Course objectives & learning outcomes:

1. To understand basic installation process of Express Framework.
2. To learn about various templates, data handling and storage concepts.
3. To brief the students about various security and authentication mechanisms in Express applications.

UNIT – I

Introduction to Express: Overview of Express, Installing Express and creating a project, Basic routing using Express, Understanding middleware in Express.

15 Hours

UNIT – II

Views and Templates: Introduction to Views and Templates, Using Pug (formerly known as Jade) for templating, creating views and templates in Express, Using layouts and partials, Handling errors and rendering error pages.

15 Hours

UNIT – III

Data handling and storage: Handling POST requests and data, Using forms to submit data to the server, Storing data in MongoDB using Mongoose, Retrieving and manipulating data from MongoDB.

15 Hours

UNIT – IV

Authentication and Security: Introduction to Authentication and Security, Using Passport.js for authentication, Using sessions and cookies, Securing your Express application, Best practices for securing your application

15 Hours

Suggested Readings:

1. Azat Mardan, "The Comprehensive Book on Express JS", LeanPub
2. Dhruti Shah, "Node.JS Guidebook", BPB Publications, 2018
3. Basarat Ali Syed, "Beginning Node.js", A press, 2014

BCA (Web Technology)–FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-1-0)
Total marks: 100

Course Title: Express Frameworks
Course Code: UMJCST401
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

Final Examination

15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Web Technology)-FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Data Structures using C
Course Code: UMJCST402
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

Course objectives & learning outcomes:

1. To learn fundamentals of Data Structures and its types.
2. To understand representations of Arrays, Linked lists, Stacks, Trees etc.
3. To brief the students about sorting and searching algorithms.

UNIT – I

Introduction and Classifications of Data Structures. Data Structure operations. Time and space complexity of algorithms. Rate of Growth: Big *O* Notation. Recursion, Pointers: Definition, Initialization, Pointers arithmetic. Structures, Self Referential Structures.

15 Hours

UNIT – II

Linear Data Structures: Arrays and its representations, Stacks and Queues and its implementation using Arrays, Dynamic memory allocation, Linked lists, Linked list-based implementation of Stacks and Queues, Evaluation of Expressions, Applications of Arrays and Linked list

15 Hours

UNIT – III

Non-Linear Data Structures: Trees, Binary Trees, Binary tree representation and traversals, Binary Search Trees, Complete Binary Tree, Heap, Graph and its representations, Applications of trees and Graphs.

15 Hours

UNIT – IV

Sorting and Searching: Linear Search and Binary Search, Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Selection Sort, Time and space complexity of sorting & search algorithms.

15 Hours

Suggested readings/ references:

1. Ashok N. Kamthane, "Introduction to Data Structures in C", Pearson Education.
2. Aaron M. Tenenbaum, "Data Structures Using C"
3. Tremblay, Jean-Paul, and Paul G. Sorenson, "An introduction to data structures with applications", McGraw-Hill

BCA (Web Technology)-FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Data Structures using C
Course Code: UMJCST402
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

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(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

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Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

Final Examination

15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Web Technology) - FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Mathematical Foundation of Computer Science
Course Code: UMJCST403
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 marks

For examinations to be held in May 2024, 2025 and 2026

Course objectives & learning outcomes:

1. To understand basic concepts of set operations and calculus.
2. To gain knowledge on Linear equations and matrices operations.
3. To brief the students about vector spaces concepts.

UNIT – I

Sets, Relations and Functions: Definition of Sets and Subsets; Intersection Union and Complements: Demorgan's Law; Cardinality; Relations - Equivalence relation etc. Mapping One-One Onto etc.

15 Hours

UNIT - II

Calculus: Functions; Limits and Continuity; Differentiation and Integration; Differential Equations of first Order and first degree.

15 Hours

UNIT –III

Linear equations and Matrices: Various types of Matrices, Row/Column operations Solution of linear equations Gaussian Eliminations etc. Properties of determinants; Cramer's Rule; transpose and inverse of a Matrix.

15 Hours

UNIT – IV

Vector Spaces: Definition of Vector, Scalar Product, Vector Product Linear Independence; Bases, Subspace and dimensionality Inner products and Norms.

15 Hours

Suggested Readings/ References:

1. M.R. Puri, Dr. Raí Krishan" Modern Algebra ", Malhotra Brothers.
2. A.R. Vasishtha Publisher,"Matrices", Krishna Prakashan Mandir.
3. Trembley, J.P. and Manohar, R.P," Discrete Mathematical Structures with Applications to Computer Science", McGraw-Hill, 1975.

BCA (Web Technology) - FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Mathematical Foundation of Computer Science
Course Code: UMJCST403
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 marks

For examinations to be held in May 2024, 2025 and 2026

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Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Web Technology) - FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Python Programming
Course Code: UMJCST404
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 2.5 hours duration
Practical: 25 marks

For examinations to be held in May 2024, 2025 and 2026

Course objectives & learning outcomes:

1. To learn about basic concepts of Python programming
2. To brief the students about different programming constructs and data types.
3. To gain knowledge on classes and module concepts.

UNIT –I

Python introduction, Python features and Application, Basic syntax, Python data types- Numeric (int, float, complex), String data type, Boolean data type, Sequence, Set, none; Variables, Input and output, output formatting, Comments-Single and Multiline comments

Arithmetic operators, Comparison operators, Logical operators, Bitwise operators, Assignment operators, Membership Operators, Identity Operators Precedence and associativity of operators, Expressions

15 Hours

UNIT –II

Conditional statements (if-else, nested if), Looping statements (while, for, nested loops), Pass statements, comprehension

Built-in functions, User defined Functions, Defining and calling functions, Parameters and arguments, Return statement, Lambda functions, generator functions, map,

15 Hours

UNIT-III

Lists, Tuples, Sets, Dictionaries, Accessing and modifying elements; Various operations on Lists, Tuples, Sets, Dictionaries. Python file handling, Creating file, file opening modes, Reading file, Writing File, deleting file

15 Hours

UNIT-IV

Classes and object, Encapsulation, Polymorphism, class method, static method, Inheritance, Single inheritance, Multiple inheritances, Multi-level inheritance, Method Resolution Order (MRO), Polymorphism, Method overriding and overloading

Modules and Packages, modules and packages, importing modules and packages, Creating and importing custom modules, Using built-in modules and packages,

15 Hours

Suggested readings/ references:

1. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt. Ltd
2. Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015.
3. Reema Thareja, "Python Programming using problem solving approach", Oxford University press, 2017

BCA (Web Technology) - SECOND SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Python Programming
Course Code: UMJCST404
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 2.5 hours duration
Practical: 25 marks

For examinations to be held in May 2024, 2025 and 2026

NOTE FOR PAPER SETTERS FOR EXAMINATIONS -

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Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Web Technology) - FOURTH SEMESTER

Course: Minor
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Internet of Things
Course Code: UMICST405
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 2.5 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

Course objectives & learning outcomes:

1. To learn about various concepts, terminologies and architecture of IoT systems.
2. To brief the students about sensors and actuators for design of IoT.
3. To gain knowledge on different protocols for design of IoT systems

UNIT –I

Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, IoT frameworks, IoT and M2M.

15 Hours

UNIT –II

Sensors Networks: Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, Raspberry Pi Development Kit, RFID Principles and components.

15 Hours

UNIT-III

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, ZigBee, Z-Wave, IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, CoAP, MQTT. Edge connectivity and protocols.

15 Hours

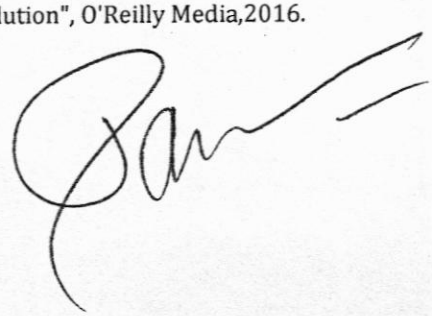
UNIT-IV

Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

15 Hours

Suggested readings/ references:

1. Hakima Chaouchi, "The Internet of Things Connecting Objects to the Web", Wiley Publications
2. Olivier Hersent, David Boswarthick, and Omar Elloumi, "The Internet of Things: Key Applications and Protocols", Wiley Publications.
3. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media,2016.



BCA (Web Technology) - SECOND SEMESTER

Course: Minor
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Internet of Things
Course Code: UMICST405
Mid Semester assessment: 10 Marks of 1.5 hours duration
End Semester assessment: 40 Marks of 2.5 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

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Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

Final Examination

15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

Bachelor of Computer Applications (BCA)

SYLLABUS

Four Year Undergraduate Programme

As per NEP 2020 guidelines

Under Choice based Credit System

FOR THE STUDENTS TO BE ADMITTED IN THE SESSIONS 2022-23, 2023-24, 2024-25

Course Details for Four Year UG Programme

S. NO.	COURSES	DISCIPLINES
1	Computer Applications (CA)- Arts & Science	Natural Science and Arts & Humanities
2	Information Technology (IT)- Arts & Science	Natural Science and Arts & Humanities
3	**Bachelor of Computer Applications (BCA)**	Computer Applications (for BCA degree)
	BCA (Web Technology)	
	BCA (Data Science)	
	BCA (Software Development)	

Bachelor of Computer Applications (BCA)

DATA SCIENCE

SCHEME

Four Year Undergraduate Programme

As per NEP 2020 guidelines

Under Choice based Credit System

FOR THE STUDENTS TO BE ADMITTED IN THE SESSIONS 2022-23, 2023-24, 2024-25

COURSES OF STUDY

Semester-I

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST131	Problem Solving using C	4(3L+1P)	15	60	10	15	100
2	Minor	UMICST132	Data Science Basics	4(3L+1P)	15	60	10	15	100
3	MD	UMDCST133	Data Mining and Data Warehousing	3	15	60	NA	NA	75
4	SEC	USECST104	PC Software: Installation and Troubleshooting	2	10	40	NA	NA	50

Semester-II

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST231	Introduction to Data Science	4(3L+1P)	15	60	10	15	100
2	Minor	UMICST232	Python Programming	4(3L+1P)	15	60	10	15	100
3	MD	UMDCST233	Introduction to Machine Learning	3	15	60	NA	NA	75
4	SEC	USECST204	Cyber Security	2	10	40	NA	NA	50

Semester-III

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST331	Ethics and Data Science	4(3L+1T)	15	60	10	15	100
2	Major	UMJCST332	Database Management System & SQL	4(3L+1P)	15	60	10	15	100
3	Minor	UMICST333	Database Management System & SQL	4(3L+1T)	15	60	10	15	100
4	MD	UMDCST334	Data Mining and Data Warehousing	3	15	60	NA	NA	75
5	SEC	USECST305	System Analysis and Design	2	10	40	NA	NA	50

Semester-IV

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST431	Python Programming	4(3L+1P)	15	60	10	15	100
2	Major	UMJCST432	Mathematics for Computer Application	4(3L+1T)	15	60	10	15	100
3	Major	UMJCST433	Fundamentals of Algorithms	4(3L+1T)	15	60	10	15	100
4	Major	UMJCST434	Software Engineering	4(3L+1T)	15	60	10	15	100
5	Minor	UMICST435	Business Intelligence	4(3L+1T)	15	60	10	15	100

BCA (Data Science) - THIRD SEMESTER

Course: Major
Course Credits: (L-P-T) (3-0-1)
Total marks: 100

Course Title: ETHICS AND DATA SCIENCE
Course Code: UMJCST331
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. To learn the fundamentals of programming language.
2. To understand the concept of different control structures.
3. To learn about different data structures
4. To understand the concept of procedural programming.

UNIT – I

Overview of ethical issues in data-driven organizations: Overview of data science as an ethical practice, Introduction to the unique ethical challenges of 'big data', Ethical Theory - Philosophical frameworks for assessing fairness, Early theories of fairness, Moving towards contemporary theories of fairness.

15 Hours

UNIT – II

Research ethics for data science: Ethical side effects of the publish or perish system: p-hacking and small sample size, The misapplication of informed consent in dataveillance practices.

Techniques of data ethics: Getting from data to individuals: Internet traces and Geo fingerprints. All data are human data: On the discriminatory trouble with training data.

15 Hours

UNIT – III

The ethics of data scraping and storage, Mosaic data, found data, and designed data.

15 Hours

UNIT – IV

Privacy and Surveillance, Special topics in surveillance: Adtech, Special topics in surveillance: Employment, Differential privacy.

15 Hours

Suggested readings/ references:

1. Ethics and Data Science, by DJ Patil, Hilary Mason, and Mike Loukides, 25 July 2018.
2. Data science from scratch, by Joel Grus, second edition, O' Reilly.
3. Data science for dummies, by Lillian Pierson, first edition, John Weily and sons.

BCA (Data Science) - THIRD SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: ETHICS AND DATA SCIENCE
Course Code: UMJCST331
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

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(4 x 3 = 12 marks)

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(4 x 12 = 48 marks)

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Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

Final Examination

15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Data Science) – THIRD SEMESTER

Course: Major
Course Credits: (L-P-T) (3-1-0)
Total marks: 100

Course Title: Database Management System & SQL
Course Code: UMJCST332
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. To present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve-efficiently, and effectively-information from a DBMS.
2. Design ER-models to represent simple database application scenarios and convert them into relational tables
3. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
4. To familiarize students with the basic issues of transaction processing and concurrency control.

UNIT-I

Introduction to Databases and Transactions: What is database system, purpose of database system, view of data, relational databases, database architecture, transaction management, Data models, degree of data abstraction.

15 Hours

UNIT-II

Database Design, ER-Diagram and Unified Modelling Language: Database design and ER Model: Overview, ER-Model, Constraints, ER-Diagrams, weak entity sets, Codd's rules, Relational Schemas, Introduction to UML.

15 Hours

UNIT-III

Relational database model: Logical view of data, keys, integrity rules.
Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).

15 Hours

UNIT-IV

Relational Algebra and Calculus Relational algebra: Introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics.
Constraints, Views and SQL: What are constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views. SQL: DDL, DML, aggregate function, Null Values, nested sub queries, Joined relations.

15 Hours

Suggested readings/ references:

1. Bipin C. Desai, "An Introduction to Database Systems", West-publishing company, 2012.
2. Elmasri, Navathe, Somayajulu, Gupt, "Fundamentals of Database Systems", Pearson Education,1992
3. Date, C. J., "An Introduction to Database Systems", Addison Wesley Pearson Education, 2014.
4. Narayan S. Umanath, Richard W. Scamell, "Data Modelling and Database Design", Thomson Course Technology India Edition.
5. R. A. Parida, Vinod Sharma, "The power of Oracle 9i", Firewall Media Publications.
6. DeshPande, "SQL/PL for Oracle 8 & 8i".

BCA (Data Science) – THIRD SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-1-0)
Total marks: 100

Course Title: Database Management System and SQL
Course Code: UMJCST332
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

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Practical/ tutorial Evaluation

Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Data Science) – THIRD SEMESTER

Course: Minor
Course Credits: (L-P-T)
(3-0-1)
Total marks: 75

Course Title: Database Management System and SQL
Course Code: UMICST333
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
2. Extract interesting patterns from large amounts of data.
3. Discover the role played by data mining in various fields.
4. Choose and employ suitable data mining algorithms to build analytical applications

UNIT-I

Introduction to Databases: What is database system, purpose of database system, view of data, relational databases, database architecture, transaction management, Data models, degree of data abstraction.

10 Hours

UNIT-II

Database Design, ER-Diagram: Database design and ER Model: Overview, ER-Model, Constraints, ER-Diagrams, weak entity sets, Codd's rules, Relational Schemas, Introduction to UML.

10 Hours

UNIT-III

Relational database model: Logical view of data, keys, integrity rules.
Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).

10Hours

UNIT-IV

Constraints, Views and SQL: What are constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views. SQL: DDL, DML, aggregate function, Null Values, nested sub queries, Joined relations.

10 Hours

Suggested readings/ references:

1) A Silberschatz, H Korth, S Sudarshan, "Database System and Concepts", fifth Edition McGraw-Hill.
2) Bipin C. Desai, "An Introduction to Database Systems", West-publishing company, 2012.
3) Elmasri, Navathe, Somayajulu, Gupt, "Fundamentals of Database Systems", Pearson Education.
4) Date, C. J., "An Introduction to Database Systems", Addison Wesley Pearson Education, 2014.
5) R. A. Parida, Vinod Sharma, "The power of Oracle 9i", Firewall Media Publications.
6) DeshPande, "SQL/PL for Oracle 8 & 8i".

BCA (Data Science) – THIRD SEMESTER

Course: Minor
Course Credits: (L-P-T) (3-0-1)
Total marks: 100

Course Title: Database Management System and SQL
Course Code: UMICST333
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

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(4 x 12 = 48 marks)

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Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Data Science) – THIRD SEMESTER

Course: Multidisciplinary (MD)
Course Credits: (L-P-T)
(3-0-0)
Total marks: 75

Course Title: Data Mining and Data Warehousi
Course Code: UMDCST334
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration

For examinations to be held in Dec 2023, 2024, and 2025

Course objectives & learning outcomes:

1. Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
2. Extract interesting patterns from large amounts of data.
3. Discover the role played by data mining in various fields.
4. Choose and employ suitable data mining algorithms to build analytical applications

UNIT-I

Data Mining: Data and Types of Data, Data Mining Functionalities. Interestingness, Patterns– Classification of Data Mining systems,Data mining Task primitives, Major issues in Data Mining–Data Preprocessing.
10 Hours

UNIT-II

Data Warehouse and OLAP Technology for Data Mining: Introduction to Data Warehouses, Differences between Operational Database Systems and Data Warehouses, Multidimensional Data Model, Three-tier Data Warehouse Architecture, Schemas -Stars, Snowflakes and Fact Constellations.
10Hours

UNIT-III

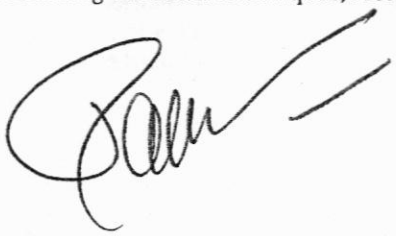
Classification: Classification and Prediction, Basic concepts, Decision tree induction, Bayesian classification, Rule–based classification, Lazy learner. 10Hours

UNIT-IV

Clustering and Applications: Cluster analysis, Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density–Based Methods, Grid–Based Methods, Outlier Analysis. 15 Hours

Suggested readings/ references:

1. JiaweiHan&MichelineKamber, "DataMining–ConceptsandTechniques–,3rdEdition", Elsevier.
2. MargaretHDunham, "DataMiningIntroductoryand Advancedtopics"PEA.
3. Ian H.Witten and EibeFrank, "DataMining:Practical Machine Learning Toolsand Techniques",Morgan Kaufmann.



BCA (Data Science) – THIRD SEMESTER

Cour Multidisciplinary (MD)
Course Credits: (L-P-T)
(3-0-0)
Total marks: 75

Course Title: Data Mining and Data Warehousing
Course Code: UMDCST334
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration

For examinations to be held in Dec 2023, 2024, and 2025

NOTE FOR PAPER SETTERS FOR EXAMINATIONS -

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

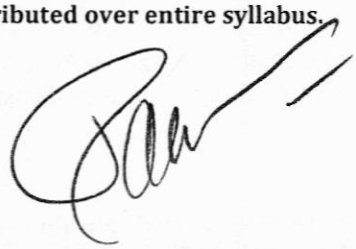
Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are requiredto attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.



BCA (Data Science) - THIRD SEMESTER

Course:	Skill Enhancement Course (SEC)	Course Title: System Analysis and Design	
Course Credits:	(L-P-T)	Course Code: USECST305	
	(2-0-0)	Mid Semester assessment:	10 Marks of 1.5 hours duration
Total marks:	50	End Semester assessment:	40 Marks of 2.5 hours duration

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. To learn the basics of Software and system development life cycle.
2. To learn different SRS and feasibility study.
3. To gain knowledge on DFDs, ER diagrams and tools.

Unit-1

Software Systems Analysis and Design Life Cycle: Requirements determination, requirements specifications, feasibility analysis, final specifications, hardware and software study, Software system design, Software system implementation, Software system evaluation, Software system modification.

15 Hours

Unit-II

Role of Software systems analyst, tools used in Software system analysis Information gathering: strategies, methods, case study Software system requirements specification: classification of requirements as strategic, tactical, operational and statutory. Feasibility analysis: deciding project goals, examining alternative solutions, cost – benefit analysis.

15 Hours

Unit-III

Tools for systems analysts: data flow diagrams, case study for use of DFD, leveling of DFDs, leveling rules, logical and physical DFDs, software tools to create DFDs. Data oriented Software systems design: entity relationship model, E-R diagrams, relationships, cardinality and participation, data base design.

15 Hours

Suggested Readings:

1. Software Engineering by Roger S. Pressman- Tata McGraw Hill.
2. Software Project Management by Bob Hughes and Mike Cotterell- Tata McGraw Hill.
3. Software Project Management by S. Kelkar- PHI.
4. Information Technology Project Management by Kathey and Schwalbe Thomson Learning
5. An Integrated Approach to Software Engineering by P. Jalote- PHI.

BCA (Data Science) - THIRD SEMESTER

Course: Skill Enhancement Course (SEC)
Course Credits: (L-P-T)
(2-0-0)
Total marks: 50

Course Title: System Analysis and Design
Course Code: USECST305
Mid Semester assessment: 10 Marks of 1.5 hours duration
End Semester assessment: 40 Marks of 2.5 hours duration

For examinations to be held in Dec 2023, 2024 and 2025

NOTE FOR PAPER SETTERS FOR EXAMINATIONS -

The question paper will be divided into the following two sections. No question shall be repeated in the question paper.

Section A shall consist Four (4) short answer questions (at least one from each unit). The students are required to attempt all questions. Each question shall be of 2½ Marks.

(4 x 2½ = 10 marks)

Section B shall consist Six (6) long answer questions (two from each unit). The students are required to attempt three questions. Each question shall be of 10 Marks.

(3 x 10 = 30 marks)

Note: The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

BCA (Data Science) – FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T) (3-1-0)
Total marks: 100

Course Title: Python Programming
Course Code: UMJCST431
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration

For examinations to be held in May 2024, 2025, and 2026

Course objectives & learning outcomes:

To understand the basic and advanced features of core language built-ins.

- To implement various packages of python library.
- To communicate using sockets, write client and server side scripts.
- To design and implement basic applications with database connectivity.
- Students will gain basic and advanced programming concepts of Python.

UNIT -I

Introduction, Python Basics: Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program.

10 Hours

UNIT -II

Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit().

Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print (), Local and Global Scope, The global Statement, Exception Handling.

10 Hours

UNIT-III

Lists: The List Data Type, Working with Lists, Augmented Assignment Operators, Methods.

10 Hours

UNIT-IV

Dictionaries and Structuring Data: The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things.

Manipulating Strings - Working with Strings, Useful String Methods.

Reference Books:

1. Allen B. Downey, "Think Python", O'Reilly, Sebastopol, California.
2. Aditya Kanetkar and Yashavant Kanetkar, "Let us Python", BPB publications.
3. John Zelle , "Python Programming: An Introduction to Computer Science", Franklin, Beedle & Associates Inc.
4. Martin C. Brown., "Python: The Complete Reference", McGraw Hill.
5. Harsh Bhasin, "Python for beginners", New age international ltd.

BCA (Data Science) – FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T) (3-1-0)
Total marks: 100

Course Title: Python Programming
Course Code: UMJCST431
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration

For examinations to be held in May 2024, 2025, and 2026

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Data Science) - FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T) (3-0-1)
Total marks: 100

Course Title: Mathematics for Computer Application
Course Code: UMJCST432
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025, and 2026

Course objectives & learning outcomes:

1. To understand basic concepts of set operations and calculus.
2. To gain knowledge on Linear equations and matrices operations.
3. To brief the students about vector spaces concepts.

UNIT-I

Sets, Relations and Functions: Definition of Sets and Subsets; Intersection Union and Complements: Demorgan's Law; Cardinality; Relations - Equivalence relation etc. Mapping One-one Onto etc.

15 Hours

UNIT-II

Calculus: Functions; Limits and Continuity; Differentiation and Integration; Differential Equations of first Order and first degree. 15 Hours

UNIT-III

Linear equations and Matrices: Various types of Matrices, Row/Column operations Solution of linear equations Gaussin Eliminations etc. Properties of determinants; Cramer's Rule; transpose and inverse of a Matrix.

15 Hours

UNIT-IV

Vector Spaces: Definition of Vector, Scalar Product, Vector Product Linear Independence; Bases, Subspace and dimensionality Inner products and Norms. 15 Hours

Suggested readings/ references:

1. Modern Algebra by Prof. M.R. Puri and Dr. Raí Krishan Publisher: Malhotra Brothers
2. Matrices by A.R. Vasishtha Publisher: Krishna Prakashan Mandir
3. Trembley, J.P. and Manohar, R.P.: Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill, 1975.

BCA (Data Science) - FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Mathematics for Computer Application
Course Code: UMJCST432
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Data Science)–FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T) (3-0-1)
Total marks: 100

Course Title: Software Engineering
Course Code: UMJCST434
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

Course objectives & learning outcomes:

1. To gain the knowledge of how analysis, design and coding processes are conducted in a software project.
2. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle
3. Demonstrate an ability to use the basic techniques and tools necessary for software development.

UNIT - I

Software Systems Analysis and Design Life Cycle: Requirements determination, requirements specifications, feasibility analysis, final specifications, hardware and software study, Software system design, Software system implementation, Software system evaluation, Software system modification. Role of Software systems analyst, tools used in Software system analysis

Information gathering: strategies, methods, case study. Software system requirements specification: classification of requirements as strategic, tactical, operational and statutory.

15 Hours

UNIT - II

Feasibility analysis: deciding project goals, examining alternative solutions, cost–benefit analysis

Tools for systems analysts: data flow diagrams, case study for use of DFD, leveling of DFDs, leveling rules, logical and physical DFDs, software tools to create DFDs .

15 Hours

UNIT - III

Structured Software systems analysis and design: procedure specifications in structured English, examples and cases, decision tables for complex logical specifications, specification oriented design vs procedure oriented.

Data oriented Software systems design: entity relationship model, E-R diagrams, relationships, cardinality and participation, data base design.

15 Hours

UNIT - IV

Data input methods: coding techniques, requirements of coding schemes, error detection of codes, validating input data, input data controls, interactive data input

Designing outputs: output devices, designing output reports, screen design, graphical user interfaces, interactive I/O on terminals.

15 Hours

Suggested readings/ references:

1. Software Engineering by Roger S. Pressman- Tata McGraw Hill.
2. Software Project Management by Bob Hughes and Mike Cotterell- Tata McGraw Hill.
3. Software Project Management by S. Kelkar- PHI.
4. Information Technology Project Management by Kathey and Schwalbe-Thomson Learning
5. An Integrated Approach to Software Engineering by P. Jalote- PHI.

BCA (Data Science)–FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Software Engineering
Course Code: UMJCST434
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

NOTE FOR PAPER SETTERS FOR EXAMINATIONS -

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Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

Final Examination

15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Data Science) - FOURTH SEMESTER

Course: Minor
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Business Intelligence
Course Code: UMICST435
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

Course objectives & learning outcomes:

1. To understand the fundamentals of Business Intelligence
2. To identify the appropriateness and need for analysis of data.
3. To learn the preprocessing, mining and post processing of the data

UNIT –I

Effective and timely decisions, Data, information and knowledge, Role of mathematical models, Business intelligence architectures: Cycle of a business intelligence analysis, enabling factors in business intelligence projects, Development of a business intelligence system, Ethics and business intelligence

15 Hours

UNIT II

The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis. Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization.

15 Hours

UNIT III

Concepts of Decision Making, Techniques of Decision Support System (DSS), Types of Decision Support System (DSS), Development of Decision Support System (DSS), Applications of DSS, Role of Business Intelligence in DSS

15 Hours

UNIT IV

Discovery, Data preparation, Preprocessing requirements, data cleaning, data integration, data reduction, data transformation, Data discretization and concept hierarchy generation, Model Planning, Model building, Communicating Results & Findings, Operationalizing, Introduction to OLAP. Introduction to BI Applications.

15 Hours

Suggested readings/ references:

1. Business Intelligence and Analytics. Systems for Decision Support - R. Sharda, D. Delen, & E. Turban,10th Edition. Pearson/Prentice Hall, 2015.
2. Business Intelligence – Data Mining and Optimization for Decision Making – Carlo Vercellis – Wiley Publications.
3. Big Data & Analytics – Seema Acharya & Subhashini Chellappan – Wiley Publications
4. Data mining concepts and techniques, Jawai Han, Michelline Kamber, Jiran Pie, Morgan Kaufmann Publishers.
5. Introduction to business Intelligence and data warehousing, IBM, PHI.

BCA (Data Science) - FOURTH SEMESTER

Course: Minor
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Business Intelligence
Course Code: UMICST435
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

Final Examination

15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

Bachelor of Computer Applications (BCA)

SYLLABUS

Four Year Undergraduate Programme

As per NEP 2020 guidelines

Under Choice based Credit System

FOR THE STUDENTS TO BE ADMITTED IN THE SESSIONS 2022-23, 2023-24, 2024-25

Course Details for Four-Year UG Programme

S. NO.	COURSES	DISCIPLINES
1	Computer Applications (CA)- Arts & Science	Natural Science and Arts & Humanities
2	Information Technology (IT)- Arts & Science	Natural Science and Arts & Humanities
3	**Bachelor of Computer Applications (BCA)**	Computer Applications (for BCA degree)
	BCA (Web Technology)	
	BCA (Data Science)	
	BCA (Software Development)	

Bachelor of Computer Applications (BCA)

SOFTWARE DEVELOPMENT

SCHEME

Four Year Undergraduate Programme

As per NEP 2020 guidelines

Under Choice based Credit System

FOR THE STUDENTS TO BE ADMITTED IN THE SESSIONS 2022-23, 2023-24, 2024-25

COURSES OF STUDY

Semester–I

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST161	Programming Paradigms & C Language	4(3L+1P)	15	60	10	15	100
2	Minor	UMICST162	Computer Fundamentals and PC Software	4(3L+1P)	15	60	10	15	100
3	MD	UMDCST163	Computer Fundamentals	3	15	60	NA	NA	75
4	SEC	USECST104	PC Software: Installation and Troubleshooting	2	10	40	NA	NA	50

Semester–II

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST261	Data and File Structures using C Language	4(3L+1P)	15	60	10	15	100
2	Minor	UMICST262	Python Programming	4(3L+1P)	15	60	10	15	100
3	MD	UMDCST263	C Programming	3	15	60	NA	NA	75
4	SEC	USECST204	Cyber Security	2	10	40	NA	NA	50

Semester-III

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST361	Object Oriented programming using C++	4(3L+1P)	15	60	10	15	100
2	Major	UMJCST362	Database Management System & SQL	4(3L+1P)	15	60	10	15	100
3	Minor	UMICST363	Open-Source Software	4(3L+1T)	15	60	10	15	100
4	MD	UMDCST364	Computer Fundamentals	3	15	60	NA	NA	75
5	SEC	USECST305	System Analysis and Design	2	10	40	NA	NA	50

Semester-IV

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCST461	Operating System	4(3L+1P)	15	60	10	15	100
2	Major	UMJCST462	Mathematics for Computer Science	4(3L+1T)	15	60	10	15	100
3	Major	UMJCST463	PHP Language	4(3L+1T)	15	60	10	15	100
4	Major	UMJCST464	Computer Networks and Internet	4(3L+1T)	15	60	10	15	100
5	Minor	UMICST465	Numerical Methods	4(3L+1T)	15	60	10	15	100

BCA (Software Development) - THIRD SEMESTER

Course: Major
Course Credits :(L-P-T)
(3-1-0)
Total marks: 100

Course Title: Object Oriented Programming using C++
Course Code: UMJCST361
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. To learn the fundamentals of object-oriented technology.
2. To learn the basics of C++ language.
3. To learn implementation of Object-Oriented Programming concepts in C++.
4. To gain knowledge mechanisms of exception handling in C++.
5. To brief the students about file handling in C++.

Unit-1

Object oriented programming: Definition, Characteristics, Advantages, Applications, Comparison of object-oriented programming and procedure-oriented programming; Object oriented programming concepts: Classes, Objects, Encapsulation, Abstraction, Inheritance, and Polymorphism.

15 Hrs

Unit-2

C++ language basics: Program structure, Character set, Identifiers, Keywords, Constants, Punctuators, Data types, Storage classes, Comments, Operators, Scope resolution operator, Member dereferencing operator, New and Delete operators, Conditional statements, Loop statements, Jump statements.

15 Hrs

Unit-3

Classes and objects in C++: Member functions inside and outside of the class, Constructors and destructor, Class members – private, protected, public, Static; Array and Strings in the class, Create array of objects, Define a function – Inline, Friend, Virtual, Recursive; Pass object by-value to a function, Pass object by-reference to a function.

15 Hrs

Unit-4

Inheritance in C++: Single, Multi-level, Hierarchical, Hybrid; Privately derived, Protected derived, Publically derived; Polymorphism in C++: Operator overloading, Function overloading, Virtual functions, Static binding, Dynamic binding; Exception handling basics in C++; File handling basics in C++.

15 Hrs

Suggested readings/ references:

1. E. Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill, 4th Edition, 2008.
2. Herbert Schildt, "C++ The Complete Reference", McGraw-Hill, 4th Edition, 2002.
3. Robert Lafore, "Object Oriented Programming in C++", Galgotia Publications, 3rd Edition, 2003.
4. Harvey M. Deitel and Paul J. Deitel, "C++: How to Program", Prentice Hall, 2006.

BCA (Software Development) - THIRD SEMESTER

Course: Major
Course Credits :(L-P-T)
(3-1-0)
Total marks: 100

Course Title: Object Oriented Programming using C++
Course Code: UMJCST361
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Software Development) - THIRD SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-1-0)
Total marks: 100

Course Title: Database Management System & SQL
Course Code: UMJCST362
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duratic
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. To learn the fundamentals of Databases.
2. To learn the basics of Relational Databases.
3. To gain knowledge Structure Query Language.
4. To brief the students about Normalization of tables in Relational Databases.

Unit-1

Database concepts: Data, Field, Record, File, Database, Advantages of databases, Disadvantages of databases; Database management system: Need of DBMS, Components of DBMS – Database administrator, DML pre compiler, DDL compiler, Query processor, Database manager, File manager, Data dictionary, Data files; Three level architecture of DBMS: External, Conceptual, and Internal; 15 Hrs

Unit-2

ER model of a database: Entities, Attributes, Relationships, ER diagrams, Notations, Conversion to Relation database design. Relational model of a database: Advantages, Relations, Schema, State, Tuple, Attribute, Domain; Keys: Super, Candidate, Primary, Alternate, Foreign; Relational constraints: Domain constraints, Key constraints, Integrity constraints; Relational operations: Insertion, Deletion, Updation, Selection, Projection, Joins. 15 Hrs

Unit-3

Dependencies: Functional dependency, Join dependency, Inclusion dependency, Template dependency; Normalization: 1st normal form, 2nd normal form, 3rd normal form, BCNF normal form, 4th normal form, 5th normal form. Concurrent transaction processing: Schedule, Concurrency problems, Serializable Schedules, Serializability; Lock Based Protocols: Locks, Binary Lock, Two Phase Locking (2PL),Deadlock handling; 15 Hrs

Unit-4

SQL: Features of SQL; DDL: Create, Alter, Drop; DML: Select, Arithmetic, Precedence, Where, Alias, Concatenation, Literal, Distinct, Between, In, Like, Null, Logical, Order By, Group By, Having, Insert Into, Update, Delete, Count, Sum, Avg, Max, Min; Views, and data dictionary; Joins: Equi Join, Natural Join, Outer Join, Self-Join. 15 Hrs

Suggested readings/ references:

1. Bayross, Ivan, "SQL, PL/SQL: The programming language of Oracle", BPB publications 2009.
2. Bipin Desai, "An Introduction to Database Systems", Galgotia Publications Pvt. Ltd.
3. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concept", McGrawHill, 7th Edition, 2020.
4. Ramon Mata-Toledo and Pauline Cushman, "Schaum's Outline of Fundamentals of Relational Databases (Schaum's Outline Series) Toledo", McGraw-Hill Education, 2000.
5. Scott Urman, Ron Hardman and Michael Mclaughlin, "Oracle Database l0g PLiSQL Programming", Tata McGraw-Hill, 8th Edition, 2008.

BCA (Software Development) - THIRD SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-1-0)
Total marks: 100

Course Title: Database Management System & SQL
Course Code: UMJCST362
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Software Development) - THIRD SEMESTER

Course: Minor
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Open-Source Software
Course Code: UMICST363
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. Students will understand what an open-source project is.
2. Students will know how to use common open-source tools.
3. Students will be able to find and contribute to open-source projects.
4. Students will create and lead an open-source project.

Unit-1

Introduction to OSS, History, Need of Open Sources, Advantages and disadvantages of OSS, Brief understanding of Software Development Life Cycle, Development and maintenance of Open-Source Software.

15 Hrs

Unit-2

Commercial Software Vs Open-Source Software, Free Software Vs Freeware Softwares, Software Licensing - GPL, LGPL and other licenses. Salient features of OSS like (Open Office, GAMBAS, GIMP, MySQL)

15 Hrs

Unit-3

Applications of Open-Source Operating System LINUX: - Introduction, General Overview, Kernel Mode and Usermode – Process and Scheduling, Development with Linux.

15 Hrs

Unit-4

Open-Source Software Organizations, hands on training on open office, Data recovery softwares, Apache Web Server its installation and deploying website.

15 Hrs

Suggested references:

1. Embedded Software Development: The Open-Source Approach by Ivan Cibrario Bertolotti and Tingting Hu
2. Understanding Open Source & Free Software Licensing by O Reilly and Andrew M. ST.Laurent
3. Best practices for commercial use of open-source software by Karl Michael Popp
4. Open-Source Software by Jeffrey P. Brown
5. Software Engineering by Roger S. Pressman

BCA (Software Development) - THIRD SEMESTER

Course: Minor
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Open-Source Software
Course Code: UMICST363
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2023, 2024 and 2025

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Software Development) - THIRD SEMESTER

Course: Multi-Disciplinary (MD)
Course Credits: (L-P-T)
(3-0-0)
Total marks: 75

Course Title: Computer Fundamentals
Course Code: UMDCST364
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. To learn the fundamentals of Computer Fundamentals.
2. To understand hardware and software.
3. To gain knowledge of operating system.
4. To brief the students about number system.

UNIT – I

Introduction to Computer, History of Computer, Features of Computer, Uses of Computers, Generation of Computer, Digital, Analog, Hybrid Computer, Computer Memory and its types, types of Primary memory, Storage Units, Secondary storage Devices: Hard disk drives, Optical Disks: CD, DVD, etc. Input Devices types, and Output Devices Monitor, Plotter. Printer and its Types.

10 Hours

UNIT - II

Software and Hardware, Type of Software: System Software, Application Software, Firmware Software, Computer Languages and its types: Machine Language, Assembly Language, High Level Language, Translators: Interpreter, Compiler, Linker, Loader, Computer Viruses introduction, Antivirus Software.

10 Hours

UNIT – III

Operating System, Functions of Operating System, Types of Operating System (Single User and Multi User), Windows operating system and its features, Desktop Elements of windows OS, Anatomy of Window: Title Bar, Menu Bar, Tool Bar, Scroll Bars, Document Area, and Status Bar.

10 Hours

UNIT – IV

Computer Number System: Decimal Number, Binary Number, Octal Number, Hexadecimal Number, Arithmetic Operations(Addition, Subtraction, Multiplication) on Binary Number, Conversion of one Number System to another.

15 Hours

Suggested readings/ references:

1. P.K Sinha and Priti Sinha, "Computer Fundamentals", BPB Publications.
2. Alexix Leon, Mathewes Leon, "Fundamentals of Information Technology",Leon Techworld.
3. Suresh K. Basandra, "Computer Systems Today", Galgotia Publications.
4. V. Rajaraman, "Fundamentals of Computers",EEE.
5. Peter Nortan, "Introduction to Computers", Tata Mcgraw Hill.

BCA (Software Development) - THIRD SEMESTER

Course: Multi-Disciplinary (MD)
Course Credits: (L-P-T)
(3-0-0)
Total marks: 75

Course Title: Computer Fundamentals
Course Code: UMDCST364
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration

For examinations to be held in Dec 2023, 2024 and 2025

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

The question paper will be divided into the following two sections. No question will be repeated in the question paper.

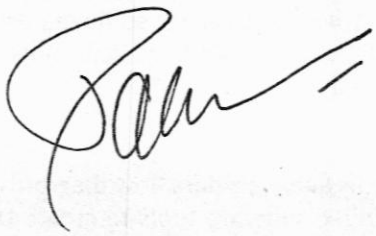
Section Ashall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section Bshallconsist Eight (8) long answer questions having two questions from each unit. The students are requiredto attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.



BCA (Software Development) - THIRD SEMESTER

Course:	Skill Enhancement Course (SEC)	Course Title: System Analysis and Design	
Course Credits:	(L-P-T)	Course Code: USECST305	
	(2-0-0)	Mid Semester assessment:	10 Marks of 1.5 hours duration
Total marks:	50	End Semester assessment:	40 Marks of 2.5 hours duration

For examinations to be held in Dec 2023, 2024 and 2025

Course objectives & learning outcomes:

1. To learn the basics of Software and system development life cycle.
2. To learn different SRS and feasibility study.
3. To gain knowledge on DFDs, ER diagrams and tools.

Unit-1

Software Systems Analysis and Design Life Cycle: Requirements determination, requirements specifications, feasibility analysis, final specifications, hardware and software study, Software system design, Software system implementation, Software system evaluation, Software system modification.

15 Hours

Unit-II

Role of Software systems analyst, tools used in Software system analysis Information gathering: strategies, methods, case study Software system requirements specification: classification of requirements as strategic, tactical, operational and statutory. Feasibility analysis: deciding project goals, examining alternative solutions, cost – benefit analysis.

15 Hours

Unit-III

Tools for systems analysts: data flow diagrams, case study for use of DFD, leveling of DFDs, leveling rules, logical and physical DFDs, software tools to create DFDs. Data oriented Software systems design: entity relationship model, E-R diagrams, relationships, cardinality and participation, data base design.

15 Hours

Suggested Readings:

1. Software Engineering by Roger S. Pressman- Tata McGraw Hill.
2. Software Project Management by Bob Hughes and Mike Cotterell- Tata McGraw Hill.
3. Software Project Management by S. Kelkar- PHI.
4. Information Technology Project Management by Kathey and Schwalbe Thomson Learning
5. An Integrated Approach to Software Engineering by P. Jalote- PHI.

BCA (Software Development) - THIRD SEMESTER

Course: Skill Enhancement Course (SEC)
Course Credits: (L-P-T)
(2-0-0)
Total marks: 50

Course Title: System Analysis and Design
Course Code: USECST305
Mid Semester assessment: 10 Marks of 1.5 hours duration
End Semester assessment: 40 Marks of 2.5 hours duration

For examinations to be held in Dec 2023, 2024 and 2025

NOTE FOR PAPER SETTERS FOR EXAMINATIONS -

The question paper will be divided into the following two sections. No question shall be repeated in the question paper.

Section A shall consist Four (4) short answer questions (at least one from each unit). The students are required to attempt all questions. Each question shall be of 2½ Marks.

(4 x 2½ = 10 marks)

Section B shall consist Six (6) long answer questions (two from each unit). The students are required to attempt three questions. Each question shall be of 10 Marks.

(3 x 10 = 30 marks)

Note: The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

BCA (Software Development) – FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-1-0)
Total marks: 100

Course Title: Operating System
Course Code: UMJCST461
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

Course objectives & learning outcomes:

1. Manage the computer's resources, such as the central processing unit, memory, disk drives, and printers
2. Establish a user interface
3. Execute and provide services for applications software.

UNIT I

Introduction to Python Language, Strengths and Weaknesses, IDLE, Dynamic Types, Naming Conventions, String Values, string Operations, String Slices, String Operators, Numeric Data Types, Built-in Functions. Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods Special Methods Class Variables, Inheritance, Polymorphism.

15 Hours

UNIT II

Introduction, Control Flow and Syntax, Indenting, the if Statement, Relational Operators, Logical, Operators, True or False, Bit Wise Operators, the while Loop, break and continue, The for Loop, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections.

15 Hours

UNIT III

Introduction Defining Your Own Functions Parameters Function Documentation Keyword and Optional Parameters Passing Collections to a Function Variable Number of Arguments Scope Functions - "First Class Citizens" Passing Functions to a Function Mapping Functions in a Dictionary Lambda Modules Standard Modules – sys Standard Modules – math Standard Modules – time The dir Function.

15 Hours

UNIT IV

I/O and Error Handling in Python: Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data from a File, Additional File Methods, Handling IO Exceptions, Working with Directories, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions.

15 Hours

Suggested readings/ references:

1. Allen B. Downey, "Think Python", O'Reilly, Sebastopol, California.
2. Aditya Kanetkar and Yashavant Kanetkar, "Let us Python", BPB publications.
3. John Zelle , "Python Programming: An Introduction to Computer Science", Franklin, Beedle & Associates Inc.
4. Martin C. Brown., "Python: The Complete Reference", McGraw Hill.
5. Harsh Bhasin, "Python for beginners", New age international ltd.

BCA (Software Development) - FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-1-0)
Total marks: 100

Course Title: Operating System
Course Code: UMJCST461
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

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Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Software Development) – FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Mathematics for Computer Science
Course Code: UMJCST462
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

Course objectives & learning outcomes:

1. Help in carrying out logical and mathematical set operations on mathematical and other real-world entities.
2. Explore and apply key concepts in logical thinking to business problems.
3. Effectively express the concepts and results of Number Theory,
4. To reinforce the plotting of points in two-dimensional Cartesian coordinate system.

UNIT I

Sets, Relations and Functions: Definition of Sets and Subsets; Intersection, Union and Complements, Demorgan's Law; Cardinality; Relations - Equivalence relation etc. Mapping One-one Onto etc. Partition of Sets, Inverse Mapping.

15 Hours

UNIT II

Logic & Methods of Proof: Propositions, Connectives, Well-formed formulas, Truth Tables, Equivalence of WFF, logical identities, semantics, Normal forms of WFF, reasoning, disjunctive normal form, principle disjunctive normal form, conjunctive normal form, predicate calculus, rules of inference. Direct proof, Indirect Proofs, Counter examples, Proof by Induction, Strong and weak induction.

15 Hours

UNIT III

Modulo arithmetic, Congruence and their applications, Multiplicative inverse, Euler's extended algorithm, Fermat's little theorem, Totient function, Euler's theorem, primitive roots, discrete logarithms, split search algorithm, Chinese remainder theorem. Prime numbers, Number bases, Primarily testing, discrete logarithm, primitive roots, Number sieves, Quadratic Residues.

15 Hours

UNIT IV

Cartesian Coordinates, Two-dimensional coordinate system, Point, locus of a point, Line, Slope of a line, Regular geometric shapes, special points in triangles, angle between two straight lines, Distance between two parallel lines; Circle, parametric equation, relative position of line and circle, tangents and chords, Conic Section, Parabola, Ellipse, Hyperbola. Three-dimensional coordinate system, Lines and planes.

15 Hours

Suggested readings/ references:

1. Modern Algebra by Prof. M.R. Puri and Dr. Raj Krishan Publisher: Malhotra Brothers
2. Trembley, J.P. and Manohar, R.P.: Discrete Mathematical Structures with Applications to Computer Science. McGraw-Hill.
3. Lew: Computer Science: A Mathematical Introduction, Prentice – Hall International (Paperback Edition).
4. Kenneth. H. Rosen: Discrete mathematics and its applications 3rd Edition, McGraw Hill international edition.
5. Algebraic Number Theory by Serge. Lang, Springer; 2nd edition.

BCA (Software Development) - FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Mathematics for Computer Science
Course Code: UMJCST462
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

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Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Software Development) – FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: PHP Language
Course Code: UMJCST463
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

Course objectives & learning outcomes:

1. How to use PHP to add some dynamic aspects to our pages. How to use HTML forms.
2. The difference between GET and POST requests.
3. How to use cookies to store some data in the browser and pass it to the next request.

UNIT-I

Introduction: History, Evaluation, Features, Installing PHP, Basic of PHP Development, Working of PHP Scripts, Data Types, Variables, Constants, Statements, Flow Control Statements, Expressions and Operators, Loops, Types of Errors, Namespaces.

15 Hrs

UNIT-II

Arrays: Types of Arrays, Operations on Arrays: Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function. Strings: Introduction to Strings, Comparing Strings, Manipulating and Searching Strings Functions: Calling a Function, Define a function, Call by value and Call by reference, Recursive function.

15 Hrs

UNIT-III

Form Handling: Working with Forms, GET Variable and POST Variable, REQUEST Variable, Combine HTML and PHP Code, Using Hidden Fields, Capturing Form Data, Form Validation, Creating the Upload Script, Redirecting the User. Understanding Exception and error, Try, catch, throw

15 Hrs

UNIT-IV

Working with File and Directories: Understanding File and Directory, Opening and Closing a File, Copying, Renaming and Deleting a File, Working with Directories, File Uploading and Downloading. PHP with MySQL: Installing and Configuring MySQL, Performing Basic DML Database Operations: Insert, Delete, Update, Select, Cookies: Setting and Using Cookie Variables, Session: Managing User Preferences with Sessions.

15 Hrs

SUGGESTED READINGS:

1. Robin Nixon, "Learning PHP, MySQL & JavaScript ", O'Reilly Media, 2021.
2. Richard Blum, "PHP, MySQL & JavaScript All-in-One For Dummies", Wiley, 2018.
3. Steven Holzner, "PHP: The Complete Reference". McGraw-Hill books, 2017.
4. Lynn Beighley, Michael Morrison, "Head First PHP & MySQL: A Brain-Friendly Guide", O'Reilly.

BCA (Software Development) - FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: PHP Language
Course Code: UMJCST463
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

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Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Software Development) – FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Computer Networks and Internet
Course Code: UMJCST464
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

Course objectives & learning outcomes:

1. Recognize computer networks.
2. List computer network topologies.
3. Explain each computer network topology physically or logically.
4. List required hardware to constitute computer network.
5. Explain the mission of each computer network.
6. Recognize essential computer network protocols.

Unit -1

Basic Concepts of Network: Network Classification, topologies, protocols, Connection-Oriented & Connectionless Network Services. Transmission Media (guided and unguided). Overview of OSI and TCP/IP reference model.

15 Hrs

Unit-2

THE DATA LINK LAYER: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. THE NETWORK LAYER: Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service.

15 Hrs

Unit-3

THE TRANSPORT LAYER: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP. THE APPLICATION LAYER: Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet.

15 Hrs

Unit – 4

HTML 5: - New markup and elements (header, footer, nav elements), Form Elements, Video and Audio tags, Canvas Element,Input type:- Color, email, range, time, date, week, month, tel, url. CSS 3: - Responsive web design, CSS3 Selectors, CSS3 variable and functions, CSS3 backgrounds, gradients, text Overflow, drop shadows, bosx sizing, Transistion, Animations.

15 Hrs

SUGGESTED READINGS:

1. Behrouz A. Forouzan (2006), Data communication and Networking, 4th Edition, Mc-Graw-Hill, India.
2. Kurose, Ross (2010), Computer Networking: A top down approach, Pearson Education, India.
3. HTML5 and CSS3 Masterclass by Robin Nixon
4. HTML5 A COMPLETE GUIDE 2019 EDITION BY Gerardus Blokdyk

BCA (Software Development) - FOURTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Computer Networks and Internet
Course Code: UMJCST464
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

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Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc. 10 marks

Final Examination 15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks

BCA (Software Development) – FOURTH SEMESTER

Course: Minor
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Numerical Methods
Course Code: UMICST465
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

Course objectives & learning outcomes:

1. Grasp the basic elements of numerical methods and error analysis.
2. Understand the basics of approximation, integration and differentiation.
3. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
4. Repetitive nature of computers to solve complex problems that require lots of iterations.

UNIT 1

Computer Arithmetic Number System, Conversion of Numbers, Representation of numbers, Floating point representation, Arithmetic operations with Normalized Floating-point Numbers, consequences of normalization. Errors in number representation, Types of errors, absolute and relative error.

15 Hrs

UNIT 2

Introduction, Methods of Solution, Iterative Methods, Bisection method, False position method, Netwon-Raphson method, Convergence of solution.

15 Hrs

UNIT 3

Simultaneous Linear Equations; Solutions of Simultaneous Linear equations – Gauss elimination method and pivoting, Ill conditioned equations and refinement of solutions; Jacobi and Gauss – Seidal interactive methods.

15 Hrs

UNIT 4

Numerical differentiation and Integration, Solutions of Differential Equations; Runga - Kuta methods; Interpolations and Approximations: Polynomial interpolation Newton, Lagranges etc. Spline Interpolation, Difference tables;

15 Hrs

Books:

1. Stoer, Bullrich: Computer Oriented Numerical Methods, Springer Verlag, 1980.
2. Krishnamurthy, E.V., Sen, S.K.: Computer Based Numerical Algorithm, East West Press, 1984.
3. Rajaraman, V.: Computer Oriented Numerical Methods, Prentice Hall India, 1980.
4. S.S. Sastry: Introductory Methods of Numerical Analysis.

BCA (Software Development) - FOURTH SEMESTER

Course: Minor
Course Credits: (L-P-T)
(3-0-1)
Total marks: 100

Course Title: Numerical Methods
Course Code: UMICST465
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Practical: 25 Marks

For examinations to be held in May 2024, 2025 and 2026

NOTE FOR PAPER SETTERS FOR EXAMINATIONS –

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Section A shall consist Four (4) short answer questions having one question from each unit. The students are required to attempt all questions. Each question shall be of 3 Marks.

(4 x 3 = 12 marks)

Section B shall consist Eight (8) long answer questions having two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of 12 Marks.

(4 x 12 = 48 marks)

Note: -The paper setter shall ensure that the questions are uniformly distributed over entire syllabus.

Practical/ tutorial Evaluation
Daily evaluation of practical's/tutorials/Viva voce/Records etc.

10 marks

Final Examination

15 Marks

Pattern for external practical examination

Practical file	5 Marks
Written examination	5 Marks
Viva-Voce	5 Marks
Total	15 Marks

Pattern for external tutorial examination

Assignment file	10 Marks
Viva-Voce	5 Marks
Total	15 Marks