



UNIVERSITY OF JAMMU

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

Academic Section
Email: academicsectionju14@gmail.com

NOTIFICATION (24/April/Adp./06)

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 Applications (B.A/B.Sc.)** of Semester Vth, VIth, VIIth and VIIIth for Four Year Under Graduate Programme (FYUGP) as per NEP-2020 (as given in the annexure) for the examinations to be held in the years as per the details given below:

Subject	Semester	For the examinations to be held in the year
Computer Applications (B.A/B.Sc.)	Semester- V	December 2024, 2025 and 2026
	Semester-VI	May 2025, 2026 and 2027
	Semester-VII	December 2025, 2026 and 2027
	Semester- VIII	May 2026, 2027 and 2028

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

Sd/-
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/24/ 939-998

Dated: 22/4/24

Copy for information and necessary action to:

1. Dean, Faculty of Mathematical Sciences
2. HOD/Convener, Board of Studies in **Computer Science**
3. S r. 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.

Sunilasham
19/4/24
Deputy Registrar (Academic)

SS
19/4/24
Cal
19/4/24

**B. A. / B. Sc. Honours
IN
COMPUTER APPLICATIONS**


SYLLABUS

Four Year Undergraduate Programme

As per NEP 2020 guidelines

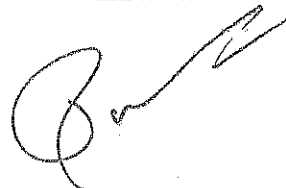
Under Choice based Credit System

**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



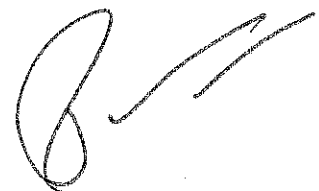
UNIVERSITY OF JAMMU, JAMMU

**Syllabus of B.A/B.Sc. Honours
in
Computer Applications**

(Four Year Undergraduate Programme)

For the students to be admitted in the year 2022-23, 2023-24 and 2024-25

The B.A/B.Sc. programme in Computer Application is a four-year undergraduate programme based on Semester System and consists of **eight** semesters.



B. A. / B. Sc.
IN
COMPUTER APPLICATIONS

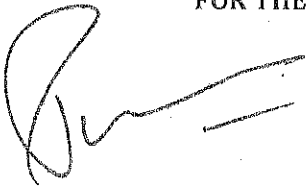
Semester wise Course details

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



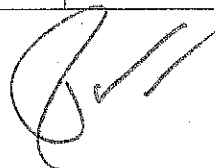
COURSES OF STUDY

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	UMJCAT101	Computer Fundamentals and Office Tools	4(3L+1P)	15	60	10	15	100
2	Minor	UMICAT102	Computer Fundamentals and Office Tools	4(3L+1P)	15	60	10	15	100
3	MD	UMDCAT103	Understanding Computers	3	15	60	NA	NA	75
4	SEC	USECAT104	Office Tools	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	UMJCAT201	Fundamentals of Internet	4(3L+1P)	15	60	10	15	100
2	Minor	UMICAT202	Fundamentals of Internet	4(3L+1P)	15	60	10	15	100
3	MD	UMDCAT203	Understanding Internet	3	15	60	NA	NA	75
4	SEC	USECAT204	Understanding e-Services	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	UMJCAT301	C Programming	4(3L+1P)	15	60	10	15	100
2	Major	UMJCAT302	PC Assembly and Installations	4(3L+1P)	15	60	10	15	100
3	Minor	UMICAT303	PC Assembly and Installations	4(3L+1T)	15	60	10	15	100
4	MD	UMDCAT304	Understanding Computers	3	15	60	NA	NA	75
5	SEC	USECAT305	Cyber Security	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	UMJCAT401	Data Structures using C	4(3L+1P)	15	60	10	15	100
2	Major	UMJCAT402	Operating System	4(3L+1T)	15	60	10	15	100
3	Major	UMJCAT403	Computer Networks	4(3L+1T)	15	60	10	15	100
4	Major	UMJCAT404	Mathematical Foundation of Computer Science	4(3L+1T)	15	60	10	15	100
5	Minor	UMICAT405	Computer Networks	4(3L+1T)	15	60	10	15	100

Semester - V

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCAT501	OOPs Using C++	4(3L+1P)	15	60	10	15	100
2	Major	UMJCAT502	Web Technologies	4(3L+1P)	15	60	10	15	100
3	Major	UMJCAT503	Computer Graphics	4(3L+1T)	15	60	10	15	100
4	Major	UMJCAT504	E-Commerce	2	10	40	NA	NA	50
5	Minor	UMICAT505	OOPs Using C++	4(3L+1P)	15	60	10	15	100
6	SEC	USECAI506	Summer Internship	2	NA	NA	NA	NA	50

Semester - VI

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCAT601	DBMS	4(3L+1P)	15	60	10	15	100
2	Major	UMJCAT602	PHP	4(3L+1P)	15	60	10	15	100
3	Major	UMJCAT603	FOSS	4(3L+1T)	15	60	10	15	100
4	Major	UMJCAT604	Internet of Things	4(3L+1T)	15	60	10	15	100
5	Minor	UMICAT605	DBMS	4(3L+1P)	15	60	10	15	100

Semester-VII

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCAT701	Machine Learning	4(3L+1T)	15	60	10	15	100
2	Major	UMJCAT702	Research Methodology and Research Ethics	4(3L+1T)	15	60	10	15	100
3	Major	UMJCAT703	Python programming	4(3L+1P)	15	60	10	15	100
4	Major	UMJCAT704	System Analysis and Design	4(3L+1T)	15	60	10	15	100
5	Minor	UMICAT705	Python programming	4(3L+1P)	15	60	10	15	100

Semester-VIII (UG Honours)

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCAP801	Project Work	12	NA	NA	NA	NA	300
2	Major	UMJCAT802	Fundamentals of Cloud Computing	4(3L+1T)	15	60	10	15	100
3	Minor	UMICAT803	Fundamentals of Cloud Computing	4(3L+1T)	15	60	10	15	100

Semester-VIII (UG Honours with Research)

S. No.	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Semester	End Exam	Assessment	Exam	
1	Major	UMJCAT804	Statistical Concepts	4(3L+1T)	15	60	10	15	100
2	Minor	UMICAT805	Statistical Concepts	4(3L+1T)	15	60	10	15	100
3	SEC	USECAP806	Research Project/ Dissertation	12	NA	NA	NA	NA	300

CA (Arts and Science) - FIFTH SEMESTER

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

Course Title: OOPs Using C++
Course Code: UMJCAT501
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 2024, 2025 and 2026

Course objectives & learning outcomes:

1. To learn the fundamentals of object-oriented programming language.
2. To understand the concept of overloading, constructors, destructors etc.
3. To understand the concept of File handling.

Unit I

Procedure Oriented Programming and Object-Oriented Programming, Need and evolution of OOP, C and C++, Applications and benefits of OOPs, C++ compilation, Overview of Abstraction, Encapsulation, Inheritance, Polymorphism, Variables, datatypes, Reference Variables. Class, Visibility modes. Decision and control structures: if statement, if-else statement, switch case statement, while, do-while, for, break, continue, go to statements.

Unit II

Operators, Scope resolution operator, Precedence and associativity of operators, Manipulators. Class and object declaration, accessing class members, Class method definition, defining a derived and base class, Accessing the base class member, Virtual base class and Abstract class. Functions: prototype, function call, passing parameters, Member functions, Inline member function, making an outside function inline, Default arguments and objects as function argument, Memory allocation of objects, Dynamic Memory Allocation with New and Delete operators, Static data member and member function. Array, pointers, passing array of objects to function, this pointer.

UNIT III

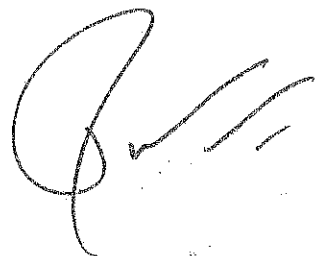
Function overloading, Declaring and defining overloaded functions, calling overloaded functions, Friend functions, Characteristics of friend functions, Forward declaration of class, Friend function's arguments passed by reference. Operator overloading and Restrictions, Operator Functions as Class Members and as Friend Functions, Overloading of Unary and Binary Operators.

UNIT IV

Characteristics of Constructors and Destructors, Default constructor, Parameterized constructor – passing initial values as arguments, Constructors with default arguments, Copy constructor, Constructor overloading, Inheritance: multilevel, multiple, hierarchical, hybrid, Overview of virtual functions, polymorphism and categorization, brief overview of concept of File handling, file classes and modes, Manipulation of file pointers.

Suggested Readings:

1. Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley.
2. Herbert Schildt, "C++ The Complete Reference", McGraw Hill.
3. K.R.Venugopal: Mastering C++
4. Robert Lafore, "Object Oriented Programming in C++", Pearson.
5. E. Balagursamy, "Object Oriented Programming using C++", Tata McGraw Hill.
6. D. Ravichandran, "Programming with C++", Tata McGraw Hill.
7. Bruce Eckel, "Thinking in C++", President. Mindview Inc., Prentice Hall.
8. Y. P. Kanetkar, Programming in C++, BPB Publications.



CA (Arts and Science) - FIFTH SEMESTER

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

Course Title: OOPs Using C++
Course Code: UMICATS01
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 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 consists 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 consists 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

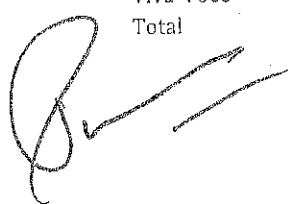
15 Marks

Pattern for external practical examination

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

Pattern for external tutorial examination

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



CA (Arts and Science) –FIFTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-1-0)
Total Marks: 100

Course Title: Web Technologies
Course Code: UMJCAT502
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 2024, 2025 and 2026

Course objectives & learning outcomes

1. To be able to create a static webpage.
2. Be acquainted with HTML basic tags, frames, lists, table, etc.
3. To create a webpage using cascading style sheets and HTML.
4. To be able to validate web pages with the help of Javascript.

Unit I

Introduction to HTML: HTML structure, elements, attributes, headings, paragraphs, styles, HTML formatting, Quotations, Comments, images, tables, lists, blocks and classes, HTML CSS, HTML frames, file paths, layout, symbols, HTML responsive.

Unit II

HTML form elements, input types, input attributes, HTML5, HTML graphics, HTML media – video, audio, plug ins, youtube. HTML API'S : Geolocation, Drag/drop, local storage, HTML SSE.

Unit III

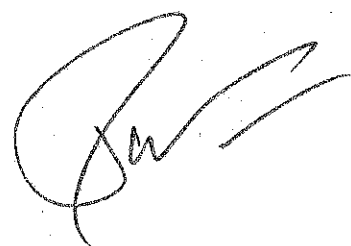
Cascading Style Sheet (CSS): CSS home, introduction, syntax, colours, back ground, borders, margins, padding, height/width, text, fonts, icons, tables, lists, position, over flow, float, CSS combinators, pseudo class, pseudo elements, opacity, tool tips, image gallery, CSS forms, CSS

Unit IV

What is dynamic html, Java Script, Javascript—The basics, Variables, String manipulation, Mathematical functions, Statements, Operators, Arrays, Functions. Objects in Java Script: Data and objects in JavaScript, Regular expressions, Exception Handling, Built in objects, Events. Dynamic HTML with Java Script: Data validation, Opening a new window, Messages and Confirmations, The status bar, Writing to a different frame, Rollover buttons, Moving images, Multiple pages in a single download, A text-only menu system, Floating logos.

Suggested Readings:

1. Steven Holzner, "HTML Black Book", Dremtech press.
2. Web Technologies, Black Book, Dreamtech Press
3. Web Applications: Concepts and Real World Design, Knuckles, Wiley-India
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearso
5. Chris Bates, Web Programming Building Internet Applications, Second Edition, Wiley (2007)



CA (Arts and Science) - FIFTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-1-0)
Total Marks: 100

Course Title: Web Technologies
Course Code: UMJCAT502
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 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 consists 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 consists 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

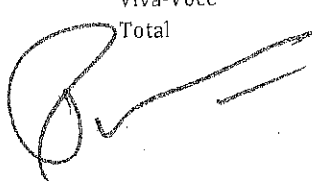
15 Marks

Pattern for external practical examination

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

Pattern for external tutorial examination

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



CA (Arts and Science) - FIFTH SEMESTER

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

Course Title: Computer Graphics
Course Code: UMICAT503
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Tutorial: 25 Marks

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

Course objectives & learning outcomes:

1. To Introduce various Graphics Applications in real world scenario
2. To be familiar with image fundamentals and animations
3. To be learn more about 2D, 3D and Curve applications
4. Applying efficient graphics technique to solve engineering problems

Unit-I

Introduction to Computer Graphics: Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays, Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video Basics, The Video Controller, Random-Scan Display Processor, LCD displays.

Unit-II

Scan conversion: Digital Differential Analyzer (DDA) algorithm, Bresenham's Line drawing algorithm, Bresenham's method of Circle drawing, Midpoint Circle Algorithm, Midpoint Ellipse Algorithm, Mid-point criteria, Problems of Aliasing, end-point ordering and clipping lines, Scan Converting Circles, Clipping Lines algorithms- Cyrus-Beck, Cohen-Sutherland and Liang-Barsky, Clipping Polygons, problem with multiple components.

Unit-III

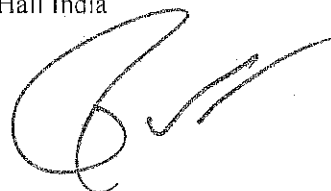
Two-Dimensional Transformations: Transformations and Matrices, Transformation Conventions, 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Translations and Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined Transformation, Transformation of Points, Transformation of The Unit Square, Solid Body Transformations, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, The Window-to-Viewport Transformations.

Unit-IV

Three-Dimensional Transformations: Three-Dimensional Scaling, Three-Dimensional Shearing, Three-Dimensional Rotation, Three-Dimensional Reflection, Three-Dimensional Translation, Multiple Transformation, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections, Oblique Projections, View volumes for projections.

Suggested Readings:

1. Computer Graphics: principals and practice Foley, vanDam, Feiner Hughes Addison Wesley
2. Mathematical Elements of Graphics Roges Tata McGrow Hill
3. Computer Graphics Donald Hearn and M.Pauline Baker Prentice Hall India
4. Procedural Elements-Computer Graphics, David Rogers, TMH
5. Principals of Computer graphics, Shalini Govil-pal, springer



CA (Arts and Science) - FIFTH SEMESTER

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

Course Title: Computer Graphics
Course Code: UMJCAT503
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Tutorial: 25 Marks

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

NOTE FOR PAPER SETTERS FOR EXAMINATIONS -

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Section A shall consists 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 consists 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

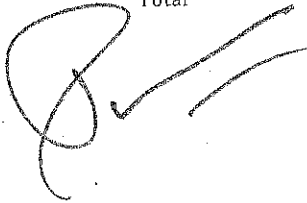
15 Marks

Pattern for external practical examination

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

Pattern for external tutorial examination

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



CA (Arts and Science) - FIFTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(2-0-0)
Total marks: 50

Course Title: E-Commerce
Course Code: UMICAT504
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 2024, 2025 and 2026

Course objectives & learning outcomes:

1. Mechanism of business transactions through electronic media.
2. Payment transactions in a secured network.
3. Different modes of E-Commerce like Electronic data interchange.

UNIT I

E-commerce- meaning and importance - E commerce vs Traditional commerce - components of e-commerce - Illustration of e commerce transaction - Business model of e-commerce - B2B-B2C-C2C-B2G-C2B-B2GG2B-G2C - E-commerce organizations - Brick and mortar - Click and mortar - Pure play organizations- Benefits of E commerce to sellers, consumers and society - Technological and non-technological limitations of e-commerce - E-Business - Digital economy - Digital goods and services.

UNIT II

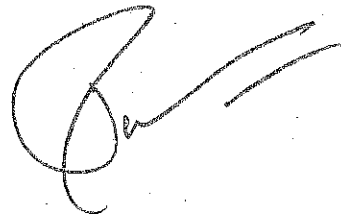
E Marketing: Meaning - nature - importance - traditional marketing vs e-marketing - types of e-marketing - limitations - Marketing strategies for e-commerce - Content marketing - meaning - features - Types of content marketing channels - website - email marketing - search engine optimization - Social media marketing - Digital advertising - Mobile marketing - Content repurposing - Advertising for ecommerce - Internet advertising - Models of internet advertising - Weakness of internet advertising.

UNIT III

Electronic payment/digital payments - Meaning – Requirements - Offline payment system vs Online payment system - Types of electronic payments - Prepaid and postpaid system - Credit card - Debit card- Smart card- EFT- EWallets - E-cash - Properties of e-cash - E-Cheque - advantages of e-cheques - E purse - Electronic tokens - Digital coins - UPI transactions, Security issues in electronic payment system.

Suggested Readings:

1. Kamlesh K. Bajaj. *E-Commerce- the cutting Edge of Business*. Tata McGraw Hill Education.
2. Vandana Ahuja. *Digital marketing*. Oxford university press.
3. Danies Armor. *The E-Business*. Prentice hall.
4. Samantha Shjurety. *E-Business via Net commerce*. Prentice hall.



CA (Arts and Science) - FIFTH SEMESTER

Course: Major
Course Credits: (L-P-T)
(2-0-0)
Total marks: 50

Course Title: E-Commerce
Course Code: UMICAT504
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 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 2.5 Marks.

(4 x 2.5 = 10 marks)

Section B shall consist Eight (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.

(3 x 10 = 30 marks)

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



CA (Arts and Science) - FIFTH SEMESTER

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

Course Title: OOPs Using C++
Course Code: UMICAT505
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 2024, 2025 and 2026

Course objectives & learning outcomes:

1. To learn the fundamentals of object-oriented programming language.
2. To understand the concept of overloading, constructors, destructors etc.
3. To understand the concept of file handling.

Unit I

Procedure Oriented Programming and Object-Oriented Programming, Need and evolution of OOP, C and C++, Applications and benefits of OOPs, C++ compilation, Overview of Abstraction, Encapsulation, Inheritance, Polymorphism. Variables, datatypes, Reference Variables. Class, Visibility modes. Decision and control structures: if statement, if-else statement, switch case statement, while, do-while, for, break, continue, go to statements.

Unit II

Operators, Scope resolution operator, Precedence and associativity of operators, Manipulators. Class and object declaration, accessing class members, Class method definition, Defining a derived and base class, Accessing the base class member, Virtual base class and Abstract class. Functions: prototype, function call, passing parameters, Member functions, Inline member function, making an outside function inline, Default arguments and objects as function argument, Memory allocation of objects, Dynamic Memory Allocation with New and Delete operators, Static data member and member function. Array, pointers, passing array of objects to function, this pointer.

UNIT III

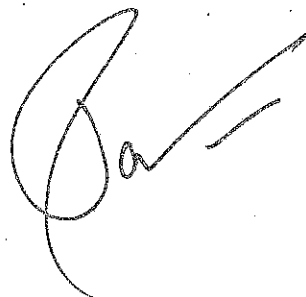
Function overloading, Declaring and defining overloaded functions, calling overloaded functions, Friend functions, Characteristics of friend functions, Forward declaration of class, Friend function's arguments passed by reference. Operator overloading and Restrictions, Operator Functions as Class Members and as Friend Functions, Overloading of Unary and Binary Operators.

UNIT IV

Characteristics of Constructors and Destructors, Default constructor, Parameterized constructor – passing initial values as arguments, Constructors with default arguments, Copy constructor, Constructor overloading, Inheritance: multilevel, multiple, hierarchical, hybrid, Overview of virtual functions, polymorphism and categorization, brief overview of concept of File handling, file classes and modes, Manipulation of file pointers.

Suggested Readings:

1. Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley.
2. Herbert Schildt, "C++ The Complete Reference", McGraw Hill.
3. K.R.Venugopal: Mastering C++
4. Robert Lafore, "Object Oriented Programming in C++", Pearson.
5. E. Balagursamy, "Object Oriented Programming using C ++", Tata McGraw Hill.
6. D. Ravichandran, "Programming with C++", Tata McGraw Hill.
7. Bruce Eckel, "Thinking in C++", President, Mindview Inc., Prentice Hall.
8. Y. P. Kanetkar, Programming in C++, BPB Publications.



CA (Arts and Science) - FIFTH SEMESTER

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

Course Title: OOPs Using C++
Course Code: UMICAT505
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 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 consists 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 consists 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	15Marks

Pattern for external tutorial examination

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



CA (Arts and Science) - FIFTH SEMESTER

Course: Skill Enhancement Course
Course Credits: (0-2-0)
Total marks: 50

Course Title: Summer Internship
Course Code: USECA1506
End Semester assessment: 50 Marks

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

It shall be a short-term internship of 15 days duration for a job/professional training in a suitable organization or hands on training or activity-based course at college level in order to gain work experience.

All students will undergo internships/ Apprenticeships in a firm, industry, or organization or Training in labs with faculty and researchers in their own or other HEIs/research institutions during the summer term. Students will be provided with opportunities for internships with local industry, business organizations, health and allied areas, local governments (such as panchayats, municipalities). Parliament or elected representatives, media organizations, artists, crafts persons, and a wide variety of organizations so that students may actively engage with the practical side of their learning and, as a by-product, further improve their employability.

Community engagement and service: The curricular component of 'community engagement and service' seeks to expose students to the socio-economic issues in society so that the theoretical learning can be supplemented by actual life experiences to generate solutions to real-life problems. This can be part of summer term activity.

Field-based learning/minor project: The field-based learning/minor project will attempt to provide opportunities for students to understand the different socio-economic contexts. It will aim at giving students exposure to development-related issues in rural and urban settings. It will provide opportunities for students to observe situations in rural and urban contexts, and to observe and study actual field situations regarding issues related to socioeconomic development. Students will be given opportunities to gain a first-hand understanding of the policies, regulations, organizational structures, processes, and programmes that guide the development process. They would have the opportunity to gain an understanding of the complex socio-economic problems in the community, and innovation practices required to generate solutions to the identified problems. This may be a summer term project.

SCHEME OF EXAMINATIONS –

The internship shall be under a college teacher who will be designated as Internship Supervisor. After completion of summer internship, students will have to produce a report related to the work carried out along with a course completion certificate from the concerned organization/industry/ institute. The internship shall be evaluated internally based on presentation and viva-voce by Board of Examiners nominated by the principal of the college.



CA (Arts and Science) - SIXTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-1-0)
Total Marks: 100

Course Title: DBMS
Course Code: UMJCAT601
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Practical 25 Marks

For examinations to be held in May 2025, 2026 and 2027

Course objectives & learning outcomes:

- 1 To learn how to store, define and manage data in a data base.
- 2 To enhance data security and privacy, constructors, destructors etc.
- 3 To understand the concept of File handling.

UNIT 1

Traditional file-based system, Need of Database Management System, Definition and functions of a database, Types of databases, Database Architecture; Three-tier architecture, Database models (Hierarchical, Network, Relational), Schemas and Instances, RDBMS; Relational model concepts, Entity relationship model, SQL (Structured Query Language).

UNIT 2

Normalization; Concept of keys, Functional dependencies, First, Second, Third Normal Forms, BCNF, ER Model; ER diagrams, Entity, attribute, relationship, Database Design; Functional dependencies, designing databases using normalization techniques, Transaction Management; ACID properties, Transaction states and their recovery.

UNIT 3

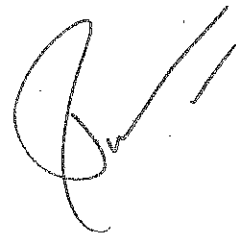
Concurrency Control; Transaction processing, Deadlocks, Locking mechanisms, Two-phase locking protocol, Database Security; Authorization and authentication, Encryption and access control, Database Connectivity; ODBC (Open Database Connectivity); JDBC (Java Database Connectivity).

UNIT 4

Distributed Databases; Concepts and architectures, Data fragmentation, replication, and allocation, Object-Oriented Database Management System (OODBMS); Concepts and features, Comparison with RDBMS, Data Warehousing and Data Mining; Concepts and applications, Recent Trends; NoSQL databases, Big Data and its impact on databases.

Suggested readings/ References:

1. Bipin C. Desai, "An Introduction to Database Systems", West-publishing company.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Education,
3. Date, C. J., "An Introduction to Database Systems", Addison Wesley Pearson Education.
4. Narayan S. Umanath, Richard W. Scamell, "Data Modelling and Database Design", Thomson Course Technology India Edition



CA (Arts and Science) – SIXTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-1-0)
Total Marks: 100

Course Title: DBMS
Course Code: UMJCAT601
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Practical 25 Marks

For examinations to be held in May 2025, 2026 and 2027

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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)

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(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

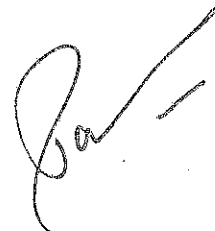
15 Marks

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



CA (Arts and Science) - SIXTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-1-0)
Total Marks: 100

Course Title: PHP
Course Code: UMJCAT602
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Practical 25 Marks

For examinations to be held in May 2025, 2026 and 2027

Course objectives & learning outcomes:

1. To impart basic knowledge of PHP.
2. To equip with programming skills in PHP.
3. To gain knowledge of MySQL.

Unit 1 Introduction to PHP, features of PHP, syntax of PHP, structure of PHP program, variables, statement, comments, output statements, PHP operators, conditional operator, data types, expressions, if statement, if-else statement, switch statements, loop: for loop, while loop, break statement, nesting of loops.
(15 Hours)

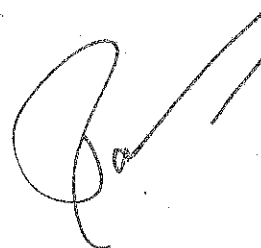
Unit 2 Arrays and its types; string, string functions, manipulating and searching strings; PHP functions, user defined function, calling function, passing parameter to function, returning value from function; variable scope.
(15 Hours)

Unit 3 Object Oriented Programming using PHP. Embedding PHP in HTML pages; PHP form, Passing information between pages, \$_GET, \$_POST, \$_REQUEST; working with files, opening and closing files, file uploading and downloading; include and require keywords, creating and destroying user Sessions, cookie management, error handling in PHP.
(15 Hours)

Unit 4 Introduction to MySQL, PHP functions for MySQL connectivity and operation- MySQL connect, mysql_select_db, mysql_query, mysql_fetch_rowetc; database operations SELECT, INSERT, DELETE, UPDATE using php; displaying data from MySQL in webpage.
(15 Hours)

Suggested Readings/References:

1. Dave W Mercer, Allan Kent, Steven D Nowicki, David Mercer, Dan Squier, Wankyu Choi "Beginning PHP", Wiley Publishing, Inc
2. Ivan Bayross – "HTML, DHTML, JavaScript, Pearl & CGI", Fourth Revised Edition, BPB Publication.
3. "Programming PHP", Rasmus Lerdorf and Kevin Tatore, Shroff Publishers & Distributors Pvt. Ltd
4. "Beginning PHP", Dave W Mercer, Allan Kent, Steven D Nowicki, David Mercer, Dan Squier, Wankyu Choi, Wiley Publishing, Inc



CA (Arts and Science) – SIXTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-1-0)
Total Marks: 100

Course Title: PHP
Course Code: UMJCAT602
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Practical 25 Marks

For examinations to be held in May 2025, 2026 and 2027

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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

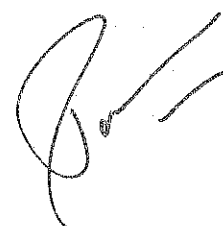
15 Marks

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



CA (Arts and Science) - SIXTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-0-1)

Total Marks: 100

Course Title: FOSS

Course Code: UMJCAT603

Mid Semester assessment: 15 Marks of 1.5 hours duration

End Semester assessment: 60 Marks of 3 hours duration

Tutorial: 25 Marks

For examinations to be held in May 2025, 2026 and 2027

Course objectives & learning outcomes:

1. To study Open Source and its related technologies.
2. To study open source licensing, copyright, patent and many more.
3. To work on some FOSS projects.

UNIT 1

Introduction: Open Source Software, Free Software, Proprietary Software, Public Domain Software. Free Software vs. Open Source Software, Free Software Comparison with proprietary Software: advantages and limitations. Proprietary Vs Open-Source Licensing Model, The Free Software Foundation and the GNU Project.

UNIT 2

Basic principles of copyright law, open source licensing, issues with copyright and patent, warranty, MIT license, BSD License, Apache license, Academic Free License, Mozilla Public License, GPL, LGPL.

UNIT 3

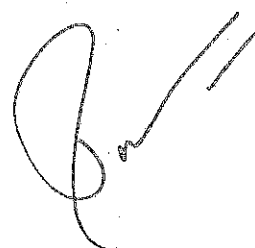
Analyzing Key Free and Open Source Software (FOSS) Projects: Apache Web Server, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, WordPress, GCC, GDB, GitHub, OpenOffice. Exploring Their Developmental Models, Licensing Approaches, Funding Mechanisms, and Their Use in Commercial and Non-Commercial Contexts.

UNIT 4

Open Source Operating Systems: Linux, Android, Open Solaris. Open Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, debuggers, Programming languages, LAMP, Open Source database technologies.

Suggested Readings/ References:

1. Kailash Vadera, Bhavyesh Gandhi, "Open Source Technology", Laxmi Publications Pvt Ltd
2. Fadi P. Deek and James A. M. McHugh, "Open Source: Technology and Policy", Cambridge Universities Press.



CA (Arts and Science) – SIXTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: FOSS
Course Code: UMJCAT603
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Tutorial: 25 Marks

For examinations to be held in May 2025, 2026 and 2027

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(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

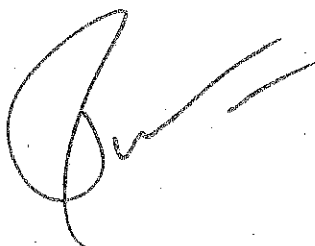
15 Marks

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



CA (Arts and Science) - SIXTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: Internet of Things
Course Code: UMJCAT604
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Tutorial: 25 Marks

For examinations to be held in May 2025, 2026 and 2027

Course objectives & learning outcomes:

1. To introduce the terminology, technology and IoT applications
2. To introduce the concept of IoT with necessary protocols.
3. To introduce Arduino and Raspberry Pi platform, that is widely used in IoT applications

UNIT 1

Definition, Characteristics, Advantages, Disadvantages and Application of IoT. M2M vs IoT . Overview of IoT components and Communication Technologies. IOT Architecture: stages and components. IoT Hardware Devices. Various Platforms for IoT

UNIT 2

IoT data protocols: Message Queuing Telemetry Transport(MQTT), Advanced Message Queuing Protocol, Data Distribution Service, Constrained Application Protocol (CoAP), Extensible Messaging and Presence Protocol(XMPP). IoT Network Protocols: wireless Body Area Networks(WBAN), Wireless Personal Area Networks(WPAN), Wireless Local Area Network(WLAN), Wireless Metropolitan Area Networks(WMANs), Wireless Wide Area Network(WWAN). LoRaWAN and 6LoWPAN.

UNIT 3

Sensors Actuators, Physical Design of IoT. Existing IoT platforms /middleware, IoT- A Hydra architecture. IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT 4

Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C). Interfacing LED, push button and buzzer with Arduino, Interfacing Arduino with LCD. Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino, Interfacing of Actuators with Arduino.

Suggested Readings:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, Editors Ovidiu Vermesan
2. Peter Friess, 'Internet of Things – From Research and Innovation to Market Deployment', River
3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers.
4. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press.

CA (Arts and Science) – SIXTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: Internet of Things
Course Code: UMJCAT604
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Tutorial: 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

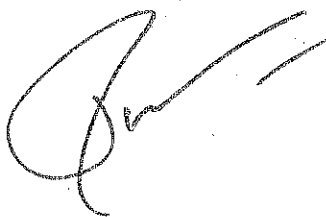
15 Marks

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



CA (Arts and Science) - SIXTH SEMESTER

Course: Minor
Course Credit: (L-P-T)
(3-1-0)
Total Marks: 100

Course Title: DBMS
Course Code: UMICAT605
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Practical: 25 Marks

For examinations to be held in May 2025, 2026 and 2027

Course objectives & learning outcomes:

- 1 To learn how to store, define and manage data in a data base.
- 2 To enhance data security and privacy, constructors, destructors etc.
- 3 To understand the concept of File handling.

UNIT 1

Traditional file-based system, Need of Database Management System, Definition and functions of a database, Types of databases, Database Architecture; Three-tier architecture, Database models (Hierarchical, Network, Relational), Schemas and Instances, RDBMS; Relational model concepts, Entity relationship model, SQL (Structured Query Language).

UNIT 2

Normalization; Concept of keys, Functional dependencies, First, Second, Third Normal Forms, BCNF, ER Model; ER diagrams, Entity, attribute, relationship, Database Design; Functional dependencies, designing databases using normalization techniques, Transaction Management; ACID properties, Transaction states and their recovery.

UNIT 3

Concurrency Control; Transaction processing, Deadlocks, Locking mechanisms, Two-phase locking protocol, Database Security; Authorization and authentication, Encryption and access control, Database Connectivity; ODBC (Open Database Connectivity), JDBC (Java Database Connectivity).

UNIT 4

Distributed Databases; Concepts and architectures, Data fragmentation, replication, and allocation, Object-Oriented Database Management System (OODBMS); Concepts and features, Comparison with RDBMS, Data Warehousing and Data Mining; Concepts and applications, Recent Trends; NoSQL databases, Big Data and its impact on databases.

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3. Date, C. J., "An Introduction to Database Systems", Addison Wesley Pearson Education.
4. Narayan S. Umanath, Richard W. Scamell, "Data Modelling and Database Design", Thomson Course Technology India Edition

CA (Arts and Science) – SIXTH SEMESTER

Course: Minor
Course Credit: (L-P-T)
(3-1-0)
Total Marks: 100

Course Title: DBMS
Course Code: UMICAT605
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Practical: 25 Marks

For examinations to be held in May 2025, 2026 and 2027.

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Practical/ tutorial Evaluation

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

10 marks

Final Examination

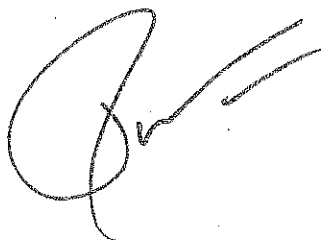
15 Marks

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



CA (Arts and Science) - SEVENTH SEMESTER

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

Course Title: Machine Learning
Course Code: UMJCAT701
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Tutorial: 25 Marks

For examinations to be held in Dec 2025, 2026 and 2027

Course objectives & learning outcomes:

1. To understand the concepts of Machine Learning.
2. Understanding the real-world applications of classification.
3. To understand complexity of Machine Learning algorithms and their limitations.
4. Analyzing various machine learning algorithms.

Unit 1

Machine Learning, Types of Machine Learning, Supervised learning, Unsupervised learning, Reinforcement learning, Comparison-supervised, unsupervised, and reinforcement learning, Applications of Machine Learning, Various tools/software's used in Machine Learning, limitation of machine learning.

Unit 2

Basic Types of Data in Machine Learning, Qualitative data, Quantitative data, Data pre-processing, need of data pre-processing, Various steps involved in data pre-processing, Data Cleaning, Data Integration, Data Transformation, Data Reduction, Identifying and handling the missing values, Handling Outliers, Splitting the dataset; Feature selection vs Feature reduction.

Unit 3

Supervised learning, Application of Supervised learning, Advantages and Disadvantages of supervised learning, Classification, Regression, Supervised learning algorithms: Linear Regression, Logistic Regression, Decision Trees, Random Forests, Support Vector Machines (SVM), Naive Bayes Classifier, K-Nearest Neighbours (KNN).

Unit 4

Unsupervised learning, Supervised learning vs Unsupervised learning, Application of Unsupervised Learning, Advantages and Disadvantages of supervised learning, Clustering, Association, Unsupervised learning algorithms: Hierarchical clustering, K-means clustering, Principal Component Analysis, Apriori Algorithm, Reinforcement learning, Application of Reinforcement learning

Suggested readings/ references:

1. Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Pearson.
2. Machine Learning, S Sridhar (Author), M Vijayalakshmi (Author), Oxford University Press
3. Machine Learning, I. A. Dhotre, Technical Publications, Pune

CA (Arts and Science) – SEVENTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: Machine Learning
Course Code: UMJCAT701
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment 60 Marks of 3 hours duration
Tutorial: 25 Marks

For examinations to be held in Dec 2025, 2026 and 2027

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(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

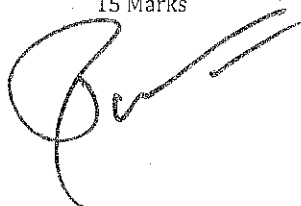
15 Marks

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



CA (Arts and Science) - SEVENTH SEMESTER

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

Course Title: Research Methodology and Research Ethics
Course Code: UMJCAT702
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Tutorial: 25 Marks

For examinations to be held in Dec 2025, 2026 and 2027

Course objectives & learning outcomes:

1. To acquaint and enhance the knowledge of research methodology and ethics.
2. To provide insights as to how research is conducted.
3. Develop the ability to design robust research studies, including selecting appropriate methodologies, sampling techniques, and data collection methods.

Unit-1

Introduction to Research: The concept of research, characteristics of good research, Application of Research, Meaning and sources of Research problem, characteristics of good Research problem, Research process, outcomes, Meaning and types of Research hypothesis, Importance of Review of Literature, Organizing the Review of Literature. Types of Research: Types of research, pure (basic, fundamental) and applied research, qualitative and quantitative.

15 Hrs

Unit-2

Research Design: Meaning, need, types of research design – Exploratory, Descriptive, Casual research Design, Components of research design, and Features of good Research design. Experiments, surveys and case study Research design. Qualitative and Quantitative Research. Sampling, Data Collection and analysis: Types and sources of data – Primary and secondary, Methods of collecting data, Concept of sampling and sampling methods – sampling frame, sample, characteristics of good sample, simple random sampling, purposive sampling, convenience sampling, snowball sampling

15 Hrs

Unit-3

Classification and tabulation of data, graphical representation of data, graphs and charts – Histograms, frequency polygon and frequency curves, bell shaped curve and its properties. Statistical Methods for Data Analysis: Applications of Statistics in Research, measures of central tendency and dispersion. Data Analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages).

15 Hrs

Unit-4

Overview of Research Ethics, Definition and importance of research ethics. Ethical Principles in Research, Principles like beneficence, justice, and respect for persons. Ethics in Data Collection and Analysis Informed consent, confidentiality, and privacy. Ethical Publication and Communication Issues of plagiarism, data fabrication, and falsification. Qualities of good researcher.

15 Hrs

Suggested readings/ references:

1. Donald Cooper and PS Schindler (2009) Business Research Methods, 9th edition, Tata McGraw Hill.
2. Kothari C. R Research Methodology
3. Uma Sekaran (2010) Research Methods for Business, 4th edition, Wiley.
4. Ranjit Kumar (2009) Research Methodology, 2nd edition, Pearson Education

CA (Arts and Science) – SEVENTH SEMESTER

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

Course Title: Research Methodology and Research Ethics
Course Code: UMJCAT702
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3.0 hours duration
Tutorial: 25 Marks

For examinations to be held in Dec 2025, 2026 and 2027

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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

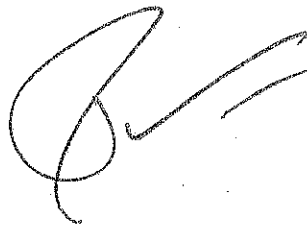
15 Marks

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



CA (Arts and Science) – SEVENTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-1-0)
Total Marks: 100

Course Title: Python Programming
Course Code: UMJCAT703
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2025, 2026 and 2027

Course objectives & learning outcomes

1. To learn the fundamentals of Python programming.
2. To understand the concept and execute a Python program.
3. To learn about their data structures.

Unit 1

Introduction to python, Features of Python, How to Run, Identifiers, Keywords, Variables, simple I/O, Operators-Arithmetic, Relational, Assignment, Logical, Bitwise, Membership and Identity Operators.

Data Types - Numbers: Mathematical Functions, Trigonometric Functions, Random Number Functions, **String:** Escape Characters, String Formatting Operator, String Formatting Functions, **Lists:** Built in list functions, Built in list Methods, Tuple, Dictionary, Data Conversion.

Unit 2

Python Program Flow and Functions Decision Making: if statement, if.... else statement, if.... elif... else statement, Nested if statement, Loops: for Loop and While Loop, Nested Loops, Types of LoopsControl Statement: break, continue and pass.

Functions – Definition, Functions calling, Function Parameters, Function Arguments, Lambda Functions, Recursive Functions, Function returning more than one value.

Unit 3

Modules- Creating Modules, Variables in Module, built in Module, import Statement: import with renaming, import From Module, dir(), reload() function.

File Handling – File Methods, open, write, read, close, File seek(), rename a file, delete a file, copy a file, move a file.

Unit 4

Classes- Create a class, Create a Object, Modify Object Properties, delete Object Properties, init(),_str(), Object Methods, Self-parameter, pass statement.

Suggested Readings/References:

1. Jeeva Jose, "Taming Python by Programming", Khanna Publishers, New Delhi.
2. Core Python Programming by Wesley J. Chun, 2nd Edition, Person Education
3. Programming in Python 3 by Mark Summerfield, Pearson Education

CA (Arts and Science) – SEVENTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-1-0)
Total Marks: 100

Course Title: Python Programming
Course Code: UMJCAT703
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2025, 2026 and 2027

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(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

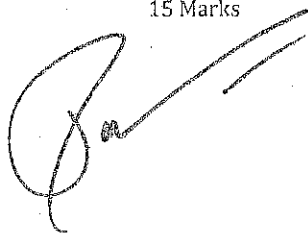
15 Marks

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



CA (Arts and Science) – SEVENTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: System Analysis and Design
Course Code: UMJCAT704
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Tutorial: 25 Marks

For examinations to be held in Dec 2025, 2026 and 2027

Course objectives & learning outcomes:

1. To have a basic understanding of a System.
2. To understand the detailed steps for developing and planning a system.
3. To learn to work on an open-source Operating System through command mode.

UNIT1

Basic Concept of a system - Definition of a system, Elements of a System- Input, Processing, Output, Control, Feedback, Environment, Boundaries and Interface; Characteristics of a System; Types of systems -Physical and Abstract System, Open and Closed Systems, Man-made Systems; Information and its categories. Information System and System Analyst Information systems - TPS, OAS, MIS, DSS, ESS; Role and need of System Analyst.

UNIT2

System Development Life Cycle, Various phases of SDLC- study, analysis, design, development, testing, implementation, maintenance; System documentation, Types of documentation and their importance. System Planning and Information Gathering, Determination of requirements, Information gathering tools- Interviews, group communication, questionnaires, presentations and site visits.

UNIT3

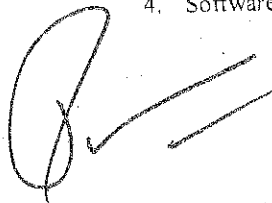
Feasibility Study and its importance, Types of feasibility study, Prototyping, Cost-Benefit Analysis and its Steps, Advantages and Limitations of Cost Benefit analysis, Tools for System Analysis -Data Flow Diagram (DFD), Logical and Physical DFDs, Developing DFD, System Flowcharts and Structured charts, Decision trees and Decision tables.

UNIT4

System Design Module specifications, Module Coupling and Cohesion, Top-down and bottom-up design; Logical and Physical design, Structured design, Input and Output design, System Implementation and Maintenance, Need of System Testing, Types of System Testing, Quality Assurance, System evaluation and performance, Maintenance activities and issues., System Security, Security Threats, Risk Analysis,

Suggested Readings/References:

1. Software Engineering by Roger S. Pressman - Tata McGraw Hill.
2. An Integrated approach to Software Engineering by P.Jalote -PHI.
3. Software Project Management by S. Kelkar -PHI.
4. Software Project Management by Bob Hughes and Mike Cotterell -Tata McGraw Hill.



CA (Arts and Science) – SEVENTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: System Analysis and Design
Course Code: UMJCA704
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Tutorial: 25 Marks

For examinations to be held in Dec 2025, 2026 and 2027

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(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



CA (Arts and Science) – SEVENTH SEMESTER

Course: Minor
Course Credit: (L-P-T)
(3-1-0)
Total Marks: 100

Course Title: Python Programming
Course Code: UMICAT705
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2025, 2026 and 2027

Course objectives & learning outcomes

1. To learn the fundamentals of Python programming.
2. To understand the concept and execute a Python program.
3. To learn about their data structures.

Unit 1

Introduction to python, Features of Python, How to Run, Identifiers, Keywords, Variables, simple I/O, Operators-Arithmetic, Relational, Assignment, Logical, Bitwise, Membership and Identity Operators.

Data Types - Numbers: Mathematical Functions, Trigonometric Functions, Random Number Functions, **String:** Escape Characters, String Formatting Operator, String Formatting Functions, **Lists:** Built in list functions, Built in list Methods, Tuple, Dictionary, Data Conversion.

Unit 2

Python Program Flow and Functions Decision Making: if statement, if... else statement, if... elif... else statement, Nested if statement, Loops: for Loop and While Loop, Nested Loops, Types of Loops Control Statement: break, continue and pass.

Functions – Definition, Functions calling, Function Parameters, Function Arguments, Lambda Functions, Recursive Functions, Function returning more than one value.

Unit 3

Modules- Creating Modules, Variables in Module, built in Module, import Statement: import with renaming, import From Module, dir(), reload() function.

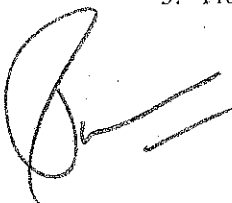
File Handling – File Methods, open, write, read, close, File seek(), rename a file, delete a file, copy a file, move a file.

Unit 4

Classes- Create a class, Create a Object, Modify Object Properties, delete Object Properties, init(),str(), Object Methods, Self-parameter, pass statement.

Suggested Readings/References:

1. Jeeva Jose, "Taming Python by Programming", Khanna Publishers, New Delhi.
2. Core Python Programming by Wesley J. Chun, 2nd Edition, Person Education
3. Programming in Python 3 by Mark Summerfield, Pearson Education



CA (Arts and Science) – SEVENTH SEMESTER

Course: Minor
Course Credit: (L-P-T)
(3-1-0)
Total Marks: 100

Course Title: Python Programming
Course Code: UMICAT705
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Practical: 25 Marks

For examinations to be held in Dec 2025, 2026 and 2027

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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

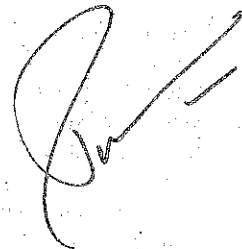
Final Examination 15 Marks

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



CA (Arts and Science) – EIGHTH SEMESTER

Course: Major
Course Credits : (L-P-T)
(0-12-0)
Total marks: 300

Course Title: Project Work
Course Code: UMICAP861
Project Evaluation: 200 Marks
Viva/Presentation: 100 Marks

For examinations to be held in May 2026, 2027 and 2028

To provide the hands on experience in analyzing, designing and implementing various projects, students will be assigned major projects based on the languages they have learned. The project work would be carried out in the department under the guidance of a faculty member. The project work will be assigned to the individual students or group of students in case of bigger project with prior permission of the faculty member of the department. The student is required to submit the certification of successful completion of project from the guide mentioning the total number of hours worked per week and conduct during the project period.

Based on the project work a formal project report should be prepared under the guidance of faculty and submitted to department for evaluation. The Project work shall be evaluated by Board of Examiners nominated by the principal of the college. Examiners will conduct the viva-voce; examine the presentation, project report and demonstration of the project.

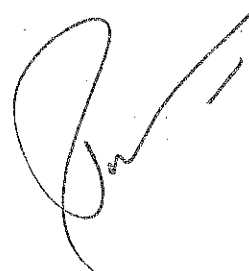
Project Work = 12 credits (300 marks)
Project Evaluation = 08 credits (200 marks)
Viva/ Presentation = 04 credits (100 marks)

Guidelines:

1. The project proposal should be prepared in consultation with the guide. The project proposal should clearly state the project objectives and the environment of the proposed project to be undertaken. As far as possible, the Project should be on a real life problem.
2. The project work should compulsorily include the software development.
3. Synopsis of the project would be submitted to the department depicting the title of the project, DFDs, brief description of project etc.
4. Project proposal to be scrutinized by the Faculty of the Department and the progress of the project work should be continuously monitored by concerned guide.
5. Student is required to work in the Computer Lab. on the project sanctioned.
6. The project report must be submitted in accordance with the prescribed format. Project report would be submitted to the Department before the prescribed date.
7. Students have to make presentations of project work during evaluation. The student shall demonstrate working of the software.

Proforma for the Project Report

1. Title of the Project
2. Objectives
3. System Analysis and Design
4. Input to the Project
5. Output generated
6. Details of Hardware Platform used and Software Tools used
7. Implementation Issues (Clearly defining the area of Application).
8. Miscellaneous
9. Future scope and further enhancement of the Project
10. Bibliography



CA (Arts and Science) – EIGHTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: Fundamentals of Cloud Computing
Course Code: UMJCAT802
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Tutorial: 25 Marks

For examinations to be held in May 2026, 2027 and 2028

Course objectives & learning outcomes

1. Knowledge of the fundamental concepts and principles of cloud computing including virtualization, scalability, reliability and security.
2. Ability to design, develop and deploy cloud based applications using popular clouds and services.
3. Understanding of the broader societal and environmental impacts of cloud based services and

UNIT – I

Cloud Computing fundamentals: History of Cloud Computing, Cloud Storage, Why Cloud Computing Matters, Advantages of Cloud Computing – Disadvantages of Cloud Computing – Cloud Services, Architectural Influences, Technological Influences, and Operational Influences.

UNIT – II

Cloud Computing Architecture: Cloud Delivery models, The SPI Framework, Cloud Software as a Service (SaaS), Cloud Platform as a Service (PaaS), Cloud Infrastructure as a Service (IaaS), Cloud deployment models, Public Clouds, Community Clouds, Hybrid Clouds, Alternative Deployment models, Expected benefits.

UNIT – III

Cloud Computing Software Security fundamentals: Cloud Information Security Objectives, Confidentiality, Integrity, Availability, Cloud Security Services, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements, Secure Development practices, Approaches to Cloud Software Requirement Engineering, Cloud Security Policy Implementation.

UNIT – IV

Cloud Computing Risk Issues: The CIA Triad, Privacy and Compliance Risks, Threats to Infrastructure, Data and Access Control, Cloud Access Control Issues, Cloud Service Provider Risks. Cloud Computing Security challenges: Security Policy Implementation, Policy Types, and Computer Security Incident Response Team (CSIRT).

Suggested Readings/ reference:

1. Cloud Computing For Dummies, Judith S. Hurwitz, Fern Halper, Robin Bloor, Marcia Kaufman
2. Cloud Computing: A Hands-On Approach, Arshdeep Bahga, and Vijay Madisetti
3. The Cloud Computing Book. Douglas E. Comer.
4. Cloud Computing: Principles and Paradigms, Rajkumar Buyya (Author), James Broberg, Andrzej Goscinski.
5. Securing the Cloud : Cloud computer security techniques and tactics, Winkler J.R, Bill Meine
6. AWS: The Complete Beginner's Guide, Stephen Baron.



CA (Arts and Science) – EIGHTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: Fundamentals of Cloud Computing
Course Code: UMJCAT802
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Tutorial: 25 Marks

For examinations to be held in May 2026, 2027 and 2028

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Practical/ tutorial Evaluation

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

10 marks

Final Examination

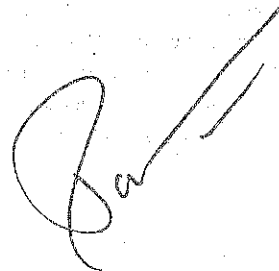
15 Marks

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



CA (Arts and Science) – EIGHTH SEMESTER

Course: Minor
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: Fundamentals of Cloud Computing
Course Code: UMICAT803
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Tutorial: 25 Marks

For examinations to be held in May 2026, 2027 and 2028

Course objectives & learning outcomes

1. Knowledge of the fundamental concepts and principles of cloud computing including virtualization, scalability, reliability and security.
2. Ability to design, develop and deploy cloud based applications using popular clouds and services.
3. Understanding of the broader societal and environmental impacts of cloud based services and applications

UNIT – I

Cloud Computing fundamentals: History of Cloud Computing, Cloud Storage, Why Cloud Computing Matters, Advantages of Cloud Computing – Disadvantages of Cloud Computing – Cloud Services, Architectural Influences, Technological Influences, and Operational Influences.

UNIT – II

Cloud Computing Architecture: Cloud Delivery models, The SPI Framework, Cloud Software as a Service (SaaS), Cloud Platform as a Service (PaaS), Cloud Infrastructure as a Service (IaaS), Cloud deployment models, Public Clouds, Community Clouds, Hybrid Clouds, Alternative Deployment models, Expected benefits.

UNIT – III

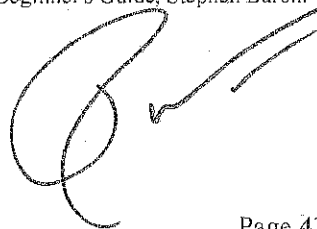
Cloud Computing Software Security fundamentals: Cloud Information Security Objectives, Confidentiality, Integrity, Availability, Cloud Security Services, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements, Secure Development practices, Approaches to Cloud Software Requirement Engineering, Cloud Security Policy Implementation.

UNIT – IV

Cloud Computing Risk Issues: The CIA Triad, Privacy and Compliance Risks, Threats to Infrastructure, Data and Access Control, Cloud Access Control Issues, Cloud Service Provider Risks. Cloud Computing Security challenges: Security Policy Implementation, Policy Types, and Computer Security Incident Response Team (CSIRT).

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6. AWS: The Complete Beginner's Guide, Stephen Baron.



CA (Arts and Science) – EIGHTH SEMESTER

Course: Minor
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: Fundamentals of Cloud Computing
Course Code: UMICAT803
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Tutorial: 25 Marks

For examinations to be held in May 2026, 2027 and 2028

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(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

CA (Arts and Science) – EIGHTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: Statistical Concepts
Course Code: UMJCAT804
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Tutorial: 25 Marks

For examinations to be held in May 2026, 2027 and 2028

Course objectives & Learning outcomes:

1. To improve the analytical skills of Statistical Concepts.
2. Formal introduction to Statistical Concepts.
3. Overall development of Statistical Concepts.

UNIT 1

Overview of Statistics: Definition and Importance of Statistics in Various Fields, Descriptives. Inferential Statistics. Types of Data: Qualitative (Categorical) Data and Quantitative (Numerical) Data, Levels of Measurement: Nominal, Ordinal, Interval and Ratio. Data Collection and Sampling Methods: Population vs. Sample, Random Sampling, Stratified Sampling, Cluster Sampling, Introduction to Data Visualization: Basic Graphs and Charts: Histograms, Pie Charts, Bar Graphs, Line Graphs.

UNIT 2

Measures of Central Tendency: Mean, Median, Mode. Measures of Dispersion: Range, Variance, Standard Deviation. Introduction to Probability: Basic Probability Concepts and Rules, Probability Distributions (with focus on Normal Distribution). Data Visualization in Practice: Box Plots, Scatter Plots, and Understanding Distributions through Graphs.

UNIT 3

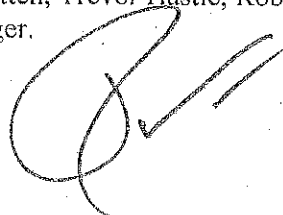
Sampling Distribution and Central Limit Theorem: Concept of Sampling Distribution, Significance of the Central Limit Theorem in Statistics. Hypothesis Testing: Null and Alternative Hypotheses, Types of Errors: Type I and Type II, p-Values and Significance Levels. Confidence Intervals: Constructing and Interpreting Confidence Intervals, Basic Regression Analysis: Simple Linear Regression: Concept and Interpretation.

UNIT 4

Correlation Analysis: Pearson and Spearman Correlation Coefficients, ANOVA (Analysis of Variance), Understanding One-Way ANOVA. Non-Parametric Tests: Chi-Square Test, Kruskal-Wallis Test. Statistical Software Overview: Introduction to Software like R, Python, SPSS, or SAS.

Suggested readings/ references:

1. Robert S. Witte and John S. Witte, "Statistics", 11th Edition, John Wiley & Sons, 2016.
2. Peter Bruce and Andrew Bruce, "Practical Statistics for Data Scientists: 50 Essential Concepts", O'Reilly Media.
3. Mario F. Triola, "Elementary Statistics", Pearson.
4. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "An Introduction to Statistical Learning: with Applications in R", Springer.



CA (Arts and Science) – EIGHTH SEMESTER

Course: Major
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: Statistical Concepts
Course Code: UMJCAT804
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Tutorial: 25 Marks

For examinations to be held in May 2026, 2027 and 2028

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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

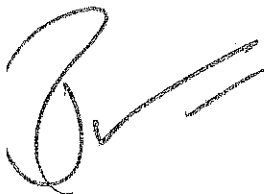
15 Marks

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



CA (Arts and Science) – EIGHTH SEMESTER

Course: Minor	Course Title: Statistical Concepts
Course Credit: (L-P-T) (3-0-1)	Course Code: UMICAT805
Total Marks: 100	Mid Semester assessment: 15 Marks of 1.5 hours duration
	End Semester assessment: 60 Marks of 3 hours duration
	Tutorial: 25 Marks

For examinations to be held in May 2026, 2027 and 2028

Course objectives & Learning outcomes:

1. To improve the analytical skills of Statistical Concepts.
2. Formal introduction to Statistical Concepts.
3. Overall development of Statistical Concepts.

UNIT 1

Overview of Statistics: Definition and Importance of Statistics in Various Fields, Descriptive vs. Inferential Statistics. Types of Data: Qualitative (Categorical) Data and Quantitative (Numerical) Data, Levels of Measurement: Nominal, Ordinal, Interval and Ratio. Data Collection and Sampling Methods: Population vs. Sample, Random Sampling, Stratified Sampling, Cluster Sampling, Introduction to Data Visualization: Basic Graphs and Charts: Histograms, Pie Charts, Bar Graphs, Line Graphs.

UNIT 2

Measures of Central Tendency: Mean, Median, Mode. Measures of Dispersion: Range, Variance, Standard Deviation. Introduction to Probability: Basic Probability Concepts and Rules, Probability Distributions (with focus on Normal Distribution). Data Visualization in Practice: Box Plots, Scatter Plots, and Understanding Distributions through Graphs.

UNIT 3

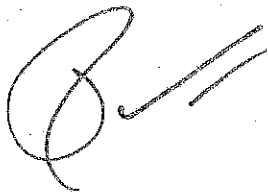
Sampling Distribution and Central Limit Theorem: Concept of Sampling Distribution, Significance of the Central Limit Theorem in Statistics. Hypothesis Testing: Null and Alternative Hypotheses, Types of Errors: Type I and Type II, p-Values and Significance Levels. Confidence Intervals: Constructing and Interpreting Confidence Intervals, Basic Regression Analysis: Simple Linear Regression: Concept and Interpretation.

UNIT 4

Correlation Analysis: Pearson and Spearman Correlation Coefficients; ANOVA (Analysis of Variance), Understanding One-Way ANOVA, Non-Parametric Tests: Chi-Square Test, Kruskal-Wallis Test. Statistical Software Overview: Introduction to Software like R, Python, SPSS, or SAS.

Suggested readings/ references:

1. Robert S. Witte and John S. Witte, "Statistics", Wiley.
2. Peter Bruce and Andrew Bruce, "Practical Statistics for Data Scientists: 50 Essential Concepts", O'Reilly Media.
3. Mario F. Triola, "Elementary Statistics", Pearson.
4. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "An Introduction to Statistical Learning: with Applications in R", Springer.



CA (Arts and Science) – EIGHTH SEMESTER

Course: Minor
Course Credit: (L-P-T)
(3-0-1)
Total Marks: 100

Course Title: Statistical Concepts
Course Code: UMICAT805
Mid Semester assessment: 15 Marks of 1.5 hours duration
End Semester assessment: 60 Marks of 3 hours duration
Tutorial: 25 Marks

For examinations to be held in May 2026, 2027 and 2028

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



CA (Arts and Science) – EIGHTH SEMESTER

Course: Skill Enhancement Course
Course Credits :(L-P-T)
(0-12-0)
Total marks: 300

Course Title: Research Project/ Dissertation
Course Code: USECAP806
Dissertation: 200 Marks
Viva/Presentation: 100 Marks

For examinations to be held in May 2026, 2027 and 2028

Research Project/Dissertation is a unique course involving application of knowledge in solving/analyzing/ exploring a real-life situation/complex problem/data analysis. It is intended to provide research competencies at the undergraduate level. It enables the acquisition of special/advanced knowledge through support study/a project work. The following mechanism shall be adopted for completion of the dissertation:

1. Admission to Honours with Research Programme (4th year, 7th Semester) shall be on the basis of the cumulative score (75% marks and above in the first five semesters) and subject to availability of permanent faculty with doctoral degree and infrastructure and number of seats in the College.
2. Research Project work (12 credits) shall be started at the beginning of 7th Semester.
3. There shall be a Project Synopsis in the programme based on the major area/subject. The permanent faculty with Ph.D. and research experience (as per UGC guidelines) shall be the research project supervisor after being recognized by the Departmental Research Committee (DRC) of the Nodal Department. The progress of the dissertation work should continuously be monitored by concerned Supervisor and the research outcomes may be published in Reputed/Refereed/Peer reviewed/indexed Journals.
4. The college offering FYUGP with Research should have its own College Research Committee (CRC) for each discipline with at least one member from any University of the region.
5. The project report/ dissertation shall be evaluated by the external expert from other University/ Colleges to be nominated by the Principal out of the panel supplied by the CRC.
6. Project proposal to be scrutinized by the College Research Committee for the concerned subject.
7. In the 8th Semester, Evaluation of Dissertation shall be offline and Viva-Voce shall be either offline or online as per the convenience of the examiner. The Dissertation evaluation shall be carried out by an external expert.

Research Project = 12 credits (300 marks)
Dissertation = 08 credits (200 marks)
Viva/ Presentation = 04 credits (100 marks)

Note: A separate guideline shall be issued with regard to the payment of remuneration to the external expert for evaluation of the Research project.

