PONDICHERRY UNIVERSITY

(A CENTRAL UNIVERSITY)

REGULATIONS, CURRICULUM & SYLLABUS
(For Affiliated Colleges)

B.C.A. (HONORS) DEGREE PROGRAMME

Bachelor of Computer Applications (Honors with Research)

Bachelor of Computer Applications (Honors)

(Under the National Education Policy 2020)

Effective from the Academic Year 2023 - 2024

November 2023

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1. PREAMBLE

This Bachelor of Computer Applications (B.C.A.) course is designed to provide the student with a comprehensive understanding of computer applications, covering a wide array of foundational concepts and practical skills. In the B.C.A. program, students will explore the fundamental principles of Computer Science, Programming Languages, Database Management, Software Development, and more.

This curriculum is crafted to equip the students with the knowledge and skills necessary to excel in the ever-evolving field of computer applications. From building a strong foundation in programming to gaining insights into system analysis and design, the B.C.A. program will prepare the students for a successful career in the dynamic and diverse world of IT.

2. PROGRAM OUTCOMES:

The expected outcomes for the Bachelor of Computer Applications (B.C.A.) program at different levels:

UG Certificate Level:

Demonstrate proficiency in solving simple problems using programming.

Develop a foundational knowledge of key concepts in information technology.

UG Diploma Level:

Demonstrate the ability to analyze and solve more complex computational problems.

Acquire the ability to analyze and design computer-based systems.

UG Degree Level:

Design and implement efficient solutions for real-world computing challenges.

Design and implement efficient solutions for real-world computing challenges.

Demonstrate understanding of software project management principles.

UG Degree with Honors:

Demonstrate advanced proficiency in programming languages and software development.

Innovate and contribute to the development of efficient solutions.

Clearly articulate complex ideas to technical and non-technical audiences.

Engage in collaborative projects and demonstrate strong teamwork skills.

Adapt to evolving technologies and continue professional development.

3. DEFINITIONS

Terms used in the NEP Regulations shall have the meaning assigned to them as given below unless the context otherwise requires:

A. Credit: A credit is the number of hours of instruction required per week for the given subject in a given semester of 16-18 weeks. One credit is equivalent to 15 hours of teaching (lecture or tutorial) or 30 hours of practice or field work or community engagement and service per Semester.

B. Academic Year: Means the year starting on 1st day of July and ends on the 30th day of June succeeding year.

C. Residence time: Means the time a student spends for attending classes in the College/Institution (either Online/Offline) as a full-time student and enrolled in any Academic programme of the Institution.

D. **Semester:** Means 18 weeks (90 Working days) of teaching-learning session of which two weeks shall be set apart for examinations and evaluation.

E. Grade: Means a letter grade assigned to a student in a course for his/her performance at academic sessions as denoted in symbols of: O(Outstanding), A+(Excellent), A(Very good), B+(Good), B(Above average), C(Average), P(Pass), F(Fail) and Ab(Absent) with a numeric value of O=10, A+=9, A=8, B+=7, B=6, C=5, P=4, and F=0, Ab=0.

F. Grade Point Average (GPA): Means an average of the Grades secured by a student in all courses in a given academic session duly weighted by the number of credits associated to each of the courses.

G. Cumulative GPA (CGPA): Means the weighted average of all courses the student has taken in the entire programme of study.

H. Common courses: Means the set of courses that all students who are admitted are required to study; these courses include, Languages (English- Modern Indian languages), NEP specific courses viz. Understanding India, Environmental sciences/Education, Health and wellbeing/Yoga, and Digital & Technological solutions.

I. Major Discipline Courses: Means the core subjects mandatory for the Computer Science discipline.

J. Minor Discipline Courses: Means allied/elective/specialization specific subjects of Computer Science discipline.

K. Credit Requirements: For a Degree/Diploma/Certificate Programme means the minimum number of credits that a student shall accumulate to achieve the status of being qualified to receive the said Degree, Diploma/Certificate as the case may be.

L. Exit option: Means the option exercised by the student, to leave the Programme at the end of any given Academic year.

M: Lateral entry: Means a student being admitted into an ongoing Programme of the University otherwise than in the 1st year of the programme.

N: Vocational Studies/Education: Means set of activities for participation in an approved project or practical or lab, practices of application of scientific theories, studio activities involving students

in creative artistic activities, workshop-based activities, field-based shop-floor learning, and Community engagement services, etc. **(These courses are expected to enable students to incorporate the learned skills in daily life and start up entrepreneurship.)**

O: Skill-based learning/project: Means activities designed to understand the different socio-economic contexts, first-hand understanding of the policies, regulations, organizational structures, processes, and programmes that guide the development process.

P: Work-based internship: Means structured internships with Software Companies, Research and Higher Educational Institution Laboratories, Corporate offices, etc. which will further improve employability.

4. AWARD OF UG DEGREE/DIPLOMA/CERTIFICATE

Four years B.C.A. Degree programme shall have options for earning a UG Certificate / Diploma / Degree / Degree with Honors based on the exit option exercised by the candidates.

4.1 Degree and Nomenclature:

Candidates who complete Eight semesters and earn a minimum of 160 credits will be awarded either of the following degrees after successful completion of the said requirements.

- B.C.A. (Honors with Research) *
- B.C.A. (Honors) **

* - for candidates who complete a research project work in the Eighth Semester.
** - for candidates who complete 3 theory courses (MJD 21, MJD 22, and MJD 23) instead of the research project work in the Eighth Semester.

4.2 Degree with Specialization:

Out of the above said 160 credits, the candidates shall earn 111 credits from the Hardcore courses and the remaining 49 credits shall be earned from the subjects they choose to study from the list of softcore courses. These 49 credits are assigned across 13 courses as listed below:

Courses	Credits per course	Total Credits
MID 1 to MID 8	4	8 x 4 = 32 Credits
MJD 19 & MJD 20	4	2 x 4 = 08 Credits
SEC 1, SEC 2 & SEC 3	3	3 x 3 = 09 Credits
	Total Credits	**49 Credits**

The 13 courses under the above said categories are chosen from the specialization of core Computer Application.

4.2.1 Exit Options

Candidates can exercise the following exit options and obtain the said certificate or diploma or degree, if the minimum required credits are earned and other conditions are met.

Exit after 2nd Semester: Certificate in Multimedia Application will be awarded for candidates who exit the course at the end of 2nd semester and earned a minimum of 40 credits and have completed a Summer Internship of 4 credits for 4-6 weeks' duration, during the summer vacation post 2nd semester.

Exit after 4th Semester: Diploma in Computer Application will be awarded for candidates who exit the course at the end of 4th semester and earned a minimum of 80 credits and have completed a Summer Internship of 4 credits for 4-6 weeks' duration, during the summer vacation post 4th semester.

Exit after 6th Semester: UG Degree in B.C.A. will be awarded for candidates who exit the course at the end of 6th semester and earned a minimum of 120 credits and have completed a Summer Internship of 4-6 weeks' duration, during the summer vacation post 4th semester.

Exit after	Credits and other requirements	Awards
2nd Semester	Min: 40 Credits, Internship 4-6 weeks'	Certificate in Multimedia Applications
4th Semester	Min: 80 Credits, Internship 4-6 weeks'	Diploma in Computer Application
6th Semester	Min: 120 Credits, Internship 4-6 weeks'	B.C.A.

5. PEDAGOGICAL APPROACHES

a) Lecture Courses	Regular classroom lectures by qualified / experienced Expert Teachers • These Lectures may also include classroom discussion, demonstrations, case analysis • Use of Models, Audio-Visual contents, Documentaries, PPTs may supplement.
b) Tutorial Courses	Problem solving Exercise classes guided discussion, supplementary readings vocational training, etc.
c) Practical / Lab work	Practical Lab activity with Theoretical support Mini projects, Activity based engagement, Program executions, Data processing and presentation exercise.
d) Seminar Course	A course requiring student to design and participate in discussions, Group Discussions, Elocution and Debate, Oral Communication Paper presentations, Poster Presentation, Role play participation, Quiz competitions, Business plan preparation/presentation, etc.

e) Internship course	Courses requiring students to *Learn by Doing* in the workplace external to the educational Institutions. Internships involve working in Software Companies, Research and Higher Educational Institution Laboratories, Corporate Offices, etc. All Internships should be properly guided and inducted for focused learning.
f) Research Project	Students need to study and analyze the recent research publications from indexed/peer reviewed journals in their area of specialization. Outcome of the study and analysis need to be presented as a thesis or research report with necessary experimental results.

6. ACADEMIC AUDIT OF COURSES

Internal Quality Assurance Cell at every institution is expected to supervise the implementation of NEP Regulations in these programmes. Availability of required number of Classrooms, Faculty rooms, Labs, Library facilities, Computer Centre and recruitment of Faculty members, allocation of funds for running the Science Labs/Computer Centre etc., is the responsibility of the College Administration.

7. ADMISSIONS & LATERAL ENTRY

7.1 Admissions Eligibility

For Affiliated Colleges: The candidates for admission to this programme shall be required to have passed 10+2 / 10+3 system of examinations or equivalent with mathematics / business mathematics / equivalent as one of the subjects of study.

Students shall be admitted to this programme based on admissions criteria fixed by the University / Government of Puducherry from time to time.

7.2 Lateral Entry

As per NEP, students have a choice of exit and entry into the programme multiple number of times. UGC specifies that about 10% of seats over and above the sanctioned strength shall be allocated to accommodate the Lateral Entry students.

Candidates seeking entry at the second, third and fourth year, should meet the necessary eligibility criteria with respect to the certificate / diploma / degree they possess, with necessary minimum credits banked in the Academic Bank of Credits (ABC). Such students who get admitted in later years, other than first year will be guided by the following clauses:

- that the University shall notify the admission process and number of vacancies open for lateral entry.
- that the Lateral entrants shall be admitted only after such transparent screening process

and such procedure that the University may prescribe from time to time. University may prescribe different methods of screening for different programmes depending on the circumstances prevailing in each case.

- Lateral entry shall be permissible only in the beginning of years 2, 3, 4 of the Under Graduate / Honors programme; provided that the students seeking lateral entry shall have obtained the minimum pass marks / grades fixed by the University in their previous academic years.

8. EVALUATION (INTERNAL & END SEMESTER ASSESSMENT) AND GRADES

All Credit courses are evaluated for 100 marks. Internal Assessment component is for 25 marks and the End Semester University exam is for 75 marks for theory courses. In case of practical courses, research project work etc., Internal Assessment component is for 50 marks and the End Semester University exam is for 50 marks.

Internal Test Scheme: Principal of the College schedules the Mid-Semester Exam for all courses during 8/9th week of start of classes. Mid-Semester exam for 90 minutes' duration need to be conducted for all these theory courses. The evaluated marks need to be uploaded to Controller of Examinations of University. The answer books of Mid-Semester exams need to be preserved until the declaration of results by the University.

8.1 INTERNAL ASSESSMENTS (For courses upto 6th Semester)

8.1.1 Internal Assessment Marks for Theory subjects

Total Internal Assessment mark for a theory subject is 25 marks. The breakup is as follows:

Evaluation Component	Marks
A. Mid Semester Exam (one)	20
B. Percentage of Attendance	05
Total	**25**

8.1.2 Internal Assessment marks for Practical / Internships subjects

Faculty member in-charge of Lab practical shall evaluate the practical subjects for 50 marks. The breakup is as follows:

Evaluation Component	Marks
A. Mid-Semester Practical Exam (one) / Viva-voce	20
B. Practical Record / Internship Report	25
C. Percentage of Attendance	05
Total	**50**

8.1.3 Internal Assessment marks for Research Project Work

There shall be a faculty member assigned as a Project Guide for each candidate doing the Research Project. Progress of the candidate can be assessed once in a month in a project review meeting. Three project review meetings shall be conducted for Internal Assessment.

Project review committee may be constituted and the committee shall organize project review meetings and evaluate the progress and to award the Internal Assessment marks. Internal Assessment component for the Research Project is 50 Marks. The breakup is as follows:

Evaluation Component	Marks
A. Monthly Review (3 Reviews – 10 Marks each)	30
B. Project Report	10
C. Project Presentation and viva-voce	10
Total	**50**

8.1.4 Internal Assessment marks for Theory Subjects with Practical Components

Faculty member in-charge of Theory Subjects with Practical Component shall evaluate the candidates both for their performance in theory and practical. Internal Assessment marks for Theory Subjects with Practical Components is 25 marks. The breakup is as follows:

Evaluation Component	Marks
A. Mid Semester Exam (one)	15
B. Observation Note / Practical Record	05
C. Percentage of Attendance	05
Total	**25**

8.1.5 Marks for Attendance is as follows

Attendance %	Marks
Below 75%	0
75% - 80%	1
80% - 85%	2
85% - 90%	3
90% - 95%	4
95% - 100%	5

8.2 END SEMESTER ASSESSMENT (ESA)[For courses upto 6th Semester]

Controller of Examinations (COE) of Pondicherry University schedules the End-Semester exams for all theory and practical subjects based on university calendar. For Theory courses with Practical components, End semester exams shall be conducted separately for Theory and Practical.

A detailed Exam Time Table shall be circulated at least 15 days before the start of exams, mostly during 15/16th week of the Semester. Question Papers shall be set externally based on BoS approved syllabus. All students who have a minimum of 70% attendance are eligible to attend the end-semester exams. Attendance percentage shall be calculated for each course to decide the eligibility of the candidate for writing the end-semester examination.

8.2.1 Breakup of End Semester Marks
(All End Semester Exams shall be conducted by the Pondicherry University)

The question paper shall be set as per the Bloom's Taxonomy. Various levels along with it's description and sample questions are as follows:

Knowledge: Recall or remember previously learned information.
Example: List the basic data types in Python

Comprehension: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating the main ideas.
Example: Explain how a stack data structure works.

Application: Apply knowledge and concepts to solve problems in new situations. Use learned information in a different context.
Example: Write a Python program to solve the deadlock problem.

Analysis: Break down information into parts and examine the relationships between the parts. Identify motives or causes.

Example: Analyse the efficiency of two sorting algorithms and compare their advantages and disadvantages.

Synthesis: Create a new whole by combining elements in novel ways. Use creativity to produce something original.

Example: Design a web application that can generate a time table of a school.

Distribution of questions at various levels are as indicated.

Course Components	Max. Marks	End-Sem Exam Duration
A. Theory subjects: Sec A: 10 Questions of 2 Marks each (20 Marks) *(Knowledge: 3, Comprehension: 2, Application: 3, Analysis:2)* Sec B: 5 out of 7 Questions of 5 Marks each (25 Marks) *(Knowledge: 1, Comprehension: 2, Application: 1, Analysis:3)* Sec C: 2 Either/OR choice questions of 15 Marks each (30 Marks) *(Application: 1, Analysis:1)* **Questions from all units of Syllabus equally distributed.**	75 Marks	3 Hours
B. Skill Enhancement/ Practical/Internship/Project Work subjects: **Skill Enhancement / Practical Subjects:** Based on Practical Exams conducted by CoE of University **Internship / Research Project Work:** Presentation of the work / Report / Viva-voce examinations	50 Marks	3 Hours --
C. Theory Subjects with Practical Components: **i. Theory Component:** Sec A: 5 Questions of 2 Marks each (10 Marks) *(Knowledge: 3, Comprehension: 2, Application: 3, Analysis:2)* Sec B: 5 out of 7 Questions of 4 Marks each (20 Marks) *(Comprehension: 2, Application: 3, Analysis:2)* Sec C: 2 Either or type questions of 10 Marks each (20 Marks) *(Analysis / Synthesis)* **Questions from all units of Syllabus equally distributed.**	50 Marks	3 Hours

ii. Practical Component: Based on Practical Exams / Presentation / Viva-voce with external examiner appointed by the University Controller of Examinations, and schedules exclusively prepared for such practical examinations by the University Examination Section. **The examination shall be conducted for 50 Marks and reduced to 25 Marks.** **Total Marks: 75 (Theory: 50 Marks + Practical: 25 Marks)**	25 Marks	3 Hours

8.3 CONSOLIDATION OF MARKS AND PASSING MINIMUM

Controller of Examinations of the University consolidates the Internal Assessment marks uploaded by the Colleges and marks secured by students in End-Semester examinations. The total marks will be converted into letter grades as shown in below Table. The passing minimum is 40% marks (Internal Assessment + End Semester Assessment put together) and students who secure between 40% and 49% will be awarded 'P' (Pass Grade).

8.3.1 Arrear Exam

A student who secures less than 40% marks in aggregate is declared as ***Fail*** and that student is eligible to take up supplementary examination by registering to the failed course in the following Semester. All other candidates who failed due to shortage of attendance and those who are seeking to improve the grade shall repeat the course.

8.3.2 Letter Grades and Calculation of CGPA

The Total Marks Secured by a student in each subject shall be converted into a letter grade. UGC Framework has suggested a Country wide uniform letter grades for all UG courses. The following Table shows the seven letter grades and corresponding meaning and the grade points for calculation of CGPA.

Equivalent Letter Grade	Meaning	Grade Points for Calculation of CGPA
O	Outstanding	10
A+	Excellent	9
A	Very Good	8
B+	Good	7
B	Above Average	6
C	Average	5

P	Pass	4
F	Fail	0
Ab	Absent	0

In order to work out the above letter grades, the marks secured by a student (Total of Internal Assessment and End Semester Assessment) would be categorized for relative grading.

The range of marks for each grade would be worked as follows:

- Highest marks in the given subject: X
- Cut of marks for grading purpose: 50 marks
- Passing minimum: 40
- Number of grades (except P - Pass) (O, A+, A, B+, B, C): G = 6
- Range of marks: K = (X - 50) / G

(i) If $K \geq 5$, then the grades shall be awarded as given in the following Table.

If K ≥ 5		
Range of Marks in %	**Letter Grade Points for**	**Grade Points for**
X to (X-K) + 1	O	10
(X-K) to (X-2K) + 1	A+	9
(X-2K) to (X-3K) + 1	A	8
(X-3K) to (X-4K) + 1	B+	7
(X-4K) to (X-5K) + 1	B	6
(X-5K) to 50	C	5
40 – 49	P	4
Below 40	F	0
Absent (Lack of Attendance)	Ab	0

(ii) If K< 5, then the grades shall be awarded as given in the following Table.

If K < 5		
Range of Marks in %	**Letter Grade Points for**	**Grade Points for**
80-100	O	10
71-79	A+	9
66-70	A	8
61-65	B+	7
56-60	B	6

50-55	C	5
40-49	P	4
Below 40	F	0
Absent (lack of attendance)	Ab	0

8.3.3 Calculation of Semester Grade Point Average and Cumulative Grade Point Average

Semester Grade Point Average (SGPA) is calculated by taking a weighted average of all grade points secured by a candidate from all subjects registered by him/her in the given Semester. The weights being the number of credits that each subject carries.

Cumulative Grade Point Average (CGPA) shall be calculated as the weighted average of credits that course carries and the value of Grade points averaged for all subjects.

8.3.4 Computation of SGPA and CGPA

The following procedure shall be followed to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):
The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student to the sum of the number of credits of all the courses undergone by a student, i.e. SGPA (S_i) = $\Sigma(C_i \times G_i) / \Sigma C_i$

where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

(i) Example for Computation of SGPA where candidate has not failed in any course

Semester	**Course**	**Credit**	**Letter Grade**	**Grade point**	**Credit Point** (Credit x Grade)
I	Course 1	3	A	8	3 X 8 = 24
I	Course 2	4	B+	7	4 X 7 = 28
I	Course 3	3	B	6	3 X 6 = 18
I	Course 4	3	O	10	3 X 10 = 30
I	Course 5	3	C	5	3 X 5 = 15
I	Course 6	4	B	6	4 X 6 = 24
		20			139
				SGPA	**139/20=6.95**

(ii) Example for Computation of SGPA where candidate has failed in one course

Semester	Course	Credit	Letter Grade	Grade point	Credit Point (Credit x Grade)
I	Course 1	3	A	8	3 X 8 = 24
I	Course 2	4	B+	7	4 X 7 = 28
I	Course 3	3	B	6	3 X 6 = 18
I	Course 4	3	O	10	3 X 10 = 30
I	Course 5	3	C	5	3 X 5 = 15
I	Course 6	4	F	0	4 X 0 = 00
		20			115
				SGPA	**115/20=5.75**

(iii) Example for Computation of SGPA where candidate has failed in two courses

Semester	Course	Credit	Letter Grade	Grade point	Credit Point (Credit x Grade)
I	Course 1	3	A	8	3 X 8 = 24
I	Course 2	4	B+	7	4 X 7 = 28
I	Course 3	3	F	0	3 X 0 = 00
I	Course 4	3	B	6	3 X 6 = 18
I	Course 5	3	C	5	3 X 5 = 15
I	Course 6	4	F	0	4 X 0 = 00
		20			85
				SGPA	**85/20=4.25**

The CGPA shall also be calculated in similar way as shown in examples (i), (ii) and (iii) of SGPA for all subjects taken by the students in all the semesters. However, if any student fails more than once in the same subject, then while calculating CGPA, the credit and grade point related to the subject in which the student fails in multiple attempts will be restricted to one time only. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

In case of audit courses offered, the students may be given (P) or (F) grade without any credits. This may be indicated in the mark sheet. Audit courses will not be considered towards the calculation of CGPA.

8.3.5 Declaration of Results

Controller of Examinations (COE) of the University shall declare the results of given UG programme following the CGPA secured by students by the end of 6th Semester and 8th Semester.

8.3.6 Classification of Divisions

Range of CGPA	Result
9.0 – 10	First Class with distinction#
6.0 - 8.99	First Class
5.0 - 5.99	Second Class
4.0 - 4.99	Pass Class

Distinction will be awarded **ONLY** to those candidates who have cleared **ALL** subjects in the first attempt.

8.4 INTERNAL ASSESSMENT/ END-SEMESTER ASSESSMENT/ PASSING MINIMUM/GRADES (FOR 7th and 8th SEMESTERS)

Regulations to be notified in the next revision after the confirmation from University NEP committee.

9. MINIMUM CREDITS REQUIREMENT

S.No	Component	3-year UG			4-year UG (Honors / Honors With research)		
		Credits	Courses	Cr/Course	Credits	Courses	Cr/Course
1	Major Disciplinary/ Interdisciplinary Courses	56	14	4	76	19	4
2	Minor Disciplinary/ Interdisciplinary Courses	24	6	4	32	8	4
3	Multi-Disciplinary Courses	9	3	3	9	3	3
4	Ability Enhancement Courses	8	4	2	8	4	2
5	Skill Enhancement Courses	9	3	3	9	3	3
6	Value-added courses	8	4	2	8	4	2
7	Summer Internship(MJD11)	4	1	4	4	1	4
8	Community Engagement and Service	2	1	2	2	1	2
9	Research Project/Dissertation	--	--	--	12	Project or 3 Courses##	
Total		**120**			**160**		

##Note: Honors students not undertaking research will do 3 courses for 12credits in lieu of a research project/Dissertation.

- MJD: Major Disciplinary (Compulsory – Hardcore Subjects)
- MID: Minor Disciplinary (Specialization Specific – Softcore Subjects)
- MLD: Multi-Disciplinary
- AEC: Ability Enhancement Courses
- SEC: Skill Enhancement Courses
- VAC: Value Added Courses
- SG: Specialization Group
- Course Code: CA1MJ01(E) (CA - Computer Application, 1-Semester, MJ-Component, 01-Course Number in the respective component, E-Elective)

ANNEXURE I – SPECIALIZATION IN CORE COMPUTER APPLICATION

CURRICULUM

FIRST SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 1	CA1MJ01	Digital Logic Fundamentals	H	4	3		2
2	MID 1	CA1MI01	Multimedia and Animation	S	4	3		2
3	MLD 1		One course from the MLD streams 1 to 10 (Table 15)	H	3	4		
4	AEC 1	CA1AE01	English I	H	2	2		2
5	SEC 1		S.No. 1 or 2 from Table 7	S	3	2		2
6	VAC 1	CA1VA01	Understanding India	H	2	4		
7	VAC 2	CA1VA02	Environmental Sciences/ Education/ Higher Order Thinking	H	2	4		
				Total	20	30 Hours		

SECOND SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 2	CA2MJ02	Problem Solving & Programming Fundamentals	H	4	3		2
2	MID 2	CA2MI02	Principles of Accounting	S	4	3		2
3	MLD 2		One course from the MLD streams 1 to 10 except the stream chosen in MLD1 (Table 15)	H	3	4		
4	AEC 2	CA2AE02	Indian Language I	H	2	2		2
5	SEC 2		S.No. 3 or 4 from Table 7	S	3	2		2
6	VAC 3	CA2VA03	Health & Wellness/Yoga Education/ Universal Human Values	H	2	2		2
7	VAC 4	CA2VA04	Digital Technologies	H	2	4		
				Total	20	30 Hours		

THIRD SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 3	CA3MJ03	Mathematical Foundations of CS	H	4	4	1	
2	MJD 4	CA3MJ04	Data Structures	H	4	3		2
3	MID 3	CA3MI03	Management Information Systems	S	4	3		2
4	MLD 3		One course from the MLD streams 1 to 10 except the streams chosen in MLD1 and MLD2 (Table 15)	H	3	4		
5	AEC 3	CA3AE03	English II	H	2	2		2
6	SEC 3		S.No. 5 or 6 from Table 7	S	3	2		2
				Total	20	27 Hours		

FOURTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 5	CA4MJ05	Computer System Architecture	H	4	3		2
2	MJD 6	CA4MJ06	Design and Analysis of Algorithms	H	4	3		2
3	MJD 7	CA4MJ07	Object Oriented Programming	H	4	3		2
4	MID 4	CA4MI04	IT Enable Services & Application	S	4	3		2
5	AEC 4	CA4AE04	Indian Language II	H	2	2		2
6	Project	CA4CS01	Community Engagement and Service	H	2			6
Total					20	30 Hours		

FIFTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 8	CA5MJ08	Operating Systems	H	4	3		2
2	MJD 9	CA5MJ09	Database Management Systems	H	4	3		2
3	MJD 10	CA5MJ10	Management Strategies & Concepts	H	4	4		
4	MID 5	CA5MI05	Visual Programming with C#	S	4	3	2	
5	MJD 11	CA5MJ11	Summer Internship	H	4			6
Total					20	25 Hours		

SIXTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 12	CA6MJ12	Computer Networks	H	4	3		2
2	MJD 13	CA6MJ13	Software Engineering Theory and Practice	H	4	3		2
3	MJD 14	CA6MJ14	System Modelling & Simulation	H	4	3		2
4	MJD 15	CA6MI15	Web Engineering	H	4	3	2	
5	MID 6		Any one course from Table 1	S	4	3		2
Total					20	25 Hours		

SEVENTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 16	CA7MJ16	Software Testing and Quality Assurance	H	4	3		2
2	MJD 17	CA7MJ17	Distributed Systems	H	4	3		2
3	MJD 18	CA7MJ18	Wireless Communication Networks (5G)	H	4	3		2
4	MID 7		Any one course from Table 2	S	4	3		2
5	MID 8		Any one course from Table 3	S	4	3		2
Total					20	25 Hours		

EIGTH SEMESTER – B.C.A. (Honors)								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 19		Any one course from Table 4	S	4	3		2
2	MJD 20		Any one course from Table 5	S	4	3		2
3	MJD 21	CA8MJ21	Robotic Process Automation	H	4	3		2
4	MJD 22	CA8MJ22	Low-code / No-code Technologies	H	4	3		2
5	MJD 23	CA8MJ23	Blockchain Application Development	H	4	3		2
			Total		20	25 Hours		

EIGTH SEMESTER – B.C.A. (Honors with Research)								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 19		Any one course from Table 4	S	4	3		2
2	MJD 20		Any one course from Table 5	S	4	3		2
3	MJD 21	CA8MJ24	Research Project	H	4	3		2
4	MJD 22	CA8MJ25	Project Report	H	4	3		2
5	MJD 23	CA8MJ26	Project Viva-voce	H	4	3		2
			Total		20	25 Hours		

Table 1: MID 6 – SIXTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MID 6	CA7MI06E1	Virtual Reality	S	4	3		2
2	MID 6	CA7MI06E2	Internet of Things	S	4	3		2

Table 2: MID 7 – SEVENTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MID 7	CA7MI07E1	UI/UX Design	S	4	3		2
2	MID 7	CA7MI07E2	Mobile Application Development	S	4	3		2

Table 3: MID 8 – SEVENTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MID 8	CA7MI08E1	E-Commerce App Development	S	4	3		2
2	MID 8	CA7MI08E2	Artificial Intelligence	S	4	3		2

Table 4: MJD 19 – EIGHTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 19	CA8MJ19E1	Data Warehousing & Mining	S	4	3		2
2	MJD 19	CA8MJ19E2	Data Science	S	4	3		2

Table 5: MJD 20 – EIGHTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 20	CA8MJ20E1	Data Analytics and Business Intelligence	S	4	3		2
2	MJD 20	CA8MJ20E2	Machine Learning	S	4	3		2

Table 6: MJD 21 / MJD 22 / MJD 23 – EIGHTH SEMESTER								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	MJD 21	CA8MJ21	Robotic Process Automation	H	4	3		2
2	MJD 22	CA8MJ22	Low-code / No-code Technologies	H	4	3		2
3	MJD 23	CA8MJ23	Blockchain Application Development	H	4	3		2

Table 7: SEC 1 / SEC 2 / SEC 3 – I / II / III SEMESTERs								
S.No	Component	Course Code	Title of the Course	H/S	Credits	Hours/Week		
						L	T	P
1	SEC 1	CA1SE01E1	Multimedia Content Management	S	3	3		2
2	SEC 1	CA1SE01E2	Programming with AppInventor	S	3	3		2
3	SEC 2	CA2SE02E1	Office Management Tools	S	3	3		2
4	SEC 2	CA2SE02E2	3D Modelling & Animation	S	3	3		2
5	SEC 3	CA3SE03E1	Data Visualization Tools	S	3	3		2
6	SEC 3	CA3SE03E2	Game Programming	S	3	3		2

Table 8: List of Major Disciplinary Courses				
S.No	Component	Course Code	Title of the Course	H/S
1.	MJD 1	CA1MJ01	Digital Logic Fundamentals	H
2.	MJD 2	CA2MJ02	Problem Solving & Programming Fundamentals	H
3.	MJD 3	CA3MJ03	Mathematical Foundations of Computer Science	H
4.	MJD 4	CA3MJ04	Data Structures	H
5.	MJD 5	CA4MJ05	Computer System Architecture	H
6.	MJD 6	CA4MJ06	Design and Analysis of Algorithms	H
7.	MJD 7	CA4MJ07	Object Oriented Programming	H
8.	MJD 8	CA5MJ08	Operating Systems	H
9.	MJD 9	CA5MJ09	Database Management Systems	H
10.	MJD 10	CA5MJ10	Management Strategies & Concepts	H
11.	MJD 11	CA5MJ11	Summer Internship	H

12.	**MJD 12**	**CA6MJ12**	Computer Networks	**H**
13.	**MJD 13**	**CA6MJ13**	Software Engineering Theory and Practice	**H**
14.	**MJD 14**	**CA6MJ14**	System Modeling & Simulation	**H**
15.	**MJD 15**	**CA6MI15**	Web Engineering	**H**
16.	**MJD 16**	**CA7MJ16**	Software Testing and Quality Assurance	**H**
17.	**MJD 17**	**CA7MJ17**	Distributed Systems	**H**
18.	**MJD 18**	**CA7MJ18**	Wireless Communication Networks (5G)	**H**
19.	**MJD 19**		Data Warehousing & Mining / Data Science	**S**
20.	**MJD 20**		Data Analytics and Business Intelligence / Machine Learning	**S**

Table 9: List of Minor Disciplinary Courses

S.No	Component	Course Code	Title of the Course	H/S
1.	**MID 1**	**CA1MI01**	**Multimedia & Animation**	**S**
2.	**MID 2**	**CA2MI02**	**Principles of Accounting**	**S**
3.	**MID 3**	**CA3MI03**	**Management Information Systems**	**S**
4.	**MID 4**	**CA4MI04**	**System Modeling & Design**	**S**
5.	**MID 5**	**CA5MI05**	**Visual Programming with C#**	**S**
6.	**MID 6**		**Virtual Reality / Internet of Things**	**S**
7.	**MID 7**		**UI/UX Design / Mobile App Development**	**S**
8.	**MID 8**		**E-Commerce App Development / Artificial Intelligence**	**S**

Table 10: List of Multi-disciplinary Courses

S.No	Component	Course Code	Title of the Course	H/S
1.	**MLD 1**	**CA1ML01**	Natural Sciences	**H**
2.	**MLD 2**	**CA2ML02**	Physical Sciences	**H**
3.	**MLD 3**	**CA3ML03**	Humanities & Social Sciences	**H**

Table 11: List of Ability Enhancement Courses

S.No	Component	Course Code	Title of the Course	H/S
1.	**AEC 1**	**CA1AE01**	English I	**H**
2.	**AEC 2**	**CA2AE02**	Indian Language I	**H**
3.	**AEC 3**	**CA3AE03**	English II	**H**
3.	**AEC 4**	**CA4AE04**	Indian Language II	**H**

Table 12: List of Skill Enhancement Courses				
S.No	**Component**	**Course Code**	**Title of the Course**	**H/S**
1.	**SEC 1**	**CA1SE01E1**	**Multimedia Content Management**	**S**
2.	**SEC 1**	**CA1SE01E2**	**Programming with AppInventor**	**S**
3.	**SEC 2**	**CA2SE02E1**	**Office Management Tools**	**S**
4.	**SEC 2**	**CA2SE02E2**	**3D Modelling & Animation**	**S**
5.	**SEC 3**	**CA3SE03E1**	**Data Visualization Tools**	**S**
6.	**SEC 3**	**CA3SE03E2**	**Game Programming**	**S**

Table 13: List of Value-Added Courses				
S.No	**Component**	**Course Code**	**Title of the Course**	**H/S**
1.	**VAC 1**	**CA1VA01**	Understanding India	**H**
2.	**VAC 2**	**CA1VA02**	Environmental Sciences / Education / Higher Order Thinking	**H**
3.	**VAC 3**	**CA2VA03**	Health & Wellness / Yoga Education / Universal Human Values	**H**
4.	**VAC 4**	**CA2VA04**	Digital Technologies	**H**

Table 14: Project (WP/ Internship)				
S.No	**Component**	**Course Code**	**Title of the Course**	**H/S**
1.	**Project**	**CA4CS01**	Community Engagement and Service	**H**

*Table 15: MLD 1 / MLD 2 / MLD 3 in Sem 1 / Sem 2 / Sem 3				
S.No	**Streams**	**Course Code**	**Title of the Course**	**H/S**
1.	**Natural Science**		Biology	**H**
2.			Botany	**H**
3.			Zoology	**H**
4.			Biotechnology	**H**
5.			Biochemistry	**H**
6.	**Physical Sciences**		Chemistry	**H**
7.			Physics	**H**
8.			Biophysics	**H**
9.			Astronomy	**H**
10.			Astrophysics	**H**
11.			Earth and Environmental Sciences	**H**
12..	**Social Sciences**		Political Sciences	**H**
13.			History	**H**
14.			Social work	**H**
15.			Sociology	**H**
16.	**Humanities**		Anthropology	**H**
17.			Psychology	**H**
18.			Economics	**H**

17.	**Computer Science & Applications**		Introduction to Python Programming	**H**
18.			Programming for Mobile Devices	**H**

*Courses will be announced after the approval of the respective boards.

Bachelor of Computer Applications
SYLLABUS

SEMESTER I

Year	I	Course Code: CA1MJ01	Credits	4
Sem.	I	Course Title: Digital Logic Fundamentals	Hours	75
Course Prerequisites, if any	NIL			
Internal Assessment Marks: 25	End Semester Marks: 75	Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.		
Course Outcomes	• Understanding the postulates of Boolean algebra and to minimize combinational functions. • Gaining knowledge to design and analyze combinational and sequential circuits. • Learning techniques for the design of digital circuits			
Unit No.	**Course Content**		**Hours**	
Theory Component				
Unit I	**Digital Systems and Binary Numbers** Digital Systems - Binary Numbers - Number-Base Conversions - Octal and Hexadecimal Numbers - Complements of Numbers - Signed Binary Numbers - Binary Codes - Binary Storage and Registers - Binary Logic - Axiomatic Definition of Boolean Algebra - Basic Theorems and Properties of Boolean Algebra - Boolean Functions Canonical and Standard Forms - Other Logic Operations - Digital Logic Gates - Integrated Circuits		9	
Unit II	**Gate-Level Minimization** Introduction - The Map Method - Four-Variable K-Map - Product-of-Sums Simplification - Don't-Care Conditions - NAND and NOR Implementation - Other Two-Level Implementations - Exclusive-OR Function - Hardware Description Language		9	
Unit III	**Combinational Logic** Introduction - Combinational Circuits - Analysis Procedure - Design Procedure - Binary Adder–Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator – Decoders – Encoders – Multiplexers - HDL Models of Combinational Circuits.		9	
Unit IV	**Synchronous Sequential Logic** Introduction - Sequential Circuits - Storage Elements: Latches - Storage Elements: Flip-Flops - Analysis of Clocked Sequential Circuits - Synthesizable HDL Models of Sequential Circuits - State Reduction and Assignment - Design Procedure		9	
Unit V	**Registers and Counters** Registers - Shift Registers - Ripple Counters - Synchronous Counters - Other Counters - HDL for Registers and Counters		9	
Practical Component				
Exercises	1. Binary to Decimal and vice-versa in Python		30	

	2. Digital Logic Gates in Python 3. Simplification of Boolean Functions in Python 4. Combinational Logic Circuits in Python i. Code Converters ii. Arithmetic (Adders, Subtractors, Multipliers, Comparators) iii. Data Handling (Multiplexers, Demultiplexers, Encoders & Decoders) (Many more programs can be included related to programming the Digital logic in Python)	
Recommended Learning Resources		
Print Resources	1. M. Morris Mano, Michael D. Ciletti, Digital design With an Introduction to the Verilog HDL, Pearson, Fifth Edition, 2013, ISBN-13: 978-0-13-277420-8, ISBN-10: 0-13-277420-8. 2. M. Rafiquzzaman, Fundamentals of Digital Logic and Microcomputer Design, John Wiley & Sons, Inc., Fifth Edition, 2005.	

Year	I	Course Code: CA1MI01	Credits	4
Sem.	I	Course Title: MULTIMEDIA AND ANIMATION	Hours	75
Course Prerequisites, if any	Nil			
Internal Assessment Marks: 25	End Semester Marks: 75	Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.		
Course Outcomes	• Describe the various elements and aspects of multimedia and animation. • Learn to work with text and images • Learn to work with audio processing tools. • Learn to work with video editing tools. • To make an animated movies using Animation and rendering tools.			

Unit No.	Course Content	Hours
	Theory Component	
Unit I	**Multimedia Overview** Introduction, Multimedia presentation and production, characteristics of a multimedia presentation, Multiple media, Utilities of multisensory perception, Hardware and software requirements, Uses of multimedia, Promotion of multimedia-based contents, steps for creating multimedia presentation.	9
Unit II	**Text and Image** Introduction, Types of Text, Unicode Standard, Font, Insertion of Text, Text compression, File Formats. Image: Introduction, Image Types, Seeing colours, colour models, Basic steps for Image processing, Scanner, Digital camera, Interface Standards, Image processing software, File formats, Image output on monitor, Image output on printer.	9
Unit III	**Audio** Introduction, Fundamentals Characteristics of sound, Elements of Audio systems, Microphone, Amplifier, Loudspeaker, Audio mixer, Musical Instrument Digital Interface (MIDI), MIDI messages, MIDI connections, Sound card, Audio File format and CODECs, Software Audio Players, Audio Recording Systems, Audio and multimedia, Audio Processing software.	9
Unit IV	**Video** Introduction, Analog video camera, Transmission of video signals, Video signal format, Digital video, Digital Video Standards, PC Video, Video File Format and CODECs, Video editing, Video editing software.	9

Unit V	**Animation** Introduction, uses of animation, key frames and Tweening, Types of animation, creating movements, Principle of animation, some Techniques of Animation, Animation on the web, 3D Animation, Special Effects, Creating Animation, Rendering algorithms, Animation software.	9
Practical Component		
Exercises	1. Design a multimedia presentation on a topic of your choice. Include text, images, audio, and video elements. 2. Identify the essential tools and equipment needed to create high-quality multimedia content. 3. Choose an existing multimedia project or create one, and develop a promotional strategy for it. 4. Create a simple document, such as a poster or brochure, with varying fonts, sizes, and styles. 5. Perform basic image processing tasks like resizing, cropping, and applying colour filters to the image using image editing software. 6. Perform various settings on the image processing tools to optimize image quality. 7. Set up a simple audio system that includes a microphone, amplifier, audio mixer, and loudspeaker. 8. Record a simple MIDI composition with multiple tracks, including various instrument sounds. 9. Create and edit MIDI sequences using software, composing simple melodies and rhythms. 10. Design a visual representation of the flow of video signals from an analog video camera to a digital format. 11. Develop a comparison chart or infographic highlighting different video file formats and CODECs. 12. Create a short tutorial video demonstrating basic editing functions of a chosen video editing software. 13. Create a storyboard for a 3D animation project. Outline key scenes, characters, and movements. 14. Design an interactive web animation prototype. Use any animation software to create a sample animation that responds to user interactions on a webpage.	30
Recommended Learning Resources		
Print Resources	TEXT BOOKS: 1. Ranjan Parekh, “Principles of Multimedia” Tata McGraw Hill, 2013 2. Tay Vaughan, "Multimedia Making Jt Works", Tata McGraw-Hill. 3. Zc-Nian Li and Mark S. Drew "Fundamentals of Multimedia" Pearson Education International 2003 REFERENCE BOOKS: 1. Rajneesh Aggarwal & B. B Tiwari, "Multimedia Systems"', Excel Publication, New Delhi, 2002 2. Li & Drew,"Fundamentals of Multimedia'', Pearson Education, 2004	

Year	I	Course Code: CA1SE01E1	Credits	3
Sem.	II	Course Title: Multimedia Content Management	Hours	60
Course Prerequisites, if any	Basic Computer Knowledge.			
Internal Assessment Marks: 50	End Semester Marks: 50	Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs		
Course Outcomes	On completion of this course, learners will be able to: 1. Describe the various elements and aspects of multimedia Contents 2. Understand the role played by various contents management. 3. Learn to add text, image, audio, video, animation contents management. 4. Learn the compression technique and conversion technique by using multimedia contents. 5. Understand common application of multimedia contents and its security technique			

Unit No.	Course Content	Hours
	Theory Component	
Unit I	Introduction, multimedia content, production applications, content management, operation management, content workflows: Broadcast e-commerce ,corporate, other organizations, system requirement, and architectural system requirement.	9
Unit II	Multimedia content: text, image, audio, video, animation and its format, support mobile learning environment, issue with multimedia contents, features, meta data of multimedia contents	9
Unit III	Text contents: text format, type of format, text content compression algorithm, Image: image contents, type of format, compression algorithm, use of text and image contents, contents conversion technique.	9
Unit IV	Audio content: audio format, type of format, compression algorithm, Video contents: format, type of format compression algorithm, animation and type of format, Types of Animation: - Cel Animation, Stop Motion Animation, Computer Animation, 2-D Animation, 3-D Animation	9
Unit V	Common Multimedia applications, VoIP, Video Conferencing, - Military Surveillance, - Interactive TV, Smart Phone, Security of multimedia contents	9
	Practical Component	
Exercisers	1. Use various components of graphical processing tools. 2. Convert given image different image format. 3. Develop images using RGB/CMY/HSB color models. 4. Design Banner using graphical processing tool. 5. Create Word art text in 2D though image processing software and apply various effect following. i)Drop Shadow. ii) vignette, iii) mirror, iv) reflection.	

	6. Design audio mix and convert audio different format through audio processing software tools. 7. Using the Compression technique applies following multimedia contents. i) Text ii) Image iii) Audio iV) Video 8. Insert an image and perform the following using Transform Tool 9. Perform the following: - a). Distort the image using Wrap Transform b). Flip the image c). Createa3-DImage d). Use Perspective Transform e). Use Shear Transform. 10. To create a Jpeg image that demonstrates the various features of an image editing tool. 11. Create a 3D pop-out effect 9 and Textures of multimedia contents. 12. Implement security tools using all multimedia contents like text, image, audio, and video.	
Recommended Learning Resources		
Print Resources	Text Book • Li &Drew, "Fundamentals of Multimedia'', Pearson Education, 2004 • Deane Barker, “Web Content Management”, O’Reilly Media, Inc., 2016, ISBN: 978-1-491-90812-9 • Chris Patmore, “The complete animation course” Baron’s Educational Series, New York, ISBN 978-0764-1239-93 • Andreas Mauthe and Peter Thomas, “Professional content management system” John Wiley & Sons Ltd, 2004, ISBN 0-470-85542-8. Reference Books ● Mario Marques da Silva, “Multimedia Communications and Networking”, CRC Press, 2012, ISBN 978 1466 5592-02 ● Borko Furht and Darko Kirovski, “Multimedia Security Handbook “, CRC Press LLC, December 2004, ISBN 978-0849327735	

Year	I	Course Code: CA1SE01E2 Course Title: Programming App Inventor	Credits	3
Sem.	II		Hours	60
Course Prerequisites , if any	Basic Computer Knowledge.			
Internal Assessment Marks: 50	End Semester Marks: 50	Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.		
Course Outcomes	The student will be able to learn and understand following: - 1. Understand the importance and basic details of App inventor 2. Analyze and compare methods for storing and accessing data in App Inventor. 3. Design and construct a mobile application using App Inventor. 4. Analyze and compare methods for storing and accessing data in App Inventor. 5. Evaluate the APK generated by App Inventor.			
Unit No.	**Course Content**		**Hours**	
Theory Component				
Unit I	**Introduction:** design Architecture, Features of App inventor, merit and demerit, operating system use, hardware requirement, app inventor environment, engineering and debugging app, web API		9	
Unit II	**Component:** layout, textbox, label, button, slider, image, graphics menu bar, animation, sound, storing variables, clock component, canvas and its behavior, Event handling: clickable, mouseover key, touch and its behavior.		9	
Unit III	**Procedure:** defining procedure, type, calling, adds parameter. return type value, Control statement: if-else ,nested if-else, iteration block ,time, date component and its behavior Operator: logical, arithmetic component.		9	
Unit IV	**Storing data on the device:** storages component, application sandbox, file component, retrieve data, tinyDB, Tag-values pair, tinyDB access multiple screen. Reading and responding sensor: orientation sensor, accelerometer.		9	
Unit V	**Communication with web API:** Develop mobile app using app inventor, distributing app: live mode, security setting, generate apk file, aia file, code version.		9	
Practical Component				
Exercisers	1. Building apps by selecting components. 2. Defining the variables to remember the values. 3. Working with iterative and control structures using blocks. 4. Generate random number. 5. Working with addition and subtraction blocks 6. Working with canvas component for drawing. 7. Working with buttons and event handlers. 8. Working with list picker and activity starter. 9. Adding media (sound and images) to apps by uploading them form computer. 10. Working with the block editor to blocks that define the components behaviour.			

	11. Working with database, connecting, storing and retrieval of information in app. 12. Testing apps with App Inventor's live testing. 13. Packaging the apps you build and downloading them to phone. 14. Create an app that can speak out a message when you shake your mobile phone. 15. Create an app for Quiz competition and display as a dashboard leader.	
Recommended Learning Resources		
Print Resources	TEXT BOOK 1. David Wolber, Hal Abelson, Ellen Spertus, & Liz Looney "APP INVENTOR create own android app" ISBN 978-1-4493-9748-7 2. Tony Gaddis and Rebecca Halsey, "Starting out with App inventor for android", ISBN-13: 978-1-292-08032-1 ISBN-10: 1-292-08032-9	

SEMESTER II

<table>
<tr><td>Year</td><td>I</td><td colspan="2" rowspan="2">Course Code: CA2MJ02
Course Title: Problem Solving & Programming Fundamentals</td><td>Credits</td><td>4</td></tr>
<tr><td>Sem.</td><td>II</td><td>Hours</td><td>75</td></tr>
<tr><td>Course Prerequisites, if any</td><td colspan="5">NIL</td></tr>
<tr><td>Internal Assessment Marks: 25</td><td colspan="2">End Semester Marks: 75</td><td colspan="3">Duration of ESA (Theory) : 03 hrs.
Duration of ESA (Practical) : 03 hrs.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">• Understand the basic concepts of programming languages, including syntax and semantics.
• Apply programming constructs like loops, conditionals, and functions in practical scenarios.
• Analyse code to identify and fix errors using debugging techniques.
• Create modular programs using functions and procedures, emphasizing good programming practices.</td></tr>
<tr><td>Unit No.</td><td colspan="3">Course Content</td><td colspan="2">Hours</td></tr>
<tr><td colspan="6">Theory Component</td></tr>
<tr><td>Unit I</td><td colspan="3">Introduction to Computer Problem-Solving
The Problem-solving Aspect - Top-down Design - Implementation of Algorithms - Program Verification - The Efficiency of Algorithms - The Analysis of Algorithms</td><td colspan="2">9</td></tr>
<tr><td>Unit II</td><td colspan="3">Basic programming constructs
Basic Data types (Numerical, String) – Variables – Expressions – I/O statements – Compile and Run - Debugging</td><td colspan="2">9</td></tr>
<tr><td>Unit III</td><td colspan="3">A Decision Making – Branching & Looping
Decision making – Relational Operators - Conditional statement, Looping statement - Nested loops - Infinite loops - Switch statements</td><td colspan="2">9</td></tr>
<tr><td>Unit IV</td><td colspan="3">Array Techniques
Array Manipulation - Different operations - one dimensional array - two-dimensional array - multi-dimensional array - Character Arrays and Strings</td><td colspan="2">9</td></tr>
<tr><td>Unit V</td><td colspan="3">Modular solutions
Introduction to functions – Importance of design of functions – Arguments – Parameters – return values – local and global scope – Recursion</td><td colspan="2">9</td></tr>
<tr><td colspan="6">Practical Component</td></tr>
<tr><td>Exercises</td><td colspan="3">1. Program to array counting, array order reversal & find the maximum number in a set.
2. Program for removal of duplicates from an ordered array & to partition an array.
3. Program to find the k^{th} smallest element.
4. Program to exchange the values of two variables without using a third variable.
5. Program that takes a list of numbers as input and counts the total number of elements in the list.
6. Program to calculate the sum of a set of numbers entered by the user.
7. Program to compute the factorial of a given integer.</td><td colspan="2">30</td></tr>
</table>

	8. Program to compute the sine of an angle (in degrees) using a series expansion. 9. Program to generate the Fibonacci sequence up to a specified limit. 10. Program that takes an integer as input and reverses its digits. 11. Program that converts a number from one base to another (e.g., binary to decimal, decimal to binary).	
Recommended Learning Resources		
Print Resources	1. E. Balaguruswamy, "Programming In ANSI C", 4th edition, TMH Publications, 2007 2. Ashok N. Kamthane, "Programming with ANSI and Turbo C", Pearson Education, 2006 3. Ashok N. Kamthane et. al., "Computer Programming and IT", Pearson Education, 2011. 4. Yashwant Kanetkar, "Let Us C", 13th Edition, PHP, 2013.	

Year	I	**Course Code: CA2MI02** **Course Title: PRINCIPLES OF ACCOUNTING**	**Credits**	4
Sem.	II		**Hours**	75
Course Prerequisites, if any	Nil			
Internal Assessment Marks: 25	End Semester Marks: 75	Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.		
Course Outcomes	• Familiarize with the Generally Accepted Accounting Principles (GAAP). • Organize and account all financial information for easy access and evaluation. • Apply bookkeeping principles to accurately record revenue and expenses. • Analyse bank statements and financial records to reconcile cash balances. • Develop a comprehensive financial reporting system incorporating GAAP principles.			

Unit No.	Course Content	Hours
	Theory Component	
Unit I	**Introduction** Meaning – Stakeholders – Advantages and Limitations – Accounting Concepts and Conventions – GAAP. Types of accounts – Rules. Preparation of Journal, Ledge rand Trial Balance.	9
Unit II	**Final Accounts** Trading Account - Profit and Loss Account - Balance Sheet Preparation of Final Accounts with simple adjustments.	9
Unit III	**Depreciation Accounting** Meaning - Straight Line and Written Down value methods - Change of method of Depreciation.	9
Unit IV	**Single Entry** Features – Advantages – Disadvantages – Single entry vs Double entry – Profit calculation understatement of affairs method.	9
Unit V	**Bank Reconciliation Statement** Bank Reconciliation Statement – Causes of Disagreement – Preparation of Bank Reconciliation Statement.	9
	Practical Component	

Exercises	1. Identify a business of your choice and list down its stakeholders. 2. Choose a business transaction and apply the accounting concepts to analyse its impact on financial reporting. 3. Prepare a ledger for each account involved in the transactions. 4. Given a list of revenue and expense items, prepare a Trading Account and Profit/Loss Account. 5. Using the information from the Profit/Loss Account, create a Balance Sheet. 6. Analyse how adjustments impact the overall financial position of the business. 7. Apply Straight Line and Written Down methods to a set of assets and analyse the differences in depreciation expense. 8. Evaluate the effects of changing the depreciation method on the financial statements. 9. Given the cost and residual value of assets, calculate depreciation using both the Straight Line and Written Down Value methods. 10. Given incomplete accounting records under a single-entry system, calculate the profit using the statement of affairs method. 11. Take a set of single-entry accounting records and convert them into double entry format. 12. Identify the improvements and additional insights gained through the conversion. 13. Given a list of transactions, identify potential causes of disagreement between the bank statement and the company's cash records. 14. Provide a set of bank transactions and cash records, and guide the preparation of a Bank Reconciliation Statement. 15. Given a Bank Reconciliation Statement, analyse and interpret the information provided.	30
Recommended Learning Resources		
Print Resources	**TEXT BOOKS:** 1. R.L. Gupta and V.K Gupta, "Financial Accounting", Sultan Chand and Sons Publishers, 2012. **REFERENCE BOOKS:** 1. Ansulene Prinsloo, "Accounting: Foundational Principles of Financial Accounting", AuRet Publishing, 2015. Joanne M. Flood, "Interpretation and Application of Generally Accepted Accounting Principles", Wiley GAAP 2023.	

Year	I	**Course Code: CA2SE02E1** **Course Title: Office Management Tools**	**Credits**	3
Sem.	II		**Hours**	60
Course Prerequisites, if any	Nil			
Internal Assessment Marks: 50	End Semester Marks: 50	Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.		
Course Outcomes	• Recall and explain basic computer concepts, including hardware, software, and key terminology. • Practice basic text entry, formatting, and document structuring using a Word Processor. • Apply spreadsheet skills to perform basic tasks such as data entry, formatting, and simple calculations. • Apply presentation software skills to create and deliver effective presentations. • Analyse and demonstrate proficiency in designing, creating, and managing databases.			
Unit No.	**Course Content**		**Hours**	
Theory Component				
Unit I	**Computer Fundamentals** Computer and Operating system Fundamentals – Components of a computer system – Input and Output devices – Memory Handling – Storage Devices		9	
Unit II	**Word Processor** Introduction to Word Processor and User Utilities – Exploring Template and Formation of Documents – Table handling – Mail Merge and Print Process		9	
Unit III	**Spreadsheet** Spreadsheet – Workbook Window – Formatting Cells / Worksheet – Working with Formula, Function and Charts – Filtering data and Printing a Presentation		9	
Unit IV	**Slides** Introduction to Slides – Creating Templates – Font and colour editing – Adding – Multimedia effects – Consolidating		9	
Unit V	**Access** Overview of Microsoft Access Databases – Design and Create Tables to Store Data – Simplify Data Entry with Forms - Obtain Valuable Information Using Queries		9	

Practical Component		
Exercises	1. Identify and list the main components of a computer system with its uses. 2. Create a table listing various input and output devices and their role in the overall functioning of a computer. 3. Explore different types of storage devices and their respective capacities. 4. Design a personalized business card, including your name, contact information, and any relevant details, using shapes and text boxes. 5. Develop a professional resume showcasing your skills, education, and work experience. Utilize appropriate formatting for headings and bullet points. 6. Develop a newsletter layout with multiple columns, images, and articles. 7. Create a personal budget spreadsheet that includes income, expenses, and a summary of the financial situation. Utilize Excel's functions for calculations. 8. Develop a grade tracker for a semester, including columns for subjects, grades, and credits. Calculate the GPA using Excel formulas. 9. Build an inventory spreadsheet for a small business. Include product names, quantities, prices, and total values. Use formulas for inventory calculations. 10. Build a photo album slideshow with captions. Apply slide transitions for smooth navigation between images. 11. Create an interactive quiz presentation. Include questions on different slides, and use hyperlinks to navigate to correct or incorrect answers. 12. Present the findings of a scientific experiment. Include graphs, charts, and visuals to illustrate the experiment process and results. 13. Create tables for student details, courses, and grades. 14. Design a database to manage inventory for a small business. 15. Develop forms for easy data entry, and generate queries to track stock levels.	30
Recommended Learning Resources		
Print Resources	**TEXT BOOKS:** 1. Vallabhan S.V. Srinivasa, “Computer Application in Business” Sultan Chand & Sons, 2011.	

Year	I	Course Code: CA2SE02E2	Credits	3
Sem.	II	Course Title: 3D Modelling & Animation	Hours	60
Course Prerequisites , if any	Basic Computer Knowledge.			
Internal Assessment Marks: 50	End Semester Marks: 50	Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs..		
Course Outcomes	The student will be able to learn and understand 1. Understand the basics of Computer-based Animation and getting started with Max. 2. Explain the functionalities of 2D splines, shapes, and compound objects. 3. Apply 3D modelling techniques and demonstrate proficiency in keyframe animation. 4. Analyse the role and impact of simulation, effects, lighting, and camera settings. 5. Apply texturing techniques within Max and utilize V-Ray for rendering.			
Unit No.	**Course Content**		**Hours**	
Theory Component				
Unit I	**Computer-based Animation & Getting Started with Max**: Definition of Computer-based Animation, Basic Types of Animation: Real Time ,Non-real-time, Definition of Modelling, Creation of 3D objects. Exploring the Max Interface, Controlling & Configuring the Viewports, Customizing the Max Interface & Setting Preferences, Working with Files, Importing & Exporting, Selecting Objects & Setting Object Properties, Duplicating Objects, Creating & Editing Standard Primitive & extended Primitives objects, transforming objects, Pivoting, aligning etc.		9	
Unit II	**2D Splines, Shapes & compound object:** Understanding 2D Splines & shape, Extrude & Bevel 2D object to 3D, Understanding Loft & terrain, Modeling simple 4 objects with splines, Understanding morph, scatter, conform, connect compound objects, blobmesh, Boolean, Proboolean & procutter compound object.		9	
Unit III	**3D-Modelling:** Modeling with Polygons, using the graphite, working with XRefs, Building simple scenes, Building complex scenes with XRefs, using assets tracking, deforming surfaces & using the mesh modifiers, modeling with patches & NURBS **Keyframe Animation:** Creating Keyframes, Auto Keyframes, Move & Scale Keyframe on the timeline, Animating with constraints & simple controllers, animation Modifiers & complex controllers, function curves in the track view, motion mixer etc.		9	
Unit IV	**Simulation & Effects:** Bind to Space Warp object, Gravity, wind, displace force object, deflectors, FFD space warp, wave, ripple, bomb, Creating particle system through parray, understanding particle flow user interface, how to particle flow works, hair & fur modifier, cloth & garment maker modifiers etc. **Lighting & Camera:** Configuring & Aiming Cameras, camera motion blur, camera depth of field, camera tracking, using basic lights &		9	

	lighting Techniques, working with advanced lighting, Light Tracing, Radiosity, video post, mental ray lighting etc.	
Unit V	**Texturing with Max:** Using the material editor & the material explorer, creating & applying standard materials, adding material details with maps, creating compound materials & material modifiers, unwrapping UVs & mapping texture, using atmospheric & render effects. **Rendering with V-Ray** V-ray light setup, V-ray rendering settings, HDRI Illumination, Fine-tuning shadows, Final render setting etc.	9
Practical Component		
Exercises	1. Create the 3D Model of any building. 2. Working with viewpoints and files. 3. Create the duplicating model from existing model. 4. Working with transforming the model. 5. Creating the 2D objects and extrude it into 3D 6. Modeling simple 4 objects with splines. 7. Working with compound objects. 8. Modeling and building of scenes. 9. Making and animation movie using all the scenes. 10. Creating the keyframes and scaling on timeline. 11. Create the Simulation of an animation movie 12. Apply various effects 13. Working with the lighting and camera effects. 14. Adding and editing the texture. 15. Rendering the movie for final publishing.	
Recommended Learning Resources		
Print Resources	TEXT BOOK 1. ASCENT, “Autodesk 3ds Max 2022 Fundamentals”, ASCENT, 2022 2. TedBoardman, “3ds max7 Fundamentals”, NewRiders, 2005 3. TedBoardman, “3ds Max6 Fundamentals”, Techmedia, 2004 4. Michele Bousquet, “Model, Rig, Animate! with 3d’s max6”, Many world production, 2003 REFERENCE BOOKS 1. Michael E. Mortenson, “3D Modelling, Animation and Rendering”, Createspace Independent Pub, 2010 2. Boris Kulagin, “3ds Max 8 from Modelling to Animation” , A-List, 2006 3. Michael G. Strintzis, “3D Modelling and Animation”, IGI Publishing, 2004 4. Lance Flavell, “Beginning Blender: Open Source 3D Modelling, Animation, and Game Design”, A press, 2010	

VALUE ADDED COURSES

Year	I	Course Code: CA2VA04 Course Title: Digital Technologies	Credits	2
Sem.	II		Hours	45
Course Prerequisites, if any	NIL			
Internal Assessment Marks: 25	End Semester Marks: 75	Duration of ESA (Theory) : 03 hrs. Duration of ESA (Practical) : 03 hrs.		
Course Outcomes	• Learn about digital paradigm. • Understand the importance of digital technology, digital financial tools, e-commerce. • Analyse the concepts of communication and networks. • Understand the e-governance and Digital India initiatives. • Understand the use & applications of digital technology. • Learn the applications of machine learning and big data.			
Unit No.	**Course Content**		**Hours**	
Theory Component				
Unit I	Introduction & Evolution of Digital Systems. Role & Significance of Digital Technology. Information & Communication Technology & Tools. Computer System & its working, Software and its types. Operating Systems: Types and Functions. Problem Solving: Algorithms and Flowcharts.		7	
Unit II	Communication Systems: Principles, Model & Transmission Media. Computer Networks & Internet: Concepts & Applications, WWW, Web Browsers, Search Engines, Messaging, Email, Social Networking. Computer Based Information System: Significance & Types. E-commerce & Digital Marketing: Basic Concepts, Benefits & Challenges.		7	
Unit III	Digital India & e-Governance: Initiatives, Infrastructure, Services and Empowerment. Digital Financial Tools: Unified Payment Interface, Aadhar Enabled Payment System, USSD, Credit / Debit Cards, e-Wallets, Internet Banking, NEFT/RTGS and IMPS, Online Bill Payments and PoS. Cyber Security: Threats, Significance, Challenges, Precautions, Safety Measures, & Tools, legal and ethical perspectives.		7	
Unit IV	Emerging Technologies & their applications: Overview of Cloud Computing, Big Data, Internet of Things, Virtual Reality,		7	
Unit V	Emerging Technologies & their applications: Blockchain & Cryptocurrency, Robotics, Machine Learning & Artificial Intelligence, 3-D Printing. Digital Signatures.		7	
Practical Component				
Exercises	1. Operating System Installation and configuration 2. Application Software Installation and configuration 3. Hardware understanding and minor troubleshooting 4. Networking, cabling, configuration		10	
Recommended Learning Resources				
Print Resources	1. Pramod Kumar, Anuradha Tomar, R. Sharmila, "Emerging Technologies in Computing - Theory, Practice, and Advances", Chapman and Hall / CRC, 1st Edition, 2021, eBook ISBN: 9781003121466. https://doi.org/10.1201/9781003121466.			

	2. V. Rajaraman, “Introduction to Information Technology”, PHI, 3rd Edition, 2018, ISBN-10: 9387472299, ISBN-13: 978-9387472297. 3. E. Balagurusamy, “Fundamentals of Computers”, Tata Mc GrawHill, 2nd Edition, 2011, ISBN: 9780071077880. 4. Behrouz A. Forouzan, “Data Communications and Networking”, McGraw Hill, 4th Edition, 2007, ISBN 978-0-07-296775-3. 5. Rajkumar Buvya, James Broberg, and Andrzej Gosciniski, “Cloud Computing-Principals and Paradigms”, Wiley, 2011, ISBN: 978-0-470-88799-8.