# PONDICHERRY UNIVERSITY 

(A CENTRAL UNIVERSITY)
SCHOOL OF ENGINEERING AND TECHNOLOGY DEPARTMENT OF COMPUTER SCIENCE

## REGULATIONS, CURRICULUM \& SYLLABUS <br> (For Affiliated Colleges)

## B.C.A. (HONORS) DEGREE PROGRAMME <br> 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), $\mathrm{A}+($ Excellent $), \mathrm{A}$ (Very good), $\mathrm{B}+($ Good $)$, B (Above average), $\mathrm{C}($ Average $), \mathrm{P}($ Pass ), F (Fail) and Ab (Absent) with a numeric value of $\mathrm{O}=10$, $\mathrm{A}+=9, \mathrm{~A}=8, \mathrm{~B}+=7, \mathrm{~B}=6, \mathrm{C}=5, \mathrm{P}=4$, and $\mathrm{F}=0, \mathrm{Ab}=0$.
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. These courses are common across all specializations of Computer Science.
J. Minor Discipline Courses: Means allied/elective/specialization specific subjects of Computer Science discipline. Based on the set of Minor Discipline Courses the candidate study, specialization in Computer Science will be awarded. Eg: B.Sc. (Computer Science) with minor discipline courses in Artificial Intelligence and Machine Learning will be awarded B.Sc. Computer Science with Specialization in AI\&ML.
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 $1^{\text {st }}$ 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 socioeconomic 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.Sc.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.Sc. Computer Application (Honors with Research) *
- B.Sc. Computer Application (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 <br> per course | Total Credits |  |  |
| :--- | :---: | :---: | :---: | :---: |
| MID 1 to MID 8 | 4 | $8 \times 4=32$ Credits |  |  |
| MJD 19 \& MJD 20 | 4 | $2 \times 4=08$ Credits |  |  |
| SEC 1, SEC $2 \&$ SEC 3 | 3 | $3 \times 3=09$ Credits |  |  |
| Total Credits |  |  |  | 49 Credits |

The 13 courses under the above said categories are chosen from the specialization of core Computer Application and the awarded degree shall be

- B.Sc. Computer Application (Honors with Research)
- B.Sc. Computer Application (Honors)


### 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 2 ${ }^{\text {nd }}$ Semester: Certificate in Computer Application will be awarded for candidates who exit the course at the end of $2^{\text {nd }}$ 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 $2^{\text {nd }}$ semester.

Exit after $4^{\text {th }}$ Semester: Diploma in Computer Application will be awarded for candidates who exit the course at the end of $4^{\text {th }}$ 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 $4^{\text {th }}$ semester.

Exit after 6 $^{\text {th }}$ Semester: UG Degree in Computer Application (B.Sc. (CA)) 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 $4^{\text {th }}$ semester.

| Exit after | Credits and other requirements | Awards |
| :--- | :--- | :--- |
| $2^{\text {nd }}$ Semester | Min: 40 Credits, Internship 4-6 weeks’ | Certificate in Multimedia Applications |
| $4^{\text {th }}$ Semester | Min: 80 Credits, Internship 4-6 weeks’ | Diploma in Computer Application |
| $6^{\text {th }}$ Semester | Min: 120 Credits, Internship 4-6 weeks’ | B.Sc. Computer Application |

## 5. PEDAGOGICAL APPROACHES

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


| e) Internship course | Courses requiring students to Learn by Doing in the workplace <br> external to the educational Institutions. <br> Internships involve working in Software Companies, Research <br> and Higher Educational Institution Laboratories, Corporate <br> Offices, etc. All Internships should be properly guided and inducted <br> for focused learning. |
| :--- | :--- |
| f) Research Project | Students need to study and analyze the recent research publications <br> from indexed/peer reviewed journals in their area of specialization. <br> Outcome of the study and analysis need to be presented as a thesis or <br> 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 $8 / 9^{\text {th }}$ 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 6 $^{\text {th }}$ 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 | $\mathbf{2 5}$ |

### 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 |

### 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 | $\mathbf{5 0}$ |

### 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 | Total | $\mathbf{2 5}$ |
|  |  | 05 |

### 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 $6^{\text {th }}$ 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 $15 / 16^{\text {th }}$ 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 <br> (All End Semester Exams shall be conducted by the Pondicherry University)

| Course Components | Max. <br> Marks | End-Sem <br> Exam <br> Duration |
| :--- | :---: | :---: |
| A. Theory subjects: <br> Sec A: 10 Questions of 2 Marks each (20 Marks) <br> (Knowledge: 3, Comprehension: 2, Application: 3, Analysis:2) |  |  |
| Sec B: 5 out of 7 Questions of 5 Marks each (25 Marks) <br> (Knowledge: 1, Comprehension: 2, Application: 1, Analysis:3) | Marks | 3 Hours |
| Sec C: 2 Either/OR choice questions of 15 Marks each (30 Marks) <br> (Application: 1, Analysis:1) <br> Questions from all units of Syllabus equally distributed. |  |  |


| B. Skill Enhancement/ Practical/Internship/Project Work subjects: <br> Skill Enhancement / Practical Subjects: <br> Based on Practical Exams conducted by CoE of University |  |  |
| :--- | :---: | :---: |
| Internship / Research Project Work: <br> Presentation of the work / Report / Viva-voce examinations | 50 | 3 Hours |
| Marks |  |  |,- --

### 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 <br> Letter Grade | Meaning | Grade Points for <br> Calculation of CGPA |
| :---: | :--- | :---: |
| O | Outstanding | 10 |
| $\mathrm{~A}+$ | Excellent | 9 |
| A | Very Good | 8 |
| $\mathrm{~B}+$ | 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: $\mathrm{K}=(\mathrm{X}-50) / \mathrm{G}$
(i) If $\mathrm{K} \geq 5$, then the grades shall be awarded as given in the following Table.

| If K $\geq \mathbf{5}$ |  |  |
| :--- | :---: | :---: |
| Range of Marks in \% | Letter Grade Points for | Grade Points for |
| X to $(\mathrm{X}-\mathrm{K})+1$ | O | 10 |
| (X-K) to $(\mathrm{X}-2 \mathrm{~K})+1$ | A+ | 9 |
| $(\mathrm{X}-2 \mathrm{~K})$ to $(\mathrm{X}-3 \mathrm{~K})+1$ | A | 8 |
| (X-3K) to $(\mathrm{X}-4 \mathrm{~K})+1$ | B+ | 7 |
| (X-4K) to $(\mathrm{X}-5 \mathrm{~K})+1$ | B | 6 |
| (X-5K) to 50 | C | 5 |


| $40-49$ | P | 4 |
| :--- | :---: | :---: |
| Below 40 | F | 0 |
| Absent (Lack of Attendance) | Ab | 0 |

(ii) If $\mathrm{K}<5$, 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 |
| $71-79$ | $\mathrm{~A}+$ | 9 |
| $66-70$ | A | 8 |
| $61-65$ | $\mathrm{~B}+$ | 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. $\operatorname{SGPA}\left(\mathrm{S}_{\mathrm{i}}\right)=\Sigma\left(\mathrm{C}_{\mathrm{i}} \times \mathrm{G}_{\mathrm{i}}\right) / \Sigma \mathrm{C}_{\mathrm{i}}$
where $C_{i}$ is the number of credits of the $\mathrm{i}^{\text {th }}$ course and $\mathrm{G}_{\mathrm{i}}$ is the grade point scored by the student in the $\mathrm{i}^{\text {th }}$ course.
(i) Example for Computation of SGPA where candidate has not failed in any course

| Semester | Course | Credit | Letter <br> Grade | Grade <br> point | Credit Point <br> (Credit x Grade) |  |  |  |
| :---: | :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| I | Course 1 | 3 | A | 8 | $3 \times 8=24$ |  |  |  |
| I | Course 2 | 4 | B+ | 7 | $4 \times 7=28$ |  |  |  |
| I | Course 3 | 3 | B | 6 | $3 \times 6=18$ |  |  |  |
| I | Course 4 | 3 | O | 10 | $3 \times 10=30$ |  |  |  |
| I | Course 5 | 3 | C | 5 | $3 \times 5=15$ |  |  |  |
| I | Course 6 | 4 | B | 6 | $4 \times 6=24$ |  |  |  |
|  |  |  |  |  |  |  | SGPA | $\mathbf{1 3 9 / 2 0}=\mathbf{6 . 9 5}$ |

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

| Semester | Course | Credit | Letter <br> Grade | Grade <br> point | Credit Point <br> (Credit x Grade) |  |  |  |  |  |
| :---: | :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| I | Course 1 | 3 | A | 8 | $3 \times 8=24$ |  |  |  |  |  |
| I | Course 2 | 4 | B+ | 7 | $4 \times 7=28$ |  |  |  |  |  |
| I | Course 3 | 3 | B | 6 | $3 \times 6=18$ |  |  |  |  |  |
| I | Course 4 | 3 | O | 10 | $3 \times 10=30$ |  |  |  |  |  |
| I | Course 5 | 3 | C | 5 | $3 \times 5=15$ |  |  |  |  |  |
| I | Course 6 | 4 | F | 0 | $4 \times 0=00$ |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | SGPA | $\mathbf{1 1 5 / 2 0}=\mathbf{5 . 7 5}$ |

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

| Semester | Course | Credit | Letter <br> Grade | Grade <br> point | Credit Point <br> (Credit x Grade) |
| :---: | :--- | :---: | :---: | :---: | :---: |
| I | Course 1 | 3 | A | 8 | $3 \times 8=24$ |
| I | Course 2 | 4 | B+ | 7 | $4 \times 7=28$ |
| I | Course 3 | 3 | F | 0 | $3 \times 0=00$ |
| I | Course 4 | 3 | B | 6 | $3 \times 6=18$ |
| I | Course 5 | 3 | C | 5 | $3 \times 5=15$ |


| I | Course 6 | 4 | F | 0 | $4 \times 0=00$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 20 |  |  | 85 |
|  | SGPA |  |  |  |  |

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 $(\mathrm{F})$ 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 $6^{\text {th }}$ Semester and $8^{\text {th }}$ Semester.

### 8.3.6 Classification of Divisions

| Range of CGPA | Result |
| :---: | :--- |
| $9.0-10$ | First Class with distinction ${ }^{\text {\# }}$ |
| $6.0-8.99$ | 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 $7^{\text {th }}$ and $8^{\text {th }}$ 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 | $\mathrm{Cr} /$ 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 ${ }^{\text {\#\# }}$ |  |
|  | Total | 120 |  |  | 160 |  |  |

\#\#Note: Honors students not undertaking research will do 3 courses for 12 credits 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- B.Sc. 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 | Comp onent | 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 | CA1MIO1 | 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 | H | 2 | 4 |  |  |
| Total |  |  |  |  | 20 |  | Ho |  |

SECOND SEMESTER

| S.No | Comp onent | 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 | CA2MIO2 | 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 | H | 2 | 2 |  | 2 |
| 7 | VAC 4 | CA2VA04 | Digital Technologies | H | 2 | 4 |  |  |
| Total |  |  |  |  | 20 | 30 Hours |  |  |

THIRD SEMESTER

| S.No | Comp onent | 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 | Compo |  |  | H/S | ts |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  | 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 | CA4PR01 | Community Engagement and Service | H | 2 |  |  | 6 |
| Total |  |  |  |  | 20 | 30 Hours |  |  |

FIFTH SEMESTER

| S.No | Compo nent | 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 |  | Ho |  |

SIXTH SEMESTER

| S.No | Compo nent | 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 | 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 | Compo nent | 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 |  | Hou |  |


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


| EIGTH SEMESTER - B.Sc. Computer Application (Honors with Research) |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| S.No | Compo nent | Course Code | Title of the Course | H/S | Credits | Hours/Week |  |  |
|  |  |  |  |  |  | L | T | P |
| 1 | MJD 19 |  | Any one course from Table 4 | H | 4 | 3 |  | 2 |
| 2 | MJD 20 |  | Any one course from Table 5 | H | 4 | 3 |  | 2 |
| 3 | MJD 21 | CA8MJ24 | Research Project | S | 4 | 3 |  | 2 |
| 4 | MJD 22 | CA8MJ25 | Project Report | S | 4 | 3 |  | 2 |
| 5 | MJD 23 | CA8MJ26 | Project Viva-voce | S | 4 | 3 |  | 2 |
| Total |  |  |  |  | 20 |  | Ho |  |

Table 1: MID 6 - SIXTH SEMESTER

| S.No | Compo nent | 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 | Compo nent | Course Code | Title of the Course | H/S | Credits | Hours/Week |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  | L | T | P |
| 1 | MID 7 | CA7MIO7E1 | UI/UX Design | S | 4 | 3 |  | 2 |
| 2 | MID 7 | CA7MIO7E2 | Mobile Application Development | S | 4 | 3 |  | 2 |

Table 3: MID 8 - SEVENTH SEMESTER

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

Table 7: SEC 1 / SEC 2 / SEC 3 - I / II / III SEMESTERs

| S.No | Compo nent | 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 | Compo <br> nent | Course <br> 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 | 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) | $\mathbf{H}$ |
| 19. | MJD 19 |  | Data Warehousing \& Mining / Data Science | $\mathbf{S}$ |
| 20. | MJD 20 |  | Data Analytics and Business Intelligence / <br> Machine Learning | S |


| Table 9: List of Minor Disciplinary Courses |  |  |  |  |  |
| :---: | :--- | :--- | :--- | :--- | :---: |
| S.No | Comp <br> onent | Course <br> 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 <br> Intelligence | S |  |


| Table 10: List of Multi-disciplinary Courses |  |  |  |  |
| :---: | :---: | :---: | :--- | :--- |
| S.No | Compo <br> nent | Course <br> Code | Title of the Course | $\mathrm{H} / \mathrm{S}$ |
| 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 | Comp <br> onent | Course <br> Code | Title of the Course | $\mathrm{H} / \mathrm{S}$ |
| 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 <br> 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 | Compon <br> ent | Course Code | Title of the Course | H/S |
| :---: | :---: | :--- | :--- | :---: |
| 1. | VAC 1 | CA1VA01 | Understanding India | H |
| 2. | VAC 2 | CA1VA02 | Environmental Sciences / Education | H |
| 3. | VAC 3 | CA2VA03 | Health \& Wellness / Yoga Education | H |
| 4. | VAC 4 | CA2VA04 | Digital Technologies | H |


| Table 14: Project (WP/ Internship) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| S.No | Compon <br> ent | Course Code | Title of the Course | H/S |
| 1. | Project | CA4PR01 | 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 <br> 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. |  |  | Introduction to Python Programming | H |


| 18. | Computer <br>  <br> Applications | Programming for Mobile Devices | H |
| :---: | :---: | :--- | :--- | :--- |

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

## Bachelor of Computer Applications SYLLABUS

SEMESTER I

| Year | 1 | Course Code: CA1MJ01 <br> Course Title: Digital Logic Fundamentals |  | Credits | 4 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Sem. | 1 |  |  | Hours | 75 |
| Course <br> Prerequisites, if any | NA |  |  |  |  |
| Internal <br> Assessment <br> 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. <br> - Gaining knowledge to design and analyze combinational and sequential circuits. <br> - Learning techniques for the design of digital circuits |  |  |  |  |
| Unit No. | Course Content |  |  | Hours |  |
| Theory Component |  |  |  |  |  |
| Unit I | Digital Systems and Binary Numbers <br> Digital Systems - Binary Numbers - Number-Base Conversions - Octal and Hexadecimal Numbers - Complements of Numbers - Signed Binary <br> Numbers - Binary Codes - Binary Storage and Registers - Binary Logic - <br> Axiomatic Definition of Boolean Algebra - Basic Theorems and Properties of Boolean Algebra - Boolean Functions <br> Canonical and Standard Forms - Other Logic Operations - Digital Logic Gates - Integrated Circuits |  |  | 9 |  |
| Unit II | Gate-Level Minimization <br> Introduction - The Map Method - Four-Variable K-Map - Product-ofSums Simplification - Don't-Care Conditions - NAND and NOR Implementation - Other Two-Level Implementations - Exclusive-OR Function - Hardware Description Language |  |  | 9 |  |
| Unit III | Combinational Logic <br> Introduction - Combinational Circuits - Analysis Procedure - Design <br> Procedure - Binary Adder-Subtractor - Decimal Adder - Binary <br> Multiplier - Magnitude Comparator - Decoders - Encoders - <br> Multiplexers - HDL Models of Combinational Circuits. |  |  | 9 |  |
| Unit IV | Synchronous Sequential Logic <br> 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 <br> Registers - Shift Registers - Ripple Counters - Synchronous Counters - <br> Other Counters - HDL for Registers and Counters |  |  | 9 |  |
| Practical Component |  |  |  |  |  |
| Exercises | 1. Binary to Decimal and vice-versa in Python <br> 2. Digital Logic Gates in Python |  |  | 30 |  |


|  | 3. Simplification of Boolean Functions in Python <br> 4. Combinational Logic Circuits in Python <br> i. Code Converters <br> ii. Arithmetic (Adders, Subtractors, <br> Multipliers, Comparators) <br> iii. Data Handling (Multiplexers, <br> Demultiplexers, Encoders \& Decoders) |  |
| :--- | :--- | :--- | :--- |
| (Many more programs can be included related to programming the |  |  |
| Digital logic in Python) |  |  |$\quad$| Recommended Learning Resources |
| :--- |


| Year | 1 | Course Code: CA1MI01 |  | Credits | 4 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Sem. | 1 | Course Title: MULTIMEDIA AND ANIMATION |  | Hours | 75 |
| Course <br> Prerequisites, if any | Nil |  |  |  |  |
| Internal Assessment Marks: 25 | End Semester Marks: 75 |  | Duration of ESA (Theory) : 03 hrs . <br> Duration of ESA (Practical) : 03 hrs . |  |  |
| Course Outcomes | - Describe the various elements and aspects of multimedia and animation. <br> - Learn to work with text and images <br> - Learn to work with audio processing tools. <br> - Learn to work with video editing tools. <br> - To make an animated movies using Animation and rendering tools. |  |  |  |  |
| Unit No. | Course Content |  |  | Hours |  |
| Theory Component |  |  |  |  |  |
| Unit I | Multimedia Overview <br> 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 <br> 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 <br> 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 <br> 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 <br> 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. <br> 2. Identify the essential tools and equipment needed to create highquality multimedia content. <br> 3. Choose an existing multimedia project or create one, and develop a promotional strategy for it. <br> 4. Create a simple document, such as a poster or brochure, with varying fonts, sizes, and styles. <br> 5. Perform basic image processing tasks like resizing, cropping, and applying colour filters to the image using image editing software. <br> 6. Perform various settings on the image processing tools to optimize image quality. <br> 7. Set up a simple audio system that includes a microphone, amplifier, audio mixer, and loudspeaker. <br> 8. Record a simple MIDI composition with multiple tracks, including various instrument sounds. <br> 9. Create and edit MIDI sequences using software, composing simple melodies and rhythms. <br> 10. Design a visual representation of the flow of video signals from an analog video camera to a digital format. <br> 11. Develop a comparison chart or infographic highlighting different video file formats and CODECs. <br> 12. Create a short tutorial video demonstrating basic editing functions of a chosen video editing software. <br> 13. Create a storyboard for a 3D animation project. Outline key scenes, characters, and movements. <br> 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: <br> 1. Ranjan Parekh, "Principles of Multimedia" Tata McGraw Hill, 2013 <br> 2. Tay Vaughan, "Multimedia Making Jt Works", Tata McGraw-Hill. <br> 3. Zc-Nian Li and Mark S. Drew "Fundamentals of Multimedia" Pear International 2003 <br> REFERENCE BOOKS: <br> 1. Rajneesh Aggarwal \& B. B Tiwari, "Multimedia Systems"', Excel Pu Delhi, 2002 <br> 2. Li \& Drew,"Fundamentals of Multimedia", Pearson Education, 2004 | ducation <br> on, New |


| Year | Course Code: CA1SE01E1 |  | Credits | 3 |
| :---: | :---: | :---: | :---: | :---: |
| Sem. | II Course Title: | imedia 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 . <br> Duration of ESA (Practical) : 03 hrs |  |  |
| Course Outcomes | On completion of this course, learners will be able to: <br> 1. Describe the various elements and aspects of multimedia Contents <br> 2. Understand the role played by various contents management. <br> 3. Learn to add text, image, audio, video, animation contents management. <br> 4. Learn the compression technique and conversion technique by using multimedia contents. <br> 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, 2D 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 comp <br> 2. Convert given im <br> 3. Develop images <br> 4. Design Banner us <br> 5. Create Word art software and app i)Drop Shadow. ii) | nents of graphical processing tools. ge different image format. ing RGB/CMY/HSB color models. <br> gg graphical processing tool. text in 2D though image processing various effect following. vignette, iii) mirror, iv) reflection. |  |  |


|  | 6. Design audio mix and convert audio different format through audio processing software tools. <br> 7. Using the Compression technique applies following multimedia contents. <br> i) Text ii) Image iii) Audio iV) Video <br> 8. Insert an image and perform the following using Transform Tool <br> 9. Perform the following: - <br> a). Distort the image using Wrap Transform b). Flip the image c). Createa3-DImage d). Use Perspective Transform e). Use Shear Transform. <br> 10. To create a Jpeg image that demonstrates the various features of an image editing tool. <br> 11. Create a 3D pop-out effect 9 and Textures of multimedia contents. <br> 12. Implement security tools using all multimedia contents like text, image, audio, and video. |
| :---: | :---: |
| Recommended Learning Resources |  |
| Print Resources | Text Book <br> - Li \&Drew, "Fundamentals of Multimedia', Pearson Education, 2004 <br> - Deane Barker, "Web Content Management", O’Reilly Media, Inc., 2016, ISBN: 978-1-491-90812-9 <br> - Chris Patmore, "The complete animation course" Baron's Educational Series, New York, ISBN 978-0764-1239-93 <br> - Andreas Mauthe and Peter Thomas, "Professional content management system" John Wiley \& Sons Ltd, 2004, ISBN 0-470-85542-8. <br> Reference Books <br> - Mario Marques da Silva, "Multimedia Communications and Networking", CRC Press, 2012, ISBN 9781466 5592-02 <br> - Borko Furht and Darko Kirovski, "Multimedia Security Handbook ", CRC Press LLC, December 2004, ISBN 978-0849327735 |


| Year | I | Course Code: CA1SE01E2 <br> Course Title: Programming App Inventor |  | Credits | 3 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Sem. | II |  |  | Hours | 60 |
| Course <br> Prerequisites , if any | Basic Computer Knowledge. |  |  |  |  |
| Internal <br> Assessment <br> 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: - <br> 1. Understand the importance and basic details of App inventor <br> 2. Analyze and compare methods for storing and accessing data in App Inventor. <br> 3. Design and construct a mobile application using App Inventor. <br> 4. Analyze and compare methods for storing and accessing data in App Inventor. <br> 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. <br> 2. Defining the variables to remember the values. <br> 3. Working with iterative and control structures using blocks. <br> 4. Generate random number. <br> 5. Working with addition and subtraction blocks <br> 6. Working with canvas component for drawing. <br> 7. Working with buttons and event handlers. <br> 8. Working with list picker and activity starter. <br> 9. Adding media (sound and images) to apps by uploading them form computer. <br> 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. <br> 12. Testing apps with App Inventor's live testing. <br> 13. Packaging the apps you build and downloading them to phone. <br> 14. Create an app that can speak out a message when you shake your mobile phone. <br> 15. Create an app for Quiz competition and display as a dashboard leader. |
| :---: | :---: |
| Recommended Learning Resources |  |
| Print <br> Resources | TEXT BOOK <br> 1. David Wolber, Hal Abelson, Ellen Spertus, \& Liz Looney "APP INVENTOR create own android app" ISBN 978-1-4493-9748-7 <br> 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

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


|  | 8. Program to compute the sine of an angle (in degrees) using a series expansion. <br> 9. Program to generate the Fibonacci sequence up to a specified limit. <br> 10. Program that takes an integer as input and reverses its digits. <br> 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, TM 2007 <br> 2. Ashok N. Kamthane, "Programming with ANSI and Turbo C", Pea 2006 <br> 3. Ashok N. Kamthane et. al., "Computer Programming and IT", Pea 2011. <br> 4. Yashwant Kanetkar, "Let Us C", 13th Edition, PHP, 2013. | Publications, son Education, son Education, |


| Year | I |  |  | Credits | 4 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Sem. | II | Course Title: PRINC | COUNTING | Hours | 75 |
| Course <br> Prerequisites, if any | Nil |  |  |  |  |
| Internal <br> Assessment <br> Marks: 25 | End Semester Marks: 75 |  | Duration of ESA (Theory) : 03 hrs . <br> Duration of ESA (Practical) : 03 hrs . |  |  |
| Course Outcomes | - Familiarize with the Generally Accepted Accounting Principles (GAAP). <br> - Organize and account all financial information for easy access and evaluation. <br> - Apply bookkeeping principles to accurately record revenue and expenses. <br> - Analyse bank statements and financial records to reconcile cash balances. <br> - Develop a comprehensive financial reporting system incorporating GAAP principles. |  |  |  |  |
| Unit No. | Course Content |  |  | Hours |  |
| Theory Component |  |  |  |  |  |
| Unit I | Introduction <br> 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 <br> Trading Account - Profit and Loss Account - Balance Sheet Preparation of Final Accounts with simple adjustments. |  |  | 9 |  |
| Unit III | Depreciation Accounting <br> Meaning - Straight Line and Written Down value methods - Change of method of Depreciation. |  |  | 9 |  |
| Unit IV | Single Entry <br> Features - Advantages - Disadvantages - Single entry vs Double entry <br> - Profit calculation understatement of affairs method. |  |  | 9 |  |
| Unit V | Bank Reconciliation Statement <br> 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. <br> 2. Choose a business transaction and apply the accounting concepts to analyse its impact on financial reporting. <br> 3. Prepare a ledger for each account involved in the transactions. <br> 4. Given a list of revenue and expense items, prepare a Trading Account and Profit/Loss Account. <br> 5. Using the information from the Profit/Loss Account, create a Balance Sheet. <br> 6. Analyse how adjustments impact the overall financial position of the business. <br> 7. Apply Straight Line and Written Down methods to a set of assets and analyse the differences in depreciation expense. <br> 8. Evaluate the effects of changing the depreciation method on the financial statements. <br> 9. Given the cost and residual value of assets, calculate depreciation using both the Straight Line and Written Down Value methods. <br> 10. Given incomplete accounting records under a single-entry system, calculate the profit using the statement of affairs method. <br> 11. Take a set of single-entry accounting records and convert them into double entry format. <br> 12. Identify the improvements and additional insights gained through the conversion. <br> 13. Given a list of transactions, identify potential causes of disagreement between the bank statement and the company's cash records. <br> 14. Provide a set of bank transactions and cash records, and guide the preparation of a Bank Reconciliation Statement. <br> 15. Given a Bank Reconciliation Statement, analyse and interpret the information provided. |
| :---: | :---: |
| Recommended Learning Resources |  |
| Print Resources | TEXT BOOKS: <br> 1. R.L. Gupta and V.K Gupta, "Financial Accounting", Sultan Chand and Sons Publishers, 2012. <br> REFERENCE BOOKS: <br> 1. Ansulene Prinsloo, "Accounting: Foundational Principles of Financial Accounting", AuRet Publishing, 2015. <br> Joanne M. Flood, "Interpretation and Application of Generally Accepted Accounting Principles", Wiley GAAP 2023. |


| Year | 1 | Course Code: CA2SE02E1 |  | Credits | 3 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Sem. | II | Course Title: Office | Tools | Hours | 60 |
| Course <br> Prerequisites, if any | Nil |  |  |  |  |
| Internal Assessment Marks: 50 | End Semester Marks: 50 |  | Duration of ESA (Theory) : 03 hrs . <br> Duration of ESA (Practical) : 03 hrs . |  |  |
| Course Outcomes | - Recall and explain basic computer concepts, including hardware, software, and key terminology. <br> - Practice basic text entry, formatting, and document structuring using a Word Processor. <br> - Apply spreadsheet skills to perform basic tasks such as data entry, formatting, and simple calculations. <br> - Apply presentation software skills to create and deliver effective presentations. <br> - Analyse and demonstrate proficiency in designing, creating, and managing databases. |  |  |  |  |
| Unit No. | Course Content |  |  | Hours |  |
| Theory Component |  |  |  |  |  |
| Unit I | Computer Fundamentals <br> Computer and Operating system Fundamentals - Components of a computer system - Input and Output devices - Memory Handling Storage Devices |  |  | 9 |  |
| Unit II | Word Processor <br> Introduction to Word Processor and User Utilities - Exploring Template and Formation of Documents - Table handling Mail Merge and Print Process |  |  | 9 |  |
| Unit III | Spreadsheet <br> Spreadsheet - Workbook Window - Formatting Cells / Worksheet Working with Formula, Function and Charts - Filtering data and Printing a Presentation |  |  | 9 |  |
| Unit IV | Slides <br> Introduction to Slides - Creating Templates - Font and colour editing <br> - Adding - Multimedia effects - Consolidating |  |  | 9 |  |
| Unit V | Access <br> 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. <br> 2. Create a table listing various input and output devices and their role in the overall functioning of a computer. <br> 3. Explore different types of storage devices and their respective capacities. <br> 4. Design a personalized business card, including your name, contact information, and any relevant details, using shapes and text boxes. <br> 5. Develop a professional resume showcasing your skills, education, and work experience. Utilize appropriate formatting for headings and bullet points. <br> 6. Develop a newsletter layout with multiple columns, images, and articles. <br> 7. Create a personal budget spreadsheet that includes income, expenses, and a summary of the financial situation. Utilize Excel's functions for calculations. <br> 8. Develop a grade tracker for a semester, including columns for subjects, grades, and credits. Calculate the GPA using Excel formulas. <br> 9. Build an inventory spreadsheet for a small business. Include product names, quantities, prices, and total values. Use formulas for inventory calculations. <br> 10. Build a photo album slideshow with captions. Apply slide transitions for smooth navigation between images. <br> 11. Create an interactive quiz presentation. Include questions on different slides, and use hyperlinks to navigate to correct or incorrect answers. <br> 12. Present the findings of a scientific experiment. Include graphs, charts, and visuals to illustrate the experiment process and results. <br> 13. Create tables for student details, courses, and grades. <br> 14. Design a database to manage inventory for a small business. <br> 15. Develop forms for easy data entry, and generate queries to track stock levels. | 30 |
| :---: | :---: | :---: |
| Recommended Learning Resources |  |  |
| Print Resources | TEXT BOOKS: <br> 1. Vallabhan S.V. Srinivasa, "Computer Application in Business" Sons, 2011. |  |


| Year | I | Course Code: CA2SE02E2 |  | Credits | 3 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Sem. | II |  |  | Hours | 60 |
| Course <br> Prerequisites if any | Basic Computer Knowledge. |  |  |  |  |
| Internal Assessment Marks: 50 | End Semester Marks: 50 |  | Duration of ESA (Theory) : 03 hrs . Duration of ESA (Practical) : $03 \mathrm{hrs}$. |  |  |
| Course Outcomes | The student will be able to learn and understand <br> 1. Understand the basics of Computer-based Animation and getting started with Max. <br> 2. Explain the functionalities of 2D splines, shapes, and compound objects. <br> 3. Apply 3D modelling techniques and demonstrate proficiency in keyframe animation. <br> 4. Analyse the role and impact of simulation, effects, lighting, and camera settings. <br> 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. |
| Practical Component |  |
| Exercises | 1. Create the 3D Model of any building. <br> 2. Working with viewpoints and files. <br> 3. Create the duplicating model from existing model. <br> 4. Working with transforming the model. <br> 5. Creating the 2D objects and extrude it into 3D <br> 6. Modeling simple 4 objects with splines. <br> 7. Working with compound objects. <br> 8. Modeling and building of scenes. <br> 9. Making and animation movie using all the scenes. <br> 10. Creating the keyframes and scaling on timeline. <br> 11. Create the Simulation of an animation movie <br> 12. Apply various effects <br> 13. Working with the lighting and camera effects. <br> 14. Adding and editing the texture. <br> 15. Rendering the movie for final publishing. |
| Recommended Learning Resources |  |
| Print <br> Resources | TEXT BOOK <br> 1. ASCENT, "Autodesk 3ds Max 2022 Fundamentals", ASCENT, 2022 <br> 2. TedBoardman, "3ds max7 Fundamentals", NewRiders, 2005 <br> 3. TedBoardman, "3ds Max6 Fundamentals", Techmedia, 2004 <br> 4. Michele Bousquet, "Model, Rig, Animate! with 3d's max6", Many world production, 2003 <br> REFERENCE BOOKS <br> 1. Michael E. Mortenson, "3D Modelling, Animation and Rendering", Createspace Independent Pub, 2010 <br> 2. Boris Kulagin, "3ds Max 8 from Modelling to Animation" , A-List, 2006 <br> 3. Michael G. Strintzis, "3D Modelling and Animation", IGI Publishing, 2004 <br> 4. Lance Flavell, "Beginning Blender: Open Source 3D Modelling, Animation, and Game Design", A press, 2010 |

## VALUE ADDED COURSES


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

