

**ASSUMPTION COLLEGE, AUTONOMOUS
CHANGANASSERY**

Accredited by NAAC with A+ Grade
Affiliated to Mahatma Gandhi University, Kottayam

**Curriculum and Syllabi for Bachelor of Computer
Application Programme**

**Under Choice Based Credit System
(Outcome-Based Education with Effect from 2023
Admissions)**



PG Department of Computer Science

**MEMBERS OF COMBINED BOARD OF STUDIES IN UG AND PG
(COMPUTER SCIENCE AND APPLICATIONS)**

Sl No	Name	Category	Designation	Official Address
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13	Dr Rani Oomman Panicker	Faculty Member	Assistant Professor	Assumption College Autonomous
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15	Ms Priya Joseph	Faculty Member	Assistant Professor	Assumption College Autonomous
16	Ms Chinnu Varghese	Faculty Member	Assistant Professor	Assumption College Autonomous
17	Ms Amalu Jacob	Faculty Member	Assistant Professor	Assumption College Autonomous

**MINUTES OF THE BOARD OF STUDIES IN COMPUTER SCIENCE
AND APPLICATIONS (COMBINED UG AND PG)**

**Minutes of the meeting of the Board of Studies in Computer Science and
Applications (Combined UG & PG) on 27/02/2023 at 11am in the Conference
Hall**

The following members were present:

- | | |
|----------------------------|------|
| 1. Mrs Sherin Babu | Sd/- |
| 2. Dr. Sabu M K | Sd/- |
| 3. Dr N Bindu | Sd/- |
| 4. Dr. Manu Sankar | Sd/- |
| 5. Mr Nipun Varma | Sd/- |
| 6. Dr Dhanya Job | Sd/- |
| 7. Dr Linz Tom | Sd/- |
| 8. Mrs. Mary Jaya V. J | Sd/- |
| 9. Mrs. Wincy Abraham | Sd/- |
| 10. Dr. Roby Jose | Sd/- |
| 11. Fr Eby Sebastian | Sd/- |
| 12. Dr Rani Omman Panicker | Sd/- |
| 13. Mrs Chinnumol K V | Sd/- |
| 14. Mrs Chinnu Varghese | Sd/- |
| 15. Mrs Amalu Jacob | Sd/- |

Agenda

1. Discussion on the revised syllabus content
2. To revise the OBE structured curriculum and model QP for both UG and PG Programme from 2023 admission onwards.
3. To finalize the introduction of Field study /Internship/Industry visit for Language in I or II Semester and for Core courses in III or IV Semester
4. To propose or modify Diploma/ Certificate/Bridge/Add-on Programme / Online courses if any and frame the Syllabus
5. Inviting suggestions on the introduction of *Extra Credit Programme [Max Credit – 20]

6. To take necessary actions, based on the curriculum feedback analysis taken from students.
7. Any other matters permitted by the chair. (eg. inclusion of Foundation Course)

* Topics for Extra Credit

Maximum Credit will be 20 out of which a student should achieve a minimum of 10 credits.

1. SWAYAM courses/Summer Fellowship – 4 credits
2. Value Education – 4 credits
3. Unnat Bharat Abhiyan (UBA) – 2 credits
4. Certificate/Add-on Course – 2 credits
5. Physical Activity – 2 credits
6. Intercollegiate Competitions- 2 credits
7. Participation in Clubs – 2 credits
8. Cultural Programme/NSS/NCC/Sports- 2 credits

Recommendations / Suggestions

1. The proposed syllabus for the academic year 2023 was presented before the Board of Studies. After detailed discussion and incorporating the suggestions and modifications raised by the members, the final form of the draft syllabus was framed, approved and recommended to present before the academic council.

After the detailed discussion the following decisions are made for the proposed BSc Computer Science Syllabus.

- A total of 14 new theory courses are introduced - Python Programming, Microprocessors and Microcontrollers, Computer Organization and Parallel Processing, Introduction to Internet of Things, Computer Networks, Cyber Security, Software Engineering, Internet and Digital Marketing, Trending Technologies in IT, Cloud Computing, Computer Graphics and Digital Image Processing Fundamentals, Data Mining and Machine Learning, Cyber Forensics, Software Testing.
- Two new practical courses are incorporated Software Lab- Programming in Python and IoT Lab

- More than 20% content change is incorporated in the following 6 courses - Fundamentals of Computers and PC Hardware, Database Management Systems, Operating Systems, Web Technology, Web Programming Lab, Environmental Studies and Human Rights.

After the detailed discussion the following decisions are made for the proposed BCA Syllabus.

- A total of 12 new theory courses are introduced - Fundamentals of Computers and Digital System, Python Programming, Computer Organization and Parallel Processing, Cyber Security, Mobile Application Development, Internet and Digital Marketing, Trending Technologies in IT, Cloud Computing, Introduction to IoT and Robotics, Data Mining and Machine Learning, Cyber Forensics, Software Testing.
- Two new practical courses are incorporated - Programming in Python and Android Programming
- More than 20% content change is incorporated in the following 10 courses - Data Structures, Database Management Systems, Computer Graphics and Multimedia, RDBMS Lab, Operating Systems, Web Technology, Web Programming Lab, Environmental Studies and Human Rights, Programming in Java, Java Programming Lab.

After the detailed discussion the following decisions are made for the proposed MSc Computer Science Syllabus.

- A total of 14 new theory courses are introduced - Research Methodology and Intellectual Property Rights, Cyber Security, Digital Image Processing, Distributed OS and Linux, Machine Learning, Data Analytics, Ethical Hacking, Mobile Computing, Cloud Computing Technologies, Quantum Computing, BlockChain Technology, Artificial Intelligence, Software Quality Assurance, Green Computing.
- Three new practical courses are incorporated - Java Programming and DBMS Lab using MySQL, Data Structures and DIP Lab, Linux Programming and Machine Learning Lab
- More than 20% content change is incorporated in the following 7 courses - Mathematical Foundations of Computer Science, Advanced Database

Management Systems, Advanced Java Programming, Advanced Data structures and Algorithms, Advanced Computer Networks, Compiler Design, Advanced Software Engineering.

- The board suggested bunching of electives of 3rd and 4th semesters to be categorized into 3 bunches, each consisting of 3 courses of Elective I, Elective II and Elective III courses, from which the students can select a particular course bunch for their study..

The board recommended that the course content of UG - Complementary courses in Mathematics and Statistics should also be revised, in such a manner that accurately augments the studies of computing and programming concepts. The board suggested to include partial differentiation, vectors, hypothesis-testing, few types of Continuous Probability Distributions etc in the syllabus.

2. The board analyzed the course outcomes of all the courses and the programme specific outcomes and suggested revisions, in the Bloom's Taxonomy level for a few courses. The board agreed upon the revised question pattern of the end semester exams for UG and PG programmes and also suggested that Bloom's Taxonomy level, Difficulty Level and CO-PO mapping of each question should be displayed in the question paper.
3. The board recommended introducing Industrial Visit as a compulsory component of study, during third or fourth semester, for BSc Computer Science & BCA programmes.
4. The board agreed to continue with the conduct of already existing two certificate courses and also recommended to include the following certificate courses.
 - a. Certificate course in Agile Project Management
 - b. Certificate course in DevOps
 - c. Certificate course in Mobile Application Development
5. The board agreed upon the introduction of extra credit programmes for both UG and PG students, where the students must achieve a minimum of 10 credits out of the 20-credits components offered by the college.
6. The Board analyzed the feedback collected from students in the year 2022-23 and commented that the present curriculum should be made competent enough with

respect to both industry and research-innovation requirements. As part of the feedback analysis, the following matters are suggested by the board.

- The board opined that the student's industry readiness can be assured by adding more advanced and latest technology related courses like AI, Machine learning, Python Programming, Internet of Things, Mobile Application Development, Digital Marketing, Data Analytics, Quantum computing, Blockchain technology etc in the revised curriculum.
 - The board recommended introducing three new industry relevant certificate courses namely Agile Project Management, DevOps and Mobile Application Development.
 - Inorder to impart experiential learning, the board recommended the inclusion of Industrial Visit component in the second year degree programme.
 - The board suggested including courses like cloud computing and green computing in the curriculum to promote environmental awareness.
 - The board recommended to introduce a foundation course on Office Automation, and the conduct of workshops on job oriented technology courses for both UG and PG Programmes.
 - The board suggested that on account of the changing paradigm of teaching learning process, new methods of evaluation like open-book exams, oral examinations, MCQ based tests etc can be introduced.
7. The board advised that the proposed OBE syllabus implementation should adhere to the academic standards established by the National Education Policy 2020, and the board suggested to get prepared for the 4-year degree programme and PG syllabus according to the NEP framework. The board suggested offering a foundation course entitled "Digital Fundamentals & Office Automation" as an online course, and a bridge course entitled "Object Oriented Programming" for the first year BSc Computer Science & BCA students. The board recommended introducing "LateX" and "Python for Machine Learning", either as a course or as a workshop for the MSc Computer Science students. The board also recommended the inclusion of soft skill training during the course of study(as student volunteership programme)

The meeting concluded at 1.15pm.

Mrs Sherin Babu
Chairman, Board of Studies
BoS in Computer Science and Application

Dr Anitha Jose
Principal
Assumption College Autonomous

ACKNOWLEDGEMENT

I would like to take this opportunity to thank everyone who helped with the effort to restructure the curriculum and syllabus for the Undergraduate Programme in Computer Science.

I am grateful to the Lord Almighty's blessing in enabling me to successfully complete the BSc Computer Science curriculum.

On behalf of the combined board of studies in UG and PG of Computer Science and Applications, I express the deepest gratitude to the patron His Grace Mar Joseph Perumthottam, Archbishop of Changanassery for the moral support and encouragement.

I place my special gratitude to Rev Dr James Palackal, our manager for stimulating suggestions and encouragement and also for sharing his vision of Higher Education.

I put on record my sincere thanks to the Honorable Vice Chancellor, Pro Vice Chancellor, Registrar and the members of the syndicate and all the academic bodies of Mahatma Gandhi University, for the guidance and help extended towards the college.

I would like to express my deep gratitude to Rev Dr Thomas Joseph Parathara, Principal of Assumption College Autonomous, for his support and encouragement at each level of this endeavor.

I sincerely thank Dr. Anitha Jose, Former Principal, Assumption College Autonomous, for her encouragement and readiness to assist at each level of this syllabus revision process.

I express my special gratitude to Ms Anne Mary Joseph and Dr Rani Maria Thomas, Vice Principals of the college for their inspiring ideas and support.

I would like to extend my sincere gratitude to each and every member of the board of studies for their assistance and knowledgeable direction in restructuring the curriculum. I owe thanks to the subject experts, industry expert, and alumni representative for their insightful remarks and recommendations.

I would like to extend my sincere gratitude to the Governing Council and Academic Council for their encouragement and assistance in this matter.

I place on record my wholehearted gratitude to the members of curriculum committee for their untiring efforts, leadership and guidance for completion of this work.

I sincerely acknowledge the contribution of the faculty members of the Department of Computer Science for their contribution towards the curriculum and syllabus restructuring.

Ms Sherin Babu
Chairman, Board of Studies
Assumption College Autonomous

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PREFACE

The Bachelor of Computer Applications (BCA) programme commenced in the year 2013 in the Department of Computer Science at Assumption College Autonomous, Changanassery. The programme was established with the goal of training young women for the range of career opportunities in the IT sector. BCA is an undergraduate degree programme, designed to bridge the gap between IT industries and institutes by incorporating the latest developments into the curriculum. BCA programme is the study of the fundamentals and applications of computer science. This programme prepares students for roles related to computer applications in the IT industry. The BCA curriculum is meant to give students a high level of technical proficiency in developing software applications and solving problems.

One of the most significant changes made in the higher education sector is the introduction of the Learning Outcomes-based Curriculum Framework (LOCF), which makes the educational process student-centric, interactive, and outcome-oriented with clearly stated purposes, objectives, and goals to achieve. The LOCF also seeks to provide uniform educational standards and content delivery across the nation, which will aid in ensuring that students receive an education of comparable quality regardless of the institution and location.

The college was following the syllabus of BCA programme of Mahatma Gandhi University, Kottayam till 2016. The college now has the privilege of reorganising the curriculum after being awarded academic autonomy in the year 2016. So the Board of Studies in Computer Science and Application has initiated the restructuring of the syllabus for BCA and the revised syllabus was implemented from 2017 Admission onwards.

Assumption College Autonomous in its pursuit of imparting quality higher education has adopted the Outcome Based Education (OBE) system recommended by UGC from the academic year 2017 onwards. In order to represent the attainment of high order learning and be in line with the outcome based approach, OBE entails reforming the curriculum, academic procedures, teaching methodologies, assessment and evaluation systems in education. It is a student-centric teaching and learning methodology that places a strong emphasis on the student and measures student achievement through outcomes. Finding curricular gaps and implementing ongoing adjustments in an institute's educational system are made possible by reports of result analysis, which is highly important. As a result, the BCA Curriculum 2023 at Assumption College Autonomous is created in accordance with the LOCF and UGC guidelines. The main goal of this new curriculum is to provide students with a comprehensive

understanding of the subject by placing a high priority on the fundamental concepts, software programming technologies and other cutting edge technologies.

Hence the Board of Studies in Computer Science and Application decided to revise and implement revised OBE based curriculum for BCA Programme at Assumption College Autonomous in accordance with the LOCF and UGC guidelines, from 2023 admission onwards. The main goal of this new BCA curriculum is to provide students with a comprehensive understanding of the subject by placing a high priority on both the fundamental concepts and cutting edge technologies.

ABOUT THE PROGRAMME

With the digital era continuing to develop rapidly, the role of computing and its impact on our lives is more important than ever. Computer science is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, in one way or the other. New and innovative computer technologies are constantly being unveiled, with software engineers, systems developers, programmers and analysts playing a vital role in their creation and development. Information Technology is growing rapidly. Increasing applications of computers in almost all areas of human endeavor has led to vibrant industries with concurrent rapid change in technology. Unlike other basic disciplines, developing core competency in this discipline that can be reasonably stable becomes a challenge.

Bachelor of Computer Applications abbreviated as BCA is a three year undergraduate programme that spreads over six semesters. BCA is a Model III programme that includes Common courses, Core courses, Complementary Courses, Choice based courses, Open courses, Project work and Course viva-voce. This programme's primary goal is to produce competent computer professionals capable of working in all computer system and software fields. The curriculum also includes interdisciplinary courses and electives to help students acquire adequate programming practice in addition to theoretical foundations and expand their professional knowledge. After completing BCA, students will have many career opportunities like software engineer, web developer, network administrator, data scientist, AI/ML personnel, IT project manager, hardware engineer and network engineer. The purpose of the BCA programme is two fold: (1) to prepare the student for a position involving the design, development and implementation of computer software/hardware, and (2) to prepare the student for entry into a program of postgraduate study in computer science/engineering and research related fields.

The Learning Outcome-based Curriculum Framework for Bachelor of Computer Application is intended to facilitate the students to achieve the following.

- To impart quality computer education to enhance logical computing and programming skills.
- To facilitate the development of strong basic fundamentals of Computer Applications.
- To provide the ideal foundation for starting a successful career in the software sector.

- To apply software technologies and solutions to complex real life problems using existing and/or novel technologies.

Eligibility for Admission

The eligibility for admission to BCA programme is a pass in Plus Two/Equivalent Examinations in Science stream with Mathematics /Computer Science/ Informatics Practices as optional courses.

**REGULATIONS FOR UNDERGRADUATE PROGRAMMES
UNDER CHOICE BASED CREDIT SYSTEM, 2023
ASSUMPTION COLLEGE AUTONOMOUS, CHANGANASSERY**

(Affiliated to Mahatma Gandhi University)

TITLE

These regulations shall be called “**Regulations for Undergraduate Programmes under Choice Based Credit System, 2023**”, Assumption College, Autonomous.

1. SCOPE

Applicable to all regular and self-financing Undergraduate Programmes conducted by the College with effect from 2023 admissions.

2. DEFINITIONS

- 2.1 **‘Academic Week’** is a unit of five working days in which the distribution of work is organized from day- one to day -five, with five contact hours one-hour duration on each day. A semester should have a minimum of 18 such academic weeks.
- 2.2 **‘College Coordinator’** is a teacher nominated by the Staff Council to co-ordinate the continuous evaluation undertaken by various departments within the college. She shall be nominated by the College Principal.
- 2.3 **‘Common Course I’** means a course that comes under the category of courses for English and **‘Common Course II’** means additional language, a selection of both is compulsory for Model I and Model II undergraduate programmes.
- 2.4 **‘Complementary Course’** means a course which would enrich the study of core courses.
- 2.5 **‘Core Course’** means a course in the subject of specialization within a degree programme.
- 2.6 **‘Course’** means Paper(s) which will be taught and evaluated within a semester.
- 2.7 **‘Credit’** is the numerical value assigned to a course according to the relative importance of the content of the syllabus of the programme.
- 2.8 **‘Department’** means any teaching department in the college.
- 2.9 **‘Department Coordinator’** is a teacher nominated by the Head of the Department to coordinate the continuous evaluation undertaken in that department.

- 2.10 **'Extra Credits'** are additional credits awarded to a student over and above the minimum credits required for a programme for achievements in co-curricular activities carried out outside the regular class hours as directed by the college.
- 2.11 **Grace Marks** shall be awarded to candidates as per the University orders issued from time to time.
- 2.12 **'Grade'** means a letter symbol (e.g., A, B, C, etc.), which indicates the broad level of performance of a student in a course/ semester/ programme.
- 2.13 **'Grade point'** (GP) is the numerical indicator of the percentage of marks awarded to a student in a course.
- 2.14 **'Institutional Average (IA)'** means average mark secured (Internal + External) for a course at the College level.
- 2.15 **'Open course'** means a course outside the field of specialization of a student and offered by the Departments which can be opted by a student.
- 2.16 **'Parent Department'** means the department which offers core courses in an undergraduate programme.
- 2.17 **'Programme'** means a three year programme of study and examinations spread over six semesters, according to the regulations of the respective programme, the successful completion of which would lead to the award of a degree.
- 2.18 **'Semester'** means a term consisting of a minimum of **450** contact hours distributed over **90** working days, inclusive of examination days, within **18** five-day academic weeks.
- 2.19 Words and expressions used and not defined in this regulation shall have the same meaning assigned to them in the Act and Statutes of the University.

3. ELIGIBILITY FOR ADMISSION AND RESERVATION OF SEATS

- 3.1 Eligibility norms for admission, reservation of seats for various Undergraduate Programmes shall be according to the rules framed by the University in this regard from time to time.
- 3.2 Students can opt for any one (other than core and complementary subjects) of the Open course offered by different departments of the college in the fifth semester (subject to the availability of vacancy in the concerned discipline). Selection of students in the open course will be done in the college based on the interest of the students.

4. DURATION

- 4.1 The duration of UG programmes shall be **6 semesters**.
- 4.2 There shall be two semesters in an academic year. The duration of odd semesters shall be from **June to October** and that of even semesters from **November to March**. There shall be two months vacation during April and May in every academic year.
- 4.3 A student may be permitted to complete the Programme, on valid reasons, within a period of 12 continuous semesters from the date of commencement of the first semester of the programme.

5. REGISTRATION

- 5.1 The number of students for each course shall remain as per existing regulations, as approved by the University except in case of open courses for which there shall be a minimum of 15 and maximum of sanctioned strength including marginal increase.
- 5.2 The number of courses/credits that a student can take in a semester is governed by the provisions in these regulations pertaining to the minimum and maximum number of credits permitted.
- 5.3 Those students who possess the required minimum attendance and progress during an academic year/semester and could not register for the annual/semester examination are permitted to apply for Notional Registration to the examinations concerned enabling them to get promoted to the next semester.

6. SCHEME AND SYLLABUS

- 6.1 The UG programmes shall include (a) Common Courses I & II, (b) Core Courses, (c) Complementary Courses, and (d) Open Courses.
- 6.2 There shall be one Open Course in the fifth semester.
- 6.3 There shall be one Choice Based course in the sixth semester with a choice of one out of three elective courses.
- 6.4 A separate minimum of 30% marks each for internal and external (for both theory and practical) and an aggregate minimum of 35% are required for a pass for a course. For a pass in a programme, a separate minimum of Grade D is required for all the individual papers. If a candidate secures F Grade for any one of the papers offered in a semester/programme, only F grade will be awarded for that semester/programme until

she improves this to D Grade or above within the permitted period. Candidate who secures D grade and above will be eligible for higher studies.

- 6.5 Improvement/supplementary examinations will be conducted only in the even semesters following the publication of the results. As an exemption to this, prior to final semester, the improvement/supplementary examinations can be arranged along with the previous end semester exam.
- 6.6 Students discontinued from previous regulations, can pursue their studies in **Regulations for Under Graduate Programmes under Choice Based Credit System, 2023**” after obtaining readmission. These students have to complete the programme as per **Regulations for Under Graduate Programmes under Choice Based Credit System, 2023**”.

7. PROGRAMME STRUCTURE**Model I BA/BSc**

a	Programme Duration	6 Semesters
b	Total Credits required for successful completion of the programme	120
c	Credits required from Common course I	22
d	Credits required from Common course II	16
e	Credits required from Core + Complementary including Project	79
f	Credits required from Open course	3
g	Minimum attendance required	75%

Model I B Com

a	Programme Duration	6 Semesters
b	Total Credits required for successful completion of the programme	120
c	Credits required from Common course I	14
d	Credits required from Common course II	8
e	Credits required from Core + Complementary including Project	95
f	Credits required from Open course	3
g	Minimum attendance required	75%

Model II BA/BSc

a	Programme Duration	6 Semesters
b	Total Credits required for successful completion of the programme	120
c	Credits required from Common course I	16
d	Credits required from Common course II	8
e	Credits required from Core + Complementary + Vocational courses including Project	93
f	Credits required from Open course	3
g	Minimum attendance required	75%

Model III BA / B Sc / BCA / BBA / BFT

a	Programme Duration	6 Semesters
b	Total Credits required for successful completion of the programme	120
c	Credits required from Common course I	8
d	Credits required from Core + Complementary + Vocational courses including Project	109
e	Credits required from Open course	3
f	Minimum attendance required	75%

8. EXAMINATIONS

8.1 The evaluation of each course shall contain two parts:

- (i) Internal or In-Semester Assessment (ISA)
- (ii) External or End-Semester Assessment (ESA)

8.2 The internal to external assessment ratio shall be 1:4, for both courses with or without practical. There shall be a maximum of 80 marks for external evaluation and maximum of **20** marks for internal evaluation. For all courses (theory & practical), grades are given on a 7- point scale based on the total percentage of marks. (*ISA + ESA*) as given below:

Percentage of Marks	Grade	Grade Point
95 and above	S Outstanding	10
85 to below 95	A ⁺ Excellent	9
75 to below 85	A Very Good	8
65 to below 75	B ⁺ Good	7
55 to below 65	B Above Average	6
45 to below 55	C Satisfactory	5
35 to below 45	D Pass	4
Below 35	F Failure	0
	AB Absent	0

9. CREDIT POINT AND CREDIT POINT AVERAGE

Credit Point (CP) of a course is calculated using the formula:-

$CP = C \times GP$, where *C* is the Credit and *GP* is the Grade point

Semester Grade Point Average (SGPA) of a Semester is calculated using the formula:-

$SGPA = TCP/TC$, where *TCP* is the Total Credit Point of that semester.

Cumulative Grade Point Average (CGPA) is calculated using the formula:-

$CGPA = TCP/TC$, where *TCP* is the Total Credit Point of that programme.

Grade Point Average (GPA) of different category of courses viz. Common Course I, Common Course II, Complementary Course I, Complementary Course II, Vocational Course, Core Course is calculated using the formula:-

$GPA = TCP/TC$, where *TCP* is the Total Credit Point of a category of course. *TC* is the total credit of that category of course

Grades for the different courses, semesters and overall programme are given based on the corresponding CPA as shown below:

CPA	Grade
9.5 and above	S Outstanding
8.5 to below 9.5	A+ Excellent
7.5 to below 8.5	A Very Good
6.5 to below 7.5	B+ Good
5.5 to below 6.5	B Above Average
4.5 to below 5.5	C Satisfactory
3.5 to below 4.5	D Pass
Below 3.5	F Failure

10. MARKS DISTRIBUTION FOR EXTERNAL AND INTERNAL EVALUATION

The external examination of all semesters shall be conducted by the College at the end of each semester. Internal evaluation is to be done by continuous assessment. **All the components of the internal assessment are mandatory.** Mark distribution for external and internal assessments and the components for internal evaluation with their marks are shown below:

10.1 For all courses without practicala) **Marks of External Examination : 80**b) **Marks of Internal Evaluation : 20**

Components of Internal Evaluation	MARKS
Attendance	5
Assignment /Seminar/Viva	5
Two Test papers (2 x 5 = 10)	10
Total	20

10.2 For all courses with practicala) **Marks of theory - External Examination : 60**b) **Marks of theory - Internal Evaluation : 15**

Components of Theory – Internal Evaluation	Marks
Attendance	5
Assignment/Seminar/Viva	2
Test Papers (2 x 4)	8
Total	15

c) **Marks of Practical - External Examination: 40****(Only in even semesters)**d) **Marks of Practical – Internal Examination: 10****(Odd and even semesters combined annually)**

Components of Practical – Internal Evaluation	Marks
Attendance	2
Test Paper (1x4)	4
Record*	4
Total	10

* Marks awarded for record should be related to the number of experiments recorded and duly signed by the concerned teacher in charge.

10.3 For Model III programmes with practicala) **Marks of Practical - External Examination: 80**b) **Marks of Practical – Internal Examination: 20**

Components of Practical – Internal Evaluation	Marks
Attendance	4
Test Paper	5
Record	7
Lab Involvement	4
Total	20

10.4 Project Evaluation: (Max. marks 100)(a) **Marks of external evaluation : 80**(b) **Marks of internal evaluation : 20**

Components of External evaluation of Project	Marks
Dissertation (External)	50
Viva-Voce (External)	30
Total	80

Components of Internal Evaluation of Project	Marks
Punctuality	5
Experiment/Data collection/Review	5
Knowledge	5
Report	5
Total	20

11. ATTENDANCE EVALUATION**1) For all courses without practical**

% of Attendance	Marks
90 and above	5
85 – 89	4
80-84	3
76-79	2
75	1

(Decimals are to be rounded to the next higher whole number)

2) For all courses with practical

% of Attendance	Marks for Theory
90 and above	5
85 – 89	4
80-84	3
76-79	2
75	1

% of Attendance	Marks for Practical
85 and above	2
75- 85	1

(Decimals are to be rounded to the next higher whole number)

3) For Model III courses with practical

% of Attendance	Marks
90 and above	4
85 – 89	3
80-84	2
75-79	1

12. ASSIGNMENTS/ SEMINAR/ VIVA

Assignments/Seminar/Viva is to be done from 1st to 5th Semesters. Each teacher can decide the mode of evaluation. The student shall appear for compulsory viva-voce in the 6th semester for each paper.

13. INTERNAL ASSESSMENT TEST PAPERS

Two internal test-papers are to be conducted in each semester for each course. The evaluations of all components are to be published and are to be acknowledged by the candidates. All documents of internal assessments are to be kept in the Department for three years and shall be made available for verification. The responsibility of evaluating the internal test papers is vested on the teacher(s), who teach the course.

13.1 Grievance Redressal Mechanism

Internal assessment shall not be used as a tool for personal or other types of vengeance. A student has all rights to know, how the teacher arrived at the marks. In order to address the grievance of students a two-level Grievance Redressal mechanism is envisaged. A student can approach the upper level only if grievance is not addressed at the lower level.

Level 1:Dept. Level: The department cell chaired by the Head, Dept. Coordinator and teacher in-charge, as members.

Level 2: College Level: A committee with the Principal as Chairman, Controller of Examination and College Coordinator as members.

13.2 The Staff Council shall nominate a senior teacher as coordinator of internal evaluations. This coordinator shall make arrangements for giving awareness of the internal evaluation components to students immediately after commencement of I semester.

14. EXTERNAL EXAMINATION

The external examination of all semesters shall be conducted by the College at the end of each semester.

14.1 Students having a minimum of 75% average attendance for all the courses only can register for the examination. Condonation of shortage of attendance to a maximum of 10 days or 50 hours in a semester subject to a maximum of 2 times during the whole period of the programme may be granted by the Principal/Controller of Examination on valid grounds. This condonation shall not be counted for internal assessment.

Benefit of attendance may be granted to students attending University/College union/Co-curricular activities by treating them as present for the days of absence, on production of Participation/attendance certificates, within one week, from competent authorities and endorsed by the Head of the institution. This is limited to a maximum of 10 days per semester and this benefit shall be considered for internal assessment also. Those students who are not eligible even with condonation of shortage of attendance shall repeat the course along with the next batch.

14.2 All students are to do a **project in the area of core course**. This project can be done individually or in groups (not more than 5 students). The projects are to be identified during the V semester of the programme with the help of the supervising teacher. The report of the project in duplicate is to be submitted to the department at the sixth semester and are to be produced before the examiners appointed by the College. External project evaluation and Viva is compulsory for all subjects and will be conducted at the end of the programme.

14.3 A student who registers her name for the external exam for a semester will be eligible for promotion to the next semester.

14.4 A student who has completed the entire curriculum requirement, but could not register for the Semester examination can register notionally, for getting eligibility for promotion to the next semester.

14.5 A candidate who has not secured minimum marks/credits in internal examinations can re-do the same registering along with the examination for the same semester, subsequently.

14.6 All programmes and courses shall have unique alphanumeric code.

15. PATTERN OF QUESTIONS

Questions shall be set to assess knowledge acquired, standard application of knowledge, application of knowledge in new situations, critical evaluation of knowledge and the ability to synthesize knowledge. The question setter shall ensure that questions covering all skills are set. The question setter shall also submit a detailed scheme of evaluation along with the question paper. Question paper shall be a judicious mix of short answer type, short essay type /problem solving type and long essay type questions according to the question paper blue print given.

Pattern of questions for external examination for theory paper without practical

Pattern	Total no. of questions	No. of questions to be answered	Marks of each question	Total marks
Short Answer	9	7	2	14
Short Essay/Problem	9	6	6	36
Essay	4	2	15	30
	22	15	X	80

Pattern of questions for external examination for theory paper with practical

Pattern	Total no. of questions	No. of questions to be answered	Marks of each question	Total marks
Short Answer	7	5	2	10
Short Essay/Problem	7	5	6	30
Essay	4	2	10	20
	18	12	X	60

16. RANK CERTIFICATE

The College publishes rank list of top 10 candidates for each programme after the publication of 6th semester results. Rank certificate shall be issued to candidates who secure positions from 1st to 3rd in the rank list. Candidates who secure positions from

fourth to tenth in the rank list shall be issued position certificate indicating their position in the rank list.

Candidates shall be ranked in the order of merit based on the CGPA scored by them. Grace marks awarded to the students should not be counted for fixing the rank/position. Rank certificate and position certificate shall be signed by the Controller of Examinations.

MARK CUM GRADE CARD

The College under its seal shall issue to the students a MARK CUM GRADE CARD on completion of each semester, which shall contain the following information:

- (a) Name of the College
- (b) Name of the University
- (c) Title & Model of the Under Graduate Programme
- (d) Name of the Semester
- (e) Name and Register Number of the student
- (f) Code, Title, Credits and Max. Marks (Int., Ext. & Total) of each course opted in the semester.
- (g) Internal, External and Total Marks awarded, Grade, Grade point and Credit point in each course opted in the semester.
- (h) Institutional average (IA) of the marks of all papers.
- (i) The total credits, total marks (Max. & Awarded) and total credit points in the semester.
- (j) Semester Credit Point Average (SCPA) and corresponding Grade.
- (k) Cumulative Credit Point Average (CCPA) corresponding to Common courses, Core and Complementary (separately and together) and whole programme.
- (l) The final Mark cum Grade Card issued at the end of the final semester shall contain the details of all papers taken during the final semester examination and shall include the final grade/marks scored by the candidate from 1st to 5th semester and the overall grade/marks for the total programme.

- (m) Conversion scale and percentage shall be shown on the reverse side of the grade card.

17. MONITORING COMMITTEE

There shall be **2 level monitoring** committees for the successful conduct of the scheme.

They are:

1. Department Level Monitoring Committee (DLMC), comprising HOD and two senior-most teachers as members.
2. College Level Monitoring Committee (CLMC), comprising Principal, Dept. Co-ordinator and A.O/Superintendent as members.

Programme Design of Bachelor of Computer Application Programme

The Under Graduate programme in Computer application includes compulsory core courses, complementary courses, practical courses, open courses, elective courses and project work. To complete this UG programme, a student shall acquire a minimum of 120 credits. **Provision has also been made for acquiring Extra credits through the Extra Credit Courses.** The course design is given below.

STRUCTURE OF THE UNDERGRADUATE PROGRAMME

Bachelor of Computer Application Syllabus (with effect from 2023 Admission)

Semester	Course Code	Course Title	Hrs/week		Credits	Max. Marks	
			Theory	Practical		ISA	ESA
FIRST	CC1ENGT01 /CC1ENCOT1	Common Course English-I	5	-	4	20	80
	CR1CACT01	Fundamentals of Computers and Digital Systems	4	-	4	20	80
	CR1CACT02 /CR1CSCT02	Methodology of Programming and Programming in C	4	-	3	20	80
	CR1CACP01/ CR1CSCP01	Software Lab -I [Programming in C]	-	4	2	20	80
	CM1CAMMT1/C M1CSMMT1	Mathematics-I(Complementary)	4	-	4	20	80
	CM1STCAT1/ CM1STMMT1	Basic Statistics (Complementary)	4	-	4	20	80
		Total		21	4	21	
SECOND	CC2ENGT03 / CC2ENCOT2	Common Course English-II	5	-	4	20	80
	CR2CACT03/ CR2CSCT03	Data Structures	4	-	3	20	80
	CR2CACT04/CR	Python Programming	4	-	3	20	80

	2CSCT04						
	CR2CACT05	System Analysis and Design	4	-	4	20	80
	CR2CACP02/ CR2CSCP02	SoftwareLab– II[Programming in Python]	-	4	2	20	80
	CM2CAMMT2/C M2CSMMT2	Discrete Mathematics -II(Complementary)	4	-	4	20	80
		Total	21	4	20		
THIRD	CR3CACT06/CR 3CSCT05	Database Management Systems	4	-	3	20	80
	CR3CACT07	Computer Graphics and Multimedia	4	-	4	20	80
	CR3CACT08/CR 3CSCT07	Computer Organization and Parallel Processing	4	-	4	20	80
	CR3CACT09	Design and Analysis of Algorithms	4	-	4	20	80
	CR3CACP03/ CR3CSCP03	Software Lab–III [RDBMS]	-	5	2	20	80
	CM3CASTT3	Advanced Statistical Methods(Complementary)	4	-	4	20	80
			Total	20	5	21	
FOURTH	CR4CACT10	Computer Networks	4	-	4	20	80
	CR4CACT11/ CR4CSCT10	WebTechnology	4	-	4	20	80
	CR4CACT12/CR 4CSCT11	Operating Systems	4	-	4	20	80
	CR4CACT13	Cyber Security	4	-	3	20	80
	CR4CACP04/ CR4CSCP04	SoftwareLab–IV[Web Programming]	-	5	2	20	80
	CM4CAMMT3	OperationalResearch(Comp lementary)	4	-	4	20	80
			Total	20	5	21	

FIFTH	CR5CACT14	Mobile Application Development	4	-	4	20	80
	CR5CACT15/ CR5CSCT14	Programming in Java	4	-	3	20	80
	CR5CACT16/ CR5CSCT15	Environmental Studies and Human Rights	4	-	4	20	80
	CR5CACP05	Software Lab –V[JAVA]	-	4	2	20	80
	CR5CACPR1	Mini Project (Android Programming)	-	5	2	20	80
	OC5CACT01 / OC5CSCT01 OC5CACT02 / OC5CSCT02	Internet & Digital Marketing Trending Technologies in IT	4	-	3	20	80
		Total	16	9	18		
SIXTH	CR6CACT17/CR 6CSCT17	Cloud Computing	5	-	4	20	80
	CR6CACT18	Introduction to IoT and Robotics	5	-	4	20	80
	CR6CACPR2	Main Project (Software Development Lab II)	-	7	4	20	80
	CR6CACSM1	Seminar		3	2	20	80
	CV6CACV01	Viva	-	-	1	20	80
	CR6CACBT1/ CR6CACBT2/ CR6CACBT3	Choice based Course : Data Mining and Machine Learning Cyber Forensics Software Testing	5	-	4	20	80
		Total	15	10	19		
	TOTAL	150		120			

Open Course

- 1.OC5CACT01 / OC5CSCT01-Internet & Digital Marketing
2. OC5CACT02 / OC5CSCT02- Trending Technologies in IT

Choice based Course

- 1.CR6CACBT1/CR6CSCBT1 – Data Mining and Machine Learning
- 2.CR6CACBT2/ CR6CSCBT2- Cyber Forensics
- 3.CR6CACBT3 / CR6CSCBT3–Software Testing

PROGRAMME OUTCOME

PO1	Domain Knowledge and Critical Thinking	Acquire knowledge in the respective programme and attain the ability to utilize critical and analytical skills to solve socially relevant problems
PO2	Effective Communication	Develop skills to communicate effectively in keeping with global requirements.
PO3	Gender Sensitivity and Environmental Consciousness	Understand the dignity of womanhood, contribute to national and societal development and practice environmentally sustainable ways of living.
PO4	Ethics, Holistic Development and Lifelong Learning	Development of physical, emotional, spiritual, relational and intellectual aspects by acquiring human values and practising ethical principles.
PO5	Effective Citizenship	Acquire empathetic social concern, equity-centered national development, and the ability to act with an informed awareness of issues and participate in civic life

PROGRAMME SPECIFIC OUTCOME

After the completion of the BCA programme, the graduates will be able to-

PSO1	Apply mathematical foundations, algorithmic principles and computational theory to develop effective programs and softwares.
PSO2	Communicate and collaborate effectively with professionals and pursue their life long development in computing.
PSO3	Familiarity and practical competence with a broad range of programming language and open-source platforms.
PSO4	Demonstrate the ethical and environmental parameters related to industry.

SEMESTER-WISE SYLLABUS

SYLLABI - CORE COURSES**SEMESTER I****CR1CACT01: Fundamentals of Computers and Digital Systems****Core: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 4.****Course Outcomes**

At the end of the Course, the student will be able to

CO No.	CO Statement	Cognitive Level	PSO	PO
CO1	Summarize Input, Output, and Secondary storage devices.	Understand	PSO1,PSO2,PSO4	P01,PO4
CO2	Demonstrate various number systems.	Analyze	PSO1,PSO2	P01
CO3	Analyze various logic gates.	Analyze	PSO1,PSO3	PO1
CO4	Explain Sequential / Combinational circuits.	Evaluate	PSO2,PSO3	PO1

Syllabus – Module Wise

Module	Course Description	CO No.	Hours
1	Computer basics		12
1.1	Parts of Computer System- Hardware, Software, Data, Users.Different types of Computers,Characterstics of computers.	CO1	1
1.2	Interacting with Computers:-Input Devices- Keyboard.	CO1	2
1.3	Mouse-Variants of Mouse.	CO1	3

1.4	Output Devices-Monitors.	CO1	3
1.5	Printers.	CO1	3
2	Storage Devices		15
2.1	Types of Storage Devices – Magnetic Storage Devices Diskettes.	CO1	4
2.2	Hard Disks, Tape drives.	CO1	4
2.3	Optical Storage devices-CD, DVD.	CO1	3
2.4	Blue-Ray Disk, USB-Pen drive.	CO1	3
2.5	External Hard Disk Drive, Mass Storage Devices.	CO1	1
3	Number Systems		15
3.1	Base of a number system, Positional number system, Popular number systems(Decimal, Binary, Octal and Hexadecimal), Counting in binary number system.	CO2	4
3.2	Conversion-Decimal to Binary, Binary to Decimal, Decimal to Octal, Octal to decimal and Binary.	CO2	4
3.3	Decimal to hexadecimal, _ Hexadecimal to decimal, Binary and octal.	CO2	3
3.4	Concept of _binary addition and subtraction.	CO2	2
3.5	Complements in binary number systems, 1s Complement, 2s Complement and their applications.	CO2	2
4	Boolean Algebra and Gate Networks		15
4.1	Logic gates- AND, OR, NOT, NAND and NOR Truth tables and graphical representation.	CO3	4
4.2	Basic laws of Boolean Algebra, Simplification of Expressions, DeMorgan's theorems.	CO3	4
4.3	Dual expressions, Canonical expressions, Simplification of expression using K-MAP (up to 4 variables)	CO3	4
4.4	Representation of simplified expressions using NAND/NOR Gates, Don't care conditions.	CO3	3
5	Sequential and Combinational Logic.		15

5.1	Flip flops- Latch, Clocked, RS, JK, T, D and Master slave , Triggering_ of flip flops .	CO4	4
5.2	Counters- Synchronous and asynchronous Half adder, Full adder(need and circuit diagram).	CO4	4
5.3	Encoders, Decoders.	CO4	4
5.4	Multiplexers and De-multiplexers (working of each with diagram).	CO4	3

Text Books

1. Peter Norton's Introduction to Computers, Sixth Edition, Published by Tata McGraw Hill
2. Introduction to Computer Science ITL Education Solutions Limited Second Edition
3. M.Morris Mano-Digital Logic and Computer Design

References

1. P K Sinha&PritiSinha ,Computer Fundamentals by Fourth Edition.
2. Floyd and Jain- Digital Fundamentals, Eighth Edition, Pearson Education
3. A P Malvino and D P Leach - Digital Principles and Applications, Fourth edition, Tata McGraw Hill Publishers, co Ltd.

CR1CACT02: Methodology of Programming and Programming in C**Core: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 3****Course Outcomes**

At the end of the Course, the student will be able to

CO No	CO Statement	Cognitive Level	PSO	PO
CO1	Debug programs written in C language.	Evaluate	PSO1,PSO3	PO1
CO2	Design programs involving decision structures, loops and functions.	Create	PSO1,PSO2,PSO3	PO1
CO3	Develop programs using multi-dimensional array.	Create	PSO1,PSO2,PSO3	PO1
CO4	Explain pointers and structures.	Understand	PSO1,PSO2,PSO3	PO1

Syllabus – Module Wise

Module	Course Description	CO No.	Hours
1	Programming Concepts		10
1.1	Program Concept, Characteristics of Programming, Various stages in Program Development Programming aids Algorithms, Flow Charts - Symbols, Rules for making Flow chart, Programming Techniques - Top down, Bottom up, Modular, Structured - Features, Merits, Demerits, and their Comparative study. Programming Logic- Simple, Branching, Looping, Recursion	CO1	7

1.2	Cohesion & Coupling Programming Testing & Debugging & their Tools	CO1	3
2	C language basics		10
2.1	C language basics: C character set, Identifiers and keywords, Data types, Enumeration type, constants, variables, declarations, qualifiers - long, short and unsigned declarations, expressions, symbolic constants, input/output functions, compound statements	CO1	4
2.2	arithmetic operators, unary operators, relational and logical operators, assignment operators, increment and decrement operators, Precedence and order of evaluation, conditional operators, bit operators,	CO1	4
2.3	Type casting and library functions in math.h	CO1	2
3	Control flow statements		16
3.1	Control flow: If statement, if...else statement, nested if ..else statement, switch statements	CO2	5
3.2	looping - for loop , while loop, do - while statements, nested loop structure, break, continue and go to statements.	CO2	5
3.3	Arrays & Strings: Single dimensional arrays, multidimensional arrays, initializing array using static declaration, Searching and sorting of Arrays, Array of Characters, Character arrays and strings, String handling Functions.	CO3	6
4	User Defined Functions		16
4.1	User Defined Functions: Function declaration, definition & scope, recursion, Arrays and functions	CO2	7

4.2	Call by Value and Call by Reference	CO2	4
4.3	Storage Class: automatic, external (global), static & registers.	CO2	5
5	Structures and pointers		20
5.1	Structures: Definition of Structures, declaration, structure passing to functions, array of structures, arrays with in structures	CO4	7
5.2	Union, typedef statements.	CO4	3
5.3	Pointers: Pointer Definition, pointer arithmetic, array & pointer relationship, pointer to array, pointer to structure	CO4	8
5.4	Dynamic memory allocation	CO4	2

Text Books:

1. E. BalaGuruswamy, Programming in ANSI C4E, Tata MCGraw-Hill, 2007.
2. Byron S Gottfried, Shaum's Outline series, Programming with C, second edition, TMH, 1996.

References:

1. P K Sinha and Priti Sinha Fourth Edition, Computer Fundamentals.
2. B. Kernighan and D. Ritchie, The ANSI C Programming Language, PHI.

CR1CACP01: Software Lab - I[Programming in C]**Core: Practical****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 2****Course Outcomes**

At the end of the Course, the student will be able to

CO No	CO Statement	Cognitive Level	PSO	PO
CO1	Understand the fundamentals of computer system and DOS	Understand	PSO1,PSO4	PO1, PO2
CO2	Choose the loops and decision making statements to solve problems	Apply	PSO1,PSO2,PSO3	PO1, PO2
CO3	Demonstrate the use of arrays and strings	Apply	PSO1,PSO2,PSO3	PO1, PO2
CO4	Use Functions and structures to solve the problems	Apply	PSO1,PSO2,PSO3, PSO4	PO1, PO2

Syllabus Module-wise

Module	Course Description	CO No.	Hours
1	Familiarization of Computer System and installation		12
1.1	Familiarization of Computer System and installation: Demonstration of various units of Computer system, handling of devices, demo on hardware units, Login process, Booting Process, software installation, driver installation, printer installation etc.	CO1	6
1.2	Operating System Commands: MS-DOS internal & External commands (dir, copy, del, ren, copy con, date, time, chkdsk, mkdir, cd, rmdir, EDIT etc). MS-WINDOWS using start menu, desk top, task bar, word pad, notepad, file management-creation, copy, delete, moving of files in directories, selecting and executing a program - Demonstration of editing, compiling and executing a C program using a C compiler.	CO1	6
2	Programs using Basic Constructs		15
2.1	Programs using Basic Constructs: Fundamental data types, qualifiers- long, short, unsigned, input/output functions - scanf(), printf(), Arithmetic expressions, Evaluation of integer, real and mixed mode arithmetic expressions, truncation effect, type casting, relational and logical expressions, Conditional operators,	CO1	10
2.2	trigonometric functions- sin(), cos(), tan(), mathematical functions - abs(), sqrt(), round() defined in math.h, printing formatted outputs using width specifier.	CO1	5
3	Programs using control structures		15

3.1	Programs using control structures: if, switch, for, while, do-while, nested structures, break and continue. Sample programs should include printing of Fibonacci numbers, prime numbers, check for Armstrong numbers, summation series - exp(x), sin series etc and verification of result using built in functions, printing pyramid like pattern & other similar patterns using nested loops.	CO2	7
3.2	Programs using Arrays: Array based programs - Creation of array containing prime numbers, matrix addition, matrix multiplication, transpose of a matrix, array sorting, preparing rank lists based on marks, searching of arrays (linear) for finding price of an item. Static initialization of arrays. String manipulation programs - reading strings using %s, gets(), getchar(), copying one string into another, counting number of characters, vowels, words etc, using string handling functions.		8
4	Programs based on user defined functions		15
4.1	User Defined Functions: Programs using return type functions, void type functions, example program using recursive functions	CO4	7
4.2	Array sorting program using function with call by reference, function to copy one string into another.	CO4	8
5	Program using structures		15
5.1	Program using structures: array of structures, program using structure containing arrays and array of structures.	CO4	8
5.2	Rank list preparation. Simple program using pointers .	CO4	7

Text Books:

1. E. BalaGuruswamy, Programming in ANSI C4E, Tata MCGraw-Hill, 2007.
2. Byron S Gottfried, Shaum's Outline series, Programming with C, second edition, TMH, 1996.

SEMESTER II**CR2CACT03: Data Structures****Core: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 3****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Explain algorithm complexity using asymptotic notations	Understand	PSO1	PSO2
CO2	Explain different operations on array, strings, stack, queue, linked list	Understand	PSO1	PSO2 PO1
CO3	Illustrate operations on various types of trees.	Understand	PSO1	PSO3 PO1
CO4	Demonstrate different searching and sorting algorithms	Apply	PSO1	PSO4 PO1

Syllabus - Module wise

Module	Course Description	CO No.	Hours
1	Introduction		6
1.1	Basic Terminology,Data structure definition and operations	CO1	1

1.2	Mathematical notations and functions	CO1	2
1.3	Algorithm Definition,Algorithmic notations	CO1	1
1.4	Complexity of Algorithms	CO1	2
2	Array and Strings		19
2.1	Array-Introduction,Linear array-Definition and Representation in memory	CO2	1
2.2	Traversal, Insertion and Deletion in linear array	CO2	6
2.3	Linear search, Binary Search,Comparison of searching algorithms	CO4	4
2.4	MultiDimensional Array;Matrices,Sparse Matrices	CO2	1
2.5	String-Basic Terminology,Representation and Operations	CO2	3
2.6	Word Processing -Insertion,Deletion,Replacement; Pattern matching algorithms	CO2	4
3	Stack and Queue		14
3.1	Stack -Introduction,Array and Linked representation of stack	CO2	2
3.2	Applications of Stack-Evaluating Arithmetic Expression, polish notation-Infix to Postfix Notation,Evaluating a Postfix Notation, Recursion, factorial function, fibonacci sequence.	CO2	6
3.3	Queue-Introduction,Array representation and Linked representation of queue	CO2	2
3.4	Priority queue, Dequeue	CO2	4
4	Linked Lists		18

4.1	Linked list-Introduction,Representation in memory	CO2	1
4.2	Traversing, Searching a list- sorted and unsorted, Insertion and Deletion in a Linked List; memory allocation:Garbage Collection	CO2	10
4.3	Header Linked List, Doubly and Circular Linked List	CO2	7
5	Trees		15
5.1	Trees :Introduction, Binary Trees, Representation, Traversing and its Algorithms	CO3	6
5.2	Threaded trees and Binary Search Trees	CO3	4
5.3	Sorting: bubble sort, Insertion sort, Selection sort, Quick sort, Comparison of sorting algorithms.	CO4	5

Text Book

Seymour Lipschutz, Theory and Problems of Data Structures:Schaum's Outline Series

References

1. Jean-Paul Tremblay &G.Sorenson,Introduction to data structures with application
2. Tanenbaum,Data structures using C and C++-Pearson 2 Edition
3. D Samanta,Classic Data Structures-Prentice Hall of India 2 Edition

CR2CACT04- Python Programming**Core: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 3****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Define Syntax, Semantics and the control flow in Python.	Understand	PSO1 PO1	PO4
CO2	Explain Strings and Files in Python.	Understand	PSO1 PO2	PO4
CO3	Illustrate functional and object oriented programming in Python	Understand	PSO1 PO1	PO4
CO4	Experiment Web Services/applications and scientific graphical applications	Apply	PSO3	PSO4

Syllabus - Module wise

Module	Course Description	CO No.	Hours
1	Introduction to Python		12
1.1	Introduction to Python, Concepts of OOPs, Features, Applications, Installation	CO1	2
1.2	Basic Syntax, Process of writing, running of a sample program	CO1	4
1.3	Data Type / Variables	CO1	3
1.4	Expressions and Statements Introduction to Flow Controls: Conditional Statements	CO1	3

2	Strings and Lists		15
2.1	String: Accessing Strings, String operations,	CO2	4
2.2	List: Introduction, Accessing list, operations.	CO2	4
2.3	Programming Dictionary: Introduction, Concept of key-value pair,	CO2	3
2.4	Tuple: Introduction, Immutable concept, operations	CO2	4
3	Functions		15
3.1	Function creation, calling , parameters	CO3	4
3.2	Importing modules and builtin functions	CO3	5
3.3	Regular expression and pattern matching	CO3	6
4	File Handling		15
4.1	File handling: open and close a file, read, write, and append	CO3	6
4.2	Exception Handling	CO3	3
4.3	Oops in Python	CO3	4
4.4	Python Packages	CO3	2
5	Advanced Python		15
5.1	Python CGI and GUI Programming	CO4	4
5.2	Network programming	CO4	4
5.3	Database programming	CO4	4
5.4	Scientific and technical computing packages	CO4	3

TextBooks

1. Budd, T. (2010). Exploring Python. McGraw Hill Higher Education.
2. Beazley, D. M. (2009). Python essential reference. Addison-Wesley Professional.
3. De Paz, A. R. (2018). Tkinter GUI Application Development Cookbook: A practical solution to your GUI development problems with Python and Tkinter. Packt Publishing Ltd.
4. Lutz, M. (2014). Python Pocket Reference: Python In Your Pocket. " O'Reilly Media, Inc."

References

1. <http://docs.python.org/3/tutorial/index.html>
2. <http://interactivepython.org/courselib/static/pythond>

CR2CACT05: System Analysis and Design**Core: Theory****Teaching hours: 4Hrs/ week (72Hrs / Sem)****Credits: 4****Course Outcomes**

At the end of the Course, the student will be able to

CO No.	CO Statement	Cognitive Level	PSO	PO
CO1	Explain the concept of information system.	Understand	PSO1,PSO2	PO1
CO2	Explain the information system levels and life cycle activities.	Analyze	PSO1,PSO2	PO1,PO4
CO3	Identify the basic tools of system analysis.	Understand	PSO1,PSO3	PO1
CO4	Summarize study phase, design phase and development activities.	Evaluate	PSO2	PO1,PO4

Syllabus – Module Wise

Module	Course Description	CO No.	Hours
1	Information systems concepts		15
1.1	Business information systems; Describing the business organization _ organization chart.	CO1	2
1.2	Organization function list ;information system levels - operational, lower, middle, top management.	CO1	3
1.3	The system development life cycle concepts; hardware and software end products.	CO1	4
1.4	Life cycle activities- life cycle flow chart, task, and management review.	CO1	4
1.5	Baseline specifications, role of system analyst.	CO1	2
2	Basic tool of system analysis		18

2.1	Identification codes _ definition, need for codes, code plan, code dictionary, common type of codes.	CO2,CO3	4
2.2	Forms design _basic parts of form, style and types of form, principles of form design.	CO2,CO3	4
2.3	Tools for structure analysis and design: Types of basic charts, decision tables, decision trees, structured English.	CO2,CO3	5
2.4	Data flow diagram, data dictionary, System flow charts, flow charting symbols, HIPO charts.	CO2,CO3	5
3	Study phase		15
3.1	Study phase activities, information service request.	CO2,CO4	4
3.2	Initial investigation, fact finding techniques, fact analysis techniques.	CO2,CO4	5
3.3	Steps infeasibility analysis.	CO4	4
3.4	Study phase report.	CO4	2
4	Design phase		12
4.1	Design phase activities, structure design.	CO2,CO4	3
4.2	Input design- input data, input media and devices.	CO4	4
4.3	Output design.	CO4	3
4.4	Design phase report.	CO4	2
5	Development phase		12
5.1	Development phase activities, bottom up and top down computer program development.	CO2,CO4	3
5.2	Training- programmer, operator, user trainings.	CO4	3
5.3	PERT, development phase report.	CO4	3
5.4	Operational Phase Activities.	CO4	3

Text Book

1. Marvin Gore & John Stubbe, Galgotia Book Source :Elements of System Analysis.
2. Elias M Awad ,Galgotia Book Source System Analysis And Design .Richard Fairley
Tata McGraw Publication Software Engineering Concepts.

CR2CACP02: Software Lab II - Programming in Python**Core: Practical****Teaching hours: 4Hrs/ week (72Hrs / Sem)****Credits: 2****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Implement python installation, version check, updation, path setting, and environment settings .	Analyse	PSO2 PSO3	PO1 PO2 PO3 PO4
CO2	Programme basic syntax, functions and data structures in python	Analyse	PSO1	PO1 PO4
CO3	Design object-oriented paradigms and regular expressions.	Evaluate	PSO3	PO3 PO1
CO4	Develop CGI, networking/database applications	Evaluate	PSO4 PSO1	PO1 PO4 PO5

Syllabus - Module wise

Module	Course Description	CO	Hours
1	Python Basics:		12
1.1	Python installation, various IDEs	CO1	2
1.2	Basic Syntax, writing process, running a sample program.	CO1	6

1.3	Datatype , Variables, Operators	CO1	4
2	String:		15
2.1	String operations	CO2	3
2.2	List	CO2	4
2.3	Dictionary	CO2	4
2.4	Tuples	CO2	5
3	Functional way		15
3.1	Functions	CO2	4
3.2	Modules	CO3	4
3.3	Regular Expression	CO3	3
3.4	Pattern matching	CO3	4
4	File Handling		18
4.1	File management	CO3	4
4.2	Exception Handling	CO3	4
4.3	OOps in Python	CO3	6
4.4	Packages	CO3	4
5	Advanced Python		12
5.1	CGI and GUI	CO4	4
5.2	Client server modal	CO4	3
5.3	Database management	CO4	3
5.4	Scientific python	CO4	2

TextBooks

1. Budd, T. (2010). Exploring Python. McGraw Hill Higher Education.
2. Beazley, D. M. (2009). Python essential reference. Addison-Wesley Professional.
3. De Paz, A. R. (2018). Tkinter GUI Application Development Cookbook: A practical solution to your GUI development problems with Python and Tkinter. Packt Publishing Ltd.
4. Lutz, M. (2014). Python Pocket Reference: Python In Your Pocket. " O'Reilly Media, Inc."

References

1. <http://docs.python.org/3/tutorial/index.html>
2. <http://interactivepython.org/courselib/static/pythond>

SEMESTER III**CR3CACT06 - Database Management Systems****Core: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 3****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Explain the key concepts of database and fundamentals of ER model and relational database models.	Understand	PSO1	PO1, PO4
CO2	Develop SQL queries for designing a relational database schema and for data manipulation.	Apply	PSO1, PSO2, PSO4	PO1
CO3	Describe good database design techniques using normalization techniques.	Understand	PSO1, PSO3	PO1
CO4	Summarize the concepts of database recovery, concurrency control mechanisms and NoSQL databases	Understand	PSO1	PO1

Syllabus – Module Wise

Module	Course Description	CO No.	Hours
1	Introduction to DBMS & ER Model		14
1.1	Disadvantages of File system and basics of DBMS	CO1	4
1.2	Structure of DBMS & Data models	CO1	4
1.3	Transaction Management & Database users	CO1	2
1.4	Database design and ER diagrams, entities, attributes, and entity sets, relationships and relationship sets,	CO1	2
1.5	Additional features of the ER model, conceptual design with the ER model, conceptual design for large enterprises	CO1	2
2	Relational Model		12
2.1	Basics of Relational model	CO1	6
2.2	Integrity Constraints over relations, enforcing integrity constraints, querying relational data	CO1	4
2.3	Introduction to views, destroying/altering tables and views.	CO1	2
3	SQL		16
3.1	Introduction to DDL	CO2	3
3.2	DML Commands	CO2	4
3.3	DCL Commands	CO2	2
3.4	Basic SQL Query, UNION, INTERSECT, and EXCEPT, nested queries, aggregate operators, null values, outer joins, complex integrity constraints, Triggers and Active Databases	CO2	7
4	Normalization		14

4.1	Informal Design Guidelines for relation schemas, functional dependencies	CO3	2
4.2	Normal forms– 1NF, 2NF, 3NF and BCNF	CO3	8
4.3	Multivalued Dependencies and 4NF	CO3	4
5	Transaction Management - Recovery, Concurrency and NoSQL		16
5.1	Recovery – Introduction, transactions, transaction recovery, system recovery	CO4	3
5.2	Media recovery and Two-phase commit	CO4	3
5.3	Concurrency – Introduction, three concurrency problems	CO4	3
5.4	Locking, deadlock, serializability and isolation levels.	CO4	4
5.5	NoSQL - Introduction, Difference between NoSQL and RDBMS, Its' need, Applications and Types of NoSQL Databases	CO4	3

Text Books

1. Raghuram Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw Hill International Edition, 3rd edition
2. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education, 6th edition.
3. C.J Date, An Introduction to Database systems, 8th edition.
4. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition, 2012.

References

1. Abraham Silberschatz, Henry F Korth and S Sudarshan, Database System Concepts, 6th edition, McGraw Hill International Edition.
2. Bipin Desai, An Introduction to Database Systems, Galgoria Publications, 1991
3. A S R Sulthana and Micheal Yeboah Frimpong, Demystifying the NoSQL Paperback, December 2021

CR3CACT07: Computer Graphics and Multimedia**Core: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 4.****Course Outcomes**

At the end of the Course, the student will be able to

CO No.	CO Statement	Cognitive Level	PSO	PO
CO1	Summarize various video display devices..	Understand	PSO1,PSO2,PSO4	PO1,PO2
CO2	Apply basic geometrical transformations on 2D objects and 3D objects, clipping operations.	Understand	PSO1,PSO2	PO1,PO2
CO3	Apply arithmetic operations techniques and model control units	Apply	PSO1,PSO2,PSO3	PO1,PO2,PO4
CO4	Illustrate the basics of multimedia	Understand	PSO1, PSO2,PSO4	PO1,PO2

Syllabus- Module Wise

Module	Course Description	CO No.	Hours
1	Overview of Graphics System		12
1.1	Display devices,Raster scan systems, random scan systems.	CO1	5
1.2	Input Devices.	CO1	5
1.3	Graphics software.	CO1	2
2	Output Primitives		15

2.1	Points and Lines, Line drawing algorithms.	CO2	4
2.2	DDA,Brasenhams line algorithm.	CO2	6
2.3	Circle generating algorithms,Mid-point circle algorithm.	CO2	5
3	2D Transformations		18
3.1	Basic transformations.	CO3	4
3.2	Matrix representations and Homogeneous coordinates.	CO3	4
3.3	Composite transformations, 2D Viewing	CO3	3
3.4	Viewing pipeline,Window to viewport coordinate transformations.	CO3	3
3.5	Clipping operations,pointclipping,line clipping,Cohen Sutherlands, polygon clipping- Sutherland Hodgemans.	CO3	4
4	3D Concepts		15
4.1	Introduction to 3D graphics, 3D display methods: Parallel Projection, Perspective Projection	CO3	2
4.2	3D representations-polygon surfaces	CO3	4
4.3	PolygonTables,Plane Equation	CO3	4
4.4	3D transformations	CO3	5
5	Multimedia		15
5.1	Definition of Multimedia, Applications, Hardware and Software requirements for creating multimedia	CO4	2
5.2	,Building blocks of multimedia – text, graphics(image), video, audio, animation.	CO4	2
5.3	Different types of animation	CO4	3
5.4	Brief overview of stages in execution of	CO4	3

	multimedia project pre production		
5.5	production and post-production phases.	CO4	5

Text Books

1. Donald Hearn & M Pauline Baker ,Computer Graphics C Version :Second edition.
2. Tay Vaughan, Multimedia ,Making It Work Multimedia,Making It Work.

References

1. Foley, Van Dam, Feiner, Hughes ,Computer Graphics Principles and Practice, Pearson education,2006.
2. Newman S Sproull ,Principles of Interactive Computer Graphics , Mc-Graw Hill
3. Ze-NianLi,Mark S Drew ,Fundamentals of Multimedia , Pearson Education
4. Fred Halsall ,Multimedia Communications – Applications, Networks, Protocols and Standards , Pearson Education.

CR3CACT08: Computer Organization and Parallel Processing**Core: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 4****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Illustrate the basic operational concepts of a computer system	Understand	PSO1,PSO2,PSO4	PO1, PO2,PO4
CO2	Classify different memory systems	Understand	PSO1,PSO3,PSO4	PO1, PO2,PO4
CO3	Apply arithmetic operation techniques and model control units	Apply	PSO1,PSO3,PSO4	PO1,PO2,PO5
CO4	Identify parallel processing techniques	Apply	PSO1,PSO4	PO1,PO2,PO4

Syllabus - Module wise

Module	Course Description	CO No.	Hours
1	Basic structure of computers		10
1.1	Functional units	CO1	1
1.2	Basic operational concepts, Bus structures	CO1	1

1.3	memory locations and addresses, memory operations	CO1	1
1.4	Instructions and Instruction sequencing, Register transfer notation and Assembly language notation	CO1	2
1.5	Basic instruction types, Instruction execution and straight line sequencing	CO1	2
1.6	Branching, Control codes	CO1	1
1.7	Addressing modes	CO1	2
2	The memory system		18
2.1	Basic concepts	CO2	1
2.2	Semiconductor Ram memories	CO2	1
2.3	Internal organization of memory chips	CO2	1
2.4	Static memories	CO2	1
2.5	Dynamic memory cell	CO2	1
2.6	Memory system considerations	CO2	2
2.7	Read Only Memories	CO2	1
2.8	Flash memory	CO2	1
2.9	Speed, size and cost	CO2	1
2.10	Cache memories	CO2	1
2.11	Mapping functions	CO2	3
2.12	Replacement algorithms	CO2	2
2.13	Performance considerations	CO2	1
2.14	Interleaving.	CO2	1

3	Arithmetic Unit		14
3.1	Addition and subtraction of signed numbers	CO3	2
3.2	Addition/subtraction logic unit	CO3	2
3.3	Design of fast adders	CO3	2
3.4	Multiplication of positive numbers	CO3	2
3.5	Signed operand multiplication	CO3	2
3.6	Booth algorithm	CO3	2
3.7	Integer division- restoring division and non-restoring division	CO3	2
4	Processing Unit		18
4.1	Fundamental concepts	CO3	2
4.2	register transfers	CO3	2
4.3	performing an arithmetic or logic operations	CO3	2
4.4	fetching a word from memory	CO3	1
4.5	Storing a word in memory	CO3	1
4.6	Execution of a complete instruction	CO3	2
4.7	Branch instructions	CO3	1
4.8	Multiple bus organization	CO3	2
4.9	Hardwired control	CO3	2
4.10	A complete processor	CO3	2
4.11	Micro programmed control	CO3	1
5	Introduction to parallel processing		12
5.1	Evolution of computer systems	CO4	1

5.2	Trends towards parallel processing	CO4	1
5.3	Parallelism in uniprocessor systems	CO4	1
5.4	Basic uniprocessor architecture	CO4	2
5.5	Parallel processing mechanisms	CO4	2
5.6	Parallel computer structures.	CO4	5

Text Books

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organisation McGraw Hill
(Fifth edition)
2. Kai Hwang and F A Briggs, Computer Architecture and parallel processing

References

1. Andrew S Tannenbaum, Structured Computer Organisation
2. William Stallings, Computer Organisation and Architecture

CR3CACT09: Design And Analysis Of Algorithms**Core: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 4.****Course Outcomes**

At the end of the Course, the student will be able to

CO No.	CO Statement	Cognitive Level	PSO	PO
CO1	Identify the time and space complexity of algorithms.	Understand	PSO1,PSO3	PO1,PO4
CO2	Demonstrate sorting and searching algorithms.	Analyze	PSO1,PSO2	PO1,PO4
CO3	Learn various traversal techniques	Understand	PSO1,PSO3	PO1
CO4	Implement Dijkstra's algorithm, binary trees, traveling sales person problem	Evaluate	PSO1,PSO2,PSO3	PO1

Syllabus – Module Wise

Module	Course Description	CO No.	Hours
1	Introduction to Algorithm		14
1.1	Definition of Algorithm, Areas of algorithm study.	CO1	4
1.2	Performance analysis space complexity, time complexity.	CO1	5
1.3	Asymptotic notations.	CO1	5

2	Divide and Conquer.		15
2.1	General method- Divide and Conquer, Binary search.	CO2	4
2.2	Finding the maximum and minimum.	CO2	4
2.3	Merge sort, Quick sort.	CO2	3
2.4	Selection, Saracen's matrix multiplication.	CO2	4
3	Greedy method		16
3.1	Greedy method- General method, Knapsack problem.	CO3	4
3.2	Job sequencing with dead lines ,Minimum cost spanning trees.	CO2,CO3	4
3.3	Prim's algorithm, Kruskal's algorithm.	CO2,CO3	4
3.4	Optimal merge patterns, Single source shortest path, Optimal binary search trees.	CO2,CO3	4
4	Dynamic programming		13
4.1	Dynamic programming _ The general method, multistage graphs.	CO2	4
4.2	All-pairs shortest path, Single source shortest path.	CO4	4
4.3	0/1 Knapsack problem.	CO3	3
4.4	Traveling Sales person problem.	CO4	2
5	Basic traversal and search techniques		14
5.1	BFS and traversal, DFS and traversal, Bi-connected components and DFS.	CO2	4
5.2	Backtracking - General method, 8-queens problem.	CO2	4
5.3	Sum of subsets problem, Graph coloring.	CO4	4
5.4	Hamiltonian cycles.	CO4	2

Text Books

1. Ellis Horowitz, SartajSahni, SanguthevanRajasekharan Computer algorithms/C++
(Second Edition) Universities Press.

References

1. AnanyLevitin Introduction to design and analysis of algorithms Addison Wesley
Low price edition.
2. Richard Neapolitan, KumarssNaimipour Foundation of Algorithms using C++

CR3CACP03: Software Lab III - RDBMS**Core: Practical****Teaching hours: 4 Hrs/ week (72 Hrs/Sem)****Credits: 2****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Build a database schema for a given problem.	Apply	PSO1, PSO2	PO1
CO2	Apply data definition, data manipulation and control languages in a database.	Apply	PSO1, PSO2	PO1
CO3	Construct queries using SQL for database views and sequences	Apply	PSO1, PSO2	PO1
CO4	Implement procedures, functions, and control structures using PL/SQL.	Apply	PSO1, PSO2	PO1

Syllabus - Module wise

Module	Course Description	CO	Hours
1	Introduction		18
1.1	Connecting to RDBMS Server, invoke SQL plus	CO1	4
1.2	Creating tables and table operations	CO1	5

1.3	Manipulating data in tables	CO1	4
1.4	DCL commands	CO1	5
2	Operations in Rows and Columns		12
2.1	Deleting rows, adding columns	CO2	3
2.2	saving and retrieving SQL commands	CO2	3
2.3	editing SQL commands	CO2	3
2.4	Oracle functions	CO2	3
3	Query		16
3.1	Querying single tables, Projection, selection, Ordering, grouping	CO2	4
3.2	Accessing records from multiple tables	CO2	3
3.3	Sub queries	CO2	3
3.4	Connecting Queries	CO2	4
3.5	Constructing English like sentences	CO2	2
4	Views		14
4.1	Defining a view, Querying views	CO3	4
4.2	dropping views	CO3	4
4.3	Sequences	CO3	6
5	PL/SQL		12
5.1	Simple program using control structures	CO4	12

Text Books

1. Perry, James T., and Joseph G. Lateer, Understanding Oracle. Sybex Incorporated, 1989.
2. Ivan Bayross. SQL, PL/SQL: The programming language of Oracle. Bpb Publications, 2009.
3. Michel Abbey & Michael J Corey, Oracle a beginners guide- McGraw-Hill Professional Publishing, 2009.
4. Loney & Koch, Oracle 9i –The complete reference, TMH Publication -2002

SEMESTER IV**CR4CACT10: Computer Networks****Core: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 4.****Course Outcomes**

At the end of the Course, the student will be able to

CO No.	CO Statement	Cognitive Level	PSO	PO
CO1	Define and use Computer Networks and the basic components of a Network system.	Understand	PSO1, PSO4	PO1
CO2	Know multiplexing ,switching techniques.	Analyze	PSO2	PO1
CO3	Illustrate the layers of OSI and TCP and get knowledge about congestion control and network security.	Evaluate	PSO2,PSO4	PO1,P04
CO4	Analyze error detection, Correction methods.	Analyze	PSO1,PSO3	PO1

Syllabus – Module Wise

Module	Course Description	CO No.	Hours
1	Network classifications		15
1.1	Need of network. Network classifications- LAN, MAN, WAN.	CO1	30MIN
1.2	wireless networks & Internet.	CO1	30MIN
1.3	Data and signals-analog and digital	CO1	1
1.4	periodic analog signals, digital signals	CO1	1
1.5	digital signals, bit rate, baud rate, bandwidth	CO1	2
1.6	Transmission impairments: attenuation distortion and noise.	CO1	1
1.7	Data communication protocols and standards	CO1	2
1.8	Network models: - OSI model-layers and their functions. TCP/IP protocol suite.	CO1	7
2	Bandwidth utilization Multiplexing FDM, TDM		14
2.1	Bandwidth utilization Multiplexing: FDM, TDM. spread spectrum.	CO2	1
2.2	Transmission Media- guided media and unguided media.	CO2	6
2.3	Switching message, Circuit and packet switched networks.	CO2	3
2.4	datagram networks	CO2	2
2.5	virtual circuit networks	CO2	2
3	Hop to Hop Delivery		15
3.1	Error Detection and Correction Type of Errors, Redundancy, Detection, Correction, Forward Error and Retransmission.	CO3	3
3.2	Coding -Block Coding(Parity Check Code and Hamming Code).	CO3	2

3.3	Cyclic Codes	CO3	2
3.4	Framing, flow and error control,	CO3	3
3.5	Protocols - Noiseless channels (Simplest, Stop and Wait) and Noisy channels(Stop and Wait and Piggy Backing) .	CO3	5
4	Multiple Access Protocols		14
4.1	Random Access-ALOHA, CSMA	CO4	3
4.2	Wired LANs-IEEE standards, standard Ethernet.	CO4	3
4.3	Wireless LANs-Bluetooth.	CO4	3
4.4	Cellular Telephony Generations-Frequency Reuse Principle, .Cellular Telephony Generations First, Second and Third generations.	CO4	3
4.5	Satellite Networks Geo, Meo, Leo.	CO4	2
5	Host- To-Host Communication		14
5.1	Network Level Logical addressing	CO4	3
5.2	Internet protocol- IPv4 andIPv6	CO4	3
5.3	Process to ProcessDelivery	CO4	2
5.4	Connectionless and Connection Oriented Service: UDP, TCP, Congestion control.	CO4	2
5.5	Name space, domain name space,	CO4	2
5.6	File transfer protocol,HTTP	CO4	2

Text Book

1. BehrouzA.Forouzan - Data Communications and Networking, TATA McGraw Hill Education.

References

1. Tanenbaum, Computer Networks(5th edition)-
2. William Stallings- Data and Computer Communications, Eighth Edition, Pearson.
3. WillaimL.Sechwebar- Data Communications, First Edition, Tata McGraw Hill Publishing Co Ltd.

CR4CACT11: Web Technology**Core: Theory****Teaching hours: 4Hrs/ week (72Hrs / Sem)****Credits: 4****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive level	PSO	PO
CO1	Explain the concepts of HTML, DHTML and Cascading Styles sheets.	Understand	PSO1	PO1
CO2	Develop websites for user interactions using JavaScript	Create	PSO1,PSO3	PO1
CO3	Develop web applications using PHP	Create	PSO1,PSO3	PO1
CO4	Construct queries using SQL for database interaction of webpages	Apply	PSO1,PSO3	PO1

Syllabus - Module wise

Module	Course Description	CO No.	Hours
1	HTML		13
1.1	HTML, Basic HTML, Document Body Text, Hyperlink, Lists, Image, Tables, Frames, Forms, HTML5	CO1	9

1.2	Basics of XHTML, Syntactic difference between HTML and XHTML	CO1	4
2	DHTML		13
2.1	DHTML, Cascading style sheets- Introduction using styles, Defining your own styles, Properties & values in styles ,Font Properties, Alignment of Text, Color, The Box Model	CO1	9
2.2	Back Ground Images, Formatting blocks of information	CO1	4
3	Java Script		15
3.1	Java Script: Introduction to Java script Basics Variables String manipulation Mathematical Functions Operations Arrays Functions Objects in Java script-regular expressions, Built- in objects	CO2	10
3.2	Data validation messages & Confirmation Status bar- Writing to a different frame	CO2	5
4	PHP		16
4.1	PHP: Origins and Uses of PHP, Including PHP in a page, Overview of PHP- Data types, Program Control, Arrays, PHP Functions	CO3	10

4.2	PHP form and passing information between pages, \$_GET, \$_POST, \$_REQUEST, Session And Cookie Management, Error handling in PHP.	CO3	6
5	MY SQL		15
5.1	Introduction to MySQL, data types, SQL commands-CREATE, UPDATE, INSERT, DELETE,SELECT	CO4	7
5.2	PHP functions for MySQL connectivity and operation- insertion, updation and deletion of data using PHP, displaying data from MySQL in webpage.	CO4	8

Text Books:

1. Chris Bates ,Web Programming, Pub: John Wiley & Sons, 3rd Edition.
2. Ivan Bayross, HTML , DHTML, JavaScript ,Perl & CGI,BPB Publication.
3. Dave W Mercer,Allan Kent, Steven D Nowicki, David Mercer,Dan Aquier,Wankyu Choi, Beginning PHP5, Wiley Publishing,Inc

References

1. Steven Holzner ,HTML Black Book, Dreamtech Publishers
2. Bear Bibeault and Yehuda Katz, jQuery in Action, Second Edition, Manning Publications. Black Book, Kogent Learning Solutions Inc. 2009.
3. Bob Boiko, Content Management Bible, 2nd Edition, Wiley Publishers.

CR4CACT12: Operating Systems**Core: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 4****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Outline the structure and functions of Operating Systems	Understand	PSO1	PO1,PO4
CO2	Compare process scheduling methods and synchronization of processes	Analyze	PSO1	PO1,PO4
CO3	Apply memory management and information management methods of an Operating System	Understand	PSO1	PO1,PO4
CO4	Demonstrate salient features available to Linux Operating Systems	Evaluate	PSO1	PO1,PO4

Syllabus - Module wise

Module	Course Description	CO	Hours
1	OS Introduction		8
1.1	Definition, Functions, OS as Resource Manager, Types of OS.	CO1	2
1.2	Concept of Batch systems, Multi programmed systems, time shared systems Multiprocessor systems.	CO1	2

1.3	Distributed systems and Real-time systems, Operating system structures.	CO1	2
1.4	OS components, OS services, System calls, System structure.	CO1	2
2	Process management		20
2.1	Process concept, Process scheduling, Operations on processes, Cooperating processes, Interprocess communication.	CO2	5
2.2	CPU scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms.	CO2	5
2.3	Process synchronization: critical-section problem, semaphores. Deadlocks: Deadlock characterization,	CO2	5
2.4	Methods for handling deadlocks, Prevention, Avoidance, Detection and recovery from deadlocks.	CO2	5
3	Storage Management		16
3.1	Memory management: Background, Swapping.	CO3	5
3.2	Contiguous memory allocation, Paging, Segmentation.	CO3	5
3.3	Virtual memory, Demand paging, Page replacement, Allocation of frames, Thrashing.	CO3	6
4	File-System Interface		16
4.1	File concept, File types, Access methods, Directory structure, Protection, File system structure.	CO3	5

4.2	File system implementation, Directory implementation, Allocation methods.	CO3	5
4.3	Free space management, Efficiency and performance, Recovery, Disk structure, Disk scheduling.	CO3	5
4.4	Recovery, Disk structure, Disk scheduling.	CO3	1
5	Linux Operating system		12
5.1	Overview and Basic Features of Linux, Simple Linux commands.	CO4	4
5.2	Directory related commands-ls, cd, pwd, cp, mv, rm, mkdir, rmdir.	CO4	2
5.3	File permissions-chmod, Listing, displaying and printing commands-ls, cat, more, less, head, tail.	CO4	2
5.4	Creating and editing files using vi editor.	CO4	4

Text Books

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts Addison Wesley
2. Cristopher Negus, Red Hat Linux Bible , Wiley

References

1. Manick & Donovan, Operating System (McGrawHill)
2. H M Deitel, Operating system (Pearson Education)
3. D.M. Dhammdhere, System programming & Operating Systems (Tata McGrawHill)

CR4CACT13- Cyber Security**Core: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 3****Course Outcomes**

At the end of the Course, the student will be able to

CO No	CO Statement	Cognitive Level	PSO	PO
CO1	Explain the concepts of cyber security and cyber crimes.	Understand	PSO1, PSO4	PO1, PO3, PO5
CO2	Summarize the various security concerns and legal aspects of social media platforms.	Understand	PSO1, PSO4	PO1, PO3, PO5
CO3	Describe the basic concepts of E-Commerce.	Understand	PSO4	PO3, PO5
CO4	Apply the basic security aspects related to computers and mobiles.	Understand	PSO4	PO3, PO5

Syllabus – Module Wise

Module	Course Description	CO	Hours
1	Defining Cyberspace and Web-technology		10
1.1	Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet.	CO1	2
1.2	Internet infrastructure for data transfer and governance,,	CO1	4

	Internet society, Regulation of cyberspace		
1.3	Concept of cyber security, Issues and challenges of cyber security	CO1	4
2	Cybercrimes and Cyber Laws		16
2.1	Classification of cybercrimes, Common cybercrimes- cybercrime targeting computers and mobiles, cybercrime against women and children, financial frauds.	CO2	4
2.2	Social engineering attacks, malware and ransomware attacks, zero day and zero click attacks,	CO2	4
2.3	Cybercriminals and their modus-operandi, Reporting of cyber crimes	CO2	4
2.4	Remedial and mitigation measures ,Legal perspective of cybercrime, IT Act 2000 and its amendments, Cybercrime and offenses, Organizations dealing with Cybercrime and Cyber security in India.	CO2	4
3	Introduction to Social networks. Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network,		14
3.1	Types of Social media, & platforms, Social media monitoring, Hashtag, Viral content	CO2	3
3.2	Social media marketing & Social media privacy, Challenges, opportunities and pitfalls in online social network	CO2	4
3.3	Security issues related to social media, Flagging and reporting of inappropriate content	CO2	3
3.4	Laws regarding posting of inappropriate content, Best	CO2	4

	practices for the use of Social media		
4	E- Commerce and Digital payments		16
4.1	Basics of E- Commerce, Main components, E-Commerce security, E-Commerce threats, E-Commerce security best practices.	CO3	4
4.2	Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments, Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments.	CO3	8
4.3	Digital payments related frauds and preventive measures, RBI guidelines on digital payments and customer protection in unauthorised banking transactions.	CO3	4
5	Digital Devices Security		16
5.1	Tools and Technologies for Cyber Security - End Point device and Mobile phone security	CO4	4
5.2	Password policy, Security patch management, Data backup, Downloading and management of third party software,	CO4	4
5.3	Device security policy, Cyber Security best practices	CO4	4
5.4	Significance of host firewall and Ant-virus, Wi-Fi security, Configuration of basic security policy and permissions.	CO4	4

Text Books

1. Cyber Crime Impact in the New Millennium, by R. C Mishra ,Auther Press. Edition 2010.2.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by SumitBelapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson, 13th November, 2001)
4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
6. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.
7. Fundamentals of Network Security by E. Maiwald, McGraw Hill

CR4CACP04: Software Lab –IV Web Programming**Core: Practical****Teaching hours: 4Hrs/ week (72 Hrs/Sem)****Credits: 2****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive level	PSO	PO
CO1	Create simple web pages using HTML	Understand	PSO1, PSO2	PO1, PO2
CO2	Create web pages using CSS and Java script	Apply	PSO1, PSO2	PO1, PO2
CO3	Learn PHP programs	Apply	PSO1, PSO2	PO1, PO2
CO4	Develop PHP application using mysql database connectivity	Apply	PSO1, PSO2	PO1, PO2

Syllabus Module wise

Module	Course Description	CO	Hours
1	Creating HTML web pages		12
1.1	Creating simple web pages using HTML head , body and image tags	CO1	6
1.2	Creating simple web pages using HTML link tags	CO1	6

2	Design of web pages using CSS		15
2.1	Creating simple web pages using inline style	CO2	7
2.2	Creating simple web pages using external style	CO2	8
3	Simple validation programs using Java Script		15
3.1	Simple java script programs based on form tag	CO2	7
3.2	Validation programs based on java script	CO2	8
4	PHP programs		15
4.1	PHP programs based on array and loops	CO3	6
4.2	PHP programs based on decision making statements	CO3	5
4.3	PHP programs based on get, post, session and cookie handling	CO3	4
5	PHP programs with MySQL		15
5.1	Database commands familiarization	CO4	5
5.2	PHP programs based on database connectivity	CO4	6
5.3	Simple Linux commands–directory related -ls, cd, pwd, cp, mv, rm, mkdir, rmdir, and file permissions-chmod, Listing, displaying and printing commands-ls, cat, more, less, head, tail.	CO4	4

Text Books:

1. Chris Bates ,Web Programming, Pub: John Wiley & Sons, 3rd Edition.
2. Ivan Bayross, HTML , DHTML, JavaScript ,Perl & CGI,BPB Publication.
3. Dave W Mercer,Allan Kent, Steven D Nowicki, David Mercer,Dan Aquier,Wanky Choi, Beginning PHP5, Wiley Publishing,Inc

SEMESTER V**CR5CACT14 -Mobile Application Development****Core: Theory****Teaching hours: 4Hrs/ week (72Hrs / Sem)****Credits:4****Course Outcome**

At the end of the Course, the student will be able to

CO No.	CO Statement	Cognitive Level	PSO	PO
CO1	Learn Android Environment, Well understanding of Android Architecture.	Understand	PSO1,PSO2,PSO3	PO1,PO2
CO2	Demonstrate android building blocks ,Customize IDE.	Analyze	PSO1,PSO2,PSO3	PO1,PO2
CO3	Expertise in creating different views of activity and manage layout for different activity.	Understand	PSO1,PSO2,PSO3	PO1,PO2
CO4	Learn JSON and XML	Evaluate	PSO1,PSO2,PSO3	PO1

Syllabus – Module Wise

Module	Course Description	CO No.	Hours
1	Introduction to Android		10
1.1	Android Versions, Android Activity, Android Features and Architecture.	CO1	2
1.2	Java JDK, Android SDK.	CO1	2

1.3	Android Development Tools, Android Virtual Devices.	CO1	3
1.4	Layouts – Linear, Absolute, Frame, Relative and Table.	CO1	3
2	Android User Interface		16
2.1	Fundamental UI design , User interface with View- Text View, Buttons, Image Button, Edit Text.	CO1	4
2.2	Check Box, Toggle Button, Radio Button and Radio Group, Progress Bar.	CO3	4
2.3	Autocomplete Text View, Spinner, List View, Grid View, Image View, Scroll View.	CO2	4
2.4	Custom Toast Alert and Time and Date Picker.	CO2	4
3	Activity – Introduction		14
3.1	Intent, Intent_filter, Activity Life Cycle.	CO3	5
3.2	Broadcast Life Cycle, Services, multimedia-Android System Architecture.	CO4	4
3.3	Play Audio and Video, Text to Speech.	CO5	5
4	SQLite Database in Android		16
4.1	Introduction to SQLite Database, Creation and Connection of the Database.	CO2	5
4.2	Transactions.	CO3	5
4.3	Telephoning and Messaging-SMS Telephony, Sending SMS, Receiving SMS.	CO3	5
4.4	Wi-Fi Activity.	CO3	1
5	Introduction to JSON and XML.		16
5.1	Use of JSON, Syntax and Rule of JSON.	CO4	4
5.2	JSON Name, JSON Values, JSON Objects.	CO4	4
5.3	JSON Arrays, Parsing JSON and XML.	CO4	4
5.4	Google Play services, Location services, Maps.	CO4	4

Text Books

1. Prasanna Kumar Dixit - ANDROID, Vikas Publishing House.
2. Anubhav Pradhan, Anil Deshpande, Composing Mobile Apps using Android, Wiley India Pvt.Ltd,2014
3. Kevin Grant and Chris Haseman, Beginning Android Programming – Develop and Design, Pearson.

CR5CACT15 :Programming in Java**Core: Theory****Teaching hours: 4Hrs/ week (72Hrs / Sem)****Credits: 3****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Describe the various features of Java	Understand	PSO1	PO1,PO4
CO2	Describe the concepts of interfaces, packages and threads in Java	Understand	PSO1,PSO3	PO1,PO3
CO3	Illustrate exception handling and event handling in Java	Apply	PSO1,PSO3	PO1,PO3
CO4	Demonstrate the use of applets, AWT, swing controls and JDBC	Apply	PSO1,PSO4	PO1,PO4,PO5

Syllabus - Module wise

Module	Course Description	CO	Hours
1	Object oriented programming		10
1.1	Encapsulation-Inheritance-Polymorphism-Genesis of Java-characteristics of java- -	CO1	2

1.2	Program structure-identifiers-operators-variables-literals-data types-Arrays. Control Statements-selection statements-iterative statements-jump statements	CO1	4
1.3	Loops- while loop-do while loop- for loop	CO1	4
2	Classes		16
2.1	Declaration, object references, instantiation, method declaration,method calling	CO2	4
2.2	this operator, constructor, method overloading, constructor overloading, method overriding, inheritance super class	CO2	6
2.3	Dynamic method dispatch, final-static, abstract classes, String Handling.	CO2	6
3	Packages		14
3.1	creating packages, using packages, Interfaces	CO3	4
3.2	Exception Handling Techniques-try-catch-throw-throws-finally	CO3	6
3.3	Multithreading: creation of multithreaded program,Thread class, Thread Lifecycle	CO3	4
4	Event Handling		16
4.1	Delegation Event Model,Event Classes,Sources of Events,Event Listeners	CO4	6
4.2	AWT: Frame Class,AWT , Controls: Label- Button-Checkbox-List-Choice control-Text Field-Text Area	CO4	6
4.3	Swing architecture, Lay out Managers	CO4	4
5	Applet , JDBC Fundamentals	CO4	16
5.1	applet tag, applet life	CO4	4
5.2	I/O Streams: Data Input Stream Data Output Stream-Buffered Reader, Buffered Writer classes setting,	CO4	8
5.3	JDBC architecture	CO4	4

Text Books

1. Java complete reference, Vth edition, Herbert Schildt.
2. Programming with Java, IVth edition, E. Balaguruswamy

References

1. Ken Arnold, James Gosling; The Java Programming Language, Addison-Wesley
Second Edition.
2. Joe Wigglesworth, Paula Lumby: Java Programming Advanced Topics, Thomson
Learning

CR5CACT16 – Environmental Studies and Human Rights**Core: Theory****Core: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 4****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Describe on the environment, biodiversity and natural resources	Understand	PSO3 PSO4	PO1 PO3 PO4 PO5
CO2	Identify environmentally friendly practices in society on a global scale.	Understand	PSO3 PSO4	PO1 PO3 PO4 PO5
CO3	Judge green approaches in IT.	Apply	PSO2 PSO3 PSO4	PO1 PO2 PO3 PO4 PO5
CO4	Develop life catering to human rights and women's rights.	Apply	PSO3 PSO4	PO1 PO2 PO3 PO4 PO5

Syllabus – Module Wise

Module	Course Description	CO	Hours
1	Environmental studies- an introduction		17
1.1	Introduction to Environmental studies	CO1	2
1.2	Natural resources	CO1	3
1.3	Ecosystem	CO1	2
1.4	Energy flow and food chain	CO1	2
1.5	Biodiversity	CO2	2
1.6	Places of biodiversity and threats	CO2, CO4	2
1.7	Pollution		2
1.5	Disaster Management	CO2	2
2	The Environment	CO1,CO2	15
2.1	Care for the environment	CO2, CO4	2
2.2	Environment and social issues	CO2, CO4	3
2.3	Hazards	CO2, CO4	6
2.4	Environment protection acts	CO2, CO4	4
3	Green Computing		14

3.1	Introduction to Green Computing	CO3	3
3.2	Environmentally Sound Practices(3 R)	CO2, CO3	3
3.3	Greening of the technology	CO2, CO3	4
3.4	Renewable energy	CO2, CO3	4
4	Human Rights		14
4.1	Concept, Origin and Definitions-Types of Human Rights	CO2, CO4	3
4.2	UNO and UDHR-Human Rights and Indian Constitution	CO2, CO4	3
4.3	Contemporary Human Rights Issues - Women Rights-Child Rights-Rights of Minorities and Dalit's	CO2, CO4	5
4.4	AIDS and challenges in society	CO2, CO4	3
5	Women Studies		12
5.1	Introduction to Women's Studies: Key concepts in Gender studies. Need, Scope and challenges of Women's Studies	CO4	2
5.2	Need for Gender Sensitization. Women's Movements. National Committees and Commissions for Women	CO4	2

5.3	Feminist thinkers and theories- New Feminist Debates- Post Colonial /Post Modern, LGBT, Masculinity Studies.	CO4	4
5.4	Feminist thinkers in 18th, 19th, 20h and 21st Century.	CO4	2
5.5	Women Law and Governance: Rights: Gender Equality, Gender Discrimination, Women's Rights as Human Rights	CO4	2

Text Books

1. Bharucha, Erach. Textbook of Environmental Studies for Undergraduate Courses. India, Universities Press (India) Pvt. Limited, 2005.
2. Sabban, Albert. "Introductory Chapter: Green Computing Technologies and Industry in 2021." *Green Computing Technologies and Computing Industry in 2021*. IntechOpen, 2021.
3. Murugesan, San. "Harnessing green IT: Principles and practices." *IT professional* 10.1 (2008): 24-33.
4. Dr. S. C. Singhal and Lakshmi Narain Agrawal. Human Rights –3rd edition, 2008.
5. Kamala, Bhasin. "Understanding Gender: Gender Basics." *New Delhi: Women Unlimited* (2004).

CR5CACP05: SOFTWARE LAB– V [JAVA]**Core: Practical****Teaching hours:4 hrs. per week(72 Hrs / Sem)****Credits:2****Course Outcomes**

At the end of the Course, the student will be able to

CO No.	CO Statement	Cognitive Level	PSO	PO
CO1	Develop Programs using class and inputs from keyboard	Apply	PSO1 ,PSO2	PO1,PO2
CO2	Familiarize inheritance, Interface, overloading, stream Classes implementation of programs	Apply	PSO1,PSO2,PO3	PO1,PO2,PO4
CO3	Apply the JDBC interface for connecting Java programs With SQL-based databases.	Apply	PSO1,PSO3,PO4	PO1,PO2,PO4
CO4	Acquire knowledge within the chosen area of technology .	Apply	PSO1,PSO2	PO1,PO2,PO4

Syllabus – Module Wise

Module	Course Description	CO	Hours
1	JAVA BASICS		14
1.1	Programs to illustrate the java program structure, to familiarize with the use of identifiers, operators, variables, literals and various data types	CO1	5
1.2	Programs to demonstrate single dimensional and two dimensional Arrays	CO1	5
	Programs to demonstrate the use of Control Statement	CO1	4
2	CLASSES		14
2.1	Programs to familiarize with the definition of Class, declaration of	CO1	2

	object references		
2.2	Programs to create and use objects by instantiation	CO1	2
2.3	Programs to demonstrate default constructor and parameterized constructor, method overloading, method overriding	C02	2
2.4	Programs to illustrate inheritance, use of this and super keywords	C02	2
2.5	Programs to demonstrate dynamic method dispatch	C02	2
2.6	Programs to demonstrate final,static keywords, abstract classes	C02	2
2.7	Programs to illustrate String Handling.	C02	2
3	PACKAGES		14
3.1	Programs to create and use Packages	C02	7
3.2	Programs to create and use Interfaces	C02	8
3.3	Programs to demonstrate Exception Handling Techniques	C02	
3.4	Programs to demonstrate Multithreading	CO2	
4	SWING		15
4.1	Programs to demonstrate Event Handling	CO3	6
4.2	Programs to demonstrate the use of AWT, Swing, Layout Managers	CO3	5
5	JDBC	CO3	4
5.1	Programs to illustrate Applets, ,		15
5.2	Programs to use the I/O Stream classes	CO4	5
5.3	Programs to illustrate the use of JDBC.	CO4	10

Text Books

1. Java complete reference, Vth edition, Herbert Schildt.
2. Programming with Java, IVth edition, E. Balaguruswamy

References

1. Ken Arnold, James Gosling; The Java Programming Language,Addison-Wesley Second Edition.
2. Joe Wigglesworth, Paula Lumby: Java Programming AdvancedTopics, Thomson Learning

CR5CACPR1: Mini Project**Core: Practical (Choice Based Course)****Teaching hours: 5 Hrs/ week****Credits: 2****Course Outcomes:**

After the completion of the course the student will be able to

CO	Course Outcome(CO)	Cognitive level	Programme Specific Outcome	Programme Outcome
CO 1	Identify the solution to a real time problem that is beneficial to society	Understand	PSO1,PSO2,PSO3	PO1
CO 2	Analyze,design and build a software product	Create	PSO1,PSO2,PSO3	PO2
CO 3	Test the software modules	Evaluate	PSO1,PSO2,PSO3	PO4
CO 4	Document the project	Create	PSO1,PSO2,PSO3	PO1, PO4

The purpose of the project work is to give the students the opportunity to apply software engineering principles to a real software project, familiarize them with the steps of a deployment pipeline, and help them create a software product using the recent software development methodology(technology/language).

OPEN COURSE**OC5CACT01: Internet & Digital Marketing****Open Course: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 3****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Explain the concepts of Data communication and Internet.	Understand	PSO1	PO2
CO2	Describe various Internet services.	Understand	PSO1	PO2
CO3	Outline the features of e-commerce and its types.	Understand	PSO3	PO2, PO5
CO4	Summarize different digital marketing types with its services.	Understand	PSO1	PO1, PO5

Syllabus – Module Wise

Module	Course Description	CO	Hours
1	Internet, Communication		16
1.1	Basic Concepts of Internet, Communication and data transmission	CO1	6
1.2	Transmission Media	CO1	6
1.3	Domain Names	CO1	4

2	Internet Services		14
2.1	Various Internet Services	CO2	9
2.2	Audio and Video Communication	CO2	3
2.3	Faxes and Files	CO2	2
3	Electronic Commerce		14
3.1	Basic Concepts and types	CO3	7
3.2	Digital Signature	CO3	4
3.3	Intellectual Property Rights	CO3	3
4	Digital Marketing		14
4.1	Introduction and types	CO4	7
4.2	Online Advertising	CO4	7
5	Various Marketing types		14
5.1	EMail Marketing	CO4	5
5.2	Social media marketing	CO4	5
5.3	Search Engine Optimization	CO4	4

Text Books

1. Douglas E. Comer, Computer Networks and Internet, Prentice Hall of India, Fifth Edition, 2008.
2. Forouzan B. A., Data Communications and Networking, Tata McGraw Hill, Fourth Edition, 2007.
3. Ian Dodson-The art of Digital Marketing, Wiley, 2016.
4. Melissa Barker, Donald I. Barker, Nicholas F. Bormann, Krista E. Neher, Puneet Singh Bhatia- Fundamentals of Digital Marketing, Social Media Marketing: A Strategic Approach, Pearson Education, 2012

References

1. Rajaraman V, Introduction to Information Technology, PHI Learning Pvt. Ltd., Second edition, 2018, .
2. Internet & World Wide Web – How to Program,, Pearson Education, Asia, 2007.
3. Deitel, Deitel and Nieto, Amir Manzoor, E-Commerce: An Introduction, LAMBERT Academic Publishing, 2010

OPEN COURSE**OC5CACT02: Trending Technologies in IT****Open Course: Theory****Teaching hours: 4Hrs/ week (72 Hrs / Sem)****Credits: 3****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Explain the concepts of Internet technologies.	Understand	PSO1,PSO2	PO1
CO2	Describe cloud computing, mobile computing.	Understand	PSO2, PSO4	PO1
CO3	Illustrate the basics of the Internet of things.	Understand	PSO2, PSO4	PO1, PO4
CO4	Outline Virtual reality and Augmented Reality.	Understand	PSO4	PO1, PO4

Syllabus – Module Wise

Module	Course Description	CO No.	Hours
1	Internet		16
1.1	Growth of Internet	CO1	2
1.2	Owners of the Internet	CO1	2

1.3	ARPANET and Internet	CO1	3
1.4	Internet components	CO1	2
1.5	History of the World Wide Web	CO1	2
1.6	Use of the Internet	CO1	2
1.7	Internet components	CO1	3
2	Cloud Computing Introduction		14
2.1	Historical developments	CO2	3
2.2	Building Cloud Computing Environments	CO2	3
2.3	Computing Platforms and Technologies	CO2	3
2.4	Cloud Platforms in Industry	CO2	3
2.5	Cloud Applications	CO2	2
3	Mobile Computing		14
3.1	Security Concern regarding Mobile Computing	CO3	4
3.2	Application and Services	CO3	4
3.3	Future of mobile computing. Emerging trends.	CO3	3
3.4	Future of mobile computing. Emerging trends.	CO3	3
4	IOT		14
4.1	Elements of an IoT ecosystem	CO4	3
4.2	Technology drivers, Business drivers	CO4	2
4.3	Overview of Governance	CO4	2
4.4	IoT applications for industry	CO4	2
4.5	Future Factory Concepts	CO4	2

4.6	Brownfield IoT, Smart Objects, Smart Applications	CO4	3
5	Introduction of Virtual Reality		14
5.1	Definition of VR. Careers in Virtual Reality	CO4	3
5.2	Modern VR Experiences	CO4	3
5.3	Augmented Reality	CO4	3
5.4	Examples	CO4	2
5.5	Comparison between Virtual reality and Augmented Reality.	CO4	3

Text Books

1. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi
McGraw Hill Education (India) Private Limited
2. Cloud Computing: Barrie Sosinsky.
3. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press,2012.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
5. THE VR book:Human Centered Design for virtual reality by Jason Jerald
6. Understanding augmented reality concepts and applications by Alan B craig
7. Web design with HTML ,CSS,Java script and JQuery set by Jon Duket.

References

1. Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, & IaaS), Michael J. Kavis.
2. Guide to cloud architecture: Pragmatic- Knowledge level: Novice
3. Vijay Madiseti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”,1st Edition, VPT, 2014

SEMESTER VI**CR6CACT17:Cloud Computing****Core: Theory****Teaching hours: 5Hrs/ week (90 Hrs / Sem)****Credits: 4****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive level	PSO	PO
CO1	Explain the cloud computing platforms and technologies	Understand	PSO1	PO1, PO4
CO2	Identify virtualization techniques	Understand	PSO1	PO1, PO4
CO3	Compare types of cloud systems and models	Analyze	PSO1	PO1, PO4
CO4	Outline industrial cloud platforms and cloud security	Understand	PSO1, PSO4	PO1,PO4, PO5

Syllabus – Module Wise

Module	Course Description	CO No.	Hours
1	Cloud Computing Introduction		20
1.1	Historical developments	CO1	2
1.2	Building Cloud Computing Environments	CO1	4
1.3	Computing Platforms and Technologies	CO1	8
1.4	Parallel vs. Distributed Computing	CO1	2

1.5	Elements of Parallel Computing	CO1	4
2	Virtualization		20
2.1	Characteristics of Virtualized Environments	CO2	4
2.2	Taxonomy of Virtualization Techniques	CO2	6
2.3	Virtualization and Cloud Computing	CO2	6
2.4	Pros and Cons of Virtualization	CO2	4
3	Cloud Computing Architecture		16
3.1	Cloud Reference Model	CO3	4
3.2	Types of Clouds	CO3	4
3.3	Economics of the Cloud	CO3	5
3.4	Open Challenges	CO3	3
4	Cloud Platforms in Industry		17
4.1	Amazon Web Services	CO4	4
4.2	Google AppEngine	CO4	4
4.3	Microsoft Azure	CO4	4
4.4	Scientific Applications, Business and Consumer Applications	CO4	5
5	Cloud Security		17
5.1	Securing the Cloud	CO4	4
5.2	Security Service Boundary	CO4	4
5.3	Mapping	CO4	4
5.4	Securing Data- Encryption	CO4	5

Text Books

1. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi
McGraw Hill Education (India) Private Limited
2. Cloud Computing: Barrie Sosinsky.

References

1. Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, & IaaS) by Michael J. Kavis.
2. Guide to cloud architecture: Pragmatic- Knowledge level: Novice

CR6CACT18 – Introduction to IOT and Robotics**Core: Theory****Teaching hours: 5Hrs/ week (90Hrs / Sem)****Credits: 4****Course Outcomes**

At the end of the Course, the student will be able to

CO No.	CO Statement	Cognitive Level	PSO	PO
CO1	Explain the basics of Internet of things	Understand	PSO1 ,PSO2,PSO3	PO1 ,PO2
CO2	Summarize the architecture of IoT	Understand	PSO1,PSO2,PO3	PO1, PO2,PO4
CO3	Define the applications of IoT	Understand	PSO1,PSO2,PO4	PO1, PO2
CO4	Illustrate the basics to robotics	Understand	PSO2,PSO3, PSO4	PO1, PO2,PO4

Syllabus- Module Wise

Module	Course Description	CO No.	Hours
1	IOT		15
1.1	IOT -What is the IoT and why is it important? Elements of an IoT ecosystem	C01	3
1.2	Technology drivers	C01	3
1.3	Business drivers, Trends and implications	C01	4
1.4	Overview of Governance, Privacy and Security Issues.	C01	5
2	IOT PROTOCOLS		15
2.1	IOT PROTOCOLS - Protocol Standardization for IoT – Efforts	C01	1
2.2	M2M and WSN Protocols	C01	3
2.3	SCADA and RFID Protocols	C01	3

2.4	Issues with IoT Standardization Unified Data Standards	C01	2
2.5	Protocols- IEEE802.15.4–BACNet Protocol	C01	3
2.6	Modbus – KNX – Zigbee	C01	3
3	IOT ARCHITECTURE		15
3.1	IoT Open source architecture (OIC)- OIC Architecture & Design principles	CO2	5
3.2	IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture	CO2	5
3.3	Resource model and Abstraction.	CO2	5
4	IOT APPLICATIONS		14
4.1	IoT applications for industry	CO3	2
4.2	Future Factory Concepts	CO3	4
4.3	Brownfield IoT	CO3	2
4.4	Smart Objects	CO3	2
4.5	Smart Applications	CO3	4
5	Introduction to robotics		15
5.1	Introduction to robotics	CO4	2
5.2	Classification of robots	CO4	3
5.3	Workspace analysis, Manipulator	CO4	3
5.4	Kinematics_ Convention for affixing frames to links – DH Representation,	CO4	3
5.5	Various types of robots.	CO4	4

Textbooks

1. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press,2012.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
3. David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, Cambridge University Press, 2010.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012.
5. K S Fu R C Gonzales, C S G Lee: Robotics Control, Sensing, Vision and intelligence, McGraw Hill 1987.
6. John J Craig, Introduction to Robotics, Mechanics and control, second edition Addison – Wesley, 1999.

Reference Books

1. Vijay Madiseti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”,1st Edition, VPT, 2014
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013
3. CunoPfister, Getting Started with the Internet of Things, O’Reilly Media, 2011, ISBN: 978-1- 4493-9357-1
4. Mark W Spong& M Vidyasagar, Robot Dynamics and Control, John Wiley & Sons, 1989.
5. R P Paul: Robot Manipulators Mathematics Programming, Control, The computer control of robotic manipulators, The MIT Press 1979.
6. Robert J Schilling: Fundamentals of Robotics, Analysis and Control. Prentice Hall of India, 1996.
Gonzalez / Woods, Digital Image Processing, Addison Wesley, 1993.

CR6CACPR2: Main Project-Software**Development Lab II****Core: Practical (Choice Based Course)****Teaching hours: 7 Hrs/ week****Credits: 4****Course Outcomes**

After the completion of the course the student will be able to

CO	CO Statement	Cognitive level	PSO	PO
CO 1	Identify the solution to a real time problem that is beneficial to society	Understand	PSO1	PO1,PO5
CO 2	Analyze,design and build a software product	Create	PSO1	PO1,PO4
CO 3	Test the software modules	Evaluate	PSO1	PO1,PO4
CO 4	Document the project	Create	PSO1,PSO4	PO2

The purpose of the project work is to give the students the opportunity to apply software engineering principles to a real software project, familiarize them with the steps of a deployment pipeline, and help them create a software product using the recent software development methodology(technology/language). A project report should be submitted in hard bound complete in all aspects. For internal evaluation, the progress of the student shall be systematically assessed through various stages of evaluation at periodic intervals.

CR6CACSM1: SEMINAR**Core: Practical (Choice Based Course)****Teaching hours: 3 Hrs/ week****Credits: 2****Course Outcomes:**

After the completion of the course the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Explain the ideas presented in technical papers	Understand	PSO1,PSO2	PO1,PO2, PO4,PO5
CO2	Summarize the concept by the means of references of various documents	Understand	PSO1,PSO2	PO1,PO2
CO3	Prepare the documents	Apply	PSO1,PSO2,PSO3	PO2,PO3,PO4
CO4	Present the topic before an audience	Apply	PSO1,PSO2	PO2,PO4

Syllabus

This course intends to enable the students to gain knowledge in any of the technically relevant current topics on Computer Science or Information Technology, and to acquire confidence in presenting and preparing a report in a relevant topic. The students are given 30 minutes for presentation and clarification. The presentation will be using digital presentation tools. A seminar report in hard bound form in the pattern of a complete technical report (with contents page, well structured presentation, references etc.) should be submitted. There will not be any external evaluation for the Seminar Presentation.

Scheme of Evaluation - Internal

- Topic/Content - 30 marks
- Knowledge -20 marks
- Presentation - 20 marks
- Clarity & Verbal Skills - 10 marks
- Ability to answer questions - 10 marks
- Report - 10 marks
- Total Marks - 100 marks

CV6CACV01: Viva Voce**Core: Practical (Choice Based Course)****Teaching hours:****Credits: 1****Course Outcomes**

After the completion of the course the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Ability to speak the ideas and concepts of courses learned through this programme.	Understand	PSO1	PO1,PO2,PO4
CO2	Attend the technical interviews	Understand	PSO1	PO1,PO4
CO3	Face the questions with confidence and answer them clearly	Understand	PSO1,PSO3	PO1,PO4
CO4	Make use of the concepts learned through this programme in future	Apply	PSO1,PSO3,PSO4	PO1,PO3,PO4

Viva Voce intends to assess the knowledge gained by a student in the core courses of this programme and to make the student aware of his/her knowledge level and. This course will help the student in preparing for comprehensive examinations and improve the confidence in answering questions in objective mode.

Each student should attend a course viva voce based on syllabus from semester I to semester IV. The evaluation is completely external evaluation.

CR6CACBT1: Data Mining and Machine Learning**Core: Theory (Choice Based Course)****Teaching hours: 5Hrs/ week (90 Hrs / Sem)****Credits: 4****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Explain the evolution of data mining and knowledge discovery	Understand	PSO1	PO1 PO4
CO2	Summarise data preprocessing activities	Understand	PSO1 PSO2	PO1 PO2 PO3
CO3	Interpret association rules and algorithms	Understand	PSO1 PSO3	PO1 PO3 PO4
CO4	Make use of machine learning techniques for knowledge discovery	Apply	PSO1 PSO3 PSO4	PO1 PO3 PO4 PO5

Syllabus - Module wise

Module	Course Description	CO No.	Hours
1	Introduction to Data Mining		16
1.1	Architecture of a Data Mining, KDD	CO1	4
1.2	Applications of Data Mining.	CO1	4

1.3	Data Preprocessing:	CO2	4
1.4	Integration and Rduction	CO2	4
2	Patterns and Association rules		16
2.1	Mining Frequent Patterns	CO3	6
2.2	Item sets	CO3	5
2.3	Association rules	CO3	5
3	Introduction to Machine Learning:		16
3.1	Definitions	CO1,CO4	2
3.2	Types of learning	CO4	6
3.3	Hypothesis space and inductive bias	CO4	4
3.4	Evaluation, cross-validation	CO4	4
4	ML Algorithms		24
4.1	Regression	CO4,CO3	5
4.2	Classification	CO4,CO3	7
4.3	Clustering	CO4, CO3	6
5	Neural Network		18
5.1	Introduction and Features	CO4, CO1	3
5.2	NN algorithm, Percepron	CO4,CO3	5
5.3	Backpropagation, Multilayer network	CO4	5
5.4	Introduction to Deep Learning.	CO4, CO1	5

Text Books

1. Han, Jiawei, Jian Pei, and Hanghang Tong. *Data mining: concepts and techniques*. Morgan kaufmann, 2022.
2. Wu, Xindong, and Vipin Kumar, eds. *The top ten algorithms in data mining*. CRC press, 2009.
3. Zhou, Zhi-Hua. *Machine learning*. Springer Nature, 2021.
3. Alpaydin, Ethem. *Introduction to machine learning*. MIT Press, 2020.
5. Theobald, Oliver. *Machine learning for absolute beginners: a plain English introduction*. Vol. 157. Scatterplot press, 2017.

CR6CACBT2: Cyber Forensics**Core: Theory (Choice Based Course)****Teaching hours: 5 Hrs/ week (90 Hrs / Sem)****Credits: 4****Course Outcomes**

At the end of the Course, the student will be able to

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Explain the basics of computer forensics	Understand	PSO1	PO1, PO4
CO2	Summarize various computer forensic tools	Understand	PSO3	PO1, PO3
CO3	Identify the vulnerabilities in a given network infrastructure	Understand	PSO1	PO1
CO4	Demonstrate real-world hacking techniques to test system security	Apply	PSO3, PSO4	PO1, PO4, PO5

Syllabus - Module wise

Module	Course Description	CO	Hours
1	Introduction to Computer Crime & Cyber Forensics, Types of CF techniques		18
1.1	Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime.	CO1	4

1.2	Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology	CO1	6
1.3	Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.	CO1	8
2	Processing Crime and Incident Scenes		18
2.1	Processing Crime and Incident Scenes – Working with Windows and DOS Systems.	CO2	8
2.2	Current Computer Forensics Tools: Software/ Hardware Tools.	CO2	10
3	Validating Forensics Data		18
3.1	Validating Forensics Data – Data Hiding Techniques, Performing Remote Acquisition	CO3	8
3.2	Network Forensics, Email Investigations	CO3	4
3.3	Cell Phone and Mobile Devices Forensics	CO3	6
4	Ethical Hacking		18
4.1	Introduction to Ethical Hacking, Footprinting and Reconnaissance	CO4	8
4.2	Scanning Networks, Enumeration, System Hacking	CO4	4
4.3	Malware Threats and Sniffing	CO4	6
5	Social Engineering related hacking		18
5.1	Social Engineering - Denial of Service - Session Hijacking	CO4	4

5.2	Hacking Web servers, Hacking Web Applications	CO4	4
5.3	SQL Injection	CO4	4
5.4	Hacking Wireless Networks, Hacking Mobile Platforms.	CO4	4

Text Books

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, —Computer Forensics and Investigations, Cengage Learning, India Edition, 2016.
2. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2015.

References

1. John R.Vacca, —Computer Forensics, Cengage Learning, 2005
2. MarjieT.Britz, —Computer Forensics and Cyber Crimel: An Introduction, 3rd Edition, Prentice Hall, 2013.
3. AnkitFadia — Ethical Hacking, Second Edition, Macmillan India Ltd, 2006
4. Kenneth C.Brancik —Insider Computer Fraud, Auerbach Publications Taylor & Francis Group–2008.

CR6CACBT3: Software Testing**Core: Theory (Choice Based Course)****Teaching hours: 5 Hrs/ week (90 Hrs / Sem)****Credits: 4****Course Outcomes**

At the end of the course, the students will be able to:

CO	CO Statement	Cognitive Level	PSO	PO
CO1	Describe various software testing processes and various software testing techniques	Understand	PSO1	PO1, PO4
CO2	Explain different types of testing environments	Understand	PSO1	PO1, PO4
CO3	Describe the various Testing tools	Understand	PSO1, PSO3	PO1,PO3,PO4
CO4	Illustrate the Quality Metrics	Understand	PSO1, PSO3	PO1,PO3,PO4

Syllabus - Module-wise

Module	Course Description	CO No.	Hours
1	Testing Environment and Test Processes		14
1.1	Building a Software testing environment	CO1	5

1.2	Seven steps of Software Testing process	CO1	9
2	Testing Techniques and Levels of Testing		22
2.1	White box and Black box approach to test design	CO1	9
2.2	Levels of testing	CO1	10
2.3	Case study for White box testing and Black box testing techniques	CO1	3
3	Incorporating Specialized Testing Responsibilities		22
3.1	Testing Client/Server systems	CO2	8
3.2	Object Oriented Testing	CO2	10
3.3	Case study for Web Application testing	CO2	4
4	Test Automation		16
4.1	Software Test Automation	CO3	5
4.2	Scope of Automation	CO3	6
4.3	Challenges in Automation	CO3	5
5	Software Testing and Quality Metrics		16
5.1	Testing of Software System Security	CO4	12
5.2	Case study for Complexity and Object Oriented Metrics	CO4	4

TextBooks

1. William Perry, *Effective Methods of Software Testing*, Third Edition, Wiley Publishing 2007
2. Srinivasan Desikan and Gopalaswamy Ramesh, *Software Testing – Principles and Practices*, Pearson Education, 2007.

References

1. Naresh Chauhan, *Software Testing Principles and Practices*, Oxford University Press, New Delhi, 2010.
2. Dale H. Besterfield et al., *Total Quality Management*, Pearson Education Asia, Third Edition, 2006.
3. Stephen Kan, *Metrics and Models in Software Quality*, Addison – Wesley, Second Edition, 2004
4. Llene Burnstein, *Practical Software Testing*, Springer International Edition, Chennai, 2003.
5. Renu Rajani, Pradeep Oak, *Software Testing – Effective Methods, Tools and Techniques*, Tata McGraw Hill, 2004.
6. Edward Kit, *Software Testing in the Real World – Improving the Process*, Pearson Education, 1995.
7. Boris Beizer, *Software Testing Techniques – 2nd Edition*, Van Nostr and Reinhold, New York, 1990

MODEL QUESTION PAPER

Assumption College Autonomous, Changanassery BCA Degree (CBCS) Examination

First Semester

BCA

CR1CACT02: Methodology of Programming and Programming in C

Time: 3 Hours

Maximum: 80 Marks

Section A

Answer any seven questions. Each Question carries 2 marks

1. What do you mean by Cohesion?
2. Write a note on errors in C programming.
3. What are keywords in C?
4. Define Typecasting in C.
5. While loop is an entry control loop. Justify.
6. Why we use user defined functions in a program?
7. Define Array and how to declare it.
8. Write the use of character array in C.
9. Define pointers and its declaration.

[7 x 2 = 14]

Section B

Answer any six questions. Each Question carries 6 marks

10. Compare top-down and bottom-up approaches.
11. Write the characteristic of a good program.
12. Describe a) C Tokens b)Data types.
13. Demonstrate the use of arithmetic operators in given inputs.
14. Discuss the use of decision statements with syntax & example.
15. Code the Fibonacci series up to a limit.
16. How to sort the array elements in ascending order? Write the code.
17. Describe storage classes with example.
18. Show with an example how pointers related to array.

[6 x 6 = 36]

Part C

Answer any two questions. Each Question carries 15 marks

19. Explain operators in C.
20. Code addition of two matrices.
21. Elaborate different categories of user defined functions with example.
22. What is Structure? Write a program to read three Student's-Name, Rollno,Mark and display the same.

[2 x 15 = 30]

MODEL MARK CARD



ASSUMPTION COLLEGE

CHANGANASSERY, KERALA 686101 | **AUTONOMOUS**
Accredited by NAAC with A+ Grade (Cycle 4) | ISO 9001:2015 Certified

CONSOLIDATED MARK CUM GRADE CARD



Name of the Candidate :

Permanent Register Number (PRN) :

Degree :

Programme :

Stream :

Date of Birth :

Date of Eligibility for the Degree :

Name of Affiliating University :

Permanent Register Number (PRN):

Course Code	Course Title	Credits (C)	Marks						Grade Awarded(G)	Grade Point (GP)	Credit Point (C*GP)	Institution Average(A)	Result
			External		Internal		Total						
			Awarded(E)	Maximum	Awarded(I)	Maximum	Awarded(E+I)	Maximum					
SEMESTER I													

	Common Course I													
	Common Course II													
	Core Course													
	Complementary Course													

SEMESTER II														
	Common Course I													
	Common Course II													
	Core Course													
	Complementary Course													

SEMESTER III														
	Common Course I													
	Common Course II													
	Core Course													
	Complementary Course													

SEMESTER IV														
	Common Course I													
	Common Course II													
	Core Course													
	Complementary Course													

SEMESTER V														
	Core Course													
	Open Course													

SEMESTER VI														
	Core Course													
	Project													
	Viva - Voce													
	Choice Based Core Course													

SEMESTER RESULTS

Semester	Marks Awarded	Maximum Marks	Credits	SCPA	Grade	Month & Year of Passing	Result
I							
II							
III							
IV							
V							
VI							
Total							

PROGRAMME PART RESULTS

Programme Part	Marks Awarded	Maximum Marks	Credit Points	Credits	CCPA	Grade
Common Course I:						
Common Course II:						
Core Course:						
Complementary Course:						
Complementary Course:						
Open Course:						
Total						

FINAL RESULT

CUMULATIVE CREDIT POINT AVERAGE (CCPA) =

GRADE AWARDED =

Controller of Examinations**Principal****Description of the evaluation process**Grade and Grade Point

The evaluation of each course comprises of Internal and External components in the ratio 1:4 for all courses. Grades and Grade points are given on a 7-point scale based on the percentage of total marks (Internal + External) as given in Table I.

Credit Point and Credit Point Average

Credit Point (CP) of a course is calculated using the formula

$CP = C \times GP$ where C = Credit. GP = Grade Point.

Table I

Percentage of Marks	Grade	Grade Point
95 and above	S Outstanding	10
85 to below 95	A+ Excellent	9
75 to below 85	A Very Good	8
65 to below 75	B+ Good	7
55 to below 65	B Above average	6
45 to below 55	C Satisfactory	5
35 to below 45	D Pass	4
Below 35	F Failure	

Grades for the different semesters and overall programme are given based on the corresponding

Credit Point Average of a Semester (SCPA) or Cumulative Credit Point Average (CCPA) for a Programme is calculated using the formula

SCPA or CCPA = TCP / TC, where TCP = Total Credit Point, TC = Total Credit.

SG = Semester Grade

CPA as shown in Table II.

Table II

CPA	Grade
Equal to 9.5 and above	S Outstanding
Equal to 8.5 and below 9.5	A ⁺ Excellent
Equal to 7.5 and below 8.5	A Very Good
Equal to 6.5 and below 7.5	B ⁺ Good
Equal to 5.5 and below 6.5	B Above average
Equal to 4.5 and below 5.5	C Satisfactory
Equal to 3.5 and below 4.5	D Pass
Below 3.5	F Failure

Coverision formule

For Conversion of SCPA into Percentage, Multiply the secured SCPA by 10

For Conversion of CCPA into Percentage, Multiply the secured CCPA by 10

Note: A separate minimum of 30% marks each for internal and external (for both theory and practical) and aggregate minimum of 35% are required for a pass in a course. For a pass in a programme, a separate minimum of **Grade D** for all the individual courses and an overall **Grade D** or above are mandatory. If a candidate secures **Grade F** for any one of the courses offered in a Semester / Programme, only **Grade F** will be awarded for that Semester / Programme until the candidate improves this to **Grade D** or above within the permitted period.