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FUTURE UNIVERSITY, BAREILLY

(Established under the Uttar Pradesh Private Universities (Third Amendment) Act, 2024)

COURSE CURRICULUM

AND

EVALUATION SCHEME

BCA

For the Students Admitted in Academic Session 2025-26

Effective From

Academic Session 2025-26

Prepared By

Board of Studies

Approved By

**Academic Council
Future University, Bareilly**

Published By

**Office of the Registrar
Future University, Bareilly**

(This Curriculum and Evaluation Scheme shall be applicable to all students admitted to the BCA Programme from the Academic Session 2025-26 onwards and shall remain in force until amended or revised by the Academic Council of Future University, Bareilly.)



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COURSE CURRICULUM & EVALUATION SCHEME

**For
Bachelor of Computer Application
BCA-2025**

FUTURE UNIVERSITY, BAREILLY (U.P.) INDIA



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Board of Studies

*(Including Proceeding, Course Structure, Course Curriculum and
Evaluation Scheme)*

for

Bachelor of Computer Application



(Effective from the Session: 2025-26)



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Attendance Sheet -Board of Studies (2024/25 Batches)
Name of Faculty: Faculty of Computer Applications

Date: 29/03/2025

S. N.	Position	Designation	Proposed Name of member, Designation, Affiliation	Signature
1	Senior Faculty	Member	Dr. Abhishek Saxena, Dean, Faculty of Computer Application, Future University, Contact No. 8475010072, Email: abhisheksaxena@futureuniversity.in	Abhis
2	HOD	Chairperson	Dr. Jeelani, HOD, Department of Computer Application, Future University, Contact No. 8273303430, Email: jeelani@futureuniversity.in	Jeelani
3	Senior Faculty	Member	Prof. (Dr.) Manish Kumar Singh, Professor, Faculty of sciences, Future University, Contact No. 8475010063, Email: mksingh@futureuniversity.in	Manish
4	Senior Faculty	Member Secretary	Dr. Schephalika, Asso. Prof. Department of Computer Application, Future University, Contact No. 8532005079, Email: schephalika@futureuniversity.in	Schephalika
5	Senior Faculty	Member	Mr. Udit Kumar Mishra, Asso. Prof. Department of Computer Application, Future University, Contact No. 9412606540, Email: uditmishra@futureuniversity.in	Udit
6	Faculty	Member	Mr. Madhuresh Yadav, Asst. Prof. Department of Computer Application, Future University, Contact No. 8077461879, Email: madhureshkumaryadav@futureuniversity.in	Madhuresh
7	Faculty	Member	Mr. Mohd. Akif, Asst. Prof. Department of Computer Application, Future University, Contact No. 9198656460, Email: mohdakif@futureuniversity.in	Akif
8	Faculty	Member	Mr. Tilak Kumar Rathour, Asst. Prof. Department of Computer Application, Future University, Contact No. 7037628213, Email: tilakrathour@futureuniversity.in	Tilak
9	Academic Expert (Member)	Member	Prof. (Dr.) Vinita Jindal, Professor, Dept of Computer science, Keshav Mahavidyalaya, University of Delhi, Contact No. 9810100377, Email: vjindal@keshav.du.ac.in	Vinita
10	Academic Expert (Member)	Member	Dr. Akhtar Hussain, Asso. Prof. Faculty of Computer Science & Information Technology, MJPRU, Bareilly, Contact No. 9319760019, Email: akhtarhusain@mjpru.ac.in	Akhtar
11	Industry Expert (Member)	Member	Mr. Sachin Saxena, Associate Consultant, TCS, Pune Office, Contact No. 7982696188, Email: connect.sachin01@gmail.com	Sachin

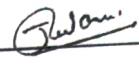
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Future University, Bareilly

Academic Council
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Dean
Faculty of Computer
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Verified by

Head of Department
Department of Computer Application

Name Dr. Jeelani Date 29/3/2025 Sign 


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Agenda

1. To approve the minutes of the second BOS held on 29-03-2025
2. To review and recommend the course structure and curriculum of Bachelor of Computer Application on the basis of the recommendations of the second BOS for the session 2024-25 and 2025-26, taking into consideration NEP 2020 guidelines.
3. To discuss the total credits to be taken for the program based on the decision taken in the meeting of all the Deans,
4. To assess the comprehensive and continuous evaluation and assessment of the students.
5. Any other item with the permission of the chair.

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Ref No: FU/CA/2024-25/INV/01

Date: 07/03/2025

Department of Computer Application
Faculty of Applications
Future University, Bareilly

To,
Prof. Vinita Jindal
Professor
Department of Computer science
Keshav Mahavidyala,
University of Delhi, New Delhi

Subject: Invitation for Board of Studies (BoS) Meeting

Respected Prof. Vinita Jindal,

We are pleased to invite you to the upcoming **Board of Studies (BoS) Meeting** of the Department of Computer Application, scheduled on **March 29, 2025 at 9:30 AM**, to be held at **Auditorium**.

The meeting will focus on reviewing and updating the curriculum, discussing academic developments, and incorporating industry trends. Your valuable insights and expertise will be highly appreciated in shaping the academic framework.

Kindly confirm your availability at your earliest convenience. We look forward to your esteemed presence.

Best Regards,

(Dr. Jeelani)
HOD
Department of Computer Application
Future University, Bareilly

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Ref No: FU/CA/2024-25/INV/01

Date: 07/03/2025

Department of Computer Application
Faculty of Applications
Future University, Bareilly

To,
Dr. Akhtar Husain
Associate Professor
Department of Computer science & IT,
Mahatma Jyotiba Phule Rohilkhand University, Bareilly

Subject: Invitation for Board of Studies (BoS) Meeting

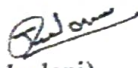
Respected Dr. Akhtar Husain,

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The meeting will focus on reviewing and updating the curriculum, discussing academic developments, and incorporating industry trends. Your valuable insights and expertise will be highly appreciated in shaping the academic framework.

Kindly confirm your availability at your earliest convenience. We look forward to your esteemed presence.

Best Regards,


(Dr. Jeelani)

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Ref No: FU/CA/2024-25/INV/01

Date: 07/03/2025

Department of Computer Application
Faculty of Applications
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To,
Mr. Sachin Saxena
Associate Consultant
TCS, Pune

Subject: Invitation for Board of Studies (BoS) Meeting

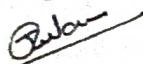
Respected Mr. Sachin Saxena,

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The meeting will focus on reviewing and updating the curriculum, discussing academic developments, and incorporating industry trends. Your valuable insights and expertise will be highly appreciated in shaping the academic framework.

Kindly confirm your availability at your earliest convenience. We look forward to your esteemed presence.

Best Regards,


(Dr. Jeelani)

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Board of Studies (BCA)

Name of Faculty: Faculty of Computer Application

S. N.	Position	Designation	Proposed Name of member, Designation, Affiliation
1	Senior Faculty	Member	Dr. Abhishek Saxena, Dean, Faculty of Computer Application, Future University, Contact No. 8475010072, Email: abhisheksaxena@futureuniversity.in
2	HOD	Chairperson	Dr. Jeelani, HOD, Department of Computer Application, Future University, Contact No. 8273303430, Email: jeelani@futureuniversity.in
3	Senior Faculty	Member	Prof. (Dr.) Manish Kumar Singh, Professor, Faculty of sciences, Future University, Contact No. 8475010063, Email: mksingh@futureuniversity.in
4	Senior Faculty	Member Secretary	Dr. Schephalika, Asso. Prof. Department of Computer Application, Future University, Contact No. 8532005079, Email: schephalika@futureuniversity.in
5	Senior Faculty	Member	Mr. Udit Kumar Mishra, Asso. Prof. Department of Computer Application, Future University, Contact No. 9412606540, Email: uditmishra@futureuniversity.in
6	Faculty	Member	Mr. Madhuresh Yadav, Asst. Prof. Department of Computer Application, Future University, Contact No. 8077461879, Email: madhureshkumaryadav@futureuniversity.in
7	Faculty	Member	Mr. Mohd. Akif, Asst. Prof. Department of Computer Application, Future University, Contact No. 9198656460, Email: mohdakif@futureuniversity.in
8	Faculty	Member	Mr. Tilak Kumar Rathour, Asst. Prof. Department of Computer Application, Future University, Contact No. 7037628213, Email: tilakrathor@futureuniversity.in
9	Academic Expert (Member)	Member	Prof. (Dr.) Vinita Jindal, Professor, Dept of Computer science, Keshav Mahavidyalaya, University of Delhi, Contact No. 9810100377, Email: vjindal@keshav.du.ac.in
10	Academic Expert (Member)	Member	Dr. Akhtar Hussain, Asso. Prof. Faculty of Computer Science & Information Technology, MJPRU, Bareilly, Contact No. 9319760019 Email: akhtarhusain@mjpru.ac.in
11	Industry Expert (Member)	Member	Mr. Sachin Saxena, Associate Consultant, TCS, Pune Office, Contact No. 7982696188, Email: connect.sachin01@gmail.com


Chairperson


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Board of Studies (BCA)

Name of Faculty: Faculty of Computer Application

S. No	Particulars	Amount	Pack	Total
1	Remuneration	5000 (including TA for Local) (otherwise 5000 + TA)	03	18000
2	Lunch	200	11	2200
3	Snacks	100	11	1100
4	Mementoes	500	03	1500
5	Miscellaneous	-	-	500
			Grand Total	23,300


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Chairperson

Minutes of Meeting (2nd Board of Studies (BCA))

Name of Faculty: Faculty of Computer Application

Date: 29-03-2025

Time: 11:30 AM

Venue: Board Room

Chairperson: Dr. Jeelani, Associate Professor

Panel of BoS Attendees:

S. N.	Position	Designation	Proposed Name of member, Designation, Affiliation
1	Senior Faculty	Member	Dr. Abhishek Saxena, Dean, Faculty of Computer Application, Future University, Contact No. 8475010072, Email: abhisheksaxena@futureuniversity.in
2	HOD	Chairperson	Dr. Jeelani, HOD, Department of Computer Application, Future University, Contact No. 8273303430, Email: jeelani@futureuniversity.in
3	Senior Faculty	Member	Prof. (Dr.) Manish Kumar Singh, Professor, Faculty of sciences, Future University, Contact No. 8475010063, Email: mksingh@futureuniversity.in
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11	Industry Expert (Member)	Member	Mr. Sachin Saxena, Associate Consultant, TCS, Pune Office, Contact No. 7982696188, Email: connect.sachin01@gmail.com

The following are the details of the discussions held:

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1. To minutes of the second BOS held on 29-03-2025 were approved by the members as no comments were received.
2. The proposed syllabus for Bachelor of Computer Application on the basis of the recommendations of the second BOS for the session 2024-25 and 2025-26, for all semesters was discussed and suggestions were given by the experts which were incorporated in the various placed.
3. The total credits to be taken for the program based on the decision taken in the meeting of all the Deans as 180 credits for teaching and 160 for award of degree was agreed in the meeting. Members suggested that 75% attendance should be mandatory for students to appear in the end semester examination.
4. After discussion it was agreed that all evaluations will be on 100 with 30 internal continuous evaluation and 70 end semester evaluation.
5. Any other item with the permission of the chair.
 - Course work and practical will have code as per the UGC suggestion for ABC purpose
 - Tutorial are not needed in practical subjects and should be removed
 - It was suggested that the University should follow the NCRF structure in all programs offered.
 - Practical credit shall be as per UGC norms.
 - UGC guidelines suggests for other Region language, and is not mentioning foreign languages as in the syllabus. College can reconsider the same.

The members appreciated the efforts of the faculty members in formulating the syllabus for 2024-25 academic batch and also 2025-26 academic batch.

HOD Computer Application informed the members that the syllabus for the year 2025-26 may need some corrections based on inputs from experts of the subject. BOS empowered the Dean Computer Applications to finalise the syllabus in consultation with subject experts and seek approval of the Academic Council when it meets next. Also, the modifications be informed the Board of Studies when it meets next.



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The meeting ended with a Vote of thanks to the external members who spared their valuable time and for the suggestions.



Dr. Jeelani

HOD,
Department of Computer Application
Faculty of Computer Applications
Future, University, Bareilly



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Course Aim and Objectives:

Our mission is to establish ourselves as a leading worldwide institution of higher education, promoting research, innovation, and moral leadership while enabling students to lead sustainable development and social well-being.

Mission:

1. Provide a cutting-edge learning environment that combines innovative teaching strategies with thorough research.
2. Encourage moral leadership and provide kids the tools they need to become competent workers.
3. Expand knowledge and encourage long-term expansion.
4. Encourage the well-being of society by upholding the values of integrity and excellence.
5. Encourage a welcoming and dynamic learning environment that prepares students for issues facing the world.








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Program Outcomes (PO):

PO1	Develop the knowledge of computer and information technology concepts and principles in different domains.
PO2	Develop the ability to Identify, formulate and analyse complex computing problems using fundamental concepts of computer science and related areas
PO3	Develop IT solutions for problems that meet the specified needs with appropriate consideration for public health, safety, cultural, societal and environmental considerations.
PO4	Develop the use of critical thinking and creativity skills to solve complex problems using modern tools and techniques in ethical way.
PO5	Work efficaciously as a team member or a leader to accomplish a common goal in a multi-disciplinary team.
PO6	Communicate effectively by imparting or exchanging of technical information by speaking, writing, or using some other medium, being able to produce technical reports and design documentation and make effective presentations.
PO7	Attain project-based learning skills, whereby being able to define the problem, identify best solutions, plan the project, execute the plan, monitor and control the project progress and finally complete the project.
PO8	Develop language proficiency to handle corporate communication demands.

Program Specific Outcome (PSO):

PSO1	An ability to enhance the application of knowledge of theory subjects in diverse fields.
PSO2	Develop language proficiency to handle corporate communication demands.
PSO3	Preparing students in various disciplines of technologies such as computer applications, computer networking, software engineering, JAVA, database concepts and programming.
PSO4	In order to enhance programming skills of the young IT professionals, the concept of project development in using the technologies learnt during the semester has been introduced.
PSO5	To enhance knowledge in robotics, provide experimental hardware equipment for teaching the basics of robotics, robot dynamics and control, and robot system design and application.
PSO6	To enhance logical ability and programming concepts by implementing programming lab.


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ORDINANCE AS PER UGC RULES AND REGULATIONS

For

Undergraduate Programme

Bachelor of Computer Applications

(B.C.A.)

Effective from the session 2024-25

ORDINANCE No - 33

33.1 ACADEMIC PROGRAMME

The BCA academic Programme comprises of the following disciplines in which the degrees are be offered:

- Bachelor of Computer Application (BCA)
- BCA (Artificial Intelligence)

33.2 ADMISSION

33.2.1 Admission to BCA & BCA-AI will be made as per the rules prescribed by the Academic Council of the Future University, Bareilly.

33.3 ELIGIBILITY FOR ADMISSIONS

33.3.1 **Admission Criteria:** Merit shall be calculated by taking percentage of marks in 12th Minimum- 45 % (any Stream) for General and OBC, and minimum 40% (Any Stream) for SC/ST students.

33.3.2 **Qualifying examination:** The eligibility condition for admission to Bachelor of Computer Applications is that the candidate should have passed the qualifying examination FUCET conducted by University.

33.3.3 Direct admission on vacant seats at institution/college level: The eligibility criteria for direct admission on seats remaining vacant in first year after entrance examination counseling shall be such as may be notified from time to time.

33.3.4 The Academic Council shall have power to amend or repeal the eligibility criteria laid down at clause 3.1. & 3.2, as per the guidelines of UGC.




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33.4. ATTENDANCE

33.4.1 Every student is required to attend all the lectures, tutorials, practicals and other prescribed curricular and co-curricular activities with minimum of 75% Attendance.

33.4.2 The attendance can be condoned up to 15% on medical grounds or for other genuine reasons beyond the control of students by concern Dean with the approval of Vice Chancellor provided that he/she has been absent with prior permission of the Head of the institution/college for the reasons acceptable to him.

33.4.3 No student will be allowed to appear in the end semester examination if he / she do not satisfy the overall average attendance requirements of Clause Nos. 33.4.1, and 33.4.2. and such candidate(s) shall be treated as having failed due to detained and will be further governed by clause no. 33.5.2 & 33.5.3.

33.4.4 In each semester, the attendance shall be counted from the date of admission in the University or start of academic session whichever is later.

33.5 DURATION OF COURSES

33.5.1 Total duration of the BCA & BCA-AI Course shall be 3 years for degree and 4 years for degree with Hons, each year comprising of two semesters. Each semester shall normally have teaching for the 90 working days or as prescribed by UGC from time to time.

33.5.2 The student admitted to 1st year BCA & BCA-AI shall complete the course within a period of five academic years for 3 years degree programmes and 6 years for degree with Hons programmes from the date of first admission, failing which he/she has to discontinue the course.

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33.5.3 A candidate, who has failed twice in first year due to any reason (either due to his/her non- appearance or he/she being not permitted to appear in semester examinations) shall not be allowed to continue his/her studies further. Provided further that if a student wishes to continue third time in first year he/she may be allowed on the terms and conditions laid down by the University for such permission but the maximum time allowed for completing the course will remain the same as in clause 4.2.

33.5.4 The minimum credit requirement for BCA & BCA-AI as approved BoS and Academic council.

33.6 CURRICULUM

33.6.1 The 3 year curriculum has been divided into 6 semesters and 4 years curriculum in 8 semesters shall include lectures, tutorials, practical's, seminars and projects etc. in addition to industrial training and educational tour etc. and with the value addition of Indian knowledge System and Life Science Monitoring as defined in the scheme and executive instructions issued by the University from time to time.

33.6.2 The curriculum will also include such other curricular, co-curricular and extracurricular activities as may be prescribed by the University from time to time.

33.7 CHANGE OF BRANCH

33.7.1 As per rules and regulation approved by the Future University

33.8 EXAMINATION

33.8.1 The performance of a student in a semester shall be evaluated through continuous class assessment and end semester examination. The continuous assessment shall be based on class tests, assignments/tutorials, quizzes/viva-voce and attendance. The marks for continuous assessment (Sessional marks) shall be awarded at the end of the semester. The end semester examination shall be comprised of written papers, practicals and viva-voce.

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33.8.2 The distribution of marks for sessional, end semester theory papers, practicals and other examinations, seminar, project and industrial training shall be as prescribed. The practicals, viva-voce, projects and reports shall be examined/evaluated through internal and external examiners as and when required.

33.8.3 The marks obtained in a subject shall consist of marks allotted in end semester theory paper and Sessional marks

33.9 ELIGIBILITY OF PASSING

33.9.1 The Credit and Grading system will be effective from the academic year 2024-2025 for Faculty of Computer Applications . In every course, based on the combined performance in all assessments in a particular semester as per the curriculum/syllabus, the student is awarded a letter grade. These letter grades not only indicate a qualitative assessment of the students's performance but also carry a quantitative (numeric) equivalent called the Grade Point.

33.9.2 A student who obtained Grades O to P shall be considered as passed. If a student secured "F" grade, he /she have to reappear for the examination. It is mandatory for a student to earn the required credits as mentioned in each semester.

(a) For a pass in a Theory Course, a student shall secure minimum of 30% of the maximum marks prescribed by the University in the end semester examination and 40% of aggregate marks in the Course including sessional marks, i.e. Minimum Passing Grade is "P".

(b) For a pass in a Practical/Internship/Project/Viva-voce examination, a student shall secure a minimum of 50% of the maximum marks prescribed by the University in the relevant Practical/Internship/Project/Viva-voce examination and 40% of marks in the aggregate in the Practical/Internship/Project/Viva-voce including sessional marks, i.e. Minimum Passing Grade in a course is "P".

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(c) For a pass in the Course which has only sessional component and No End semester exam component, such as Seminar, a student shall secure a minimum of 40% of the maximum marks prescribed. i.e. Minimum Passing Grade is "P".

33.9.3 The students who do not satisfy the condition 33.9.2 or the student who remains absent shall be deemed to have failed in that subject and may reappear for the University examination in the subsequent examinations. However, the Sessional marks awarded to the student/s at previous attempt in the concerned subject will be carried forward.

33.9.4 A student shall be declared to have completed the program of B.C.A. degree, provided the student has undergone the stipulated course work as per the regulations and has earned total credits prescribed in the curriculum.

33.10 ELIGIBILITY FOR PROMOTION

33.10.1 There shall not be any restriction for promotion from an odd semester to the next even semester.

33.10.2 For promotion from even semester to the next odd semester (i.e. of the next academic year) the student has secured either of the semester of an academic year is fully cleared or earned the credit greater than or equal to minimum credit of either of the semester..

33.10.3 In yearly result, a student shall be declared PASS only if he/ she secures "P" or above grades in all the subjects and minimum Semester Grade Point Average (SGPA) of 5.0, in each semester of an academic year.

33.11 CARRY OVER SYSTEM

33.11.1 Following rules shall be followed for carry over papers:

- (a) A candidate who satisfies there requirements of clause 33.9.1 and 32.9.1 will be required to appear in those theory papers / practical during respective end semester exams in which he/she failed.




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- (b) A candidate satisfying clause 33.9.3 shall be required to appear in theory papers/practical examination to fulfill the requirements of clause 33.9.2 (a) and (b).
- (c) A candidate shall be required to exercise his/her choice of minimum theory papers in which he/she desires to appear in the examination for improvement of SGPA as per rules made by Future university .
- (d) Candidate appearing for carry over paper in any semester shall be examined with the examination paper of that subject running in that semester.

33.11.2 All carryover examinations shall be held only with end semester examination.

33.12 RE-ADMISSION IN THE UNIVERSITY

A candidate may be allowed for re-admission provided he/she satisfies one of the following conditions:

- (a) A candidate is declared fail.
- (b) A candidate did not appear in a semester examination / or he/she was not granted permission to appear in the examination.
- (c) A candidate has been detained by the institute and subsequently has been permitted to take re-admission.

33.13 COURSES

33.13.1 There will be four types of courses.

- (i) Foundation Courses: The Foundation Courses are of two kinds: *Compulsory Foundation* and *Elective foundation*.

“Compulsory Foundation”: These courses are the courses based upon the content that leads to Knowledge enhancement. They are mandatory for all disciplines.

“Foundation Electives”: These are value based courses aimed at man making education.



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- (ii) Core Courses: This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirements of a program in a said discipline of study.
- (iii) Elective Courses: This is course, which can be chosen from the pool of papers. It may be supportive to the discipline for nurturing student proficiency skills.
- (iv) Mandatory Courses: These courses are mandatory for students joining BCA & BCA- AI. Program and students have to successfully complete these courses before the completion of degree.
- (v) A student shall exercise his option in respect of the electives and register for the same at the beginning of the concerned semester. The student may be permitted to opt for change of elective subject within 15 days from the date of commencement of the semester as per the calendar of the University.

33.14 COMPUTATION OF SGPA, YGPA AND CGPA

As per Appendix I

33.15 CONVERSION OF CGPA INTO PERCENTAGE

Conversion formula for the conversion of CGPA into Percentage is $(CGPA) \times 10 =$ Percentage of marks scored.

33.16 AWARD OF DIVISION AND RANK

33.16.1 Division and CGPA shall be awarded only after the eighth and final semester examination based on integrated performance of the candidate for all the eight semesters (six semesters for lateral entry) as per following details.

- (a) After successful completion of 120 credits, a student shall be eligible to get under graduate degree in engineering/technology.



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- (b) The student shall be awarded **First division with Distinction** Degree only if he/she secures 7.50 or above CGPA and passed each subject of that degree program in single attempt without any grace marks and without any gap.
- (c) A candidate who qualifies for the award of the degree by securing E or above grades in all subjects of all the semesters (eight semesters/six semesters) as applicable, and secures CGPA less than 7.5 and greater than or equal to 6.5 shall be declared to have passed the examination in **FIRST DIVISION**.
- (d) All other candidates who qualify for the award of degree by securing E or above grades in all subjects of all semesters (eight semesters/six semesters as applicable) and secures CGPA below 6.5 and greater than or equal to 5.0 shall be declared to have passed the examination in **SECOND DIVISION**.

If two students get the same *CGPA*, the tie should be resolved by considering the number of times a student has obtained higher *SGPA*; but, if it is not resolved even at this stage, the number of times a student has obtained higher grades like A⁺, A, B⁺, B etc. shall be taken into account in rank ordering of the students in a program.

33.17 SCRUTINY AND RE-EVALUATION

33.17.1 Scrutiny and re-evaluation shall be allowed in only theory papers.

33.17.2 Revaluation of theory/practical papers is permitted only with certain conditions as laid down by university.

33.18 UNFAIR MEANS

Cases of unfair means shall be dealt as per the rules and regulations of the University (**ANNEXURE-II**).

33.19 AWARD OF SESSIONAL MARKS



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Sessional marks for theory subjects, practicals and project shall be awarded as prescribed and at present the break-up of sessional marks shall be as follows:

(a) Theory Subjects:

- (i) Class test which will comprise 30 % of total theory marks with two mid-term tests of equal weightage.
- (ii) Teacher Assessment Tutorial/Assignment/ Quizzes/ Attendance comprises 20% of total theory marks.

(a) Practical,

- (i) Two mid-term viva-voce/tests of equal weightage 30% of total Practical marks.
- (ii) Teacher Assessment: Lab, Record/ Attendance 20% of total Practical marks.
- (c) Make-up test may be held only for those students who could not appear in any one of mid-term class tests due to genuine reasons for which the prior permission from the Head of Institution/College was taken. Make up test shall ordinarily be held about two weeks before the semester examination. The syllabus for the make-up test shall be the whole syllabus covered by the subject teacher up to that time.

33.20 AWARD OF SEMINAR INDUSTRIAL TRAINING, EDUCATIONAL TOUR MARKS AT UNIVERSITY LEVEL

33.20.1 The marks of Seminar, Industrial Training, Educational tour marks shall be awarded on the following basis:

- 12 Write-up / Report 50%
- 13 Presentation 50%

33.20.2 The marks in Seminar, Industrial Training and Educational Tour shall be awarded by a committee consisting of following members:

- (i) Head of the Department or his/her nominee.
- (ii) Concerned Officer – In charge.
- (iii) Senior Faculty Member of the department nominated by the Head of Department.



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33.21 CANCELLATION OF ADMISSION

The admission of a student at any stage of study shall be cancelled if:

(a) He / She is not found qualified as per Future University / State Government norms and guidelines or the eligibility criteria prescribed by the University. or

(b) He / She is found unable to complete the course within the stipulated time as prescribed in clause 4.2 or

(c) He / She is found involved in creating indiscipline in the Institution / College or in the

University.

(d) The Academic Council shall have the power to relax any provision provided in the ordinance in any specific matter/situation subject to the approval of Executive Council of the University.

The Academic Council of Future University shall have the authority to amend, modify, or replace any provision of this Ordinance from time to time in order to ensure compliance with the regulations, guidelines, and directives issued by the statutory and regulatory bodies such as the University Grants Commission (UGC) and other competent authorities.



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Bachelor of Computer Application (BCA) (Hons) (Undergraduate Regular)											
Course Structure/ Degree Award Checklist 2026-2030											
Program Name:			Bachelor of Computer Application (BCA) (Hons)							Program Code: 04	
Total Credit of Program: 165											
Semester-I											
			Theory	Week			Evaluation Scheme		Total	Credit	
SN.	Course Category	Course Code	Course Title	L	T	P	CA	EE			
1	Major Core Course	BCA1101	Computer Fundamental & Emerging Technology	4	0	0	30	70	100	4	
2	Skill Enhancement Course	UCC1102	AI for Everyone	3	0	0	30	70	100	3	
3	Major Core Course	BCA1103	Principles of Problem Solving using C	4	0	0	30	70	100	4	
4	Minor Course	BCA1105	Mathematical Foundation	4	0	0	30	70	100	4	
5	Value Added Course	BCA1106	MOOC-I	Self-Paced Learning							
6	Multidisciplinary	UCC1101	IKS-I (Indian Knowledge System - I)	1	0	0	50	0	50	1	
Practical											
1	Major Core Course	BCA1170	Office Automation Lab	0	0	2	50	50	100	1	
2	Major Core Course	BCA1171	Principles of Problem-Solving using C Lab	0	0	2	50	50	100	1	
			TOTAL	16	0	4	270	380	650	18	

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Semester -II										
SN.	Course Category	Course Code	Theory	Week			Evaluation Scheme		Total	Credit
			Course Title	L	T	P	CA	EE		
1	Major Core Course	BCA1201	Python Programming	3	1	0	30	70	100	4
2	Major Core Course	BCA1202	Computer Network	3	1	0	30	70	100	4
3	Major Core Course	BCA1203	Advance Database Management System	3	1	0	30	70	100	4
4	Multidisciplinary	BCA1206	Environmental Science	2	0	0	30	70	100	2
5	Ability Enhancement Course	BCA1205	AI for Developers	3	0	0	30	70	100	3
6	Value Added Course	BCA1210	MOOC-II	Self-Paced Learning						
7	Minor Course	BCA1209	Discrete Mathematics	3	0	0	30	70	100	3
8	Skill Enhancement Course	LSM1202	LSM-I (Life Skills & Mentoring – I)	0	0	0	0	0	0	0
Practical										
1	Major Core Course	BCA1270	ADBMS Lab	0	0	2	50	50	100	1
2	Major Core Course	BCA1273	Python Programming Lab	0	0	2	50	50	100	1
TOTAL				17	3	4	280	520	800	22


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Semester -III

			Theory	Week			Evaluation Scheme		Total	Credit
SN.	Course Category	Course Code	Course Title	L	T	P	CA	EE		
1	Multidisciplinary	BCA2301	Management Information Systems (MIS)	3	0	0	30	70	100	3
2	Major Core Course	BCA2302	Data Structure Using C	3	0	0	30	70	100	3
3	Minor Course	BCA2303	Principal of Management OR	3	0	0	30	70	100	3
		BCA2305	Remedial Mathematics (Theory)							
4	Major Core Course	BCA2304	Web Development	3	0	0	30	70	100	3
5	Value Added Course	BCA2306	MOOC-I	Self-Paced Learning						
6	Major Core Course	BCA2310	OOPs with JAVA	3	1	0	30	70	100	4
	Ability Enhancement Course	BCA2313	Organizational Behavior	2	0	0	0	50	50	2
	Skill Enhancement Course	BCA2314	Industrial Training-I	0	0	0	50	0	50	
Practical										
1	Major Core Courses	BCA2370	Data Structure Using C Lab	0	0	2	50	50	100	1
2	Major Core Courses	BCA2371	Web Development Lab	0	0	2	50	50	100	1
	Major Core Course	BCA2377	OOPs with JAVA LAB	0	0	2	50	50	100	1
			TOTAL	17	1	6	350	550	900	21



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Semester-IV										
			Theory	Week			Evaluation Scheme			
SN.	Course Category	Course Code	Course Title	L	T	P	CA	EE	Total	Credit
1	Major Core Course	BCA2401	Advance Python Programming	3	1	0	30	70	100	4
2	Major Core Course	BCA2413	Software Engineering	3	0	0	30	70	100	3
3	Major Core Course	BCA2403	Operating Systems	3	0	0	30	70	100	3
4	Major Core Course	BCA2414	Digital Electronics	3	0	0	30	70	100	3
5	Ability Enhancement Course	BCA2415	Organizational Behavior	2	0	0	0	50	50	2
6	Skill Enhancement Course	BCA2416	Industrial Training-I	0	0	0	50	0	50	
5	Minor Course		Elective-I	3	0	0	30	70	100	3
7	Value Added Course	BCA2408	MOOC-II	Self-Paced Learning						
Practical										
1	Major Core Course	BCA2471	Advance Python Programming Lab	0	0	2	50	50	100	1
2	Major Core Course	BCA2472	OS LAB	0	0	2	50	50	100	1
	Major Core Course	BCA2478	Digital Electronics LAB	0	0	2	50	50	100	1
			TOTAL	17	1	6	350	550	900	21


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Semester -V										
			Theory	Week			Evaluation Scheme		Total	Credit
SN.	Course Category	Course Code	Course Title	L	T	P	CA	EE		
1	Major Core Course	BCA3501	Machine Learning Fundamental	3	0	0	30	70	100	3
2	Major Core Course	BCA3502	Computer Organization Architecture	3	0	0	30	70	100	3
3	Major Core Course	BCA3515	Cloud Computing	3	0	0	30	70	100	3
4	Major Core Course	BCA3504	Mobile Application Development	3	0	0	30	70	100	3
5	Ability Enhancement Course	BCA3518	Professional Communications	2	0	0	0	50	50	2
	Skill Enhancement Course	BCA3519	Industrial Training-II	0	0	0	50	0	50	
6	Minor Course		Elective-II	3	0	0	30	70	100	3
7	Value Added Course	BCA3508	MOOC-III	Self-Paced Learning						
Practical										
1	Major Core Course	BCA3571	Machine Learning LAB	0	0	2	50	50	100	1
2	Major Core Course	BCA3572	Mobile Application Development LAB	0	0	2	50	50	100	1
3	Research Project/ Dissertation	BCA3573	(Internship)/Minor Project	0	0	6	50	50	100	3
			TOTAL	17	0	10	350	550	900	22



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Semester-VI										
			Theory	Week			Evaluation Scheme		Total	Credit
SN.	Course Category	Course Code	Course Title	L	T	P	CA	EE		
1	Major Core Courses	BCA3601	Digital Image Processing	3	1	0	30	70	100	4
	Ability Enhancement Course	BCA3612	Professional Communications	2	0	0	0	50	50	2
	Skill Enhancement Course	BCA3613	Industrial Training-II	0	0	0	50	0	50	
2	Minor Courses		Elective-III	3	0	0	30	70	100	3
3	Value Added Courses	BCA3606	MOOC-IV	Self-Paced Learning						
Practical										
1	Research Project/ Dissertation	BCA3671	Major Project	0	0	24	100	300	400	12
			TOTAL	8	0	24	210	490	700	21



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Semester -VII										
			Theory	Week			Evaluation Scheme			
SN.		Course Code	Course Title	L	T	P	CA	EE	Total	Credit
1	Major Core Courses	BCA4701	Data Mining	3	1	0	30	70	100	4
2	Major Core Courses	BCA4702	Soft Computing	3	0	0	30	70	100	3
3	Major Core Courses	BCA4703	Introduction to Research Methodology	3	0	0	30	70	100	3
4	Minor Courses		Elective-IV	3	0	0	30	70	100	3
5	Value Added Courses	BCA4708	MOOC-V	Self-Paced Learning						
Practical										
1	Major Core Courses	BCA4771	Research Methodology Lab	0	0	2	50	50	100	1
2	Research Project/ Dissertation	BCA4772	Minor Dissertation	0	0	12	100	100	200	6
			TOTAL	12	1	14	270	430	700	20



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Semester-VIII										
			Theory	Week			Evaluation Scheme			
SN.		Course Code	Course Title	L	T	P	CA	EE	Total	Credit
1	Major Core Courses	BCA4801	R Programming	3	1	0	30	70	100	4
2	Minor Courses		Elective-V	3	0	0	30	70	100	3
3	Value Added Courses	BCA4806	MOOC-VI	Self-Paced Learning						
Practical										
1	Major Core Courses	BCA4871	R Programming Lab	0	0	2	50	50	100	1
2	Research Project/ Dissertation	BCA4872	Major Dissertation	0	0	24	200	300	500	12
			TOTAL	6	1	26	310	490	800	20

Sr.N	Course Category
1	Major(Core)
2	Minor Stream
3	Multidisciplinary
4	Ability Enhancement Course
5	Skill Enhancement Course
6	Value Added Courses Common for All UG
7	Summer Internship
8	Research Project/ Dissertation



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List of Elective Courses		
SN.	ELECTIVE-I:	
1	BCA2412	Introduction to AI and ML (EL)
2	BCA2406	Data Warehousing and Data Mining (EL)
3	BCA2407	Data Compression and Multimedia System (EL)
SN.	ELECTIVE-II:	
1	BCA3505	Social Media Analytics (EL)
2	BCA3506	Big Data Analytics (EL)
3	BCA3507	Natural Language Processing (EL)
SN.	ELECTIVE-III:	
1	BCA3602	Deep Learning (EL)
2	BCA3603	Neural Network (EL)
3	BCA3604	Introduction To Internet Of Things (EL)
SN.	ELECTIVE-IV	
1	BCA4704	Mobile Computing (EL)
2	BCA4705	Fundamentals of Data Privacy (EL)
3	BCA4706	Soft Skills And Interpersonal Communications (EL)
SN.	ELECTIVE-V:	
1	BCA4809	DevOps (EL)
2	BCA4804	Cyber Analytics (EL)







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Syllabus

BCA (Hons) 1st Year Ist Semester



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BCA1101: COMPUTER FUNDAMENTAL & EMERGING TECHNOLOGY

Course Outcome (CO)

CO1	Demonstrate the knowledge of the basic structure, components, features and Generations of computers.	
CO2	Describe the concept of computer languages, language translators and construct Algorithms to solve problem using programming concepts.	
CO3	Compare and contrast features, functioning & types of operating system and computer networks.	
CO4	Demonstrate architecture, functioning & services of the Internet and basics of Multimedia.	
CO5	Illustrate the emerging trends and technologies in the field of Information Technology.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Computer: Definition, Computer Hardware & Computer Software, Types of computers, evolution of computers. Components: Hardware – Introduction, Input devices, Output devices, Central Processing Unit, Memory-Primary and Secondary Software-Introduction, Types – System and Application. Computer Languages: Introduction, Concept of Compiler, Interpreter & Assembler. Computer Generations: Generations of Computers.	8
II	Operating system: Definition, Functions, Types, Classification, concept of multiprogramming, multitasking, multithreading, multiprocessing, single-user & multi-user operating system. Computer Network: Overview, Types (LAN, WAN and MAN), Transmission medium, topologies.	8
III	Internet: Overview, Architecture, Functioning, Basic services like- WWW, FTP, HTTP, Telnet, etc., Search engines-mail, Web Browsers. Internet of Things (IOT): Definition, Sensors, their types and features, Smart Cities, Industrial Internet of Things.	8
IV	Block chain: Introduction, overview, features, limitations and application are as fundamentals of Block Chain. Cloud Computing: It nature and benefits, AWS, Google, Microsoft & IBM Services.	8
V	Emerging Technologies: Introduction, overview, features, limitations and application areas of Augmented Reality, Virtual Reality, Grid computing, Green computing, Bigdata analytics, Quantum Computing and Brain Computer Interface	8

Reference Books:

1. Gupta Seema (2020), Digital Marketing, Mc Graw Hill Publications.
2. Puthussery Antony (2020), Digital Marketing. Notion Press.
3. Bhatia Puneet (2019), Fundamentals of Digital Marketing, Pearson Publications.
4. Greenstein, Electronic Commerce, Tata McGraw Hill, New Delhi.
5. Norton, Peter: Introduction to Computer 4/E, Tata McGraw Hill (P) Ltd., New Delhi.


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UCC1102: AI FOR EVERYONE

Course Outcome (CO)

CO1	Understand the fundamental principles and applications of AI in different industries.
CO2	Explain key AI techniques, including supervised and unsupervised learning, deep learning, and neural networks.
CO3	Analyze ethical challenges and biases in AI systems and their impact on society.
CO4	Apply AI-driven solutions in fields like healthcare, finance, and automation.
CO5	Critically evaluate the benefits and risks associated with AI technologies.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to AI (Concept + Hands-on): What is AI? Understanding AI vs. Machine Learning vs. Deep Learning, AI in daily life: Smart assistants, AI in social media, AI in e-commerce, Prompt Engineering, Real Life Applications of AI. Tools: Explore AI-based tools (Google AI, ChatGPT, MetaAI, Gemini).	8
II	Introduction to Machine Learning and Deep Learning: Introduction to learning theory, Methods and Models. Supervised vs. Unsupervised Learning (Examples from real life), Reinforcement Learning, Introduction to ANN and Deep Learning.	9
III	Computer Vision & Image Processing: Introduction to Image processing and Computer Vision ?, Hardware used, Face Recognition, Object Detection, and AI-powered Cameras, How AI understands text & speech, AI in Chatbots, Sentiment Analysis, and AI-based Translation Practical	9
IV	AI in Automation & Robotics: AI-powered automation in businesses, How AI is used in robotics and smart homes, Ethical AI & Responsible AI, Bias in AI and fairness in decision-making, How to use AI responsibly.	8
V	Mini AI Projects (Without Coding): Hands-on Project Options: AI for Image Classification: Train an AI model to recognize objects Create an AI Chatbot: Use Dialog flow or Chatbot.com AI in Business: Automate tasks using AI-based productivity tools.	8

Suggested Readings:

1. **Software Engineering**, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
2. **Software 2Engineering: A Primer**, Waman S Jawadekar, Tata McGraw-Hill, 2008
3. **Software Engineering, 3Principles and Practices**, Deepak Jain, Oxford University Press.
4. **Software Engineering1: 4Abstraction and modelling**, Diner Bjarne, Springer International edition, 2006.
5. **Software 5Engineering2: Specification of systems and languages**, Diner Bjorner, Springer International edition 62006.
6. **Software Engineering Principles and Practice**, Hans Van Vliet, 3rd edition, John Wiley & 7Sons Ltd.
7. **7. Software Engineering3: Domains, Requirements, and Software Design**, D. Bjorner, 8Springer International Edition.
8. **Introduction to Software Engineering**, R. J. Leach, CRC Press.

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BCA1103: PRINCIPLES OF PROBLEM SOLVING USING C

Course Outcome (CO)

CO1	Elucidate the basic architecture and functionalities of a Computer
CO2	Apply programming constructs of C language to solve the real-world problems
CO3	Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems
CO4	Design and Develop Solutions to problems using structured programming constructs such as functions and procedures

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Introduction to C, Assembler, Compiler, Interpreter, Loader and Linker. Algorithm: Representation of Algorithm, Flowchart. Programming Basics: Structure of C Program, Writing and Executing the First C Program, Syntax and Logical Errors in Compilation, Object and Executable Code. Components of C Language. Standard I/O in C, Fundamental Data types, Variables and Memory Locations, Storage Classes:	8
II	Conditional Control Statements: if statement, if-else statement, if-else-if statement, nested-if statement, While-loop, do-while loop, for-loop, break statements, continue statements, switch statement, goto statement. Operators- Operators, Types of operators. Functions: Introduction, Types, Declaration of a Function, Function calls, Defining functions, Function Prototypes, Passing arguments to a function Return values and their types, Writing multi-function program, Calling function by value, Recursive functions.	8
III	Arrays: Array and representation of an array, Declaring one-dimensional array, Initializing arrays, Accessing array elements, Manipulating array elements, Arrays of unknown or varying size, Two-dimensional arrays, Multidimensional arrays. Strings: Introduction, Initializing strings, Accessing string elements, Array of strings, Passing strings to functions, String functions. Pointers: Introduction, Characteristics, Pointer type declaration and assignment, Pointer arithmetic, Call by reference, Passing pointers to functions, array of pointers, Pointers to functions, Pointer to pointer, Array of pointers.	8
IV	Structure: Introduction, Initializing, defining and declaring structure, Accessing members, Operations on individual members, Operations on structures, Structure within structure, Array of structure, Pointers to structure. Union: Introduction, Declaring union, Usage of unions, Operations on union. Enumerated data types	8
V	Dynamic Memory Allocation: Introduction, Library functions– malloc(), calloc(), realloc() and free. File Handling: Basics, File types, File operations, File pointer, File opening modes, File handling functions, File handling through command line argument, Record I/O in files.	8

Reference Books:

1. Let Us C (17th Edition) – Yashavant Kanetkar, BPB Publications, 2023
2. Programming in ANSI C (8th Edition) – E. Balagurusamy, McGraw Hill Education, 2023.
3. K.R.Venugopal, Programming with C, 1997, McGraw-Hill.

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BCA1105: MATHEMATICAL FOUNDATION

Course Outcome (CO)

CO1	Students will be able to demonstrate competency in the areas that comprise the core of the mathematics major.	
CO2	They will be able to solve applied problems with the application of differentiation and integration.	
CO3	They will be able to use appropriate technologies to solve mathematical problems.	
CO4	They will be able to apply matrices in different industry problems.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	BASIC CONCEPTS: Definition of Sets, Number systems, Relations Functions. LIMIT CONTINUITY: Definition of limit, Limit of a function, Right and Left hand Limits, Algebra of limits, General principle for existence of limit, limit of inequalities, Method of finding limits, Continuity of functions, Cauchy's definition, graphical meaning of continuity, Kinds of discontinuities. DIFFERENTIAL CALCULUS: Successive differentiation, Leibnitz theorem, Partial differentiation, Euler's Theorem, change of variables, Jacobian theorem.	8
II	SEQUENCE: Definition of Sequence, Series and Progression; Definition of Arithmetic Progression (AP); nth term of an AP; sum of n terms of an AP; Arithmetic Mean (AM); Properties of AP; Definition of Geometric Progression (GP); nth term of a GP; Sum of n terms of a GP; Geometric Mean (GM); Properties of GP; Definition of Harmonic Progression (HP); Harmonic Mean (HM); Relations between AM, GM and HM.	8
III	MATRICES: Definition of a Matrix; Various Types of Matrices; Operations on Matrices; Symmetric and Skew-Symmetric Matrices; Row Operations, Column Operations; Inverse of a Matrix by Elementary Row Operations. Determinants: Concept of Determinant; Minors and Co-factors in Determinants; Expansion of a Determinant; Properties of Determinants.	8
IV	DIFFERENTIATION: Basic Formulae of Differentiation; Differentiation from the First Principle; Derivative of the Product of Functions, Quotient of two functions, Function of a function (Chain Rule). Derivatives of Exponential functions, Logarithmic functions, Inverse Trigonometric functions; Differentiation by Trigonometrical Transformations; Differentiation of Implicit functions; Differentiation using Logarithms.	8
V	COORDINATE GEOMETRY: Straight lines, Circles and the system of circles; standard equations and properties of Parabola. Ellipse and Hyperbolas, General equation of second degree in two variables, tracing of simple conic section.	8

Reference Books:

1. E. Kreyzig, "Engineering Mathematics".
2. B.S. Grewal, "Higher Engineering Mathematics"
3. Shanti Narayan, "Differential Calculus"

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UCC1101: IKS-I (INDIAN KNOWLEDGE SYSTEM – I)

Course Outcome (CO)

CO1	Creating awareness amongst the youths about the true history and rich culture of the country.	
CO2	Understanding the scientific value of the traditional knowledge of Bharata.	
CO3	Promoting the youths to do research in the various fields of Bhartiya knowledge system.	
CO4	Converting the Bhartiya wisdom into the applied aspect of the modern scientific paradigm.	
CO5	Adding career, professional and business opportunities to the youths.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Indian Education - Vedic Education: Focuses on the traditional system of learning during the Vedic period. - Spiritual and Moral Development: The role of education in promoting ethics and spiritual growth. - Intellectual Growth: How Vedic education contributed to intellectual advancement. Social and Cultural Refinement: The cultural impact of education on society.	3
II	Methodology of Indian Knowledge System Pramana: The means of obtaining knowledge and validation in Indian philosophy. Nyaya: Logical reasoning and debate in the Indian knowledge tradition.	3
III	Indian Metallurgy Indian Text for Metallurgy: Ancient Indian scriptures related to metallurgy. Important Specimens of Metals Preserved/Found: Notable examples of metalwork from Indian history. Vedic References of Metals: Mentions of metals in Vedic texts and their significance.	3
IV	Indian Health Sciences Literature: Vedic Foundations of Ayurveda: Ancient texts that form the basis of Ayurveda. Ayurveda Concern for Good Health: Focus on holistic well-being. Three Guna, Three Dosha, Panch Mahabhoot, Sapta Dhatu, Six Rasa: Concepts central to Ayurveda. Dincharya & Ritucharya: Daily and seasonal regimens for health. Practical: Sushruta Samhita: Ancient text on surgery. Charaka Samhita: Ayurvedic text on medicine. Ashtanga Hridaya – Sutra Sthana: An Ayurvedic classic.	3

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	Qualities of a Surgeon: The required attributes of a good surgeon. Surgical Practices: Ancient Indian surgical methods.	
V	Foundational Literature of Indian Civilization Vedang, Ayurveda, Natya Shastra, Dharma Shastra, Arthashastra: Key texts that shaped Indian civilization in various fields like linguistics, health, arts, law, and politics.	3
VI	Bharata varsha—A Land of Rare Natural Endowments Seasons, Land Variations, Heritage, Natural Resources, Geographical Isolation: The geography of India and how it shaped the country's culture, heritage, and resources.	3

Reference Books:

1. Pride of India- A Glimpse of India's Scientific Heritage edited by Pradeep Kohle et al. Samskrit Bharati (2006).
2. Vedic Physics by Keshav Dev Verma, Motilal Banarsidass Publishers (2012).
3. India's Glorious Scientific Tradition by Suresh Soni, Ocean Books Pvt. Ltd. (2010).

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BCA1170: OFFICE AUTOMATION LAB

Course Outcome (CO)

CO1	Demonstrate the knowledge of the basic structure, components, features and Generations of computers.	
CO2	Describe the concept of computer languages, language translators and construct Algorithms to solve problem using programming concepts.	
CO3	Compare and contrast features, functioning & types of operating system and computer networks.	
CO4	Demonstrate architecture, functioning & services of the Internet and basics of Multimedia.	
CO5	Illustrate the emerging trends and technologies in the field of Information Technology.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
	Demonstrate the various hardware components of computer system. 1. Open the command prompt and create a directory in C: system drive using MS DOS commands. Now change the directory and create a subdirectory in this folder. 2. Create the following directory structure using MS DOS commands ❖ UIM ❖ UIT • CSE • MECH ❖ LAW ❖ USCS • MCA • BCA • BSCIT i.Remove the directory named MECH and MGT. ii.Remove the directory named UIT in single step. iii.Rename the directory LAW to LLB iv.Display the directory structure of UU. v.Rename the directory named BSCIT to BSIT. 3. Create Microsoft Word document with the name as UIM-MY-BIOGRAPHY. Write about your basic information, likes, dislikes, strengths and weakness. Along with, write the fields in which you excel. Also write about the concepts that inspire you. The font size of the title must be 14 and that of remaining text as 12. The font must be Times New Roman. Write a short biography having not more than 150 words. 4. Create your C.V. using pre-installed templates in WORD. 1- Use table for education qualification, apply paragraph formatting while stating the summary at the end of your C.V., use bullets and numbering wherever applicable 2- Use TIMES NEW ROMAN with font of size 12 and for heading size 14. 5. Invite your friends and relatives to your birthday party by creating a .mdb and linking it with the word document using a utility called Mail Merge. The list of invitees should not be less than 15. Apply formatting to the invitation - apply page borders to the final merged document. Provide the word "birthday invitation" in the header part and "name and contact number" in the footer part.	

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6. Create the following table in MS Word and name it as UIM-Student.

Roll no.	Name	Father's Name
1	Aman	Akhilesh Sharma
2	Raman	Narendra Gupta

Insert one more row in the existing table and input the data as: Roll no=3, Name= Daman, Father's Name= Anuj Kumar. Insert one more column named Mother's Name, next to the Column named Father's Name and complete the data of existing records. The student named "Raman" decided to leave the course, so his record needs to be removed from the table. Apply table design to improve its visibility.

7. Create a power point presentation of topic of your own choice and apply different transitions, animations to the slide in your presentation. You must have at least 15 slides in your presentation.

NOTE:- The presentation must have table of contents, consisting of

1. Introduction
2. History/ Background
3. Features
4. Working
5. Advantages
6. Limitation
7. Conclusion, if applicable
8. References- mandatory
9. Thank you .

8. Create the record of at least 10 students in MS Excel consisting of the following Columns:-

- Column 1. Serial number
- Column 2. Roll number
- Column 3. University ID
- Column 4. Your name
- Column 5. Father's name
- Column 6. Mother's name
- Column 7. Address
- Column 8. Your contact number
- Column 9. Father's contact number
- Column 10. Mother's contact number
- Column 11. Date of birth
- Column 12. Total Marks obtained in previous semester
- Column 13. Percentage obtained in previous semester

Consider the following sample table:

S. No.	R. No.	UID	Name	Father's Name	Mother's Name	Address	Contact No.	Father's Contact No.	Mother's Contact No.	Date of Birth	Marks Obtained in Previous Semester	Percentage Obtained in Previous Semester
1	1	1010101	Aman	Amit	Sumita	123, Main Road, Dehradun, UK	7000000000	7000010000	7000015750	12 March 2000	80%	75%
2	2	1010102	Amrita	Amrit	Sumita	123, Main Road, Dehradun, UK	7000000000	7000010000	7000015750	12 March 2000	80%	75%
3	3	1010103	Amrita	Amrit	Sumita	123, Main Road, Dehradun, UK	7000000000	7000010000	7000015750	12 March 2000	80%	75%
4	4	1010104	Amrita	Amrit	Sumita	123, Main Road, Dehradun, UK	7000000000	7000010000	7000015750	12 March 2000	80%	75%
5	5	1010105	Amrita	Amrit	Sumita	123, Main Road, Dehradun, UK	7000000000	7000010000	7000015750	12 March 2000	80%	75%
6	6	1010106	Amrita	Amrit	Sumita	123, Main Road, Dehradun, UK	7000000000	7000010000	7000015750	12 March 2000	80%	75%
7	7	1010107	Amrita	Amrit	Sumita	123, Main Road, Dehradun, UK	7000000000	7000010000	7000015750	12 March 2000	80%	75%
8	8	1010108	Amrita	Amrit	Sumita	123, Main Road, Dehradun, UK	7000000000	7000010000	7000015750	12 March 2000	80%	75%
9	9	1010109	Amrita	Amrit	Sumita	123, Main Road, Dehradun, UK	7000000000	7000010000	7000015750	12 March 2000	80%	75%
10	10	1010110	Amrita	Amrit	Sumita	123, Main Road, Dehradun, UK	7000000000	7000010000	7000015750	12 March 2000	80%	75%

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9. Display 10 student's result with

Column 1. Roll number

Column 2. Name

Column 3. Subject 1

Column 4. Subject 2

Column 5. Subject 3

Column 6. Subject 4

Column 7. Subject 5

Column 8. Calculate the sum of marks obtained in all the subject

Column 9. Calculate percentage marks obtained

Column 10. If percentage is ≥ 40 then display "Pass" in front of that cell otherwise display "Fail"?

Consider the following sample data:

Student Data												
S. No.	R. No.	UID	Name	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Marks Obtained	Percentage	Result	Remarks
1	1	UU101	Aman	61	76	88	66	67	358	71.6	Pass	
2	2	UU102	Baman	43	82	40	82	87	334	66.8	Pass	
3	4	UU104	Cherry	90	67	52	81	82	372	74.4	Pass	
4	5	UU105	Daman	40	78	54	58	67	297	59.4	Pass	
5	6	UU106	Ehrish	89	63	85	62	83	382	76.4	Pass	
6	7	UU107	Gagan	98	54	90	56	68	366	73.2	Pass	
7	9	UU109	Ishar	97	74	61	68	94	394	78.8	Pass	
8	10	UU110	Jagan	50	93	72	71	58	344	68.8	Pass	
9	11	UU111	Kamal	92	88	72	83	40	375	75	Pass	
10	12	UU112	Madan	91	51	57	83	48	330	66	Pass	

10. In the above task include the following column as well:

Column 11. Display remarks as "Excellent" if percentage of student is greater than or equal to 85 but less than 95 and display remarks as "Distinction" if percentage is greater than or equal to 95 but less than or equal to 100.

11. Consider the following sample data of students:

S. No.	Male Height	Female Height
1	159	152
2	162	148
3	163	156
4	164	155

1. Find the average height of male and female students respectively.
2. Find the maximum and minimum height of male and female students respectively.

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BCA1171: PROGRAMMING IN C LAB

Course Outcome (CO)

CO1	Elucidate the basic architecture and functionalities of a Computer
CO2	Apply programming constructs of C language to solve the real-world problems
CO3	Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems
CO4	Design and Develop Solutions to problems using structured programming constructs such as functions and procedures

DETAILED SYLLABUS

S.No	PRACTICAL NO.	PRACTICAL TITLE
1	01	Design, Develop Program in C for the following a. to find the greatest of the three numbers. b. to check the entered number is odd or even c. to swap the values of variables using third variable. d. to swap the values of variables without using third variable.
2	02	Design, Develop Program in C for the following a. to check whether the given number is Palindrome number. b. to check whether the number is prime or not.
3	03	Design, Develop and Implement a menu driven Calculator Program in C for the following operations on Integers a. Find addition b. Find subtraction c. Find multiplication d. Find division e. Find reminder f. Exit
4	04	Design, Develop and Implement a Program in C a. to reverse a four-digit integer without using loop. b. to reverse an integer Using While loop.
5	05	Design, Develop Program in C for the following a. to check Fibonacci series of any given number. b. to check factorial of a number using for loop
6	06	Design, Develop and Implement a Program in C to print different Patterns using for loops.
7	07	Design, Develop Program in C for the following a. to show the use of function. b. to show call by value c. to show call by reference
8	08	Design, Develop Program in C for the following a. to show the use of array. b. to sort an array in ascending order c. use of recursive function
9	09	Design, Develop and Implement a menu driven Program in C for the following operations on two-dimensional array of Integers a. Find addition of two matrix b. Find subtraction of two matrix c. Find transpose of a matrix

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		d. Exit	
10	10	Design, Develop and Implement a Program in C to show different string operations.	
11	11	Design, Develop and Implement a Program in C a. to show use of structures. b. to show use of nested structures.	
12	12	Design, Develop and Implement a Program in C a. to show use of pointers. b. to show dereferencing of pointer c. to show pointer to pointer.	
13	13	Design, Develop and Implement a Program in C to show the use of calloc() and malloc () function	
14	14	Design, Develop and Implement a Program in C to write the data in file.	







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Syllabus

BCA (Hons) 1st Year
IIn^d Semester



BCA1209: DISCRETE MATHEMATICS		
Course Outcome (CO)		
CO1	Discuss mathematical logic and Boolean algebraic switching circuits & logic circuits.	
CO2	Discuss the type of relationship and apply the knowledge using the Hass diagram.	
CO3	Discuss the set theory and recursive function. Also, they will construct the grammars.	
CO4	Describe graph theory and its applicability in various computer applications.	
CO5	Discuss problem in various fields in computer application using the basic concepts of group theory and coding.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Mathematical Logic: Proposition & Propositional Form conditional and Bi- conditional Statements, Negation operation, Logic connectives and compound statements, conjunction, disjunction, truth tables, Duality conditional and in-conditional statements.	8
II	Boolean Algebra: Development of Boolean Algebra, Truth functions, The AND, OR, NOT operators, Laws of Boolean Algebras, Reducing Boolean Expressions, Boolean expressions and logic diagrams Universal Building blocks, Negative Logic Min terms, Truth tables and K-maps, Reduction of K maps Disjunctive normal form.	8
III	Set Theory: Sets, Types of Sets, Basic Operations on Sets, Venn diagram, Cartesian product of two sets, Distributive law, De Morgan's Law. Functions: Interval and sub-intervals. Definition of function and examples, polynomial, rational, exponential, logarithmic and trigonometric functions.	8
IV	Function and Relation: Injective and subjective functions, composition of function, Inverse function, Use of function in coding theory, Relation composition of relation, Equivalence relation.	8
V	Graph theory: Definition of a graph, finite and infinite graphs, Incidence and degree, null graph, Sub graphs walks, Paths and circuits in a graph, connected graphs, Trees, Properties of Trees, Planner graphs. Incidence Matrix.	8
Reference Books:		
1. C.L. Liu, "Elements of Discrete Mathematics" Mc Graw Hill Book Co., 1985 2. N. Deop, "Graph Theory with applications to Engineering and Computer Science", PHI 1993. 3. B. Colman and Robert C. Busby, "Discrete Mathematical structure for Computer Science," PHI. 4. Olympia Nicodemi, "Discrete Mathematics" CBS Publication, Delhi. 5. M.N.S. Swamy and K. Thulasiraman, "Graphs, Networks and Algorithms," Wiley Inter Science, NY, 1989.		

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BCA1201: PYTHON PROGRAMMING		
Course Outcome (CO)		
CO1	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.	
CO2	Express proficiency in the handling of strings and functions.	
CO3	Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.	
CO4	Identify the commonly used operations involving file systems and regular expressions.	
CO5	Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction and Overview: Overview of Python Programming: Structure of Python Program, Elements of Python, Python Interpreter, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings.	8
II	Operators and Statements: Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator). Creating Python Programs: Input and Output Statements	8
III	Decision making and Branching: Control statements (Branching, Looping, Conditional Statement, Difference between break, continue and pass, default Arguments. Defining Functions.	8
IV	Classes and Objects: An introduction to object-oriented programming in Python. Objects, operator overloading, overriding, special methods. Inheritance, polymorphism and composition	8
V	Iterators and Generators: Iteration protocol, Inerrable objects, generators and Generator expressions. Use of generators, assertions. Testing and debugging of a python project, Web Scrapping in Python.	8
Reference Books:		
1. Core Python Programming, W.Chun, Pearson. 2. Introduction to Python, Kenneth A. Lambert, Cengage 3. Learning Python, Mark Lutz, Orielly		

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BCA1202: COMPUTER NETWORK

Course Outcome (CO)

CO1	Students will be able to identify some of the factors driving the need for network security.	
CO2	Students can identify and classify particular examples of attacks.	
CO3	Students will able define the terms vulnerability, threat and attack.	
CO4	They may identify physical points of vulnerability in simple networks.	
CO5	Students can compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack, and explain the characteristics of hybrid systems.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Network: Definition, Goals, Point-To Point Networks; Network Topology and their various Types; Types of Network: LAN, MAN, WAN; Modes of Communication: Simplex, Half Duplex, Full Duplex; Protocols and Standards.	8
II	Network Models: Design Issues of the Layer, Protocol Hierarchy, ISO-OSI Reference Model: Functions of each Layer, Various Terminology used in Computer Network, Connection-Oriented & Connectionless Services, TCP/IP Model.	8
III	Transmission Media: Transmission Media, Guided Media (Wired): Coaxial Cable: Physical Structure, Standards, Twisted Pair, UTP vs. STP, Connectors, Fiber Optics Cable: Advantages & Disadvantages; Unguided Media (Wireless): Wireless Network, Bluetooth.	8
IV	Network Connectivity Devices: Categories of Connectivity Devices, Passive and Active Hubs, Repeaters, Bridges, Switches (2-Layer Switch, 3-Layer, Switch (Router), Gateways, Network Security Devices (Firewalls, Proxy Servers).	8
V	Internet Basics: Internet: Growth, Architecture, Accessing, Internet Service Providers (ISP), Internet Addressing System: IP Address, DNS, URL; World Wide Web(WWW): Web Servers, Web Browsers, Search Engine; Concept of Intranet & Extranet.	8

Reference Books:

1. Tanenbaum, A.S. "Computer Networks," PHI, 1990.
2. Stallings, W: Data and Computer Communication, Prentice Hall of India.
3. Fororuzan "Data Communication and Networking" TMH.

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BCA1203: ADVANCE DATABASE MANAGEMENT SYSTEM

Course Outcome (CO)

CO1	Identify the basic concepts and various data model used in database design ER modelling concepts and architecture use and design queries using SQL.	
CO2	Apply relational database theory and be able to describe relational algebra expression, tuple and domain relation expression from queries.	
CO3	Recognize and identify the use of normalization and functional dependency, indexing and hashing technique used in database design.	
CO4	Recognize/ identify the purpose of query processing and optimization and also demonstrate the basic of query evaluation.	
CO5	Apply and relate the concept of transaction, concurrency control and recovery in database.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Data, information and knowledge, Characteristics of database approach, Data independence, Architecture of database system, Data dictionary, Types of database language, database system life cycle, Overview of hierarchical, network and relational model. Relations and Codd's rules, Concepts of keys.	8
II	Relation Algebra: Select, Project, Joins, Set operations, Update operations – tuple relational calculus, Relational Calculus vs. relational algebra. Data definition, data manipulation, view definition, nested queries, updation, Embedded SQL, Handling of nulls and cursors.	8
III	Data Models: Conceptual, Logical and Physical design, ER models, ER diagrams, Strong and weak entity sets, Generalization, Specialization and Aggregation, Conversion of ER model into relational schemas, Extended Relational Model & Object Oriented Database System; New Data Types, User Defined Abstract Data Types	8
IV	Normalization: Normalization concepts, Functional dependencies and dependency preservations, Normal forms – 1NF, 2NF, 3NF, BCNF, 4NF, 5NF. SQL: Introduction, Data definition, views and queries in SQL, SQL construct, Type of SQL (Brief Overview), SQL Join: Multiple table queries, Built-in functions, Specifying constraints and indexes in SQL, Data Manipulation, Data maintenance, Multiple Table Operations, Transaction integrity facilities, Overview of ORACLE; (Data Type, DDL, DML, DCL).	8
V	Transaction Handling: Transaction recovery, System recovery, two phase commit, concurrency problems, locking, deadlocks, security.	8

Reference Books:

1. C.J. Date, "An introduction to Database system: Vol. 1, Addison Wesley.
2. Bipin Desai, "An introduction to Database system", Galgotia Publications, New Delhi.
3. Korth, "Database and its Concept", TMH.
4. DBMS, Katson Publication, New Delhi.

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BCA1206: ENVIRONMENTAL SCIENCE		
Course Outcome (CO)		
CO1	Explain ecological concepts and compare schools of environmental thought.	
CO2	Analyze population change factors and identify ecosystem threats & conservation methods.	
CO3	Apply pollution monitoring indicators for air, water, and soil quality assessment.	
CO4	Interpret sustainable development, food security issues, and environmental economics basics.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Human beings and nature: interdependence Meaning of EVS and its concepts, Minerals and rocks, Human beings and nature relationship, Modern schools of ecological thought, Deep ecology vs shallow ecology, Stewardship of land, Social ecology (Marxist environmentalism / socialist ecology), Feminism and Green politics, Sustainable development.	8
II	Population and Conservation Ecology: Population dynamics: birth, death, immigration, emigration, Age structure, population pyramids, survivorship curves, r and K strategies. Human populations: Malthusian model, demographic transition. Population regulation: exponential & logistic growth. Human population control: family planning, education, women status, Threats to ecosystem & biodiversity loss. Conservation: Indian forests, conflicts, JFM, wildlife sanctuaries, Project Tiger.	8
III	Monitoring Pollution: Pollution monitoring fundamentals, Atmospheric monitoring techniques, National and international air quality standards, Water testing: indicators of water quality, Soil testing: indicators of soil type and quality.	8
IV	Sustainable Development & Environmental Economics: Third world development and urban-rural divide, Urban environmental planning: sanitation, water, transport, energy, air quality, housing, Sustainable agriculture: traditional systems, green revolution, HYVs, pesticides impacts. Food security: production vs access, global food situation. Environmental & natural resource economics: scarcity, natural capital accounting, Externalities and cost-benefit analysis, International relations & environment: Amazonia, wildlife trade, ozone depletion. Globalization: WTO, GATT, IPR and environmental impacts.	8
Suggested Readings: 1. Erach Bharucha – Textbook of Environmental Studies. 2. R. Rajagopalan – Environmental Studies: From Crisis to Cure. 3. P.D. Sharma – Ecology and Environment. 4. S. C. Santra – Environmental Science.		

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BCA1205: AI FOR DEVELOPERS

Course Outcome (CO)

CO1	Understand fundamental AI concepts and their applications.
CO2	Develop and implement machine learning models using Python.
CO3	Apply AI techniques in natural language processing and computer vision.
CO4	Integrate AI tools in software development processes.
CO5	Explore advanced AI applications in real-world scenarios.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Artificial Intelligence: Definition and Scope of AI, History and Evolution of AI, AI vs. Machine Learning vs. Deep Learning, Applications of AI in Software Development, AI Ethics and Responsible AI.	8
II	Machine Learning for Developers: Supervised, Unsupervised, and Reinforcement Learning, Data Preprocessing and Feature Engineering, Model Selection and Evaluation Metrics, Popular ML Libraries: Scikit-Learn, TensorFlow, PyTorch, Implementing ML Models in Python.	8
III	Natural Language Processing (NLP) and Computer Vision: NLP Basics: Tokenization, Stemming, Lemmatization,	8
IV	Sentiment Analysis and Chatbot Development, Image Processing and Feature Extraction, CNNs for Image Recognition (Introduction to OpenCV, TensorFlow), AI-based Object Detection and Face Recognition.	8
V	AI in Software Development: AI-powered Code Generation (GitHub Copilot, ChatGPT API), Automated Testing and Debugging using AI, AI in DevOps: CI/CD Automation, Performance Monitoring, AI-based Security: Intrusion Detection and Threat Analysis, AI and Cloud Computing (AWS AI, Azure AI, Google AI).	8

Reference Books:

1. "Artificial Intelligence: A Guide for Thinking Humans" – Melanie Mitchell
2. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" – Aurélien Géron
3. "Deep Learning for Coders with fastai & PyTorch" – Jeremy Howard, Sylvain Gugger
4. "Pattern Recognition and Machine Learning" – Christopher M. Bishop
5. "Artificial Intelligence: A Modern Approach" – Stuart Russell, Peter Norvig

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BCAI270: ADVANCE DATABASE MANAGEMENT SYSTEM LAB

Course Outcome (CO)

CO1	Identify the basic concepts and various data model used in database design ER modelling concepts and architecture use and design queries using SQL.
CO2	Apply relational database theory and be able to describe relational algebra expression, tuple and domain relation expression from queries.
CO3	Recognize and identify the use of normalization and functional dependency, indexing and hashing technique used in database design.
CO4	Recognize/ identify the purpose of query processing and optimization and also demonstrate the basic of query evaluation.
CO5	Apply and relate the concept of transaction, concurrency control and recovery in database.

DETAILED SYLLABUS

1. Create a table named uim_employee having attributes such as: Employee id, Employee name, Employee's department number, Employee's date of joining, Employee's salary, Employee's email_id and Employee's contact number.
Consider the following table:

Attribute	Datatype	Size
employee_id	Varchar2	10
employee_name	Char	25
employee_department_no	Number	03
employee_date_of_joining	Date	-
employee_salary	Number	8,2
employee_email_id	Varchar2	30
employee_contact_no	Number	12

Note: Insert department number values as 111, 222, 333, 444,etc.

Note: Insert employee id values as UU1001, UU1002, UU1003, UU1004,etc.

Write SQL queries to:

- Insert at least 10 tuples in the table.
- Display employee's complete details including *employee_id*, *employee_name*, *employee_department_no*, *employee_date_of_joining*, *employee_salary*, *employee_email_id* and *employee_contact_no*.
- Display employee's complete details including *employee_id*, *employee_name*, *employee_department_no*, *employee_date_of_joining*, *employee_salary*, *employee_email_id* and *employee_contact_no* who work in department number 444.
- Display *employee_id*, *employee_name* and *employee_date_of_joining* who work in work in department number 222.
- Delete the employee's details having *employee_id* as UU1003.
- Update *employee_contact_no* to 9592929295 having *employee_id* as UU1007.

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2. Implement DDL and DML on the `uim_employee` table.
Consider the following table:

Attribute	Datatype	Size
employee id	Varchar2	10
employee name	Char	25
employee department no	Number	03
employee date of joining	Date	-
employee salary	Number	8,2
employee email id	Varchar2	30
employee contact no	Number	12

- Add a new column named `employee_address` having data type as `varchar2`, size 30 in the `uim_employee` table.
- Update the addresses of existing `uim_employees` in the table.
- Drop the column named `employee_date_of_joining` from the table.
- Modify the size of the column named `employee_contact_no` to 14.
- Rename the table to `uim_employee_details` from the table name `uim_employee`.
- Truncate as the records from the `uim_employee_details` table.
- Drop the table named `uim_employee_details`.

3. Implementation of keys and constraints concept. Create a table named `uim_student` having attributes such as: student's roll number, student's name, student's date of birth, student's course, student's house address, student's contact number, student's aadhaar number. The attribute named: `student_roll_no` has a PRIMARY KEY constraint, `student_name` has NOT NULL constraint, `student_aadhaar_no` as UNIQUE constraint.
Consider the following table:

Attribute	Datatype	Size	Constraint
student roll no	Number	3	PRIMARY KEY
student name	Char	25	NOT NULL
student date of birth	Date	-	-
student course	Varchar	15	-
student address	Varchar2	30	-
student contact no	Number	10	-
student aadhaar no	Number	12	UNIQUE

- Describe the structure of `uim_student` table.
- Insert few tuples in the table.
- Examine the error message by inserting same `student_roll_no` values for two rows. Write the error message and reason.
- Examine the error message by NOT inserting `student_name` value in a row in the table.

v. Examine the error message by inserting same *student_aadhaar_no* values for two rows.
Write the error message and reason.

4. Implementation of Foreign key concept using two tables named: *uim_employee* and *uim_department*. The employee table has employee's id, employee's name and employee's department number. The department table has department number, department name and department location.
Consider the following two tables:

Table name: uim_employee				Table name: uim_department			
Attribute	Data type	Size	Constraint	Attribute	Data type	Size	Constraint
employee_id	Char	8	-	department_no	Number	3	PRIMARY KEY
employee_name	Varchar2	20	-	department_name	Char	15	-
employee_department_no	Number	3	FOREIGN KEY	department_location	Varchar2	20	-

- Display the structure of *uim_employee* table
- Display the structure of *uim_department* table
- Insert at least three department details in the *uim_department* table.
- Display the data of *uim_department* table.
- Insert employee's details working in the corresponding departments as in the *uim_department* table.
- Display the data of *uim_department* table.
- Examine the error message by inserting a value in *employee_department_no* which is NOT there in *uim_department* table's *department_no*. Write the error message and reason.
- Delete any department number from the *uim_department* table and examine its effects in *uim_employee* table.

5. Create a table named *employee_contact_details* from *employee* table by taking the attribute named: *employee_id*.

Consider the table below:

Table name: employee_contact_details		
Attribute	Datatype	Size
employee_id	employee_id from employee table	

- Display the contents of *employee_contact_details* table
- Add a new column *employee_contact_no* having data type as Number and size as 12 in *employee_contact_details* table
- Display the contents of *employee_contact_details* table.
- Update the contact details of existing employees

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BCA1273: PYTHON PROGRAMMING LAB

Course Outcome (CO)

CO1	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.	
CO2	Express proficiency in the handling of strings and functions.	
CO3	Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.	
CO4	Identify the commonly used operations involving file systems and regular expressions.	
CO5	Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.	

DETAILED SYLLABUS

LIST OF PROGRAMS:

1. Input and Output

- Write a program to find the largest element among three Numbers.
- Write a program to print the sum of all the even numbers in the range 1 - 50 and print the even sum.
- Write a Program to display all prime numbers within an interval of given X1 & X2.

2. Variables and Functions

- Write a program to swap two numbers without using a temporary variable.
- Write a program to define a function with multiple return values.
- Write a program to define a function using default arguments.

3. Loops and conditionals

- Write a program to print the following patterns using loop: *

*** ** *

- Write a program to print multiplication table of a given number X1 to range X2.

4. Strings

- Write a program to find the length of the string without using any library functions.
- Write a program to check if two strings are anagrams or not.
- Write a program to check if the substring is present in a given string or not.

5. Lists

a. Write a program to perform the given operations on a list:

- i. add
- ii. insert
- iii. slicing

b. Write a program to perform any 5 built-in functions by taking any list.

c. Write a program to get a list of the even numbers from a given list of numbers.
(use only comprehensions)

6. Tuples

a. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.

b. Write a program to return the top 'n' most frequently occurring chars and their respective counts. e.g. aaaaabbbbcccc, 2 should return [(a 5) (b 4)]

7. Sets

a. Write a program to count the number of vowels in a string (No control flow allowed).

b. Write a program that displays which letters are present in both strings.

c. Write a program to sort given list of strings in the order of their vowel counts.

8. Dictionaries

a. Write a program to check if a given key exists in a dictionary or not.

b. Write a program to add a new key-value pair to an existing dictionary.

c. Write a program to sum all the items in a given dictionary.

9. Files

a. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper case words from source must be lowered.

b. Write a program to find the most frequent words in a text. (read from a text file).

10. Classes

a. Write a Python class named Person with attributes name, age, weight (kgs), height (ft) and takes them through the constructor and exposes a method get_bmi_result() which returns one of "underweight", "healthy", "obese".

b. Write a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle.

11. Arrays

a. Write a program to create, display, append, insert and reverse the order of the items in the array.

b. Write a program to add, transpose and multiply two matrices.

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Syllabus

BCA 2nd Year
3rd Semester



BCA2301: Management Information Systems (MIS)

Course Outcome (CO)

CO1	Explain the importance and functioning of MIS in business contexts.	
CO2	Analyze and evaluate decision support systems and their business impact.	
CO3	Apply database and data management techniques in business solutions.	
CO4	Understand and assess e-commerce and enterprise applications.	
CO5	Address security challenges and explore emerging trends in MIS.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Definition and components of MIS Types of Information Systems: TPS, MIS, DSS, ESS, Role of MIS in business organizations, System development life cycle (SDLC), Information system resources: hardware, software, people, data, processes, Ethical and social issues in IS	8
II	Decision-Making Process and types of decisions , Simon's Model of Decision-Making, DSS and GDSS (Group Decision Support Systems), Role of MIS in decision support, Business Intelligence (BI) and Data Mining, Case studies on decision-making using MIS	9
III	Basics of Data, Information, and Knowledge Database Management Systems (DBMS) – concepts and types Data Models: Relational, Hierarchical, Network, Data Warehousing and Data Mining, Big Data & Cloud Computing in MIS, SQL Basics and database applications in business.	9
IV	E-commerce : types, models (B2B, B2C, C2C, G2C), advantages & challenges ERP Systems: Introduction, modules, implementation, benefits, Supply Chain Management (SCM) and Customer Relationship Management (CRM, E-Governance and E-Business Applications, Mobile Commerce (M-commerce), Digital Payments, and Security	8
V	Information Systems Security and Emerging Trends IS Security Threats: malware, phishing, hacking, cybercrime, Security Measures: encryption, firewalls, antivirus, disaster recovery, Information Security Policies and Governance, Emerging trends: IoT, AI in MIS, Blockchain, Cloud Services, Case Studies on security breaches and mitigation.	8

Suggested Readings:

Textbook:

1. "Management Information Systems" by **Kenneth C. Laudon & Jane P. Laudon**, Pearson Education

Reference Books:

1. "Management Information Systems" by W.S. Jawadekar, Tata McGraw-Hill
2. "Information Systems for Managers" by Gordon B. Davis
3. "MIS: Managing the Digital Firm" by Laudon & Laudon, Pearson
4. "Enterprise Resource Planning" by Alexis Leon, Tata McGraw-Hill
5. "Introduction to Information Systems" by James A. O'Brien & George M. Marakas, McGraw-Hill

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BCA2302: DATA STRUCTURE USING C

Course Outcome (CO)

CO1	Able to understand basics of C programming language and arrays.	
CO2	Able to understand basic concepts of linked list.	
CO3	To understand the basic concepts of stack and queues through array and linked list.	
CO4	To understand the basic knowledge of trees and graph.	
CO5	Able to understand the concepts of sorting and searching techniques.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Introduction to Data Structure, Efficient use of memory, Elementary Data Organization, Structure operations, Time and space complexity of algorithms and asymptotic notations. Array Definition and Representation, Single and Multidimensional Arrays, Address calculation, Application of arrays, Character String in C, Character string operation, Array as Parameters	8
II	Linked list: Representation and Implementation of Singly Linked List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, doubly linked list and dynamic storage management, Circular Link List, Garbage Collection and Compaction.	9
III	Stacks & Queues: Introduction to Stack, Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Linked Representation of Stack, Application of stack: Postfix and Prefix conversions, Evaluation of expressions using stack. Introduction to Queue, Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues and De-queue, Priority Queues.	9
IV	Trees & Graph Theory: Basic terminology, Binary Trees, Binary tree representation and Traversal, Algebraic Expressions, Complete Binary Tree, Threaded Binary trees, Binary Search Tree (BST), Height balanced tree and various Rotations. Graph Theory: Terminology & Representations, Traversal- BFS and DFS, Dijkstra's algorithm for shortest path, Prim's and Kruskal's Algorithm for Minimal Spanning tree	8
V	Searching & Sorting: Sequential search, Binary search, and Hash search, Comparison and analysis. Sorting: Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Two Way Merge Sort and Heap Sort.	8

Suggested Readings:

Reference Books:

1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., New Delhi
2. M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.

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BCA2303: PRINCIPAL OF MANAGEMENT

Course Outcome (CO)

CO1	Demonstrate the nature & purpose, importance & Functions.	
CO2	Describe the Evolution of Management Thought.	
CO3	Understand the Process of Planning, Barriers to Effective Planning.	
CO4	Explain Process of Communication, Non- verbal Communication.	
CO5	Describe Writing of Proposal; Significance. Nuances of Delivery.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Nature of Management: Meaning, Definition, nature & purpose, importance & Functions, Management as Art, Science & Profession, Management as social System Concepts of management-Administration-Organization, Management Skills, Levels of Management.	8
II	Evolution of Management Thought: Contribution of F.W.Taylor, Henri Fayol, Elton Mayo, Chester Barhard & Peter Drucker to the management thought. Business Ethics & Social Responsibility: Concept, Shift to Ethics, Tools of Ethics.	8
III	Functions of Management: Part-I Planning – Meaning- Need & Importance, types, Process of Planning, Barriers to Effective Planning, levels –advantages & limitations. Forecasting- Need & Techniques, Decision making-Types – Process of rational decision making & techniques of decision making, Organizing – Elements of organizing & processes: Types of organizations, Delegation of authority – Need, difficulties , Delegation – Decentralization, Staffing – Meaning & Importance, Direction – Nature – Principles, Communication – Types & Importance.	8
IV	Functions of Management: Part-II Motivation–Importance–theories Leadership–Meaning –styles, qualities & function of leader Controlling – Need, Nature, importance, Process & Techniques, Total Quality Management, Coordination – Need – Importance	8
V	Management of Change: Models for Change, Force for Change, Need for Change, Alternative Change Techniques, New Trends in Organization Change, Stress Management. Strategic Management: Definition, Classes of Decisions, Levels of Decision, Strategy, Role of different Strategist, Relevance of Strategic Management and its Benefits, Strategic Management in India	8

Suggested Readings:

1. Essential of Management – Horold Koontz and Iteinz Weibrich- McGraw-Hill's International
2. Management Theory & Practice – J.N.Chandan
3. Essential of Business Administration – K.Aswathapa, Himalaya Publishing House
4. Principles & practice of management – Dr. L.M.Prasad,, Sultan Chand & Sons – New Delhi
5. Business Organization & Management – Dr. Y.K.Bhushan
6. Management: Concept and Strategies by J.S. Chandan, Vikas Publishing
7. Principles of Management, By Tripathi, Reddy Tata McGraw Hill

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BCA2305: REMEDIAL MATHEMATICS (Theory)

Course Outcome (CO)

CO1	Describe the Introduction, Polynomial, Rational fractions, Proper and Improper fractions.
CO2	Explain Matrices and Determinant.
CO3	Discuss the Derivative of a function, Derivative of a constant.
CO4	Evaluate the Analytical Geometry.
CO5	Analyze the Introduction, Definition, Properties of Laplace transform.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Partial fraction: Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics. Logarithms: Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems. Function: Real Valued function, Classification of real valued functions. Limits and continuity: Introduction, Limit of a function, Definition of limit of a function ($\epsilon - \delta$ definition), $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}, \quad \lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1.$	8
II	Matrices and Determinant: Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley-Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations.	8
III	Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – Derivative of x^n w.r.t.x, where n is any rational number, Derivative of e^x, Derivative of $\log_e x$, Derivative of a^x. Derivative of trigonometric functions from first principles (without Proof), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application	8

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IV	Analytical Geometry Introduction: Signs of the Coordinates, Distance formula, Straight Line : Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line Integration: Introduction, Definition, Standard formulae, Rules of integration , Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application	8
V	Differential Equations : Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations Laplace Transform : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations	8
<u>Suggested Readings:</u> 1. Differential Calculus by Shanthinarayan 2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H. 3. Integral Calculus by Shanthinarayan 4. Higher Engineering Mathematics by Dr.B.S.Grewal		

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BCA2304: WEB DEVELOPMENT

Course Outcome (CO)

CO1	Know different OS types and basic component of OS Architecture.	
CO2	Analyze issues in process management and evaluations of various scheduling algorithms.	
CO3	Understand process synchronization problem and provide solution for critical section problem and deadlock management.	
CO4	Analyze and implement various memory management techniques.	
CO5	Understand various disk scheduling algorithms and Process Management in Unix.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Introduction to Internet, www, Internet browsers, what is web, Introduction to Client Server Concepts, History of the web, Growth of the web, protocols governing the web, web development strategies, Web applications, web project, web team.	8
II	Web Page Designing: HTML: list, table, images, frames, forms, Cascading Style Sheet (CSS); XML: Introduction to XML, DTD, XML schemes, presenting and using XML.	9
III	Scripting: Introduction to Java script, variables, control structures, looping structures, documents, forms, statements, functions, objects, event and event handling, Arrays; Introduction to VB Script, Fundamental of AJAX.	9
IV	Server Site Programming: Introduction to java server pages (JSP), JSP application design, tomcat server, JSP Life Cycle, JSP Implicit objects, JSP Scripting Elements, declaring variables, and methods, debugging, sharing data between JSP pages, Session, Database with JSP, Introduction to active server pages (ASP), ASP.NET.	8
V	PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form mail, file upload, session, error, exception, filter, PHP-ODBC.	8

Suggested Readings:

Reference Books:

1. Burdman, Jessica, "Collaborative Web Development" Addison Wesley
2. Xavier, C, "Web Technology and Design", New Age International
3. Ivan Bayross, "HTML, DHTML, Java Script, Perl & CGI", BPB Publication
4. Hans Bergsten, "Java Server Pages", SPD O'Reilly
5. Margaret Levine Young, "The Complete Reference Internet", McGraw Hill.
6. Greg Lim, "Beginning Node.js, Express & MongoDB Development", 1 September 2020, Greg Lim
7. Shannon Bradshaw, Eoin Brazil, Kristina Chodorow, "MongoDB: The Definitive Guide, 3rd Edition", December 2019, O'Reilly Media, Inc.

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BCA2310: OOP CONCEPTS USING JAVA

Course Outcome (CO)

CO1	Use of OOPs concepts	
CO2	Classify the conditional control statements, array & concept of string.	
CO3	Use of Packages and Interface in java.	
CO4	Develop and understand exception handling, multithreaded applications with synchronization.	
CO5	Design GUI based applications and develop using AWT & Swing.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Features of the Java Language, JVM, JDK, JRE, Platform Independency, Data type, Variables, types of variables, Operators, types of operators OOPS: Object, Class, Methods & classes, Inheritance, Polymorphism, Overloading, and Overriding of methods, Encapsulation, Abstraction.	8
II	Conditional Control Statements: If statements, if-else, if-else-if statements, break & continue keyword, loops, while loop, do-while loop and for loop. Arrays: Concept of array, initialising and accessing array, types of array. String: string in java, mutable and immutable string, creating string using String Buffer.	8
III	Interface: Introduction, abstract keyword and interface, Multiple inheritances Using interface. Packages: Concept of Package, creating package, Importing packages, Child Packages.	8
IV	Exception Handling: Exceptions & Errors, Types of Exception, Use of the Try, catch, finally, throw, throws in Exception Handling. In-built and User define Exceptions. Multi-Threading: Threads, Needs of Multi-Threaded Programming, How to create your own thread, Thread Life-Cycle, Thread Priorities, Synchronization of Thread.	8
V	GUI Application Development: Introduction to AWT, AWT controls Java Applet, Layout Managers, Menus, Images, Graphics, Event Handling, Swing, Containers, Panes, Frames, Dialogue boxes, working with image controls.	8

Text and Reference Books:

1. The Complete Reference Internet, Margaret Levine Young, TMH, 1999.
2. The Complete Reference JAVA 2, Naughton Schildt, TMH, 5th Edition.
3. Programming in JAVA, E. Balagurusamy E, TMH, 3rd Edition, 2006.
4. Java Black book, Steven Helzner, Dreamtech, 2002

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BCA2313: ORGANIZATIONAL BEHAVIOR

Course Outcome (CO)

CO1	Understanding Individual Behavior
CO2	Analyzing Group Dynamics & Teamwork
CO3	Applying Motivation and Leadership Theory
CO4	Managing Organizational Structure and Change
CO5	Developing HR and Emotional Intelligence Skills

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Unit 1: Foundations of Individual Behaviour, Introduction to OB: Definition, Nature, Scope, and Importance, Personality: Concept, determinants, and types (Big Five Model, Type A & B), Perception: Meaning, Process, and Factors influencing perception (Selective perception, Stereotyping), Attitudes & Values: Components of attitude, Job satisfaction, and the importance of values in a workplace, Learning: Concept and Theories (Classical & Operant Conditioning).	8
II	Unit 2: Motivation and Group Dynamics, Motivation: Concept, Importance, and Theories (Maslow's Hierarchy, Herzberg's Two-Factor Theory, McGregor's Theory X & Y), Group Dynamics: Definition of Group, Types of Groups (Formal vs. Informal), and Stages of Group Development (Tuckman's Model: Forming, Storming, Norming, Performing), Leadership: Meaning, Importance, and Styles (Autocratic, Democratic, Laissez-faire), Communication: Process, Barriers to effective communication, and Role of IT in organizational communication.	8
III	Unit 3: Organizational Culture and Conflict Management, Organizational Culture: Concept, characteristics, and how culture is created and sustained, Organizational Conflict: Sources of conflict, types of conflict, and resolution techniques (Negotiation and Mediation), Organizational Change: Nature of change, Resistance to change, and how to manage change effectively, Stress Management: Causes of stress at the workplace and coping strategies (Individual and Organizational level).	8

Text and Reference Books:

1. Luthans, F. (2017). Organisational Behavior-An evidence based approach. (12th ed.). McGraw-Hill Education.
2. Pareek, U. (2014). Understanding Organisational Behavior. Delhi, India: Oxford University Press.
3. Robbins, S. T., & Judge, T. A. (2019). Essentials of Organizational Behaviour. (14th ed.). London, United Kingdom: Pearson.
4. Singh, A. K., & Singh, B. P. (2007). Organisational Behavior. Delhi, India: Excel Books Pvt. Ltd.
5. Singh, K. (2015). Organisational Behavior: Texts & Cases. (3rd ed.). India: Pearson.

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BCA2370: DATA STRUCTURE USING C LAB		
Course Outcome (CO)		
CO1	Understand and apply fundamental data structures (arrays, stacks, queues, linked lists) using C.	
CO2	Implement non-linear data structures like trees and graphs.	
CO3	Analyze algorithm efficiency using sorting and searching techniques.	
CO4	Solve real-world problems using appropriate data structures.	
CO5	Demonstrate proficiency in memory management and pointer manipulation in C.	
DETAILED SYLLABUS		
S.No.	Topic	Hours
	Arrays and Linked Lists 1. Array Implementation of Stack 2. Array Implementation of Queue 3. Singly Linked List: Creation, Insertion, Deletion 4. Doubly Linked List Operations 5. Circular Linked List Operations Stack and Queue Applications 1. Infix to Postfix Conversion using Stack 2. Postfix Expression Evaluation using Stack 3. Implement Circular Queue using Array and Linked List 4. Palindrome Checker using Stack Trees 1. Binary Tree Creation and Traversals (Inorder, Preorder, Postorder) 2. Binary Search Tree (BST): Insertion, Deletion, Search 3. Find Height/Depth of a Binary Tree 4. Count Leaf Nodes and Non-leaf Nodes in a Tree Searching and Sorting 1. Linear Search and Binary Search 2. Bubble Sort, Insertion Sort, Selection Sort 3. Quick Sort Implementation 4. Merge Sort Implementation Graphs (Optional for Basic Labs) 1. Graph Representation using Adjacency Matrix and List 2. Depth-First Search (DFS) and Breadth-First Search (BFS)	
Suggested Readings: 1. Fundamentals of Data Structures in C, By Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Publisher: University Press 2. Data Structures Using C, By Reema Thareja, Publisher: Oxford University Press 3. Data Structures Using C, By Yashavant Kanetkar, Publisher: BPB Publications 4. Data Structures Through C, By G.S. Baluja, Publisher: Dhanpat Rai Publications 5. Data Structures and Algorithm Analysis in C, By Mark Allen Weiss, Publisher: Pearson Education		

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BCA2377: OOP WITH JAVA LAB

Course Outcome (CO)

CO1	Understand the basics of object-oriented programming using JAVA.	
CO2	Apply the concept of classes, Java, JDK Components and develop Simple Java Programs.	
CO3	Develop Simple Java Programs using inheritance and Exception handling.	
CO4	Develop Multi-threading Programming and Interfaces.	
CO5	Develop GUI applications using Applet classes, Swing components and Event handling programs.	

DETAILED SYLLABUS

S.No.	Topic	Hours
1	Program to define a structure of a basic JAVA program	
2	Program to define the data types, variable, operators, arrays and control structures.	
3	Program to define class and constructors. Demonstrate constructors.	
4	Program to define class, methods and objects. Demonstrate method overloading.	
5	Program to define inheritance and show method overriding.	
6	Program to demonstrate Packages.	
7	Program to demonstrate Exception Handling.	
8	Program to demonstrate Multithreading.	
9	Program to demonstrate I/O operations.	
10	Program to demonstrate Network Programming.	
11	Program to demonstrate Applet structure and event handling.	
12	Program to demonstrate Layout managers.	
13	WAP to demonstrate data types available in java	
14	WAP to design a simple calculator using switch case statement	
15	WAP to print all prime numbers between 1 to	
16	WAP to implement linear search in 1D array.	
17	WAP to implement bubble sort in 1 D array.	
18	WAP to multiply 2 matrices in java.	
19	WAP to implement recursion function in java.	
20	WAP to demonstrate some in-built functions on Strings	
21	WAP to demonstrate concept of Class, Object, and methods in java.	
22	WAP to demonstrate method overloading in java.	
23	WAP to demonstrate inheritance in java.	
24	WAP to demonstrate multiple inheritance using interface.	
25	WAP to demonstrate method over riding in java	
26	WAP to demonstrate exception handling in java	
27	WAP to demonstrate multi-threading in java.	
28	WAP to read, write, append data in files.	
29	WAP to demonstrate database connectivity using JDBC.	
30	WAP to create a Swing Application with JDBC CO4	
31	WAP to design a Menu using Swing in Java.	



BCA2371: WEB DEVELOPMENT LAB

Course Outcome (CO)

CO1	Define the principle of Web page
CO2	Define the basics in web design
CO3	Visualize the basic concept of HTML.
CO4	Recognize the elements of HTML.
CO5	Develop the concept of web publishing

DETAILED SYLLABUS

S.No.	Topic	Hours
	- Develop static pages (using only HTML) of an online Book store. The pages should resemble: www.amazon.com The website should consist the following pages. - Home page, - Registration and user Login, - User profile page, - Books catalog, - Shopping cart, - Payment By credit card, - Order confirmation. - Validate the Registration, user login, user profile and payment by credit card pages using JavaScript. - Design a web page using CSS (Cascading Style Sheets) which includes the following: - Use different font, styles: In the style definition you define how each selector should work (font, color etc.). - Then, in the body of your pages, you refer to these selectors to activate the styles. - Design a web page using CSS (Cascading Style Sheets) which includes the following: - Set a background image for both the page and single elements on the page - Control the repetition of the image with the background-repeat property - Design an HTML page with JavaScript that takes a number from one text field in the range 0-999 and display it in other text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box. - Write a JavaScript code that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt - Develop and demonstrate a HTMLS file that includes JavaScript script that uses functions for the following problems: - Parameter. A string Output: The position in the string of the left-most vowel - Parameter: A number	

Output: The number with its digits in the reverse order

8. Develop a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
9. Develop a PHP program to generate online electricity bill where user provides the input of previous reading and present reading and prepare an electricity bill using the following conditions.

Units Consumed	Rate
<100	Rs 3/Unit
Between 100 and 200	Its 4/Unit
Between 201 and 300	Its 5/Unit
>301	Rs 6 /Unit

10. Design an HTML form to input the salary details of an employee (Employee name, Basic pay, DA and HRA). Write a PHP script to accept user input data and store it in a text file. Write a PHP script to display the contents of the file.
11. Develop a PHP program to implement a session based counter which counts the number of how time does the user view the web page for this create a session variable using PHP. Display the session variable using PHP.
12. Create a PHP program to develop a web application which display the result of the student I which users inputs the marks list of the student and connect to a database and retrieve data from a table and show the details in a neat format
 - a) Mark list of a student is entered and saved to MySQL table using PHP
 - b) Data stored in MySQL table is displayed

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Syllabus

BCA 2nd Year
4th Semester



BCA2401: ADVANCE PYTHON PROGRAMMING

Course Outcome (CO)

CO1	Understand advanced features of Python like file handling, error handling, and OOP.	
CO2	Develop real-world applications using object-oriented concepts.	
CO3	Use Python for database interaction and basic GUI development.	
CO4	Work with advanced modules like NumPy, Pandas, and Matplotlib for data handling and visualization.	
CO5	Implement mini projects and scripts for automation, data processing, or GUI-based apps.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Advanced Python Basics: Review of Python basics (data types, loops, functions), Modules and Packages, File Handling (Text, Binary, CSV), Exception Handling (try, except, else, finally), Working with with statement.	8
II	Object-Oriented Programming: Classes and Objects, __init__() and __str__() methods, Inheritance and Method Overriding, Encapsulation and Polymorphism, Static and Class Methods.	9
III	GUI and Database Programming: Introduction to Tkinter (Basic GUI: Label, Entry, Button), Event handling in GUI, Connecting Python with MySQL using MySQLConnector, CRUD Operations (Create, Read, Update, Delete), Form-based simple database applications.	9
IV	Data Handling and Visualization: Introduction to NumPy (Arrays, Slicing, Indexing), Introduction to Pandas (Series, DataFrames, Import/Export CSV), Data Cleaning and Filtering, Visualization using Matplotlib (Line, Bar, Pie charts).	8
V	Advanced Topics and Mini Projects: Working with JSON and XML, Sending Emails with smtplib, Web Scraping using BeautifulSoup or requests, Mini Projects: Student Information System, Weather App using API, Expense Tracker, Data Plotting Dashboard.	8

Suggested Readings:

Reference Books:

1. "Python Programming" by Reema Thareja – Oxford University Press
2. "Learning Python" by Mark Lutz – O'Reilly Media
3. "Python for Everybody" by Dr. Charles R. Severance – Free eBook
4. "Automate the Boring Stuff with Python" by Al Sweigart – No Starch Press

Online Documentation:

1. <https://docs.python.org/3/>
2. <https://pandas.pydata.org/>
3. <https://matplotlib.org/>

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BCA2413: SOFTWARE ENGINEERING

Course Outcome (CO)

CO1	To apply fundamental software engineering principles.	
CO2	To apply fundamental software engineering practices to real-world scenarios.	
CO3	To compare and contrast different SDLC models.	
CO4	To analyze user needs and translate into clear, concise, and measurable requirements.	
CO5	To apply fundamental project management principles.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction of Software Engineering ,Software Development Life Cycle, Software Process Introduction, S/W Engineering Paradigm life cycle models: waterfall, incremental, spiral, win-win spiral, Agile, evolutionary, prototyping , Object-Oriented life cycle models-system engineering , computer-based system, life cycle process, development process.	8
II	Requirements Software Requirements: Functional & non-functional ,user- system requirement engineering process , feasibility studies , elicitation, validation & management , software prototyping ,S/W documentation, Analysis and modeling, Case Tools.	8
III	Design: Design Concepts and Principles Modular design, design heuristic, Software architecture, data design, architectural design, transform & transaction mapping, Introduction to SCM process, Software Configuration Items.	8
IV	Testing, Software Testing Taxonomy of Software testing, levels , black box testing, testing boundary conditions ,structural testing ,regression testing, Software testing strategies, unit testing, integration testing ,validation testing, system testing and debugging , Traceability matrix.	8
V	Software Project Management Software cost estimation, Function point models, COCOMO model, Project Scheduling-Delphi method, Software challenges, and Software Maintenance, Reliability, Reliability and availability models.	8

Reference Books:

1. Roger S.Pressman, Software Engineering- A practitioner's Approach, McGraw-Hill
2. Ian Sommerville, Software engineering, Pearson education Asia
3. Pankaj Jalote, Software Engineering – A Precise Approach Wiley
4. Behhforoz & Frederick Hudson, Software Engineering Fundamentals, OXFORD
5. Rajib Mall, Fundamentals of software Engineering, Prentice Hall of India.
6. Deepak Gaikwad, Viral Thakkar, DevOps Tools from Practitioner's ViewPoint, Wiley
7. Merlin Dorfman (Editor), Richard H. Thayer (Editor) ,Software Engineering
8. Robert C. "Uncle Bob" Martin, Clean Architecture: A Craftsman's Guide to Software Structure and Design.

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BCA2403: OPERATING SYSTEMS

Course Outcome (CO)

CO1	Define the principle of Web page
CO2	Define the basics in web design
CO3	Visualize the basic concept of HTML.
CO4	Recognize the elements of HTML.
CO5	Develop the concept of web publishing

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Definition and types of Operating systems, Batch Systems, Multiprogramming, Time Sharing, Parallel, Distributed and Real-Time Systems, Operating System Structure, Operating System Components and Services, System Calls, System Programs, Virtual Machines.	8
II	Process Management: Process Concept, Process Scheduling, Cooperating Processes, Threads, Interprocess Communication, CPU Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling and Algorithm evaluation.	9
III	Process Synchronization and Deadlocks: The Critical-Section Problem, Synchronization Hardware, Semaphores Classical Problems of Synchronization, Critical Regions, Monitors, Deadlocks-System Model, Characterization, Deadlock Prevention, Avoidance and Detection, Recovery from Deadlock, Combined approach to Deadlock Handling.	9
IV	Memory Management: Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with Paging, Virtual Memory, Demand Paging and its performance, Page Replacement Algorithms, Allocation of Frames, Thrashing, Page Size and other considerations, Demand Segmentation.	8
V	Disk Scheduling and Process Management in UNIX: File concept, Access methods, Directory Structure, Disk scheduling, UNIX overview, Processes in UNIX, Process Fundamentals, Creating a New Process, Parent Child Process, Connecting Processes with Pipes, Background Process, Managing Multiple Processes, Process Related Commands, Changing Process Priority. Process Scheduling: Scheduling of Processes, Process Daemon, And Process Scheduling Commands.	8

Suggested Readings:

Reference Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne "Operating System Concepts", 9th Edition, Wiley 2018
2. D M Dhamdhare, "Operating Systems: A Concept-Based Approach", 3rd edition, McGraw Hill Education, 2017
3. Thomas Anderson and Michael Dahlin, "Operating Systems: Principles and Practice", 2014
4. William Stallings, "Operating Systems: Internals and Design Principles", 7e (Old Edition), Pearson Education India, 2013
5. Gary J Nutt, "Operating Systems: A Modern Perspective". 1997.

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BCA2414: DIGITAL ELECTRONICS		
Course Outcome (CO)		
CO1	Examine the structure of various number systems and its application in digital design.	
CO2	Classify the fundamental concepts and techniques used in digital electronics.	
CO3	Ability to understand, analyze and design various combinational and sequential circuits.	
CO4	Describe the memory management techniques	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Number systems : Binary number system, Octal & Hexa-decimal number system, Conversion of Number System, r 's & $(r-1)$'s complement, Arithmetic operation on Binary numbers, Codes-ASCII, EBCDIC codes, Gray code, Excess-3 & BCD Code, Weighted Binary Codes, non-weighted Codes, Error Detecting Codes, Error Correcting Codes, Alphanumeric Codes.	8
II	Logic Gates : AND, OR, NOT GATES and their Truth tables, NOR, NAND & XOR gates, Boolean Operations: AND, OR, Inversion, Boolean algebra, Basic Boolean Law's, Demorgan's theorem, Minimization techniques: K -Map, Sum of Product & Product of Sum combinational circuit design, Gray to binary code conversion circuits, binary to Gray code conversion circuit.	8
III	Combinational circuits : Multiplexers, Demultiplexers, Decoders, 5x32 Decoders & Encoders, seven segment decoder, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Full Adder to Full Subtractor, Implementation of Boolean expression through Decoder and Multiplexer. NAND AND NOR implementation of Adder and Subtractor.	8
IV	Memory Organization : Memory Hierarchy, Main Memory: RAM & ROM chips, Memory Address Map, Auxiliary memory: Magnetic Disks, Magnetic Tape, Associative Memory, Cache memory, Virtual Memory, Introduction to memory management hardware.	8
V	I/O Interface : I/O bus and interface modules, Asynchronous data transfer: Strobe control, Hand Shaking, Modes of transfer: Programmed I/O, Interrupt initiated I/O, DMA, Interrupts & Interrupt handling, Direct Memory access: DMA Controller and DMA Transfer.	8
Suggested Readings: 1. Mano Morris, Digital Logic, Prentice Hall of India. 2. Stallings, Computer Organization, Prentice Hall of India. 3. Mano M., Computer System Architecture, Prentice Hall of India. 4. Tannenbaum, Structured Computer Organization, Prentice Hall of India. 5. Hayes John P., Computer Organization, McGraw Hill. 6. Digital Electronics (TMH) 1998 : Malvino and Leach		

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BCA2415: ORGANIZATIONAL BEHAVIOR		
Course Outcome (CO)		
CO1	Understanding Individual Behavior	
CO2	Analyzing Group Dynamics & Teamwork	
CO3	Applying Motivation and Leadership Theory	
CO4	Managing Organizational Structure and Change	
CO5	Developing HR and Emotional Intelligence Skills	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Unit 1: Foundations of Individual Behaviour, Introduction to OB: Definition, Nature, Scope, and Importance, Personality: Concept, determinants, and types (Big Five Model, Type A & B), Perception: Meaning, Process, and Factors influencing perception (Selective perception, Stereotyping), Attitudes & Values: Components of attitude, Job satisfaction, and the importance of values in a workplace, Learning: Concept and Theories (Classical & Operant Conditioning).	8
II	Unit 2: Motivation and Group Dynamics, Motivation: Concept, Importance, and Theories (Maslow's Hierarchy, Herzberg's Two-Factor Theory, McGregor's Theory X & Y), Group Dynamics: Definition of Group, Types of Groups (Formal vs. Informal), and Stages of Group Development (Tuckman's Model: Forming, Storming, Norming, Performing), Leadership: Meaning, Importance, and Styles (Autocratic, Democratic, Laissez-faire), Communication: Process, Barriers to effective communication, and Role of IT in organizational communication.	8
III	Unit 3: Organizational Culture and Conflict Management, Organizational Culture: Concept, characteristics, and how culture is created and sustained, Organizational Conflict: Sources of conflict, types of conflict, and resolution techniques (Negotiation and Mediation), Organizational Change: Nature of change, Resistance to change, and how to manage change effectively, Stress Management: Causes of stress at the workplace and coping strategies (Individual and Organizational level).	8
Text and Reference Books:		
6. Luthans, F. (2017). Organisational Behavior-An evidence based approach. (12th ed.). McGraw-Hill Education. 7. Pareek, U. (2014). Understanding Organisational Behavior. Delhi, India: Oxford University Press. 8. Robbins, S. T., & Judge, T. A. (2019). Essentials of Organizational Behaviour. (14th ed.). London, United Kingdom: Pearson. 9. Singh, A. K., & Singh, B. P. (2007). Organisational Behavior. Delhi, India: Excel Books Pvt. Ltd. 10. Singh, K. (2015). Organisational Behavior: Texts & Cases. (3rd ed.). India: Pearson.		

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BCA2471: ADVANCED PYTHON PROGRAMMING LAB

Course Outcome (CO)

CO1	Apply advanced Python concepts such as decorators, generators, and exception handling.	
CO2	Design object-oriented programs using encapsulation, inheritance, and polymorphism.	
CO3	Handle, analyze, and visualize data using Python libraries like pandas and matplotlib.	
CO4	Develop web applications and perform database interactions using Python frameworks.	
CO5	Implement multithreaded applications and network communication using Python.	
CO6	Build end-to-end projects demonstrating real-world problem-solving using Python.	

DETAILED SYLLABUS

S.No.	Topic	Hours
	Advanced Python Concepts 1. Implement a program using decorators and generators. 2. Program to demonstrate file handling (read, write, append in text and binary files). 3. Implement exception handling with custom exceptions. Object-Oriented Programming 1. Create classes with inheritance, polymorphism, and encapsulation. 2. Use of abstract classes and interfaces via abc module. Data Handling and Visualization 1. Read/write CSV and Excel files using pandas. 2. Data visualization using matplotlib and seaborn. 3. Implement basic data analysis: descriptive stats, filtering, and grouping. Web and Database Applications 1. Create a simple Flask web application with HTML templates. 2. Implement database CRUD operations using sqlite3 or SQLAlchemy. Multithreading and Networking 1. Demonstrate multithreading with thread synchronization. 2. Build a simple TCP/UDP client-server chat application using socket. 3. Implement a web scraper using BeautifulSoup or Scrapy. 4. Create a GUI application using tkinter or PyQt. 5. Mini-project: Choose any domain (e.g., data analysis, automation, web) to build a complete Python application.	

Suggested Readings:

1. "Learning Python" by Mark Lutz – O'Reilly Media.
2. "Fluent Python" by Luciano Ramalho – O'Reilly Media.
3. "Python Cookbook" by David Beazley and Brian K. Jones – O'Reilly Media.
4. "Python for Data Analysis" by Wes McKinney – O'Reilly Media.
5. "Automate the Boring Stuff with Python" by Al Sweigart – No Starch Press.
6. "Core Python Programming" by Wesley J. Chun – Prentice Hall.
7. Online Documentation: Python Official Docs

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BCA2472: OPERATING SYSTEMS LAB

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	WEEK 1: Practice File handling utilities, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities. WEEK 2: Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or directory and reports accordingly. Whenever the argument is a file it reports no of lines present in it. WEEK 3: Simulate the following CPU scheduling algorithms. a)FCFS b) SJF c) Round Robin d) Priority. WEEK 4: Simulate Bankers Algorithm for Dead Lock Avoidance; Simulate Bankers Algorithm for Dead Lock Prevention. WEEK 5: a) Write a C program to simulate the concept of Dining-philosophers problem. b)Write a C program to simulate producer-consumer problem using Semaphores WEEK 6: a) Write a C program to implement kill(), raise() and sleep()functions. b) Write a C program to implement alarm(), pause() and abort()functions c) Write a program that illustrate communication between two process using unnamed pipes WEEK 7: a) Write a program that illustrates communication between two process using named pipes or FIFO. b) Write a C program that receives a message from message queue and display them. WEEK 8: Write a C program that illustrates two processes communicating using Shared memory. WEEK 9: Simulate all page replacement algorithms a) FIFO b) LRU c) OPTIMAL WEEK 10: Write a C program that takes one or more file/directory names as command line input and reports following information A) File Type B) Number Of Links C) Time of last Access D) Read, write and execute permissions WEEK 11 a) Implement in c language the following UNIX commands using system calls i) cat ii) ls iii) Scanning Directories (Ex: opendir(), readdir(),etc.) b) Write a C program to create child process and allow parent process to display "parent" and the child to display "child" on the screen WEEK 12: Write a C program to simulate disk scheduling algorithms. a) FCFS b) SCAN c) C-SCAN	8

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BCA2478: DIGITAL ELECTRONICS LAB

Course Outcome (CO)

CO1	Understand and implement basic logic gates and Boolean algebra simplification.	
CO2	Design combinational circuits like adders, subtractors, multiplexers, etc.	
CO3	Design and analyze sequential circuits including flip-flops and counters.	
CO4	Utilize simulation tools for design and verification of digital circuits.	
CO5	Demonstrate practical skills in handling digital ICs and designing real-time circuits.	

DETAILED SYLLABUS

S.No.	Topic	Hours
	Verification of Basic Gates - Implement AND, OR, NOT, NAND, NOR, XOR, XNOR using ICs and truth tables. Implementation of Boolean Expressions - Simplify expressions using Karnaugh Maps and implement circuits. Half Adder and Full Adder / Subtractor - Design and implement using logic gates. 4-bit Binary Adder using IC 7483 - Understand and use parallel adders. Multiplexer and Demultiplexer - Implement 4:1 MUX and 1:4 DEMUX using ICs or gates. Decoder and Encoder Circuits - Realize 3:8 decoder and 8:3 encoder. BCD to 7-Segment Display Decoder - Interfacing BCD to 7-segment display using IC 7447. Flip-Flops (SR, JK, D, T) - Design and verify flip-flop behavior using ICs. Shift Registers (SIPO, PISO, SISO, PIPO) - Design and implementation using IC 7495 or similar. Asynchronous Counters 2-bit/3-bit ripple counters using T Flip-Flops. Synchronous Counters 3-bit up/down counters using JK Flip-Flops. Ring Counter and Johnson Counter - Implementation and analysis. Universal Shift Register - Implement 4-bit register with control on shift directions. Simulation-Based Experiments (Optional) - Design and simulate circuits using Logisim or Proteus.	

Suggested Readings:

1. "Morris Mano – Digital Logic and Computer Design, Pearson Education.
2. R.P. Jain – Modern Digital Electronics, Tata McGraw-Hill.
3. Thomas L. Floyd – Digital Fundamentals, Pearson Education.
4. Anand Kumar – Fundamentals of Digital Circuits, PHI Learning.
5. Charles Roth & Larry Kinney – Fundamentals of Logic Design, Cengage Learning.



BCA2412: INTRODUCTION TO AI AND ML (EL)

Course Outcome (CO)

CO1	Explain the concepts and types of artificial intelligence.	
CO2	Illustrate basic machine learning methods for regression, classification and clustering.	
CO3	Identify real-world applications across different disciplines.	
CO4	Make use of prompt engineering techniques to interact with generative AI tools.	
CO5	Outline recent trends in artificial intelligence and machine learning.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work? Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Is Artificial Intelligence Same as Augmented Intelligence and Cognitive Computing, Machine Learning and Deep Learning.	8
II	Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search).	8
III	Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.	8
IV	Machine Learning: Techniques in AI, Machine Learning Model, Regression Analysis in Machine Learning, Classification Techniques, Clustering Techniques, Naïve Bayes Classification, Neural Network, Support Vector Machine (SVM).	8
V	Trends in AI: AI and Ethical Concerns, AI as a Service (AIaaS), Recent trends in AI, Expert System, Internet of Things, Artificial Intelligence of Things (AIoT).	8

Suggested Readings:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach (4th Edition), Pearson Education, 2023.
2. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, Artificial Intelligence, McGraw Hill Education.
3. Tom Taulli, Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond, Apress, Springer Nature.
4. Nilakshi Jain, Artificial Intelligence: Making A System Intelligent, First Edition, Wiley.

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BCA2406: DATA WAREHOUSING AND DATA MINING (EL)		
Course Outcome (CO)		
CO1	To understand the principles of Data warehousing and Data Mining.	
CO2	To be familiar with the Data warehouse architecture and its Implementation.	
CO3	To know the Architecture of a Data Mining system.	
CO4	To understand the various Data preprocessing Methods.	
CO5	To perform classification and prediction of data.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.	8
II	Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture of A Typical Data Mining Systems- Classification of Data Mining Systems. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.	8
III	Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.	8
IV	Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.	8
V	Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.	8
Suggested Readings:		
1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007. 2. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006. 3. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006. 4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.		

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BCA2407: DATA COMPRESSION AND MULTIMEDIA SYSTEMS (EL)

Course Outcome (CO)

CO1	Describe and apply various techniques for text compression and also evaluate performance of the coding techniques.	
CO2	Define the operation of scalar and vector quantizer.	
CO3	Differentiate lossless and lossy image and video compression techniques and standards.	
CO4	Developed understanding of technical aspect of multimedia systems.	
CO5	Contrast the various file formats for audio, video and text media.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression. Introduction to Information Theory and Models: Physical models, Probability models, Markov models.	8
II	Huffman Coding Algorithms: Minimum variance Huffman codes. Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure, Applications of Huffman coding.	8
III	Arithmetic Coding, Scalar and Vector Quantization: Arithmetic Coding: Coding a sequence, Generating a Binary code, Comparison of Arithmetic and Huffman coding. Dictionary based compression techniques Static Dictionary: Diagram Coding, Adaptive Dictionary, The LZ77, LZ78 and LZW Approach. Concept of Vector Quantization Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo Gray Algorithm. Image compression Techniques	8
IV	Introduction to Multimedia: Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work, Convergence of Computer, Communication and Entertainment products. Stages of Multimedia Projects, Multimedia software's, presentation tools, Tools for object generations, Video, Sound, Image capturing, Authoring tools.	8
V	Multimedia Building Blocks: Text, Graphics and Image Data Representations: Popular File Formats, Sound MIDI, Digital Audio, Audio file formats, MIDI under windows environment, Multimedia Network Communications and Applications. Virtual Reality: Intelligent multimedia system, Desktop Virtual Reality (VR). VR operating System.	8

Suggested Readings:

1. Khalid Sayood, "Introduction to Data Compression", Morgan Kaufmann Publishers.
2. David Salomon, "Data Compression: The Complete Reference", Springer.
3. Buford, "Multimedia Systems", Addison Wesley.
4. Sleinreitz, "Multimedia System", Addison Wesley.
5. Fundamentals of Multimedia, Ze-Nian Li and Mark S. Drew School of Computing Science Simon Fraser University, Pearson Education International, ISBN 0-13-127256-X

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Syllabus

BCA 3rd Year
5th Semester



BCA3501: MACHINE LEARNING FUNDAMENTAL

Course Outcome (CO)

CO1	Develop and apply classification algorithms to classify multivariate data.	
CO2	Apply learning algorithms for finding relationships between data variables.	
CO3	Develop and apply reinforcement learning algorithms for learning to control complex systems.	
CO4	Discuss the Scientific reports on computational machine learning methods, results and conclusions.	
CO5	Implement the clustering algorithms to real time problems.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	BASICS: Learning Problems, Perspectives and Issues, Concept Learning, Find-S, Version Spaces and Candidate Eliminations, Inductive bias.	8
II	DECISION TREE & NEURAL NETWORKS: Decision Tree Learning - Introduction, Decision tree representation, appropriate problems, ID3 algorithm. Neural Network Representation Problems, Perceptions Multilayer Networks and Back Propagation Algorithms,	9
III	BAYESIAN AND COMPUTATIONAL LEARNING: Bayes Theorem, Concept Learning Maximum, Likelihood Minimum Description Length, Principle Bayes Optimal Classifier, Gibbs Algorithm, Naïve, Bayes Classifier, Bayesian Belief Network, EM Algorithm, Probability Learning.	10
IV	INSTANT BASED LEARNING: K- Nearest Neighbour Learning, Locally weighted Regression Radial, Bases Functions, Case Based Learning.	9
V	CLUSTERING: Overview- Types of clustering, Types of clusters, K-Means, Agglomerative Hierarchical, Clustering, Density-Based Clustering, Graph-Based Clustering, Cluster evaluation.	9

Suggested Readings:

1. S. Shalev-Shwartz, S.Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2nd Edition, 2018.
3. Duda, Richard, Peter Hart, and David Stork, "Pattern Classification," 2nd Edition, John Wiley & Sons, Hoboken, 2000.
4. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.

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BCA3502: COMPUTER ORGANIZATION ARCHITECTURE
Course Outcome (CO)

CO1	Identify various components of computer and their interconnection	
CO2	Identify basic components and design of the CPU: the ALU and control unit	
CO3	Compare and select various Memory devices as per requirement.	
CO4	Compare various types of IO mapping techniques	
CO5	Critique the performance issues of cache memory and virtual memory	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	UNIT - I: STRUCTURE OF COMPUTERS: Computer types, Functional units, Basic operational concepts, Von Neumann Architecture, Bus Structures, Software, Performance, Multiprocessors and Multicomputer, Data representation, Fixed and Floating point, Error detection and correction codes. COMPUTER ARITHMETIC: Addition and Subtraction, Multiplication and Division algorithms, Floating-point Arithmetic Operations, Decimal arithmetic operations.	8
II	UNIT - II: BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction codes, Computer Registers, Computer Instructions and Instruction cycle. Timing and Control, Memory-Reference Instructions, Input-Output and interrupt. Central processing unit: Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs RISC	9
III	UNIT - III: REGISTER TRANSFER AND MICRO-OPERATIONS: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logic shift unit. MICRO-PROGRAMMED CONTROL: Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit.	9
IV	UNIT - IV: MEMORY SYSTEM: Memory Hierarchy, Semiconductor Memories, RAM(Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations, Virtual memory, Paging, Secondary Storage, RAID.	8
V	UNIT - V INPUT OUTPUT: I/O interface, Programmed IO, Memory Mapped IO, Interrupt Driven IO, DMA. MULTIPROCESSORS: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization, Cache Coherence.	8

Suggested Readings:

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India.
2. William Stallings (2010), Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersey
3. Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, Pearson Education Inc,
4. John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGrawHill

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BCA3515: CLOUD COMPUTING

Course Outcome (CO)

CO1	Classify the concepts, applications, principles and implementation of cloud computing.	
CO2	Define the Cloud Computing Architecture, Cloud Virtualization, Cloud Programming Models, Cloud security and applications.	
CO3	Explain the theoretical concepts but also strongly focuses on practical skill-based learning.	
CO4	Designing, implementing and managing the issues of cloud computing in their personal as well professional life.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Cloud Computing: Overview of Cloud Computing, Evolution of Cloud Computing, Characteristics of Cloud Computing, Types of cloud and its Cloud services, Benefits and challenges of cloud computing, Applications cloud computing, Cloud Storage, Cloud services requirements, Cloud and dynamic infrastructure, Cloud adoption.	8
II	Cloud Computing Architecture: Cloud reference model, Platform as service, Software as a service, Infrastructure as service, Cloud deployment models, public clouds, Private clouds, Community cloud, Hybrid clouds, Cloud design and implementation using SOA, security, trust and privacy.	8
III	Cloud Virtualization Technology: Overview of Virtualization techniques, Types of Virtualizations, Implementation Levels of Virtualization Structures, Virtualization benefits, Server virtualization, hypervisor management software, virtual infrastructure requirements	8
IV	Map Reduce: Introduction to parallel computing, Map-reduce model, Applications of map reduce, Parallel efficiency of Map Reduce, MapReduce infrastructure, Introduction to Security, Cloud Security challenges and Risks, Software-as-a-Service Security Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control.	8
V	Cloud platforms and applications: Web services, App Engine, Azures Platform, Aneka, Open challenges, Scientific applications, Business and Consumer applications	8

Suggested Readings:

1. Dr. Kumar Saurabh, Cloud Computing
2. Raj Kumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing.

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BCA3504: MOBILE APPLICATION DEVELOPMENT

Course Outcome (CO)

CO1	Understand mobile application development fundamentals and platforms.	
CO2	Design and develop user-friendly mobile applications using Android/iOS.	
CO3	Work with UI/UX design, multimedia, and databases in mobile applications.	
CO4	Integrate networking, sensors, and third-party APIs.	
CO5	Deploy, test, and publish mobile applications on app stores	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Mobile Application Development: Evolution of mobile computing, Mobile platforms: Android, iOS, Hybrid frameworks (React Native, Flutter), Mobile app development process and architecture, Setting up the development environment (Android Studio, Xcode), Basic programming concepts (Java/Kotlin for Android, Swift for iOS)	8
II	User Interface (UI) and User Experience (UX) Design: UI components: Views, Layouts, Widgets, Menus, Activity lifecycle and navigation, Event handling and touch gestures, Material design principles and themes, Fragments and multi-screen support, Introduction to responsive UI with Jetpack Compose (Android)	8
III	Data Handling and Storage: Shared Preferences and SQLite database, Room Database (Android) and Core Data (iOS), File handling and internal/external storage, Working with Web APIs (RESTful APIs, JSON, Retrofit, Volley), Firebase Realtime Database and Cloud Firestore	8
IV	Advanced Features and Integration: Working with sensors (GPS, accelerometer, gyroscope), Multimedia handling (camera, audio, video), Networking and Bluetooth communication, Notifications and background tasks (WorkManager, Services), Third-party API integration (Google Maps, Payment Gateway, Social Media)	8
V	Deployment, Testing, and Security: App testing strategies (Unit Testing, UI Testing, Espresso), App security: Permissions, Secure Data Storage, Encryption, Performance optimization techniques, Publishing apps on Google Play Store and Apple App Store, Introduction to DevOps for mobile applications (CI/CD pipelines)	8

Suggested Readings:

1. "Android Programming: The Big Nerd Ranch Guide" – Bill Phillips, Chris Stewart
2. "Professional Android" – Reto Meier
3. "iOS Programming: The Big Nerd Ranch Guide" – Christian Keur, Aaron Hillegass
4. "Kotlin for Android Developers" – Antonio Leiva
5. "Flutter for Beginners" – Alessandro Biessek

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BCA3518: PROFESSIONAL COMMUNICATION

Course Outcome (CO)

CO1	Become confident of speaking in English impeccably and with utmost enthusiasm.	
CO2	Be familiar with different styles of communication	
CO3	Practice different types of communication and successfully confront the different barriers of communication.	
CO4	Involve in conversations without fear, shy and apprehension and become more self-confident and develop strong determination.	
CO5	Understand and practice interview etiquettes and socialize with ease and comfort.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Unit 1: Fundamentals of Communication (The Basics), Nature & Process: (Process Model), Types of Communication: Verbal (Oral/Written) vs Non-Verbal (Body Language, Gestures, Eye Contact), Barriers: Physical, Semantic, Psychological, 7 C's of Effective Communication: Clarity, Conciseness, Concrete, Correctness, Consideration, Completeness, Courtesy.	8
II	Unit 2: Written Business Communication (Documentation), Business Letters: Internal Communication: Memos, Circulars, Notices, and Agenda/Minutes of Meeting, Technical Writing: Email Etiquette:	8
III	Unit 3: Oral & Presentation Skills (Speaking), Public Speaking: PPT Presentations, Group Discussion (GD): (Leadership skills), Meetings & Conferences:	8
IV	Unit 4: Employment Communication (Career Readiness), Job Interviews, Professional Grooming: (Corporate Etiquette),	8
V	Unit 5: Grammar & Vocabulary (Foundational), Applied Grammar: Parts of Speech, Tenses, Active/Passive Voice, Direct/Indirect Speech	8

Suggested Readings:

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning PLtd
2. Business Correspondence and Report Writing by Prof. R.C., Sharma & Krishna Mohan, TMH
3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.
4. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd.
5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
6. English Grammar and Usage by R.P. Sinha, Oxford University Press, 2005, New Delhi.
7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.



BCA3572: MOBILE APPLICATION DEVELOPMENT LAB

Course Outcome (CO)

CO1	Understand principles and best practices of mobile application development using flutter framework	
CO2	Develop cross-platform (iOS and Android) mobile application development using the Flutter framework	
CO3	Explore concepts such as stateful and stateless widgets; material design; themes; assets; text input; gestures; retrieving local and real-time data	
CO4	Employ best practices for developing mobile applications	
CO5	Develop multimedia applications in Android	

DETAILED SYLLABUS

S.No.	Topic	Hours
	Installation of Dart ID: • Installation of Dart IDE and Writing Dart Program Simple App Design: • Create a Pizza Order Program Simple App Design: • Create a Small Overtime Payment Program Create Flutter App: • Create a Simple Flutter App Develop Restaurant Menu: • Create a Restaurant Menu Develop App with Navigation: • Navigation and Routing a Pizza Store App Develop Flutter App with features: • Create a Flutter App using BottomNavigationBar Navigation Technique Develop E-AppCommerce: • Creating a Hotel Reservation App Create User Profile Interface: • Create a User Profile Interface using Firebase	

Suggested Readings:

1. Subhash Chandra Shukla, "Flutter zero to hero edition - 2023", Splendid Coder
2. Marco L. Napoli, "Beginning Flutter", Wrox publication
3. Livre Books, "Flutter A Complete Book For Mobile App Development", Livre Books

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BCA3573: MINOR PROJECT

Course Outcome (CO)

CO1	Identify project/research problems; understand information and grasp meaning; translate knowledge into new context; use information, methods, concepts, and theories of fundamental topics in computer science in new situations (Knowledge, Comprehension);	
CO2	Apply computer science principles and practices to a real-world problem; demonstrate in-depth knowledge in the area of the project they have undertaken; solve problems using required knowledge and skills; implement and test solutions/algorithms (Application and Evaluation);	
CO3	Identify potential solutions/algorithms for the project problem; see patterns and modularize the problem, recognize hidden meanings and identify components, show proficiency in software engineering principles (Analysis);	
CO4	Apply a software development methodology currently practiced in industry to produce software system in a rigorous and systematic way using different software life cycle phases (specification, architecture, design, implementation, validation, documentation) (Synthesis);	
CO5	Show evidence (group collaboration, regular meetings, email communications, significant knowledge and skills contributions, etc.) of working productively as an individual and in a team on a project that produces a significant software product (Team Work);	
CO6	Show evidence of competency in oral and written communications skills through oral presentations (project presentation, department seminar or conferences, client interactions), technical reports and/or published research papers in conferences and/or journals (Communications);	
CO7	Use modern techniques, skills and tools necessary for computer science practices relevant to the project they undertake; use techniques in recent research papers to solve problems (Lifelong Learning).	

DETAILED SYLLABUS

Sr. N	Topic	Hours
	LAB: Besides completing the subject/Lab assignments, the students will be required to complete one mini project as follows: MINI-PROJECT in VB, VC++ or Java under Linux(UNIX)/Windows In addition to completing Mini-Project, the students will be doing the exercises provided by the respective teachers in their class rooms. The individual teachers who are teaching the courses will be responsible for completing their respective lab assignments.	

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	Some of the representative areas/problems may include the following:	
	Developing Window Based Applications using recent technologies using .NET Platform or Java Technologies like Java Servlet, Java Beans, COM, CORBA etc.	
	Students should learn languages such as PROLOG or LISP to solve the Laboratory exercises.	
	An expert system shell such as IITM rule be used to create a small expert system for, say, troubleshooting moped, VCR etc. Some suggested experiments are : Tour of India, Stable marriage problem, Game playing (such as bridge), coin change problem etc.	

Suggested Readings:

1. Robert Lafore, "Object Oriented Programming in C++", Pearson
2. R. Brown, "Visual Basic .NET – Your Visual Blueprint for Building Versatile Programs on the .NET Framework", Wiley Publishing, Inc.
3. Ivan Bayross, "Oracle", BPB
4. E.N. Mackay, "Developing user Interfaces for Windows", WP Publishers & Distributors Pvt. Ltd.

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BCA3505: SOCIAL MEDIA ANALYTICS (EL)		
Course Outcome (CO)		
CO1	To define concept of social media and social media analytics.	
CO2	Understand Network fundamentals, models and making connections.	
CO3	To understand the web analytics tools and techniques.	
CO4	To understand the Facebook Analytics & Network analysis.	
CO5	To know about the Applications in Advertising and Game Analytics.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction to Social Media Analytics (SMA): Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas.	8
II	Network fundamentals and models: The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization. Making connections: Link analysis. Random graphs and network evolution. Social Contexts: Affiliation and identity.	8
III	Web analytics tools and techniques: Click stream analysis, A/B testing, online surveys, Use of Google Analytics; Web crawling and Indexing; Natural Language Processing Techniques for Micro-text Analysis. LinkedIn Analytics: An overview of LinkedIn, Benefits of LinkedIn Network, Building connections of LinkedIn, Using LinkedIn for analytics.	8
IV	Facebook Analytics: Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on FB, Use of Facebook Business Manager; Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis. (LinkedIn, Instagram, YouTube Twitter etc.	8
V	Processing and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification. Applications in Advertising and Game Analytics (Use of tools like Unity3D / PyCharm). Introduction to Python Programming, Collecting and analyzing social media data; visualization and exploration.	8
Suggested Readings: 1. Mathew Ganis, Avinash Koitrkar , Social Media Analytics , IBM Press , 2015 / 1st. 2. Jim Sterne, Social Media Metrics, Wiley ,Latest. 3. Oliver Blanchard ,Social Media ROI ,Que Publishing ,Latest. 4. Marshall Sponder, Gorah F. Khan ,Digital Analytics for Marketing ,Routledge ,2017 / 1st. 5. Tracy L. Tuten, Michael R. Solomon ,Social Media Marketing ,Sage ,2018 / 3rd. 6. Gohar F. Khan ,Creating Value With Social Media Analytics ,CreateSpace Independent, Publishing ,2018.		

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BCA3506: BIG DATA ANALYTICS (EL)

Course Outcome (CO)

CO1	Define the Big Data and its analytics in the real world	
CO2	Contrast the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics	
CO3	Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm	
CO4	Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence.	8
II	Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharing, master-slave replication, peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.	8
III	Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures.	8
IV	MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats.	8
V	Hbase, data model and implementations, Hbase clients, Hbase examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration. Hive, data types and file formats, Hive QL data definition, Hive QL data manipulation, Hive QL queries.	8

Suggested Readings:

1. Seema Acharya, Subhashini Chellappan, "Big Data Analytics", 1st Edition, Wiley, 2015.
2. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions".
3. Chris Eaton, Dirk Deroos et. al., "Understanding Big data", Indian Edition, McGraw Hill, 4. Tom White, "HADOOP: The definitive Guide", 3rd Edition, O Reilly, 2012.

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BCA3507: NATURAL LANGUAGE PROCESSING (EL)

Course Outcome (CO)

CO1	Understand the fundamental concepts and applications of Speech and NLP.	
CO2	Apply syntactic and parsing techniques to analyze sentence structures.	
CO3	Perform semantic and pragmatic analysis on natural language data.	
CO4	Demonstrate knowledge of speech signal processing and recognition systems.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Natural Language Processing (NLP): Basics of NLP: Definition, scope, applications. NLP tasks: Tokenization, stemming, lemmatization. Language models: N-gram models, smoothing techniques. Part-of-Speech (POS) tagging: Rule-based, stochastic, HMM-based methods. Morphology and syntax: Word structure, sentence structure.	8
II	Syntax and Parsing Techniques: Context-Free Grammars (CFG). Parsing algorithms: Top-down, bottom-up, CYK, Earley parser. Dependency parsing. Feature structures and unification. Probabilistic CFG (PCFG).	8
III	Semantics and Pragmatics: Semantic analysis: Meaning representation (First-order logic, semantic roles). Lexical semantics: Word sense disambiguation (WSD), thesauri (WordNet). Pragmatics: Discourse analysis, co-reference resolution. Ambiguity resolution. Dialogue systems and Natural Language Generation (NLG).	8
IV	Speech Processing: Introduction to speech signals: Phonetics, phonology. Speech production and perception. Speech signal processing: Sampling, feature extraction (MFCC, LPC). Speech recognition: Acoustic modeling, language modeling, Hidden Markov Models (HMM), ASR systems. Text-to-Speech (TTS) synthesis.	8
V	Applications and Advanced Topics: Information Retrieval (IR), Question Answering (QA). Sentiment Analysis, Text Classification. Machine Translation (MT): Statistical MT, Neural MT. Recent trends: Deep Learning in NLP, Transformers, BERT, GPT. NLP tools: NLTK, SpaCy, Stanford NLP.	8

Suggested Readings:

1. Daniel Jurafsky & James H. Martin, Speech and Language Processing, 3rd Edition (Draft), Pearson Education.
2. Christopher D. Manning, Hinrich Schütze, Foundations of Statistical Natural Language Processing, MIT Press.
3. Steven Bird, Ewan Klein, and Edward Loper, Natural Language Processing with Python, O'Reilly Media.
4. Lawrence Rabiner and Biing-Hwang Juang, Fundamentals of Speech Recognition, Prentice Hall.

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BCA3601: DIGITAL IMAGE PROCESSING		
Course Outcome (CO)		
CO1	Classify the need for image transforms different types of image transforms and their properties.	
CO2	Develop any image processing application.	
CO3	Explain the need for image compression and to learn the spatial and frequency domain techniques of image compression.	
CO4	Discuss the different techniques employed for the enhancement of images.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction: The Origins of Digital Image Processing – Application of Digital Image Processing – Fundamental Steps in Digital Image Processing – Component of Image Processing System FUNDAMENTALS: Image Acquisition Using a Single Sensor – Image Acquisition Using Sensor Arrays	8
II	Image Sampling and Quantization: Basic Concepts-Representing Digital Images – Spatial and Grey Level Resolution-Aliasing & more patterns – Zooming and Shrinking Digital Images. BASIC RELATIONSHIPS BETWEEN PIXELS: Neighbors of a Pixel – Adjacency, Connectivity, Regions and Boundaries – Distance Measures, Image Operations on a Pixel Basis	8
III	Color Image Processing: Fundamentals-color models: RGB color model-CMY and CMYK color model-HIS model-Color Image smoothing & color Image sharpening. IMAGE ENHANCEMENT IN SPATIAL DOMAIN: Gray Level Transformation – Image Negatives – Log Transformations – Piecewise-Linear transformation function-Enhancement Using Arithmetic/Logic Operations – Image Subtraction – Image Averaging	8

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BCA3612: PROFESSIONAL COMMUNICATION

Course Outcome (CO)

CO1	Become confident of speaking in English impeccably and with utmost enthusiasm.	
CO2	Be familiar with different styles of communication	
CO3	Practice different types of communication and successfully confront the different barriers of communication.	
CO4	Involve in conversations without fear, shy and apprehension and become more self-confident and develop strong determination.	
CO5	Understand and practice interview etiquettes and socialize with ease and comfort.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Unit 1: Fundamentals of Communication (The Basics), Nature & Process: (Process Model), Types of Communication: Verbal (Oral/Written) vs Non-Verbal (Body Language, Gestures, Eye Contact), Barriers: Physical, Semantic, Psychological, 7 C's of Effective Communication: Clarity, Conciseness, Concrete, Correctness, Consideration, Completeness, Courtesy.	8
II	Unit 2: Written Business Communication (Documentation), Business Letters: Internal Communication: Memos, Circulars, Notices, and Agenda/Minutes of Meeting, Technical Writing: Email Etiquette:	8
III	Unit 3: Oral & Presentation Skills (Speaking), Public Speaking: PPT Presentations, Group Discussion (GD): (Leadership skills), Meetings & Conferences:	8
IV	Unit 4: Employment Communication (Career Readiness), Job Interviews, Professional Grooming: (Corporate Etiquette),	8
V	Unit 5: Grammar & Vocabulary (Foundational), Applied Grammar: Parts of Speech, Tenses, Active/Passive Voice, Direct/Indirect Speech	8

Suggested Readings:

8. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning PLtd
9. Business Correspondence and Report Writing by Prof. R.C., Sharma & Krishna Mohan, TMH
10. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.
11. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd.
12. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
13. English Grammar and Usage by R.P. Sinha, Oxford University Press, 2005, New Delhi.
14. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.



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BCA3671: MAJOR PROJECT LAB

Course Outcome (CO)

CO1	To help students develop openness to new ideas in computer science, develop the ability to draw reasonable inferences from observations and learn to formulate and solve new computer science problems using analytical and problem-solving skills;	
CO2	To help students develop the ability to synthesize and integrate information and ideas, develop the ability to think creatively, develop the ability to think holistically and develop the ability to distinguish between facts and opinion;	
CO3	To help students acquire the necessary competences to build a real-life software system by completing different software life cycle phases (like, specification, architecture, design, implementation, validation, documentation, etc);	
CO4	To help students develop the ability to work individually and as part of a team, develop a commitment to accurate work, develop management skills, improve speaking and writing skills, improve the ability to follow directions, instructions and plans, and improve the ability to organize and use time effectively;	
CO5	To help students develop a commitment to personal achievement, the ability to work skillfully, informed understanding of the role of science and technology, a lifelong love of learning, and cultivates a sense of responsibility for one's own behavior and improves self-esteem/self-confidence.	

DETAILED SYLLABUS

Sr. N	Topic	Hours
	Course Content This course consists of the development of a realistic application, representative of a typical real-life software system or to carry a research based project in an area related to CS & IT. 1. The students are expected to propose, analyze, design, develop, test and implement a real life software system using recent technologies. 2. In case of a research based project, the students are required to follow a proper research methodology to propose a solution (in terms of a model/ framework/ algorithm, etc) of a research problem related to computer science and IT. 3. The student will deliver oral presentations, progress reports, and a final report. A. Depending on the topic of the project and the chosen software development methodology, the following themes may be addressed to some extent: Software development methodologies, static (products) and dynamic aspects (processes);	

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Requirement analysis (goals, use cases), software architectures, architectural styles and patterns, model-driven engineering(MDE);

- Programming techniques, software development environments, refactoring;
- Software validation through unit tests, integration tests, functional and structural tests, and code reviews.
- Project management, planning, resource estimation, reporting.
- Version management by using a version management tool.
- Examples of kinds of systems to be developed are distributed systems, client/server systems, web based systems, secure systems, mobile systems, adaptable systems, optimizations of existing systems or data-intensive systems, etc.

B. Typical process of research based problems may include, selection of a research topic followed by an extensive literature survey with an aim to find the research gap. Proposing a solution based on the findings (i.e., research gap) and publishing the research work.

Suggested Readings:

1. Robert Lafore, "Object Oriented Programming in C++", Pearson
2. R. Brown, "Visual Basic .NET – Your Visual Blueprint for Building Versatile Programs on the .NET Framework", Wiley Publishing, Inc.
3. Ivan Bayross, "Oracle", BPB
4. E.N. Mackay, "Developing user Interfaces for Windows", WP Publishers & Distributors Pvt. Ltd.

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BCA3602: DEEP LEARNING (EL)		
Course Outcome (CO)		
CO1	Understand the fundamentals of deep learning.	
CO2	Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems	
CO3	Illustrate the strength and weaknesses of many popular deep learning approaches.	
CO4	Understanding the working of Convolutional Neural Networks and RNN in decision making.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction: What is a Neural Network?, The Human Brain, Models of a Neuron, Neural Networks Viewed As Directed Graphs, Feedback, Network Architectures, Rosenblatt's Perceptron: Introduction, Perceptron, The Perceptron Convergence Theorem, Relation Between the Perceptron and Bayes Classifier for a Gaussian Environment.	8
II	Multilayer Perceptrons: Introduction, Batch Learning and On-Line Learning, The Back-Propagation Algorithm, XOR Problem, Heuristics for Making the Back-Propagation Algorithm Perform Better, Back Propagation and Differentiation.	8
III	Regularization for Deep Learning: Parameter Norm Penalties - L2 Parameter Regularization, Dataset Augmentation, Semi-Supervised Learning. Optimization for Training Deep Models: Challenges in Neural Network Optimization – III Conditioning, Local Minima, Plateaus, Saddle Points and Other Flat Regions.	8
IV	Convolution neural networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Convolutional Networks and the History of Deep Learning.	8
V	Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Long Short-Term Memory and Other Gated RNNs	8
Suggested Readings: 1. Deep Learning by François Chollet (Indian Edition) 2. Deep Learning: A Practitioner's Approach" by Adam Gibson and Josh Patterson (Indian Edition) 3. Python Deep Learning" by Ivan Vasilev, Daniel Slater, and others (Indian Edition)		

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BCA3603: NEURAL NETWORK (EL)		
Course Outcome (CO)		
CO1	Study the concepts of neural network and some related problems.	
CO2	Develop the knowledge supervised and unsupervised.	
CO3	Study the concepts of architecture of Neural network.	
CO4	Learn the concepts of principle component and SOM.	
CO5	Develop the skills on FUZZY techniques, soft computing and concepts of CVNN, CVBP.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Neural Networks: Terminology, Neural Network Architecture, Perceptron's, Linear Separability. Perceptron Training Algorithm: Termination Criteria, Choice of Learning Rate, Non-numeric Input. Modifications: Pocket Algorithm.	8
II	Supervised/Unsupervised Learning: Prediction Networks, Winner Take-All Networks, Hamming Networks, Max Net, Simple Competitive Learning, Counter Propagation, Neo Cognition. Associative Models: Hopfield Network, Brain-State-on-a-Box Network, Boltzmann Machines.	8
III	Accelerated Learning BP Multilayered Network Architecture, Back Propagation Algorithm, Heuristics for Making Algorithm. Accelerated Learning BP: Recursive Least Square, Quick Prop, RPROP Algorithm, Approximation Properties of RBF Networks, Comparison with Multilayer Perceptron.	8
IV	Recurrent Network: Temporal Feed-forward Network, Implementation with BP, Self-Organizing Map and SOM Algorithm, Properties of Feature Map and Computer Simulation, Principal Component, Independent Component Analysis, Application to Image and Signal Processing.	8
V	Complex Valued NN: Complex Valued BP, Analyticity of Activation Function, Application in 2D Information Processing, Complexity Analysis of Network Models, Soft Computing, Neuro Fuzzy-Genetic Algorithm Integration.	8
Suggested Readings: 1. K. Mehrotra, Mohan, Ranka "Elements of Artificial Neural Networks" Penram International Publishing 2. J.A. Anderson, "An Introduction to Neural Networks", MIT. 3. Hagen Demuth Beale, "Neural Network Design", Cengage Learning. 4. Laurene V. Fausett, "Fundamentals of Neural Networks. Architectures, Algorithms and Applications", Pearson India.		

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BCA3604: INTRODUCTION TO INTERNET OF THINGS (EL)

Course Outcome (CO)

CO1	Classify the fundamentals of IoT, its architecture, and applications.	
CO2	Identify and use IoT hardware, networking components, and communication protocols.	
CO3	Organize the IoT data handling techniques and security challenges.	
CO4	Develop IoT applications using programming and cloud platforms.	
CO5	Evaluate case studies and emerging technologies in IoT.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to IoT : Definition, Characteristics, and Evolution of IoT, IoT Architecture & Layers, IoT vs. Traditional Embedded Systems, IoT Communication Models & Protocols, IoT Ecosystem and Applications (Smart Homes, Healthcare, Agriculture, Smart Cities, etc.)	8
II	IoT Hardware & Networking : Sensors, Actuators, and Microcontrollers (Raspberry Pi, Arduino), IoT Communication Technologies: Wi-Fi, Bluetooth, Zigbee, LoRa, NB-IoT, IoT Connectivity: IPv6, MQTT, CoAP, HTTP, Edge Computing and Fog Computing in IoT, Power Management in IoT Devices	8
III	IoT Protocols & Data Handling : IoT Protocols: MQTT, CoAP, AMQP, HTTP; Cloud Computing for IoT, IoT Data Processing & Storage (Big Data & NoSQL Databases), Security & Privacy Issues in IoT, IoT Middleware and IoT Platforms (AWS IoT, Google IoT Core, Azure IoT)	8
IV	IoT Application Development & Security : IoT Programming (Python for IoT, Node.js), IoT Operating Systems (Contiki, RIOT, Free RTOS), Security Challenges in IoT (Threats, Authentication, Cryptography), Blockchain for IoT Security, IoT Testing & Debugging Tools	8
V	Case Studies & Future Trends in IoT : IoT Applications in Smart Cities, Agriculture, Healthcare, Industry 4.0; AI and Machine Learning for IoT, Digital Twin Technology in IoT, Future Trends in IoT (5G & Beyond, Quantum IoT), Ethical & Social Implications of IoT	8

Suggested Readings:

1. "Internet of Things: A Hands-On Approach" – By Arshdeep Bahga & Vijay Madisetti
2. "Internet of Things (IoT): Principles, Paradigms and Applications" – By Rajkumar Buyya & Amir Vahid Dastjerdi
3. "The Internet of Things: Connecting Objects to the Web" – By Hakima Chaouchi
4. "Internet of Things (IoT) with Raspberry Pi and Arduino" – By Rajesh Singh & Anita Gehlot
5. "IoT and Smart Cities: Advances in Green Computing" – By Pradeep Tomar & Gurjit Kaur

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Syllabus

BCA 4th Year
7th Semester



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BCA4701: DATA MINING		
Course Outcome (CO)		
CO1	To understand the basics of Data mining concepts and their applications with trends.	
CO2	To understand the importance of decision tree, Neural Network and Genetics algorithm.	
CO3	To learn classification-based algorithms and their implementations.	
CO4	To Learn various Data mining Techniques algorithms.	
CO5	Describe Data Mining Association rules measurements and quality of rules.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction to Data Mining: Definition and Functionalities of Data Mining. Knowledge representation in Data Bases. Data Mining issues, Data Mining Matrices, Data Mining applications and Trends.	8
II	Data Mining Techniques: A statistical approach on data mining, similarity measures, Decision Trees, Neural Network, and genetic Algorithm.	8
III	Classification: Statistical Based Algorithm, Distance Based Algorithm, Decision Based Algorithms.	8
IV	Algorithm: Clustering Tree Algorithm. Neural Network Algorithm, Rule Based Algorithm, and Combining Techniques: Introduction, Similarity and Distance measures outliers, Hierarchical Algorithm.	8
V	Association Rules: Introduction. Large Item sets, Parallel and distributed Algorithm, Comparing approaches, Incremental rules, advance association Rules, Measuring the quality of rules	8
Suggested Readings:		
1. Data Mining Techniques, Arun K Pujari, University Press		
2. Data Mining Concepts and Techniques, 3rd Edition, Jiawei Han, Micheline Kamber, Jian Pei.		

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BCA4702: SOFT COMPUTING

Course Outcome (CO)

CO1	Classify the knowledge of soft computing concepts and he can apply them for practical applications.
CO2	Design suitable Neural Network for real time problems.
CO3	Discuss the appropriately use fuzzy rules and reasoning to develop decision making and expert systems.
CO4	Formulate the importance of optimization techniques and genetic programming.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Soft Computing, Differences between Soft Computing and Hard Computing, Requirements of Soft Computing, Applications of Soft Computing; Introduction to Artificial Intelligence, Models of Artificial Neural Network, Feed forward artificial neural networks, Perceptron and Multilayer Perceptron neural networks, Radial basis function artificial neural networks, Recurrent neural networks, Modular neural networks.	8
II	Learning Rules and Various Activation Functions: Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule, Widrow, Hoff Learning Rule, Correlation Learning Rule, Winner take All Learning Rule, Associative Memories.	8
III	Introduction to Fuzzy System: Fuzzy System, Fuzzy Logic, Fuzzy Sets and Crisp Sets, Evolution of Fuzzy System, Fuzzy Set Operations, Fuzzy to Crisp Conversion, Inference in Fuzzy Logic, Fuzzy Rule Base, Fuzzy Knowledge Base, Fuzzyfication and Defuzzyfication.	
IV	Genetic Algorithm-I: Genetic Algorithm, Basic Concept, Working Principle of Genetic Algorithm, Flow Chart of Genetic Algorithm, Genetic Representation (Encoding), Initialization and Selection.	8
V	Genetic Algorithm-II: Genetic Representations, (Encoding), Genetic Operators, Mutation, Generational Cycle.	8

Suggested Readings:

Reference Books

1. S. Rajsekaran & G.A. VijayalakshmiPai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India, 2003
2. Anderson, James, "Introduction to Neural Networks", PHI Publication, Delhi, India
3. N.P. Padhy, "Artificial Intelligence and Intelligent Systems" Oxford University Press, USA, 2005.
4. Simon Haykin, "Neural Networks and Learning Machines" Prentice Hall of India, 2005, Third Edition.

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BCA4703: INTRODUCTION TO RESEARCH METHODOLOGY

Course Outcome (CO)

CO1	Define the basic framework of research process.	
CO2	Formulate hypotheses or suggested solutions.	
CO3	Use various sources of research design, information for literature review and data collection.	
CO4	Discuss the different sampling techniques	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Research: Meaning of Re-search, Retracing the path, Importance of re-search. Philosophies, and the language of research theory building Theoretical background of a research philosophy. The meaning of methodology (structured definition and examples). Understanding research terminologies i.e., Concepts, Constructs, Variables, and Definitions etc.	8
II	Problems and Hypotheses: Identifying research problem, State-of-the-Art, The problem definition lifecycle. Meaning/Definition of a hypothesis. Real world examples. Testing and Verification of Hypothesis.	8
III	Research design: Experimental and Non-experimental research design. Field research, Survey Research, Survey outcomes. Methods of data collection – Secondary data collection methods, qualitative methods of data collection, and Survey methods of data collection.	8
IV	Sampling Techniques: Research Population and Sample. Target Population, Accessible Population. Sampling techniques – The nature of sampling, Probability sampling design. Nonprobability sampling design, Determination of sample size.	8
V	Data Analysis & Report Generation: Types of Data Sources, Web Data, Survey Data. Data attributes, Discrete vs. Continuous Data attributes. Mean, Median, Mode; Range, Quartile, Variance, SD, Interquartile Range	8

Suggested Readings:

Text book(s):

1. Bryman, Alan & Bell, Emma (2011). Business Research Methods (Third Edition), Oxford University Press.
2. Kerlinger, F.N., & Lee, H.B. (2000). Foundations of Behavioural Research (Fourth Edition), Harcourt Inc.
3. Rubin, Allen & Babbie, Earl (2009). Essential Research Methods for Social Work, Cengage Learning Inc., USA.

Other References:

1. Chawla, Deepak & Sondhi, Neena (2011). Research methodology: Concepts and cases, Vikas Publishing House Pvt. Ltd. Delhi.
2. Pawar, B.S. (2009). Theory building for hypothesis specification in organizational studies, Response Books, New Delhi.
3. Neuman, W.L. (2008). Social research methods: Qualitative and quantitative approaches, Pearson Education.

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BCA4771: RESEARCH METHODOLOGY LAB

Course Outcome (CO)

CO1	Identify and formulate research problems with an understanding of research design.	
CO2	Conduct systematic literature reviews using reliable sources and databases.	
CO3	Apply appropriate methodologies, tools, and techniques for data collection and analysis.	
CO4	Demonstrate academic integrity, ethical considerations, and proper citation practices.	
CO5	Draft high-quality research proposals, papers, and technical reports.	

DETAILED SYLLABUS

Sr. N	Topic	Hours
1	Introduction to Research: Definition, types, and significance of research. Research process: Problem identification, objectives, hypothesis. Research ethics and plagiarism.	
2	Literature Review: Importance and sources of literature. Using digital libraries: IEEE Xplore, Springer, Scopus, Google Scholar. Reference management tools: Mendeley, Zotero, EndNote.	
3	Research Design and Methodology: Qualitative vs Quantitative research. Sampling methods, data collection tools, surveys, experiments. Case studies and simulation methods.	
4	Data Analysis and Tools: Statistical analysis basics: Mean, median, mode, standard deviation. Tools: Excel, SPSS, R, Python (pandas, matplotlib). Interpretation and visualization of data.	
5	Research Documentation and Writing: Research paper structure: Abstract, Introduction, Methodology, Results, Discussion, Conclusion. Technical report writing. Referencing styles: APA, IEEE, MLA.	
6	Research Communication: Preparing presentations and posters. Publishing in journals, conferences. Handling peer review and revision.	

Suggested Readings:

1. C.R. Kothari, Research Methodology: Methods and Techniques, New Age International, 2004.
2. Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, SAGE Publications, 2019.
3. Jonathan Schwabish, Better Data Visualizations, Columbia University Press, 2021.
4. Robert V. Labaree, Research Guides and Academic Databases, USC Libraries.
5. Eliot Freidson, Professional Powers: A Study of the Institutionalization of Formal Knowledge, University of Chicago Press.

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BCA4704: MOBILE COMPUTING (EL)

Course Outcome (CO)

CO1	To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.	
CO2	To understand the typical mobile networking infrastructure through a popular GSM protocol.	
CO3	To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer	
CO4	To understand the database issues in mobile environments & data delivery models.	
CO5	To understand the ad hoc networks and related concepts.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	INTRODUCTION: Introduction to Mobile Computing — Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing — Spread spectrum -MAC Protocols -SDMA- TDMA- FDMA- CDMA	8
II	MOBILE TELECOMMUNICATION SYSTEM: Introduction to Cellular Systems — GSM — Services & Architecture — Protocols — Connection Establishment — Frequency Allocation — Routing — Mobility Management — Security — GPRS- UMTS — Architecture — Handover — Security	8
III	MOBILE NETWORK LAYER: Mobile IP — DHCP — AdHoc- Proactive protocol- DSDV, Reactive Routing Protocols — DSR, AODV , Hybrid routing -ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) -MANET Vs VANET — Security.	8
IV	MOBILE TRANSPORT AND APPLICATION LAYER: Mobile TCP- WAP — Architecture — WDP — TLS — WTP -WSP — WAE — WTA Architecture — WML	8
V	MOBILE PLATFORMS AND APPLICATIONS: Mobile Device Operating Systems — Special Constraints & Requirements — Commercial Mobile Operating Systems — Software Development Kit: iOS, Android, BlackBerry, Windows Phone — M-Commerce — Structure — Pros & Cons — Mobile Payment System — Security Issues	8

Suggested Readings:

1. Jochen Schiller, —Mobile CommunicationsI, Addison-Wesley, Second Edition, 2004.
2. Stojmenovic and Cacute, —Handbook of Wireless Networks and Mobile ComputingI, Wiley, 2002, ISBN 0471419028.
3. Reza Behravanfar, —Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XMLI, ISBN: 0521817331, Cambridge University Press, Oct 2004.

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BCA4705: FUNDAMENTALS OF DATA PRIVACY (EL)

Course Outcome (CO)

CO1 Explain the fundamental concepts of data privacy and identify privacy threats.

CO2 Describe data collection practices and the principles of ethical data handling.

CO3 Apply privacy-enhancing technologies in real-world scenarios.

CO4 Analyze current trends, challenges, and case studies in data privacy.

CO5

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Data Privacy: Definition and Importance of Data Privacy, Types of Data: Personal, Sensitive, and Anonymized Data, Privacy vs. Security, Historical Context and Evolution of Privacy Laws, Privacy Threats: Data Breaches, Surveillance, Profiling, and Tracking.	8
II	Data Collection and Usage: Principles of Data Collection: Consent, Notice, and Purpose Limitation, Data Minimization and Retention Policies, Data Flow and Lifecycle: Collection, Storage, Processing, and Deletion, User Tracking Techniques: Cookies, Web Beacons, and Device Fingerprinting, Behavioral Targeting and Profiling	8
III	Privacy Regulations and Legal Frameworks: General Data Protection Regulation (GDPR), California Consumer Privacy Act (CCPA), Health Insurance Portability and Accountability Act (HIPAA), Data Protection Bill (India) – Overview Compliance, Penalties, and Enforcement Mechanisms.	8
IV	Privacy Enhancing Technologies (PETs): Data Anonymization and Pseudonymization Techniques, Differential Privacy: Basics and Use Cases, Cryptographic Techniques: Encryption, Homomorphic Encryption, Access Control and Data Masking, Secure Multi-party Computation and Blockchain for Privacy.	8
V	Emerging Trends and Case Studies: Privacy in IoT and Mobile Devices, Artificial Intelligence and Data Privacy Challenges, Social Media and Privacy Issues, Case Studies: Facebook-Cambridge Analytica, GDPR Fines, Healthcare Data Breaches, Future of Data Privacy: Challenges and Opportunities.	8

Suggested Readings:

1. Daniel J. Solove, Understanding Privacy, Harvard University Press, 2008.
2. Mike Chapple and David Seidl, Privacy and Data Protection Essentials, Wiley, 2021.
3. Simson Garfinkel and Gene Spafford, Web Security, Privacy and Commerce, O'Reilly Media, 2nd Edition, 2002.
4. Bruce Schneier, Data and Goliath: The Hidden Battles to Collect Your Data and Control Your World, W.W. Norton & Company, 2015.
5. Arvind Narayanan et al., Privacy Technologies and Policy, Springer, 2017.
6. Relevant legislation texts like GDPR, CCPA (available online).

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BCA4706: SOFT SKILLS AND INTERPERSONAL COMMUNICATIONS (EL)

Course Outcome (CO)

CO1	Understand and apply various soft skills essential for personal and professional development.	
CO2	Communicate effectively and confidently in diverse scenarios using verbal and non-verbal skills.	
CO3	Demonstrate strong interpersonal skills in teamwork, leadership, and conflict resolution settings.	
CO4	Exhibit professionalism through personal grooming, ethics, and time management.	
CO5	Prepare and present themselves effectively for interviews, group discussions, and workplace communication.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Soft Skills: Definition and Importance of Soft Skills, Classification of Soft Skills: Personal, Interpersonal, Social. Key Soft Skills: Adaptability, Creativity, Work Ethic, Time Management, Difference between Hard Skills and Soft Skills, Developing a Soft Skill Mindset, Role of Soft Skills in Career and Life Success.	8
II	Communication Skills: Verbal and Non-verbal Communication, Barriers to Effective Communication, Listening Skills: Types, Barriers, and Strategies, Writing Skills: Emails, Reports, and Business Correspondence, Public Speaking and Oral Presentation Skills, Communication Etiquette (Phone, Email, Social Media).	8
III	Interpersonal Communication: Basics of Interpersonal Communication, Relationship Building: Trust and Respect, Conflict Resolution and Negotiation Skills, Empathy and Emotional Intelligence, Group Discussions and Debates Interview Skills: Preparation and Practice.	8
IV	Teamwork and Leadership: Importance of Teamwork in Professional Life, Team Roles and Responsibilities, Leadership Styles and Theories, Motivation and Influencing Skills, Collaboration and Delegation, Problem-solving and Decision-making in Teams.	8
V	Personality Development and Professionalism: Self-Awareness and Self-Motivation, Building a Positive Attitude and Confidence, Personal Grooming and Body Language, Stress and Time Management, Professional Ethics and Work Culture Resume Writing and Career Planning.	8

Suggested Readings:

1. Goleman, Daniel – Emotional Intelligence, Bantam Books.
2. Carnegie, Dale – How to Win Friends and Influence People, Simon & Schuster.
3. Rao, M.S. – Soft Skills – Enhancing Employability: Connecting Campus with Corporate, I.K. International Publishing.
4. Meenakshi Raman and Sangeeta Sharma – Technical Communication: Principles and Practice, Oxford University Press.
5. Barun K. Mitra – Personality Development and Soft Skills, Oxford University Press.

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6. Ashraf Rizvi – Effective Technical Communication, Tata McGraw-Hill.



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Syllabus

BCA 4th Year 8th Semester



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BCA4801: R PROGRAMMING		
Course Outcome (CO)		
CO1	Understand the fundamentals of R programming and environment setup.	
CO2	Apply various data structures in R for effective data representation and manipulation.	
CO3	Perform data import/export operations and handle real-world data preprocessing.	
CO4	Visualize data effectively using R's powerful graphical capabilities.	
CO5	Conduct statistical analysis and apply basic machine learning techniques in R.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction to R Programming: Introduction to R and RStudio, Installation and Setup of R environment, Basic syntax: Variables, Data Types, Operators, R scripts and R console, Input and Output functions, Control Structures: if, else, switch, for, while, repeat, break, next.	8
II	Data Structures in R: Vectors, Lists, Matrices, Arrays, Factors and Data Frames, Indexing and Slicing, Functions: Built-in and User-defined, Apply family of functions: apply(), lapply(), sapply(), tapply().	8
III	Data Manipulation and Import/Export: Data Import: Reading CSV, Excel, Text, JSON, XML files, Data Export: Writing Data to Files, Data Cleaning and Preprocessing, Data Manipulation using dplyr, tidyr, String manipulation with stringr, Date and Time handling with lubridate.	8
IV	Data Visualization in R: Base plotting functions, Advanced visualization using ggplot2, Bar Charts, Line Charts, Histograms, Scatterplots, Boxplots, Customizing Plots: Titles, Labels, Legends, Themes, Saving plots to files, Introduction to shiny for interactive visualization (optional).	8
V	Statistical Analysis and Applications: Descriptive Statistics: Mean, Median, Mode, Variance, Standard Deviation, Probability Distributions: Normal, Binomial, Poisson, Hypothesis Testing: t-test, chi-square test, ANOVA, Correlation and Regression	8

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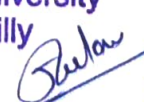
	Analysis, Introduction to Machine Learning in R: Linear Regression, Clustering (k-means).	
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Suggested Readings:

1. "The Art of R Programming" by Norman Matloff, No Starch Press
2. "R for Data Science" by Hadley Wickham and Garrett Golemund, O'Reilly Media
3. "Hands-On Programming with R" by Garrett Golemund, O'Reilly Media
4. "Advanced R" by Hadley Wickham, Chapman and Hall/CRC
5. "Beginning R: The Statistical Programming Language" by Mark Gardener, Wiley

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BCA4871: R PROGRAMMING LAB

DETAILED SYLLABUS

1. Download and install R-Programming environment and install basic packages using install. Packages () command in R.
2. Learn al the basics of R-Programming (Data types ,Variables , Operators etc.)
3. Implement R-Loops with different examples.
4. Learn the basics of functions in R and implement with examples.
5. Implement data frames in R. Write a program to join columns and rows in a data frame using c bind () and r bind () in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R(Vectors ,Lists ,Data Frames)
8. Write a program to read acsv file and analyze the data in the file in R
9. Create pie charts and bar charts using R.
10. Create a data set and do statistical analysis on the data using R.
11. Write R program to find Correlation and Covariance
12. Write R program for Regression Modeling
13. Write R program to build classification model using KNN algorithm
14. Write R program to build clustering model using K-mean algorithm

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BCA4809: DEVOPS (EL)

Course Outcome (CO)

CO1	Understand and explain the fundamentals of DevOps, including its lifecycle, principles, and cultural aspects in modern software development environments	
CO2	Apply version control systems such as Git and collaborative platforms like GitHub for efficient source code management.	
CO3	Design and implement Continuous Integration and Continuous Deployment (CI/CD) pipelines using tools like Jenkins.	
CO4	Develop containerized applications using Docker and manage orchestration using Kubernetes.	
CO5	Utilize configuration management and Infrastructure as Code (IaC) tools such as Ansible to automate system deployment and management	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to DevOps: DevOps: Definition, Goals, and Benefits, Traditional Software Development vs DevOps, DevOps Lifecycle (Plan → Code → Build → Test → Release → Deploy → Operate → Monitor), Key Concepts: Continuous Integration (CI), Continuous Delivery (CD), Continuous Deployment, DevOps Culture and Collaboration, Agile, Scrum, and DevOps Relationship	8
II	Version Control & Source Code Management: Introduction to Version Control Systems (VCS), Centralized vs Distributed VCS, Git Fundamentals: Repositories, Commits, Branching, Merging, Git Workflows (Git Flow, Feature Branch Workflow), Repository Hosting Platforms: GitHub, GitLab, Bitbucket, Collaboration using Pull Requests / Merge Requests	8
III	Continuous Integration & Continuous Deployment (CI/CD): CI/CD Concepts and Pipeline Design, Build Automation Tools: Jenkins, Maven, Gradle, Pipeline as Code, Automated Testing in CI/CD Deployment Strategies: Blue-Green Deployment, Canary Releases, CI/CD Tools: CircleCI, Travis CI.	8
IV	Containerization & Configuration Management: Virtualization vs Containerization Container Tools: Docker, Kubernetes, Docker Concepts: Images, Containers, Docker file, Docker Compose, Container Orchestration using Kubernetes Configuration Management Tools: Ansible, Puppet, Chef, Infrastructure as Code (IaC)	8
V	Monitoring, Logging & Cloud Integration: Monitoring and Logging in DevOps, Monitoring Tools: Prometheus, Grafana, Log Management: ELK Stack (Elasticsearch, Logstash, Kibana), Cloud Platforms: Amazon Web Services, Microsoft Azure, Google Cloud Platform, DevOps Security (DevSecOps Basics), Performance Monitoring & Incident Management	8

Suggested Readings:

- [1] The DevOps Handbook, G. Kim, J. Humble, P. Debois, and J. Willis, The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations. Portland, OR, USA: IT Revolution Press, 2016.
- [2] Continuous Delivery, J. Humble and D. Farley, Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation. Boston, MA, USA: Addison-Wesley, 2010.
- [3] The Phoenix Project, G. Kim, K. Behr, and G. Spafford, The Phoenix Project: A Novel about IT, DevOps, and Helping Your Business Win. Portland, OR, USA: IT Revolution Press, 2013.

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BCA4804: CYBER ANALYTICS (EL)		
Course Outcome (CO)		
CO1	Students after completing this module will be able to understand the basic terminologies related to cyber security and current cyber security threat landscape.	
CO2	After completion of the module, students will have complete understanding of the cyber-attacks that target computers, mobiles and persons.	
CO3	Students after completing this module will be able to understand the legal framework that exist in India for cyber crimes	
CO4	After completing this module, students will understand the aspects related to personal data privacy and security.	
CO5	Students after completing this module will understand the main components of cyber security plan.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.	8
II	Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.	8
III	Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.	8
IV	Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement of the Policies.	8
V	Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.	8
Suggested Readings: 1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analyzing Computer Security", Pearson Education India. 2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India. 3. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla, "Introduction to Information Security and Cyber Law" Willey Dreamtech Press.		

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