



FUTURE UNIVERSITY

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FUTURE UNIVERSITY, BAREILLY

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

COURSE CURRICULUM

AND

EVALUATION SCHEME

BCA-AI

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-AI 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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Board of Studies

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

for

Bachelor of Computer Application with AI



(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	<i>Abhishek</i>
2	HOD	Chairperson	Dr. Jeelani, HOD, Department of Computer Application, Future University, Contact No. 8273303430, Email: jeelani@futureuniversity.in	<i>Jeelani</i>
3	Senior Faculty	Member	Prof. (Dr.) Manish Kumar Singh, Professor, Faculty of sciences, Future University, Contact No. 8475010063, Email: mksingh@futureuniversity.in	<i>Manish</i>
4	Senior Faculty	Member Secretary	Dr. Schephalika, Asso. Prof. Department of Computer Application, Future University, Contact No. 8532005079, Email: schephalika@futureuniversity.in	<i>Schephalika</i>
5	Senior Faculty	Member	Mr. Udit Kumar Mishra, Asso. Prof. Department of Computer Application, Future University, Contact No. 9412606540, Email: uditmishra@futureuniversity.in	<i>Udit</i>
6	Faculty	Member	Mr. Madhuresh Yadav, Asst. Prof. Department of Computer Application, Future University, Contact No. 8077461879, Email: madhureshkumaryadav@futureuniversity.in	<i>Madhuresh</i>
7	Faculty	Member	Mr. Mohd. Akif, Asst. Prof. Department of Computer Application, Future University, Contact No. 9198656460, Email: mohdakif@futureuniversity.in	<i>Mohd. Akif</i>
8	Faculty	Member	Mr. Tilak Kumar Rathour, Asst. Prof. Department of Computer Application, Future University, Contact No. 7037628213, Email: tilakrathour@futureuniversity.in	<i>Tilak</i>
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	<i>Vinita</i>
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	<i>Akhtar</i>
11	Industry Expert (Member)	Member	Mr. Sachin Saxena, Associate Consultant, TCS, Pune Office, Contact No. 7982696188, Email: connect.sachin01@gmail.com	<i>Sachin</i>

HOD

**Department of Computer Application
Future University, Bareilly**

**Dean
Faculty of Computer
Applications
Future University
Bareilly**

**Academic Council
Future University
Bareilly**

Verified by

Head of Department
Department of Computer Application

Name Dr. Jeehani Date 29/3/2025 Sign Jeehani


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Board of Studies (BCA in AI)

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
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Chairperson


Dean
Faculty of Computer
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Bareilly


Academic Council
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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

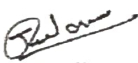
Respected Dr. Akhtar Husain,

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**.

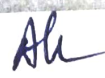
The meeting will focus on reviewing and updating the curriculum, discussing academic developments, and incorporating industry trends. Your valuable insights and expertise will be highly appreciated in shaping the academic framework.

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

Best Regards,


(Dr. Jeelani)

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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,
Mr. Sachin Saxena
Associate Consultant
TCS, Pune

Subject: Invitation for Board of Studies (BoS) Meeting

Respected Mr. Sachin Saxena,

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.

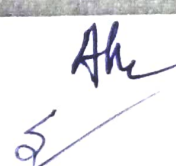
Kindly confirm your availability at your earliest convenience. We look forward to your esteemed presence.

Best Regards,


(Dr. Jeelani)

HOD

Department of Computer Application
Future University, Bareilly



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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 in Artificial Intelligence 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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Board of Studies (BCA in AI)

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

Chairperson

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

Name of Faculty: Faculty of Computer Application

Date: 29-03-2025

Time: 11:30 AM

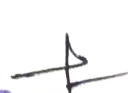
Venue: Board Room

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
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

The following are the details of the discussions held:


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The following are the details of the discussions held:

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 in Artificial Intelligence on the basis of the recommendations of the first 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 183 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, Computer Application
Department of Computer Application
Faculty of Computer Applications
Future University, Bareilly



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Dated: January 31, 2025

Ref. No. FUCA/Notice/2025/Even Semester/001

Notice/Circular

Subject: Curriculum Development Committee for BCA-AI 2025-26

The following Curriculum Development Committee has been constituted for the departmental academic course structure/curriculum design considering Industry trends for the session 2025-26.

Curriculum Development Committee (CDC)

This committee has been framed in the department with faculty members:

No	ame	signation	sition
1.	r. Udit Mishra	sociate Professor	ordinator
2.	r. Madhuresh Yadav	sistant Professor	ember
3.	r. Aaryan Rastogi	sistant Professor	ember


Dr. Jeelani
Head, CA

C.C:

1. Dean Academics
2. Dean Research
3. Registrar


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4. All Faculty Members



Dated: February 12, 2025

Ref. No. FUCA/Notice/2025/Even Semester/002

Notice/Circular

Subject: Curriculum Development Committee for BCA-AI 2025-26

This is to inform you that to design the syllabus for BCA-AI session 2025-26 which last date of design the syllabus is 13/02/2025. Therefore, do the needful.

Following details are given below:

List of Syllabus Design for BCA-AI session 2025-26

Sr.N	Subject Code	Subject Name	Credits	Units	Assign Faculty
1	BCAA-301	Operating System and Unix Shell programming	4	(1-5)	Mr. Sanjeev Pal
2	BCAA-302	Computer Architecture	4	(1-5)	Mr. Aryan Rastogi
3	BCAA-303	Web Technologies services using Python	4	(1-5)	Mr. Rajkumar Singh
4	BCAA-304	Theory of Computation	4	(1-5)	Mr. Madhuresh Yadav
5	BCAA-305E	Introduction to AI and ML and Data Science (EL)	3	(1-5)	Dr. Jeelani
6	BCAA-306E	Introduction to Blockchain Technology (EL)	3	(1-5)	Mr. Mohd Akif
7	BCAA-307E	Cyber Analytics (EL)	3	(1-5)	Mr. Udit Mishra
8	BCAA-401	OOPs concept with Java	4	(1-5)	Mr. Tilak Rathore
9	BCAA-402	Internet of Things	4	(1-5)	Mr. Mohd Akif
10	BCAA-403	Machine learning technology using Python	4	(1-5)	Dr. Schephalika
11	BCAA-404	Computer Vision	3	(1-5)	Mr. Rajkumar Singh
12	BCAA-405E	Data Warehousing and Data Mining (EL)	3	(1-5)	Mr. Aryan Rastogi
13	BCAA-406E	Social Media Analytics (EL)	3	(1-5)	Mr. Tilak Rathore
14	BCAA-407E	Big Data Analytics (EL)	3	(1-5)	Dr. Schephalika
15	BCAA-501	Data Structures and Algorithms using Java	4	(1-5)	Mr. Madhuresh Yadav
16	BCAA-502	Data Science and Analytic using Python	4	(1-5)	Mr. Sachin Kumar
17	BCAA-503	Deep Learning	4	(1-5)	Mr. Sachin Kumar


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18	BCAA-504E	Natural Language Processing (EL)	3	(1-5)	Mr. Aryan Rastogi
19	BCAA-505E	Soft Computing (EL)	3	(1-5)	Dr. Jeelani
20	BCAA-506E	Cloud Computing (EL)	3	(1-5)	Mr. Sachin Kumar
21	BCAA-601	Artificial Neural Networks	3	(1-5)	Mr. Sanjeev Pal
22	BCAA-602	Artificial Intelligence in Business	3	(1-5)	Dr. Jeelani
23	BCAA-701	Introduction to Research Methodology	4	(1-5)	Dr. Jeelani
24	BCAA-702	Android Applications Development	4	(1-5)	Mr. Madhuresh Yadav
25	BCAA-703	Modern Hacking Techniques	4	(1-5)	Mr. Mohd Akif
26	BCAA-704E	Information Security and Cyber Laws (EL)	4	(1-5)	Mr. Tilak Rathore
27	BCAA-705E	Digital Image Processing (EL)	4	(1-5)	Mr. Udit Mishra
28	BCAA-706E	Mobile Computing (EL)	4	(1-5)	Dr. Schephalika
29	BCAA-801E	Augmented Reality & Virtual Reality (EL)	4	(1-5)	Mr. Sanjeev Pal
30	BCAA-802E	Fundamentals of Data Privacy (EL)	4	(1-5)	Mr. Rajkumar Singh
31	BCAA-803E	Storage Area Network (EL)	4	(1-5)	Mr. Mohd Akif

Signature

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Signature
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Board of Studies

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

for

**Bachelor of Computer Application
Specialization in Artificial Intelligence**

(Effective from the Session: 2025-26)



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Board of Studies (BCA in AI)

Name of Faculty: Faculty of Computer Application

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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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Faculty of Computer Applications



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**ORDINANCE AS PER UGC
RULES AND REGULATIONS**

For

Undergraduate Programme

Bachelor of Computer Applications

in Artificial Intelligence

(B.C.A.-AI)

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.

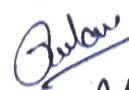
33.13 COURSES

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.


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

- (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.


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


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33.19 AWARD OF SESSIONAL MARKS

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.

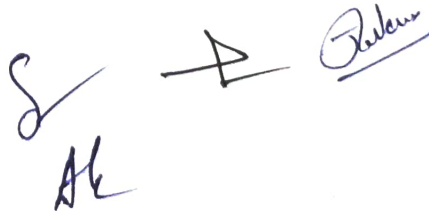
- (c) Make-up test may be held only for those students who could not appear in any one of mid-term class tests due to genuine reasons for which the prior permission from the Head of Institution/College was taken. Make up test shall ordinarily be held about two weeks before the semester examination. The 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%


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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.

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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BCA with AI (Undergraduate Regular)										
Course Structure/ Degree Award Checklist 2026-2030										
Program Name:			BCA with specialization in Artificial Intelligence							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	3	0	0	30	70	100	3
2	Skill Enhancement Course	UCC1102	A I for Everyone	3	0	0	30	70	100	3
3	Major Core Course	BCA1103	Principle of Problem-Solving using C Programming	4	0	0	30	70	100	4
4	Minor Course	BCA1105	Mathematical Foundation for AI	3	0	0	30	70	100	3
5	Value Added Course	BCA1106	MOOC-I	Self-Paced Learning						
6	Major Core Course	BCA1107	Python Programming	3	0	0	30	70	100	3
7	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	Programming in C Lab	0	0	2	50	50	100	1
3	Major Core Course	BCA1172	Python Programming LAB	0	0	2	50	50	100	1
			TOTAL	17	0	6	350	500	850	20

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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	BCA1203	Advance Database Management System	3	1	0	30	70	100	4
2	Multidisciplinary	BCA1206	Environmental Science	2	0	0	30	70	100	2
3	Ability Enhancement Course	BCA1205	AI for Developers	3	0	0	30	70	100	3
4	Value Added Course	BCA1210	MOOC-II	Self-Paced Learning						
5	Major Core Course	BCA1207	OOPs concept using JAVA	3	0	0	30	70	100	3
6	Major Core Course	BCA1208	Software Engineering	3	0	0	30	70	100	3
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	BCA1272	OOPs concept using JAVA Lab	0	0	2	50	50	100	1
			TOTAL	17	1	4	300	520	800	20

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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	Minor Courses	BCA2303	Principal of Management OR	3	0	0	30	70	100	3
		BCA2305	Remedial Mathematics (Theory)							
2	Value Added Course	BCA2306	MOOC-I	Self-Paced Learning						
3	Multidisciplinary	BCA2307	E-commerce & Digital Marketing	3	0	0	30	70	100	3
4	Major Core Course	BCA2308	Operating System and Unix Shell programming	3	0	0	30	70	100	3
5	Major Core Course	BCA2309	Web Technologies services using Python	3	0	0	30	70	100	3
6	Major Core Course	BCA2311	Advance Python Programming	3	0	0	30	70	100	3
7	Major Core Course	BCA2312	Digital Electronics	2	0	0	30	70	100	2
8	Ability Enhancement Course	BCA2313	Organizational Behaviour	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	BCA2375	Digital Electronics LAB	0	0	2	50	50	100	1
2	Major Core Course	BCA2376	Advance Python Programming LAB	0	0	2	50	50	100	1
3	Major Core Courses	BCA2374	Web Technologies services using Python LAB	0	0	2	50	50	100	1
			TOTAL	19	0	6	380	620	1000	22

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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	BCA2413	Data Science and Analytics	3	0	0	30	70	100	3
2	Value Added Course	BCA2408	MOOC-II	Self-Paced Learning						
3	Major Core Course	BCA2412	Data Structures and Algorithms using Java	3	1	0	30	70	100	4
4	Major Core Course	BCA2410	Introduction to Internet of Things	3	0	0	30	70	100	3
5	Major Core Course	BCA2411	Machine Learning Technology	3	0	0	30	70	100	3
6	Ability Enhancement Course	BCA2415	Organizational Behaviour	2	0	0	0	50	50	2
	Skill Enhancement Course	BCA2416	Industrial Training-I	0	0	0	50	0	50	
7	Minor Course		Elective-I	3	0	0	30	70	100	3
Practical										
1	Major Core Courses	BCA2475	Data Science Lab	0	0	2	50	50	100	1
2	Major Core Courses	BCA2476	Machine Learning Lab	0	0	2	50	50	100	1
	Major Core Courses	BCA2477	DSA using Java LAB	17	1	4	300	500	800	20

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Semester –V										
			Theory	Week			Evaluation Scheme			
SN.	Course Category	Course Code	Course Title	L	T	P	CA	EE	Total	Credit
	Value Added Course	BCA3508	MOOC-III	Self-Paced Learning						
1	Major Core Course	BCA3516	Artificial Neural Networks	3	1	0	30	70	100	4
2	Major Core Course	BCA3506	Natural Language Processing	3	0	0	30	70	100	3
3	Multidisciplinary	BCA3517	Computer Vision	2	0	0	30	70	100	2
4	Minor Course		Elective-II	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	
Practical										
1	Research Project/ Dissertation	BCA3573	Minor Project	0	2	4	100	0	100	4
2	Major Core Courses	BCA3576	NLP Lab	0	0	2	50	50	100	1
3	Major Core Courses	BCA3577	Computer Vision Lab	0	0	2	50	50	100	1
			TOTAL	13	3	8	370	430	800	20

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Semester-VI										
			Theory	Week			Evaluation Scheme			
SN.	Course Category	Course Code	Course Title	L	T	P	CA	EE	Total	Credit
1	Major Core Courses	BCA3602	Deep Learning	3	0	0	30	70	100	3
2	Value-added Courses	BCA3606	MOOC-IV	Self-Paced Learning						
3	Major Core Courses	BCA3607	Artificial Intelligence in Business	3	0	0	30	70	100	3
4	Minor Courses		Elective-III	2	0	0	30	70	100	2
5	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	
Practical										
1	Major Core Courses	BCA3672	Deep Learning Lab	0	0	2	50	50	100	1
2	Major Core Courses	BCA3673	Big Data Lab	0	0	2	50	50	100	1
3	Research Project/ Dissertation	BCA3671	Major Project	0	0	20	100	200	300	10
			TOTAL	10	0	24	340	560	900	22

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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	BCA4703	Introduction to Research Methodology	3	1	0	30	70	100	4
2	Value Added Courses	BCA4708	MOOC-V	Self-Paced Learning						
3	Major Core Courses	BCA4709	Android Applications Development	3	1	0	30	70	100	4
4	Minor Courses		Elective-IV	3	0	0	30	70	100	3
Practical										
1	Major Core Courses	BCA3771	Research Methodology Lab	0	0	2	50	50	100	1
2	Research Project/ Dissertation	BCA3772	Minor Dissertation	0	4	8	100	100	200	8
3	Major Core Courses	BCA3773	Android Applications Development LAB	0	0	2	50	50	100	1
			TOTAL	9	6	12	290	410	700	21

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Semester-VIII

			Theory	Week			Evaluation Scheme			
SN.		Course Code	Course Title	L	T	P	CA	EE	Total	Credit
1	Value Added Courses	BCA3805	MOOC-VI	Self-Paced Learning						
2	Major Core Courses	BCA3806	Augmented Reality (AR) and Virtual Reality (VR)	3	1	0	30	70	100	4
3	Minor Courses		Elective-V	3	0	0	30	70	100	3
Practical										
1	Research Project/ Dissertation	BCA3872	Major Dissertation	0	6	12	200	300	500	12
2	Major Core Courses	BCA3873	AR and VR Lab	0	0	2	50	50	100	1
			TOTAL	6	7	14	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	BCA2406	Data Warehousing & Data Mining (EL)
2	BCA2417	Computer Architecture (EL)
3	BCA2418	Social Media Analytics (EL)
SN.	ELECTIVE-II:	
1	BCA3512	Introduction to Blockchain Technology (EL)
2	BCA3514	Information Security & Cyber Laws (EL)
3	BCA3513	Soft Computing (EL)
SN.	ELECTIVE-III:	
1	BCA3609	Data Privacy & Ethics in AI(EL)
2	BCA3610	Mobile Computing (EL)
3	BCA3611	Edge Computing (EL)
SN.	ELECTIVE-IV:	
1	BCA4710	Cloud Computing (EL)
2	BCA4411	Digital Image Processing (EL)
3	BCA4712	Cyber Analytics (EL)
SN.	ELECTIVE-V:	
	BCA4809	DevOps (EL)





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Syllabus

BCA AI 1st Year
Ist Semester



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 Engineering: A Primer**, Waman S Jawadkar, Tata McGraw-Hill, 2008
3. **Software Engineering, 3 Principles and Practices**, Deepak Jain, Oxford University Press.
4. **Software Engineering1: 4 Abstraction and modelling**, Diner Bjarne, Springer International edition, 2006.
5. **Software Engineering2: Specification of systems and languages**, Diner Bjorner, Springer International edition 62006.
6. **Software Engineering Principles and Practice**, Hans Van Vliet, 3rd edition, John Wiley & Sons Ltd.
7. **Software Engineering3: Domains, Requirements, and Software Design**, D. Bjorner, Springer 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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BCA1107: PYTHON PROGRAMMING
Course Outcome (CO)

CO1	Understand the fundamentals of Python programming including variables, datatypes, and operators	
CO2	Apply conditional logic and iteration through control structures and functions in Python.	
CO3	Explore and implement clean coding practices in Python for writing readable and maintainable code	
CO4	Analyze and manipulate data using Python libraries such as NumPy and Pandas	
CO5	Visualize data using libraries like Matplotlib and Seaborn	
CO6	Apply Python programming to real-world AI and ML-related problems using clean coding principles	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Python and Clean Code Principles: Introduction to Python: Features, Applications, Python Installation & IDEs (Jupyter, VS Code), Writing and executing Python scripts, Clean Code Basics: Readability, Naming conventions, Code formatting, Comments, Docstrings, and Code structure, Variables, Datatypes, Type Conversion, Operators: Arithmetic, Logical, Relational, Input/Output and String manipulation	8
II	Control Structures and Modular Programming: Conditional Statements: if, if-else, nested if, Loops: for, while, break, continue, Clean Coding in Control Structures, Functions: Defining, Calling, Parameters, Return values, Clean function design, Avoiding code duplication, Lambda functions and scope, Basic error handling (try-except)	8
III	Python Data Structures: Lists, Tuples, Sets, Dictionaries, Indexing, Slicing, Nesting, Built-in functions and methods, List/Dictionary comprehensions, Data structure selection for clean and efficient code, Writing reusable utility functions	8
IV	NumPy and Pandas for Data Manipulation: NumPy Arrays, Vectorized Operations, Array indexing, slicing, and reshaping, Pandas: Series and DataFrame creation, Reading/writing data from CSV/Excel, Data selection, filtering, and transformation, Merging and joining dataframes, GroupBy and aggregation function, Clean data wrangling practices	12
V	Data Visualization in Python: Introduction to Data Visualization, Plots using Pandas: Line, Bar, Scatter, Pie, Matplotlib: Histogram, Box plot, KDE, Seaborn: Strip plot, Pair plot, Count plot, Heatmap, Best practices for clean and effective visualizations, Customizing plots (labels, legends, titles, styles)	12
VI	Real-world Applications and Mini Project: Case studies from AI, Healthcare, Finance, and E-Commerce, Clean coding in projects: modularization, documentation, Independent mini project using real-world dataset, Code review and presentation of outcomes, Submission of project report	10

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Reference Books:

Text Books:

1. PYTHON PROGRAMMING FOR THE ABSOLUTE BEGINNER by MICHAEL DAWSON, Cengage India Private Limited.

References:

1. FUNDAMENTALS OF PYTHON : FIRST PROGRAMS WITH MINDTAP by KENNETH A. LAMBERT, CENGAGE LEARNING
2. CLEAN CODE: A HANDBOOK OF AGILE SOFTWARE CRAFTSMANSHIP by ROBERT C. MARTIN
3. PYTHON FOR DATA ANALYSIS by WES MCKINNEY

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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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BCA1172: PYTHON PROGRAMMING LAB
Course Outcome (CO)

CO1	Explore and implement clean coding practices in Python for writing readable and maintainable code	
CO2	Analyze and manipulate data using Python libraries such as NumPy and Pandas	
CO3	Visualize data using libraries like Matplotlib and Seaborn	
CO4	Apply Python programming to real-world AI and ML-related problems using clean coding principles	

DETAILED SYLLABUS

	List of Practicals / Experiments: List of Practicals • Write a Python program to accept two numbers and perform arithmetic operations (+, -, *, /, %, //, **). • Create a cleanly coded function to find factorial of a number using loops. • Implement a menu-driven program using conditional statements and functions. • Write a Python script to demonstrate list and dictionary operations using clean code structure. • Create a Pandas DataFrame and perform indexing, filtering, and column operations. • Perform merge operations on dataframes using inner, outer, left, and right joins. • Use NumPy to create arrays and perform vectorized arithmetic and slicing operations. • Write a Python script to visualize a dataset using Matplotlib (histogram, pie chart). • Perform multivariate data visualization using Seaborn (pair plot, heatmap). • Develop a mini project on a real-world dataset and present with documentation and clean coding practices.	

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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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Handwritten signatures:
1. Top right: A signature in blue ink.
2. Middle right: A signature in blue ink.
3. Bottom right: A signature in blue ink.
4. Bottom right: A signature in blue ink.

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	UA/101	Aman	Aman	Sumita	#123, Prem Nagar, Dehradun, UK	7060609000	7060610900	7060615700	12 March 2000	400	70%
2	2	UA/102	Cherry	Amer	Priya	#123, Setaqui, Dehradun, UK	7060607270	7060612170	7060616000	20 March 2000	400	70%
3	3	UA/103	Raman	Siraj	Anika	#123, Clement Town, Dehradun, UK	7060607870	7060612770	7060617570	15 April 2000	400	70%
4	4	UA/104	Udan	Amit	Priya	#123, Setaqui, Dehradun, UK	7060608000	7060613370	7060618100	25 April 2000	350	65%
5	5	UA/105	Singh	Gurpreet	Vishal	#123, Setaqui, Dehradun, UK	7060609000	7060613870	7060618700	17 March 2000	350	65%
6	6	UA/106	Shah	Anant	Mamta	#123, Clement Town, Dehradun, UK	7060609000	7060614870	7060619300	28 October 2000	350	65%
7	7	UA/107	Agar	Arjun	Rajesh	#123, Clement Town, Dehradun, UK	7060610300	7060615470	7060619900	10 January 2000	350	65%
8	8	UA/108	Kamal	Ashwini	Priyanka	#123, Vasant Vihar, Dehradun, UK	7060610900	7060616700	7060620600	22 March 2000	440	88%
9	9	UA/109	Madan	Pooja	Arundha	#123, Prem Nagar, Dehradun, UK	7060611510	7060618300	7060617100	26 June 2000	400	70%

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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	Elvish	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

- Find the average height of male and female students respectively.
- 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 AI 1st Year
IInd 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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BCA1207: OOPS CONCEPT 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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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 Weseley.
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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BCA1270: DBMS 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:

- i. Insert at least 10 tuples in the table.
- ii. 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*.
- iii. 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.
- iv. Display *employee_id*, *employee_name* and *employee_date_of_joining* who work in work in department number 222.
- v. Delete the employee's details having *employee_id* as UU1003.
- vi. 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.

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

i. Display the structure of *uim_employee* table

ii. Display the structure of *uim_department* table

iii. Insert at least three department details in the *uim_department* table.

iv. Display the data of *uim_department* table.

v. Insert employee's details working in the corresponding departments as in the *uim_department* table.

vi. Display the data of *uim_department* table.

ii. 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.

iii. 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: <i>employee_contact_details</i>		
Attribute	Datatype	Size
<i>employee_id</i>	<i>employee_id</i> from <i>employee</i> table	

i. Display the contents of *employee_contact_details* table

ii. Add a new column *employee_contact_no* having data type as Number and size as 12 in *employee_contact_details* table

iii. Display the contents of *employee_contact_details* table.

iv. Update the contact details of existing employees

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BCA1272: OOPS CONCEPT WITH JAVA LAB
Course Outcome (CO)

CO1	Demonstrate Java environment and executing Java Programs	
CO2	Understand and formulate the problems in basic programming constructs	
CO3	Applying OOP concepts to solve real world problems	
CO4	Implement inheritance and polymorphism features of Java	
CO5	Implementing multithreading to enhance efficiency and handle run time errors	

DETAILED SYLLABUS

Sr. N.	Topic	Hours
	Experiments: 1. WAP in Java to print Hello and explore the difference between print() and println() 2. WAP in Java with two classes create an object of first class and call into another class (having main method) 3. WAP in Java to find product of two numbers. 4. WAP in Java product of two numbers (Input by the user) 5. WAP in Java to illustrate the concept of local, instance and static variable 6. WAP in Java to count the total number of vowels and consonants in a string. 7. WAP in Java input a string and check whether it is palindrome or not. 8. WAP in Java to implement implicit and explicit type casting 9. WAP in Java to implement various operators in java 10. WAP in Java to check whether the given number is prime or not. 11. WAP in Java for constructor overloading. 12. WAP in Java for method overloading 13. WAP in Java for method overriding 14. WAP in Java to find the factorial of a given number. 15. WAP in Java to show run time polymorphism (up casting) 16. WAP in Java for access specifiers (all four) 17. WAP in Java to implement the single dimension array 18. WAP in Java to copy the elements from one array to another array 19. WAP in Java to perform the addition and multiplication in 2-D array 20. WAP in Java to print the duplicate elements of an array. 21. WAP in Java to find the sum of each row and each column of a matrix 22. WAP in Java to sort the elements of an array in ascending/ descending order using Bubble Sort and Insertion sort. 23. WAP in Java for simple inheritance 24. WAP in Java for Final keyword 25. WAP in Java for super keyword 26. WAP in Java to create package (user defined) 27. WAP in Java for abstract method, class 28. WAP in Java for interface	

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| <ul style="list-style-type: none">29. WAP in Java multiple inheritance30. WAP in Java for exception handling by using try, catch and finally31. WAP in Java for throw and throws exception32. WAP in Java to throw your own exceptions33. WAP in Java to reading and writing through console class.34. WAP in Java how to create thread using Thread Class.35. WAP in Java how to create thread using runnable interface.36. WAP in Java to implement the multithreading. | |
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Syllabus

**BCA (AI) 2nd Year
3rd Semester**



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), $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}$, $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$.	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) – Without Proof , Derivative of x^n w. r. to 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 O to be a maximum or a minimum at a point. Application	8
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	8

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	straight line Integration: Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application	
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

Suggested Readings:

1. Differential Calculus by Shanthi narayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthi narayan
4. Higher Engineering Mathematics by Dr. B. S. Grewal

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BCA2307: E-COMMERCE & DIGITAL MARKETING

Course Outcome (CO)

CO1	To know about E-Commerce in context to Digital Marketing	
CO2	To understand about different modes of digital marketing with their influences.	
CO3	Construct the E-Banking-Concept, operations, online fund transfer-RTGC, ATM,	
CO4	Explain the Artificial intelligence and virtual Reality in Digital Marketing	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Digital Marketing: Evolution of digital Marketing, Traditional vs Digital Marketing, Digital Marketing Channels, Digital Marketing Plan, Digital Marketing Strategy, Digital Marketing Application and Benefits, Digital Marketing in India.	8
II	The Consumer and Digital Marketing: Consumer Behaviour on internet, Impact of Digital Technology on Consumer Behaviour, Attributes of online buying Behaviour, Marketing Intelligence from user's online data understanding consumer demands, brand building on web	8
III	Social Media Marketing: Social Networking, Objectives of Social Media Strategy , Building social media strategy, Types of Social media marketing , Facebook marketing , LinkedIn marketing, Instagram marketing , You tube Marketing, Twitter Marketing,	8
IV	Emerging Platforms of digital marketing: E-mail marketing, Mobile marketing, Video Marketing, Artificial intelligence and virtual Reality in Digital Marketing.	8
V	Introduction to E-Commerce: Meaning of electronic commerce, business applications of ecommerce, comparison with traditional commerce. Business Models in E-Commerce-e-shops, e-procurement, e-auctions, value chain integrators, information brokerage, telecommunication, collaboration platforms, etc.; Electronic payment system; E-Banking-Concept, operations, online fund transfer-RTGC, ATM, etc.,	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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BCA2308: Operating System and Unix Shell Programming

Course Outcome (CO)

CO1	Able to understand detailed introduction and types of OS	
CO2	Able to understand CPU scheduling.	
CO3	Able to understand Memory Management.	
CO4	Able to understand the basic Unix architecture, commands and utilities of the UNIX operating system and to work confidently in Unix/Linux environment and open systems	
CO5	Able to write simple and complex shell scripts to automate various tasks using shell programming	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Operating system and function, the evolution of OS, Operating System services, OS Components. Operating Systems Types: Batch, Time Sharing, Multiprogramming, Multitasking, Multiprocessor, Distributed, Real Time, Network.	8
II	CPU Scheduling: Process concept, Process state transitions, schedulers (long term, short term, mid-term), Scheduling concept, Performance criteria, Scheduling algorithms, multiple processor scheduling.	8
III	Memory Management: Resident monitor, multiprogramming with fixed Partition, multiprogramming with variable partition, paging, segmentation, paged segmentation, virtual memory, demand paging, thrashing.	8
IV	Introduction: Introduction to Unix, Unix System Organization (The Kernel and the Shell), Files and Directories, Library Functions and System Calls, Editors (vi and ed).	8
V	Unix Shell Programming: Types of Shells, Shell Meta characters, Shell Variables, Shell scripts, Shell Commands, Unix Environment, Integer Arithmetic and String Manipulation, Special Command Line Characters, Decision Making and Loop Control, Controlling Terminal Input, Trapping Signals, Arrays.	8

Suggested Readings:

1. Peterson & Silberschatz, "Operating System Concepts", Addison-Wesley company
2. Tenenbaum, A.S., "Modern Operating System", PHI Publication
3. Parata, "Advanced Unix Programming guide", BPB.
4. Yashwant Kanitkar, "Unix Shell Programming", BPB.

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BCA2309: WEB TECHNOLOGIES SERVICES USING PYTHON

Course Outcome (CO)

CO1	Classify the fundamental concepts of web technologies and client-server architecture.	
CO2	Develop web applications using the Flask framework and integrate them with databases.	
CO3	Design the RESTful APIs and handle JSON data effectively.	
CO4	Implement user authentication and authorization in web applications.	
CO5	Construct the responsive front-end interfaces and integrate them with back-end services.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Web Technologies & basics for Web Development Overview of web technologies, Understanding client-server architecture, Introduction to HTTP/HTTPS protocols, Setting up the development environment, Review of Python fundamentals, Introduction to virtual environments and package management (pip).	9
II	Overview of Web Frameworks & Flask Framework: Introduction to web frameworks, Comparison of popular Python web frameworks (Flask, Django, Fast API), Setting up a basic Flask application, Routing and URL handling, Request and response objects, Templating with Jinja2, Static files and media handling.	9
III	Building RESTful APIs with Flask & Database Integration: Understanding REST principles, Creating RESTful endpoints, Handling JSON data, Introduction to Flask-RESTful, Introduction to databases (SQL vs NoSQL), Using SQLite with Flask, Introduction to SQLAlchemy ORM, CRUD operations with a database.	9
IV	User Authentication and Authorization & Frontend Integration: Understanding user authentication, Implementing user registration and login, Securing routes and managing sessions, Introduction to Flask-Security, Introduction to HTML, CSS, and JavaScript, Using Bootstrap for responsive design, AJAX and Fetch API for asynchronous requests, Integrating frontend with Flask backend.	10
V	Testing, Debugging & Deployment, Hosting: Importance of testing in web development, writing unit tests with pytest, debugging techniques in Flask applications, Using Flask's built-in debugger, Overview of deployment options (Heroku, AWS, Digital Ocean), Preparing the application for production, Environment variables and configuration management, Deploying a Flask application	10

Suggested Readings:

1. "Flask Web Development" by Miguel Grinberg
2. "Django for Beginners" by William S. Vincent

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BCA2311: 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, <code>__init__()</code> and <code>__str__()</code> 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 MySQL Connector, 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, Data Frames, 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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BCA2312: 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:

- Mano Morris, Digital Logic, Prentice Hall of India.
- Stallings, Computer Organization, Prentice Hall of India.
- Mano M., Computer System Architecture, Prentice Hall of India.
- Tannenbaum, Structured Computer Organization, Prentice Hall of India.
- Hayes John P., Computer Organization, McGraw Hill.
- Digital Electronics (TMH) 1998 : Malvino and Leach

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BCA2313: ORGANIZATIONAL BEHAVIOUR

Course Outcome (CO)

CO1	Understanding Individual Behaviour
CO2	Analysing 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 Behaviour-An evidence based approach. (12th ed.). McGraw-Hill Education.
2. Pareek, U. (2014). Understanding Organisational Behaviour. 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 Behaviour. Delhi, India: Excel Books Pvt. Ltd.
5. Singh, K. (2015). Organisational Behaviour: Texts & Cases. (3rd ed.). India: Pearson.

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BCA2375: 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 Behaviour 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.	

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Suggested Readings:

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

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4. **Programs on Packages:**

- a. Create two packages one with name "Arithmetic" that contains all arithmetic related operations and another with name "interest" that contains operations that implement simple and compound interests
- b. Create the directory name called "Cars" inside this directory create sub-directories "BMW", "Audi" and "Nissan" and inside these subdirectories create the corresponding python files that maintain the corresponding Car models, prices, and Manufacturing years. Create "view.py" in "Cars" that takes a particular Car name and outputs the corresponding details.

5. **ProgramsonNumpy-1:**

- a) Write a Python Program to demonstrate numpy arrays creation using array () function.
- b) Write a python program to demonstrate use of ndim, shape, size, dtype.
- c) Python program to demonstrate basic slicing, integer and Boolean indexing.
- d) Write a python program to find min, max, sum, cumulative sum of array.

6. **ProgramsonNumpy-2:**

- a. Create two single dimensional NumPy arrays, one is height, and another is weight, calculate BMI (weight/height**2) and keep all BMI values in another NumPy Array. Calculate mean, median, and standard deviation of BMI values.
- b. Integrate the above height and weight arrays as single 2D NumPy array, and show slicing of elements, apply sum() and sort() operations on each row of the 2D NumPy array

7. **Programs on Pandas and Data Visualization:**

- a. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
 - i. Apply head() transaction to the pandas dataframe
 - ii. Perform various data selection operations on DataFrame
- b. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib.

8. Matplotlib-1

- a. Write a Python program to draw a line using given axis values with suitable label in the x axis, y axis and a title.
- b. Write a Python program to plot several lines with different format styles in one command using arrays.
- c. Write a Python program to draw a line using given axis values taken from a text file, with suitable label in the x axis, y axis and a title.

9. Matplotlib-2

- a. Write a Python programming to display a bar char to f the popularity of programming

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Languages.

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++

Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

- b. Write a Python program to display a horizontal bar chart of the popularity of programming Languages.

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++ Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

10. Matplot-3

- a. Write a Python program to create a bar plot of scores by group and gender. Use multiple X values on the same chart for men and women.

Sample Data:

Means(men)=(22,30,35,35,26)

Means(women)=(25,32,30,35,29)

- b. Write a Python programming to create a pie-chart with a title of the popularity of programming Languages.

Sample data:

Programming languages: Java, Python, HP, JavaScript, C#, C++

Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

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BCA2374: WEB TECHNOLOGIES SERVICES USING PYTHON LAB

Course Outcome (CO)

CO1	Understand the fundamentals of web development and Python-based web frameworks.	
CO2	Develop dynamic and interactive web applications using Python.	
CO3	Implement client-server communication and API development.	
CO4	Integrate databases with Python-based web applications.	
	Deploy and manage web applications effectively using cloud and containerization technologies.	

DETAILED SYLLABUS

Sr. N.	Topic	Hours
	Introduction to Web Technologies and Python: 1. Overview of web technologies and protocols (HTTP, HTTPS, REST, etc.) 2. Setting up Python for web development 3. Installing and using Flask/Django framework HTML, CSS, and JavaScript Basics for Web Development: 1. Creating simple webpages using HTML and CSS 2. Enhancing interactivity with JavaScript 3. Integrating Bootstrap for responsive design Flask/Django Basics: 1. Setting up a Flask/Django project 2. Creating and handling routes 3. Rendering templates using Jinja2 (Flask) or Django templates Form Handling and User Authentication: 1. Handling form submissions using Flask/Django 2. Implementing user authentication (login, logout, and session management) 3. Using Flask-WTF/Django Forms for secure input validation Database Connectivity: 1. Introduction to databases (SQLite, MySQL, PostgreSQL) 2. Connecting a Flask/Django app to a database using SQLAlchemy/Django ORM 3. Performing CRUD operations RESTful API Development: 1. Creating RESTful APIs using Flask-RESTful/Django REST Framework 2. Handling API requests (GET, POST, PUT, DELETE) 3. Consuming APIs using Python requests module Frontend and Backend Integration: 1. AJAX and Fetch API for asynchronous requests 2. Fetching and displaying API data using JavaScript	

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3. Building a simple Single Page Application (SPA) with Flask/Django as the backend

Web Application Security:

1. Implementing authentication and authorization
2. Preventing SQL injection, XSS, and CSRF attacks
3. Using security libraries like Flask-Security/Django Allauth

Deployment and Cloud Integration:

1. Deploying a web application on Heroku, AWS, or PythonAnywhere
2. Containerizing applications using Docker
3. Configuring web servers (Gunicorn, Nginx, Apache)

Advanced Topics and Project Development:

1. Implementing WebSockets for real-time communication
2. Using Celery for background tasks and scheduling
3. Developing a mini-project using Flask/Django with database integration

Reference Books:

1. Flask Web Development: Developing Web Applications with Python – Miguel Grinberg
2. Django for Beginners – William S. Vincent
3. Python Web Development with Django – Jeff Forcier, Paul Bissex, Wesley Chun

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Syllabus

BCA (AI) 2nd Year 4th Semester



BCA2413: DATA SCIENCE AND ANALYTICS

Course Outcome (CO)

CO1	Understand the fundamentals of Data Science and its applications.	
CO2	Perform data preprocessing and data manipulation using Python libraries.	
CO3	Visualize datasets using appropriate tools and perform Exploratory Data Analysis.	
CO4	Apply statistical techniques and probability distributions for data-driven decision-making.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Data Science: Definition, Applications, and Data Science Lifecycle, Python for Data Science: Introduction, Installation, and IDEs (Jupyter Notebook, VS Code), Python Libraries for Data Science: NumPy, Pandas, Matplotlib, Seaborn, SciPy, Handling Data in Python: Importing, Exporting, and Manipulating Datasets, Data Wrangling: Data Cleaning, Handling Missing Values, and Data Transformation.	8
II	Data Visualization and Exploratory Data Analysis (EDA): Importance of Data Visualization in Analytics, Matplotlib and Seaborn for Data Visualization, Types of Data Visualization: Bar Charts, Histograms, Box Plots, Scatter Plots, Heatmaps, Exploratory Data Analysis: Understanding Data Distributions and Relationships, Feature Engineering: Feature Selection and Feature Extraction.	8
III	Statistical Data Analysis and Probability Distributions: Descriptive Statistics: Measures of Central Tendency and Dispersion, Inferential Statistics: Hypothesis Testing (t-test, Chi-Square Test, ANOVA), Probability Distributions: Normal, Binomial, Poisson, and Exponential Distributions, Correlation and Regression Analysis, Introduction to Time Series Analysis.	8
IV	Machine Learning for Data Science: Introduction to Machine Learning: Supervised vs. Unsupervised Learning, Regression Models: Linear Regression, Multiple Regression, Classification Models: Logistic Regression, Decision Trees, Random Forest, SVM, Clustering Models: K-Means Clustering, Hierarchical Clustering, Model Evaluation: Accuracy, Precision, Recall, F1-score, ROC Curve.	8
V	Advanced Topics in Data Science & Real-world Applications: Deep Learning Basics: Introduction to Neural Networks and TensorFlow, Natural Language Processing (NLP) Fundamentals, Big Data Analytics: Introduction to Hadoop and Spark, Case Studies: Real-world Applications in Healthcare, Finance, and E-commerce, Data Science Project: End-to-End Implementation Using Python.	8

Reference Books:

1. Joel Grus – Data Science from Scratch: First Principles with Python, O'Reilly Media.
2. Jake VanderPlas – Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly Media.
3. Aurélien Géron – Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media.
4. Sebastian Raschka & Vahid Mirjalili – Python Machine Learning, Packt Publishing.
5. Tariq Rashid – Make Your Own Neural Network, CreateSpace Independent Publishing.

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BCA2412: DATA STRUCTURES AND ALGORITHMS USING JAVA

Course Outcome (CO)

CO1	Define the basic terminology about data structures.	
CO2	Ability to implement logical thinking problems.	
CO3	Demonstrate the Programming experience of sorting the numbers in ascending or descending order.	
CO4	Describe the experience graph related problems in real world.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introductory Concepts -Algorithm Constructs, Complexity analysis of algorithms (Big O notation), OO design: Abstract Data Types (ADTs), Basic Data Structures, Arrays, Stacks, Queues, Circular Queues, Link lists.	8
II	Searching Algorithms -The Sequential Search, Analysis of Sequential Search, The Binary Search, Analysis of Binary Search,	8
III	Introduction to sorting - Selection sort, Insertion sort, Bubble sort, Heap sort, Merge sort, Quick sort, Analysis of sorting algorithms.	8
IV	Graphs and Applications -, Introduction to graph theory, Graph Terminology, Different types of Graphs, Representation of Graphs, Adjacency Matrix, Adjacency List, Graph Traversal Algorithms (Breadth First Search, Depth First Search) Shortest Path, Level Setting: Dijkstra's algorithm, Level Correcting: All-pairs shortest path, Floyd-Warshall algorithm, Spanning Trees o Minimum spanning tree algorithms, Prim's algorithm, Kruskal's Algorithm.	8
V	Algorithm Designs - Analysis of different type of Algorithms, Divide and Conquer Algorithm, Greedy algorithm, Dynamic Programming algorithm, Branch-and-bound algorithms.	8

Suggested Reading:

1. Problem Solving: Best Strategies to Decision Making, Critical Thinking and Positive Thinking by Thomas Richards / Kindle Edition
2. Data Abstraction and Problem Solving with Java: Walls and Mirrors by Janet Prichard , Frank M. Carrano / Pearson
3. Object-oriented Analysis and Design Using UML - An Introduction to Unified Process and Design Patterns by Mahesh P. Matha / PHI
4. Introduction to Algorithms by Cormen, Leiserson, Rivest and Stein

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BCA2410: INTRODUCTION TO INTERNET OF THINGS

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 Madiseti
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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BCA2411: MACHINE LEARNING TECHNOLOGY

Course Outcome (CO)

CO1	Classify the basic theory underlying machine learning, types, and the process.	
CO2	Describe the data and visualize univariate, bivariate, and multivariate data using statistical techniques and dimensionality reduction.	
CO3	Demonstrate the various machine learning algorithms such as similarity-based learning, regression, decision trees, and clustering.	
CO4	Explain the learning theories, probability-based models.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Machine Learning: Need for Machine Learning, Machine Learning Explained, Types of Machine Learning, Challenges of Machine Learning, Machine Learning Process, Machine Learning Application. Introduction, Big Data Analytics and Types of Analytics, Big Data Analysis Framework, Descriptive Statistics, Univariate Data Analysis and Visualization, Bivariate Data and Multivariate Data.	8
II	Understanding Data: Multivariate Statistics, Essential Mathematics for Multivariate Data, Overview of Hypothesis, Feature Engineering and Dimensionality Reduction Techniques. Basics of Learning Theory: Introduction to Learning and its Types, Introduction to Computation Learning Theory, Design of a Learning System, Introduction to Concept Learning, Induction Biases, Modelling in Machine	8
III	Similarity-based Learning: Introduction to Similarity or Instance-based Learning, Nearest-Neighbor Learning, Weighted K-Nearest-Neighbor Algorithm, Nearest Centroid Classifier, Locally Weighted Regression (LWR). Regression Analysis: Introduction to Regression, Introduction to Linearity, Correlation, and Causation, Introduction to Linear Regression, Validation of Regression Methods, Multiple Linear Regression, Polynomial Regression, Logistic Regression.	8
IV	Models Based on Decision Trees: Introduction to Decision Tree, Decision Tree for Classification, Impurity Measures for Decision Tree Construction, Properties of Decision Tree Classifier (DTC), Applications in Breast Cancer Data, Regression Based on Decision Trees. Bayesian Learning: Introduction to Probability-based Learning, Fundamentals of Bayes Theorem, Classification Using Bayes Model.	8
V	Clustering: Introduction to Clustering, Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering. Reinforcement Learning: Overview and Scope of Reinforcement Learning, Components of Reinforcement Learning, Q-Learning. Python Basics: Entering Expressions into the Interactive Shell, Data Types, String Concatenation and Replication, Flow control: Boolean Values, Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(), Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Scopes, The global Statement, Exception Handling,	8

Suggested Readings:

1. S Sridhar and M Vijayalakshmi, "Machine Learning", Oxford University Press, 2021.
2. M N Murty and Ananthanarayana V S, "Machine Learning: Theory and Practice", Universities Press (India) Pvt. Limited, 2024.
3. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education, 2013.
4. Miroslav Kubat, "An Introduction to Machine Learning", Springer, 2017.

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BCA2415: ORGANIZATIONAL BEHAVIOUR
Course Outcome (CO)

CO1	Understanding Individual Behaviour
CO2	Analysing 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 Behaviour-An evidence-based approach. (12th ed.). McGraw-Hill Education.
2. Pareek, U. (2014). Understanding Organisational Behaviour. 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 Behaviour. Delhi, India: Excel Books Pvt. Ltd.
5. Singh, K. (2015). Organisational Behaviour: Texts & Cases. (3rd ed.). India: Pearson.

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BCA2406: DATA WAREHOUSING AND DATA MINING (EL)

Course Outcome (CO)

CO1	Classify the functionality of the various data mining and data warehousing component	
CO2	Demonstrate the limitations of various data mining and data warehousing models	
CO3	Explain the analysing techniques of various data	
CO4	Describe different methodologies used in data mining and data ware housing	
CO5	Compare different approaches of data ware housing and data mining with various technologies	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	UNIT – I Data Warehouse: Introduction to Data Ware House, Differences between operational data base systems and data Ware House, Data Ware House characteristics, Data Ware House Architecture and its components, Extraction-Transformation-Loading, Logical (Multi-Dimensional), Data Modelling, Schema Design, star and snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; Fact Less-Facts, Dimension Table characteristics; Fact-Less-Facts, Dimension Table characteristics; OLAP cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP	9
II	UNIT -II Introduction to Data Mining: Introduction, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing- Data Cleaning, Missing Data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binaryzation, Data Transformation; Measures of similarity and dissimilarity-Basics	8
III	UNIT – III Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation, APRIORI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set- Maximal Frequent Item Set, Closed Frequent Item Set.	9
IV	UNIT -IV Classification: Problem definition, General Approaches to solving a classification problem, Evaluation of Classifiers, Classification techniques, Decision trees-Decision Tree Construction, Methods for expressing attribute test conditions, Measures for Selecting the Best split, Algorithm for Decision tree Induction, Naïve-Bayes Classifier, Bayesian Belief Networks; K-nearest neighbour classification-Algorithm and characteristics	8
V	UNIT – V Clustering: Problem Definition, Clustering overview, Evaluation of clustering algorithms, Partitioning clustering K-Means Algorithm, K-Means Additional Issues, PAM Algorithm, Hierarchical Clustering-Algorithm- Agglomerative Methods and Divisive Methods, Basic Agglomerative Hierarchical Clustering Algorithm, Specific techniques, Key Issues in Hierarchical Clustering, Strengths and weakness, Outlier Detection.	8

Suggested Readings:

1. Data Mining Introductory and advanced topics -Margaret H Dunham. Pearson education.
2. Data Mining Techniques - Arun K Pujari. University Press.
3. Data Warehousing in the Real World- Sam Aanhory & Dennis Murray Pearson in Edn Asia. .
4. .Data Warehousing Fundamentals-Paulraj Ponnaiah Wiley student Edition The Data Warehouse Life cycle Tool kit-Ralph Kimball Wiley student edition

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BCA2417: COMPUTER ARCHITECTURE(EL)

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, VonNeumann 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, Safea Zaky (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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BCA2418: 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. Analysing page audience. Reach and Engagement analysis. Post- performance on FB, Use of Facebook Business Manager; Social campaigns. Measuring and Analysing 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 analysing social media data; visualization and exploration.	8

Reference Books:

1. Mathew Ganis, Avinash Koihrkar , 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. Marshall Sponder ,Social Media Analytics ,McGraw Hill ,Latest.
6. Tracy L. Tuten, Michael R. Solomon ,Social Media Marketing ,Sage ,2018 / 3rd.
7. Gohar F. Khan ,Creating Value With Social Media Analytics ,CreateSpace Independent, Publishing ,2018 / 1st.

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BCA2475: DATA SCIENCE LAB

Course Outcome (CO)

CO1	Understand and apply NumPy arrays and their operations for data handling.	
CO2	Perform data preprocessing and transformation using NumPy functions.	
CO3	Implement mathematical and statistical computations using NumPy.	
CO4	Handle multi-dimensional arrays and perform matrix manipulations.	
CO5	Use NumPy for real-world data analytics problems.	

DETAILED SYLLABUS

S.No.	Topic	Hours
	Introduction to NumPy and Arrays: 1. Write a Python program to create a NumPy array and display its properties. 2. Implement slicing and indexing operations on a given NumPy array. 3. Write a program to iterate over NumPy arrays using <code>nditer()</code>. Array Operations and Broadcasting: 1. Write a program to perform element-wise arithmetic operations on two NumPy arrays. 2. Implement broadcasting with arrays of different shapes. 3. Demonstrate array concatenation and splitting operations. Linear Algebra with NumPy: 1. Write a program to create a matrix and perform basic matrix operations. 2. Compute the determinant and inverse of a given matrix. 3. Find eigenvalues and eigenvectors of a given matrix. 4. Solve a system of linear equations using NumPy. Statistical and Mathematical Functions: 1. Compute mean, median, variance, and standard deviation of a dataset. 2. Generate random numbers using different probability distributions. 3. Find correlation and covariance between two datasets. Real-World Data Analysis using NumPy: 1. Load a dataset using NumPy and perform data preprocessing. 2. Compare the performance of NumPy arrays and Python lists in large data operations. 3. Use NumPy with Pandas and Matplotlib for basic data analysis and visualization.	
Suggested Readings: 1. Wes McKinney, Python for Data Analysis, O'Reilly Media, 2017. 2. Jake VanderPlas, Python Data Science Handbook, O'Reilly Media, 2016. 3. Mark Lutz, Learning Python, O'Reilly Media, 2013. 4. David Cournapeau & Travis Oliphant, Guide to NumPy, 2nd Edition. 5. Joel Grus, Data Science from Scratch, O'Reilly Media, 2019.		

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BCA2476: MACHINE LEARNING LAB

Course Outcome (CO)

CO1	Understand the fundamentals of machine learning and deep learning using TensorFlow.	
CO2	Implement data preprocessing and feature engineering for ML models.	
CO3	Develop and train various machine learning models using TensorFlow.	
CO4	Design and optimize deep neural networks for real-world applications.	
CO5	Deploy and evaluate machine learning models in production environments.	

DETAILED SYLLABUS

Sr. N.	Topic	Hours
	Introduction to TensorFlow: 1. Install and set up TensorFlow 2. Basic operations and tensors in TensorFlow 3. Performing mathematical computations using TensorFlow Data Preprocessing and Feature Engineering: 1. Loading datasets using TensorFlow and Pandas 2. Data cleaning and handling missing values 3. Feature scaling and normalization Building and Training a Simple Linear Regression Model: 1. Implement a simple linear regression model using TensorFlow 2. Train the model and evaluate its performance 3. Visualize results using Matplotlib Implementing Classification Models: 1. Logistic regression for binary classification 2. Implementing decision trees using TensorFlow 3. Evaluating model performance using accuracy, precision, and recall Neural Networks using TensorFlow: 1. Building a feedforward neural network 2. Training a neural network using TensorFlow and Keras 3. Optimizing neural networks using activation functions and optimizers Convolutional Neural Networks (CNNs): 1. Implementing CNNs for image classification 2. Using pre-trained models (e.g., VGG16, ResNet) 3. Fine-tuning CNN models for custom datasets Recurrent Neural Networks (RNNs) and LSTMs: 1. Building an RNN for time series forecasting 2. Implementing LSTMs for sequential data processing 3. Training and evaluating sequence models Natural Language Processing (NLP) using TensorFlow: 1. Text preprocessing (tokenization, stemming, lemmatization) 2. Implementing sentiment analysis using RNNs/LSTMs 3. Training a Transformer-based model for NLP tasks Model Evaluation and Hyperparameter Tuning:	

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	1. Using TensorFlow callbacks for model training 2. Performing hyperparameter tuning with Keras Tuner 3. Implementing cross-validation for ML models Model Deployment and Productionization: 1. Saving and loading trained models 2. Deploying models using TensorFlow Serving 3. Using TensorFlow Lite for mobile and edge devices	
Reference Books: 1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow – Aurélien Géron 2. Deep Learning with Python – François Chollet 3. TensorFlow for Deep Learning – Bharath Ramsundar & Reza Bosagh Zadeh 4. Python Machine Learning – Sebastian Raschka & Vahid Mirjalili 5. Neural Networks and Deep Learning – Michael Nielsen		

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BCA2477: DSA USING JAVA LAB

Course Outcome (CO)

CO1 Implement basic data structures in Java.

CO2 Apply OOP concepts in programs.

CO3 Perform searching and sorting

CO4 Work with trees and graphs

CO5 Work with trees and graphs

DETAILED SYLLABUS

DETAILED SYLLABUS																																		
S.No.	Topic	Hours																																
	List of Programs																																	
	<table><tr><th></th><th>Programs</th></tr><tr><td>1</td><td>Write a Program to implement addition and multiplication of two 2D arrays</td></tr><tr><td>2</td><td>Write a Program to implement Singly Linked List</td></tr><tr><td>3</td><td>Write a Program to implement stack using array.</td></tr><tr><td>4</td><td>Write a program to implement queue using array.</td></tr><tr><td>5</td><td>Write a program to implement circular queue using array.</td></tr><tr><td>6</td><td>Write a program to implement stack using linked list.</td></tr><tr><td>7</td><td>Write a program to implement queue using linked list.</td></tr><tr><td>8</td><td>Write a program to implement circular queue using linked list.</td></tr><tr><td>9</td><td>Write a program to implement binary search tree using linked list.</td></tr><tr><td>10</td><td>Write a program to implement Linear search and binary Search.</td></tr><tr><td>11</td><td>Write a program to implement Insertion Sorting.</td></tr><tr><td>12</td><td>Write a program to implement Bubble Sorting.</td></tr><tr><td>13</td><td>Write a program to convert Infix to Prefix and postfix representation of an expression.</td></tr><tr><td>14</td><td>Write a program to implement BFS using array.</td></tr><tr><td>15</td><td>Write a program to implement DFS using linked list.</td></tr></table>		Programs	1	Write a Program to implement addition and multiplication of two 2D arrays	2	Write a Program to implement Singly Linked List	3	Write a Program to implement stack using array.	4	Write a program to implement queue using array.	5	Write a program to implement circular queue using array.	6	Write a program to implement stack using linked list.	7	Write a program to implement queue using linked list.	8	Write a program to implement circular queue using linked list.	9	Write a program to implement binary search tree using linked list.	10	Write a program to implement Linear search and binary Search.	11	Write a program to implement Insertion Sorting.	12	Write a program to implement Bubble Sorting.	13	Write a program to convert Infix to Prefix and postfix representation of an expression.	14	Write a program to implement BFS using array.	15	Write a program to implement DFS using linked list.	
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Syllabus

BCA (AI) 3rd Year
5th Semester



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BCA3516: ARTIFICIAL NEURAL NETWORKS

Course Outcome (CO)

CO1	Understand the learning and generalisation issue in neural computation.	
CO2	Understand the basic ideas behind most common learning algorithms for multilayer perceptions, radial-basis function networks, and Kohonen self-organising maps.	
CO3	Apply neural networks to classification and recognition problems.	
CO4	Implement common learning algorithms using an existing package.	
CO5	To understand complex value of neural network and complexity analysis	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction of Neural Networks: History, Artificial and biological neural networks, Historical notes, human Brain, neuron Model, Knowledge representation, AI and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.	8
II	Data processing: Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.	8
III	Multilayered network architecture: Introduction, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.	8
IV	Kohonen Self-Organising Maps: Recurrent network and temporal feed-forward network, implementation with BP, self-organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.	8
V	Complex valued NN and complex valued BP: Complex valued NN and 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

Reference Books:

1. J.A Anderson, "An introduction to neural networks", MIT
2. Hageen Demuth Beale, "Neural Network Design" Cengage Learning.

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BCA3506: NATURAL LANGUAGE PROCESSING

Course Outcome (CO)

CO1	Classify the sensitivity to linguistic phenomena and an ability to model them with formal grammars.
CO2	Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
CO3	Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods
CO4	Able to design, implement, and analyze NLP algorithms
CO5	Able to design different language modeling Techniques.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	UNIT - I Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches	8
II	UNIT - II Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues	8
III	UNIT - III Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.	8
IV	UNIT - IV Predicate-Argument Structure, Meaning Representation Systems, Software.	8
V	UNIT - V Discourse Processing: Cohension, Reference Resolution, Discourse Cohension and Structure Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, LanguageSpecific Modeling Problems, Multilingual and Crosslingual Language Modeling	8

Suggested Readings:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni,
2. Pearson Publication Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

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BCA3517: COMPUTER VISION

Course Outcome (CO)

CO1	Classify the fundamental concepts and techniques in computer vision.	
CO2	Implement basic image processing and manipulation techniques using OpenCV.	
CO3	Detect and describe features in images and match them across different images.	
CO4	Demonstrate the object detection and image classification using deep learning frameworks. Analyze video data for motion detection and tracking.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Computer Vision: Overview of computer vision and its applications, History and evolution of computer vision, Key challenges in computer vision. Image Processing Fundamentals: Understanding digital images (pixels, color spaces), Image representation and manipulation, Basic image processing techniques (filtering, transformations), Introduction to OpenCV.	9
II	Feature Detection and Description: Key point detection (Harris, SIFT, SURF), Feature descriptors (ORB, BRIEF), Matching features between images, Applications of feature detection. Image Segmentation: Introduction to image segmentation techniques, Thresholding methods, Edge detection (Canny, Sobel), Region-based segmentation (Watershed, GrabCut).	9
III	Object Detection: Overview of object detection techniques, Traditional methods (Haar cascades, HOG), Introduction to deep learning for object detection (YOLO, SSD), Implementing object detection with pre-trained models. Image Classification: Understanding image classification tasks, Convolution Neural Networks (CNNs) basics, Transfer learning and fine-tuning pre-trained models, implementing image classification using TensorFlow/Keras.	10
IV	Video Analysis: Introduction to video processing, Motion detection and tracking, Optical flow and background subtraction, Applications in surveillance and activity recognition. 3D Vision and Depth Estimation: Understanding 3D vision concepts, Stereo vision and depth perception, Structure from motion (SfM), Applications in robotics and augmented reality	10
V	Image Generation and Enhancement: Introduction to Generative Adversarial Networks (GANs), Image super-resolution techniques, Image inpainting and style transfer, Applications in art and design. Advanced Topics in Computer Vision: Overview of current research trends, Explainable AI in computer vision, Ethical considerations and biases in computer vision, Real-world case studies	10

Suggested Readings:

1. "Learning OpenCV" by Gary Bradski and Adrian Kaehler
2. "Deep Learning for Computer Vision with Python" by Adrian Rosebrock.
3. "Computer Vision: Algorithms and Applications" by Richard Szeliski (2011).
4. "Computer Vision: Models, Learning, and Inference" by Simon J. D. Prince (2012).
5. "Multiple View Geometry in Computer Vision" by Richard Hartley and Andrew Zisserman (2004).

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BCA3512:INTRODUCTION TO BLOCKCHAIN TECHNOLOGY (EL)

Course Outcome (CO)

CO1	Classify the Growth of Blockchain technology, History of blockchain and Bitcoin	
CO2	Construct the Methods and Routes of decentralization, Decentralized organizations and platforms for decentralization.	
CO3	Define the Architecture, Life use cases of blockchain, Bitcoin digital keys and addresses, Limitations of Bitcoin.	
CO4	Organize Concept of Double Spending, Bitcoin Network and payments, Bitcoin Clients and APIs.	
CO5	List the Ethereum, Hyperledger, IOTA, EOS, Multichain, Bigchain, Design a distributed application, Blockchain applications.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Discover Blockchain Technology: Blockchain, Growth of blockchain technology, Distributed systems, History of blockchain and Bitcoin, Types of blockchain.	8
II	Decentralization: Methods of decentralization, Routes of decentralization, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized organizations and platforms for decentralization.	8
III	Blockchain: Architecture, Versions, Variants, Use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications. Bitcoins: Introducing Bitcoin, Bitcoin digital keys and addresses, Transactions, Blockchain mining. Alternative Coins. Limitations of Bitcoin.	9
IV	Concept of blockchain: Concept of Double Spending, Hashing, Proof of work. Bitcoin Network and payments, Bitcoin network, Wallets, Bitcoin payments, Innovation in Bitcoin, Bitcoin Clients and APIs.	8
V	Introduction to Blockchain Platforms: Ethereum, Hyperledger, IOTA, EOS, Multichain, Bigchain, etc. Advantages and Disadvantages, EthereumvsBitcoin, Design a new blockchain, Potential for disruption, Design a distributed application, Blockchain applications.	9

Suggested Readings:

1. "Mastering Blockchain" – Imran Bashir
2. "Blockchain Basics" – Daniel Drescher
3. "Blockchain Revolution" – Don Tapscott & Alex Tapscott
4. "The Basics of Bitcoins and Blockchains" – Antony Lewis
5. "Blockchain for Dummies" – Tiana Laurence

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BCA3514: INFORMATION SECURITY & CYBER LAWS (EL)		
Course Outcome (CO)		
CO1	Sketch the structure, mechanics and evolution of various crime threats	
CO2	Discuss the information systems from external attacks by developing skills in enterprise security, wireless security and computer forensics.	
CO3	Contrast the risks involved while sharing their information in cyber space and numerous related solutions like sending protected and digitally signed documents	
CO4	Identify the Digital Signature and Electronic Signature, Digital Certificate.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Definitions: Protection, Security, risk, threat, vulnerability, exploit, attack, confidentiality, integrity, availability, non-repudiation, authentication, authorization, codes, plain text, encryption, decryption, cipher text, key, ciphers, Symmetric and asymmetric 19 cryptography, Public key, private key, Crypt analysis, Cyber forensics. Substitution cipher (Caesar), Transposition cipher (Rail-Fence).	8
II	Risk analysis, process, key principles of conventional computer security, security policies, data protection, access control, internal vs external threat, security assurance, passwords, access control, computer forensics and incident response.	8
III	CYBER ATTACKS (definitions and examples): Denial-of-service attacks, Man-in-the middle attack, Phishing, spoofing and spam attacks, Drive-by attack, Password attack, SQL injection attack, Cross-site scripting attack, Eavesdropping attack, Birthday attack, Malware attacks, Social Engineering attacks.	8
IV	Brief Introduction of handling the attacks described in UNIT 3. Firewalls, logging and intrusion detection systems, e-mail security, security issues in operating systems, ethics of hacking and cracking.	8
V	Definitions: Digital Signature and Electronic Signature, Digital Certificate. i.[Section 43] Penalty and compensation for damage to computer etc. ii.[Section 65] Tampering with computer source documents. iii.[Section 66A] Punishment for sending offensive messages through communication service etc. iv.[Section 66B] Punishment for dishonestly receiving stolen computer resource or communication device. v.[Section 66C] Punishment for identity theft. vi.[Section 66D] Punishment for cheating by impersonation by using computer resource. vii. [Section 66E] Punishment for violation of privacy. viii.[Section 66F] Punishment for cyber terrorism. xii.[Section 72] Breach of confidentiality and privacy.	8
Suggested Readings:		
1. Merkow, M., & Breithaupt, J.(2005) Information Security Principles and Practices. 5th edition. Prentice Hall.		
2. Snyder, G.F. (2010). Network Security, Cengage Learning.		
3. Whitman, M. E. & Mattord, H. J. (2017) Principles of Information Security. 6th edition. Cengage Learning.		

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BCA3513: SOFT COMPUTING (EL)
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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BCA3573:(INTERNSHIP)/ MINOR PROJECT LAB

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	

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	teachers who are teaching the courses will be responsible for completing their respective lab assignments.	
	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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BCA3576: NLP LAB

Course Outcome (CO)

CO1	Understand basic NLP concepts and preprocessing	
CO2	Apply tokenization, stemming, lemmatization	
CO3	Use NLP libraries (NLTK/SpaCy)	
CO4	Perform text classification & sentiment & analysis	
CO5	Evaluate NLP models and applications	

DETAILED SYLLABUS

S.No.	Topic	Hours
	List of Experiments 1. Write a Python Program to perform following tasks on text a) Tokenization b) Stop word Removal 2. Write a Python program to implement Porter stemmer algorithm for stemming 3. Write Python Program for a) Word Analysis b) Word Generation 4. Create a Sample list for at least 5 words with ambiguous sense and Write a Python program to implement WSD 5. Install NLTK tool kit and perform stemming 6. Create Sample list of at least 10 words POS tagging and find the POS for any given word 7. Write a Python program to a) Perform Morphological Analysis using NLTK library b) Generate n-grams using NLTK N-Gram's library c) Implement N-Grams Smoothing 8. Using NLTK package to convert audio file to text and text file to audio files. TEXT BOOKS: 1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication. 2. O'Reilly Practical natural Language Processing, A Comprehensive Guide to Building Real World NLP Systems. 3. Daniel Jurafsky, James H. Martin – Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.	

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BCA3577: COMPUTER VISION LAB

Course Outcome (CO)

CO1	Basics of Computer Vision
CO2	Image preprocessing techniques
CO3	Feature extraction
CO4	Object detection & classification
CO5	Model evaluation

DETAILED SYLLABUS

S.No.	Topic		Hours
	Sr. No.	Objective(s) of Experiment	
	1.	Implementing various basic image processing operations in python/MATLAB/open-CV: Reading image, writing image, conversion of images, and complement of an image	
	2.	Implement contrast adjustment of an image. Implement Histogram processing and equalization.	
	3.	Implement the various low pass and high pass filtering mechanisms.	
	4.	Use of Fourier transform for filtering the image.	
	5.	Utilization of SIFT and HOG features for image analysis.	
	6.	Performing/Implementing image segmentation	
	7.	Implement optical flow computation algorithm.	
	8.	Demonstrate the use of optical flow in any image processing application	
	9.	Object detection and Recognition on available online image datasets	

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Syllabus

BCA (AI) 3rd Year 6th Semester



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BCA3602: DEEP LEARNING

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 – Ill 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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BCA3607: ARTIFICIAL INTELLIGENCE IN BUSINESS
Course Outcome (CO)

CO1	Define the AI and the role it can play to deliver benefits for your organization.	
CO2	Identify potential applications of AI in practice.	
CO3	Explain the main capabilities of AI and the core technologies that help deliver them.	
CO4	Describe the implications of AI for business strategies.	
CO5	Know where the AI technologies are heading within the next few years.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Introduction to AI, 'Winters' and 'summers' of AI, Machine learning, Deep learning. Supervised vs unsupervised learning, Business challenges and opportunities to deployment of AI, Deployment of AI solutions within your organization.	8
II	Learning to Know Your Customers Through NLP: Introduction to natural language processing, The NLP pipeline, From text to data, Applications of NLP, Overfitting, Evaluation metrics, Decision trees, Business challenges and opportunities to deployment of NLP, Opportunities for deployment of NLP within your organization.	8
III	Enhancing the Customer Experience Through NLG: Introduction to natural language generation (NLG), Turing test, Difficulties in applying NLG, Application of NLG, Knowledge structures and rules, Rules vs learning. Business challenges and opportunities for deployment of NLG, Opportunities for deployment of NLG within your organization.	8
IV	Search and Data Mining: Introduction to search and recommendation systems, Internet search, page rank, knowledge graph, Ethical implications and responsibilities. Applications of data mining, Personalization, Micro-segmentation, Business challenges and opportunities for deployment of data mining, Opportunities for deployment of data mining within your organization	8
V	AI in your Organization and Future Directions: Selecting a process, Matching problems to solutions, choosing an algorithm for a given problem, Introducing AI into your organization, Current status, Business strategy, Organization position within AI capability model, AI heat map. AI as a service, new opportunities or hype? Cost benefit of deep learning, Ethics of AI deployment, Ethical framework in place within your organization, Deployment of an AI solution within your organization.	8

Suggested Readings:
Text Books

1. Artificial Intelligence By Example by Denis Rothman.
2. Applied Artificial Intelligence: A Handbook For Business Leaders by Mariya Yao, Adelyn Zhou, and Marlene Jia.

Reference Books

1. Artificial Intelligence for Dummies by John Paul Mueller and Luca Massaron.
2. AI for People and Business by Alex Castrounis.

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BCA3609: DATA PRIVACY & ETHICS IN AI(EL)

Course Outcome (CO)

CO1	Classify the fundamental concepts and importance of data privacy.	
CO2	Identify and explain key legal frameworks and regulations related to data privacy.	
CO3	Construct the ethical considerations and Conduct Privacy Impact Assessments (PIAs) and assess privacy risks.	
CO4	Develop incident response plans for data breaches & Evaluate privacy-enhancing technologies and their applications.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Data Privacy & Key Concepts: Definition and importance of data privacy, Historical context and evolution of data privacy, Overview of data privacy issues in the digital age, Personal data vs. sensitive data, Data subjects and data controllers, Data processing and data lifecycle, Privacy by design and by default.	9
II	Legal Frameworks and Regulations in Data Privacy Overview of global data privacy laws (GDPR, CCPA, HIPAA, etc.), Key principles of GDPR (transparency, purpose limitation, data minimization), Understanding consent and user rights, Data collection methods and practices, Data storage and security measures, Data sharing and third-party data processing, Privacy notices and user agreements.	9
III	Ethical Considerations in Data Privacy & Privacy Impact Assessments (PIAs) Ethical implications of data collection and usage, Balancing privacy with innovation and business needs, Case studies of data breaches and ethical failures, Understanding the purpose and process of PIAs, Conducting a PIA: steps and best practices, Tools and frameworks for assessing privacy risks	10
IV	Data Breaches and Incident Response Types of data breaches and their implications, Legal obligations in the event of a data breach, Developing an incident response plan, Case studies of notable data breaches, Overview of privacy-enhancing technologies (PETs), Encryption, anonymization, and pseudonymization, Tools for managing data privacy (DLP, consent management platforms).	9
V	Future Trends and Emerging Technologies in Data Privacy Data privacy in IoT (Internet of Things), Understanding cross-border data transfers, Mechanisms for lawful data transfers (Standard Contractual Clauses, Privacy Shield), Challenges and best practices for international compliance, Evolving regulatory landscape, The role of data privacy in corporate governance, Emerging trends and technologies impacting data privacy.	10

Suggested Readings:

1. "Data Privacy: A Runbook for Engineers" by T. J. McCarthy
2. "Privacy and Data Protection Law" by Paul M. Schwartz and Daniel J. Solove.
3. "Data Privacy" by Nishant Bhajaria (2021).
4. "Cyber Privacy: Who Has Your Data and Why You Should Care" by April Falcon Doss (2020).
5. "Consumer Privacy and Data Protection, Fourth Edition" by Daniel J. Solove (2021).

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BCA3610: MOBILE COMPUTING (EL)

Course Outcome (CO)

CO1	Define the Mobile Application Development and Deployment about Android programming from basics to building mobile applications for digital world.
CO2	Explain state of art techniques in wireless communication.
CO3	Differentiate the CDMA, GSM. Mobile IP, Wlmax
CO4	Demonstrate program for CLDC, MIDP let model and security concerns
CO5	Contrast the various services and network facilities provided by android platform.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	INTRODUCTION: Mobile Computing – Mobile Computing Vs Wireless Networking – Mobile Computing Applications – Characteristics of Mobile Computing – Structure of Mobile Computing Applications - MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.	8
II	MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER: Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – Route Optimization - Overview of TCP/IP – Architecture of TCP/IP – Adaptation of TCP Window – Improvement in TCP Performance.	8
III	MOBILE TELECOMMUNICATION SYSTEMS: Global Systems for Mobile Communication (GSM)- General Packet Radio Service (GPRS)- Universal Mobile Telecommunication System (UMTS).	8
IV	MOBILE AD-HOC NETWORKS: Ad-Hoc basic concepts – Characteristics- Applications Design Issues – Routing – Essential of Traditional Routing Protocols – Popular Routing Protocols – Vehicular Ad-Hoc Networks (VANET)- MANET Vs VANET – Security.	8
V	MOBILE PLATFORMS AND APPLICATIONS: Mobile Device Operating Systems – Special Constrains and 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. Ashok Talukder, Roopa Yavagal, Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2nd Edition, Tata McGraw Hill, 2010.
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley India, 2003

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BCA3611:EDGE COMPUTING

Course Outcome (CO)

CO1	Understand the fundamental concepts of edge computing and its significance in the context of distributed systems.
CO2	Ability to design edge computing solutions, including architectures, models, and platforms.
CO3	Develop knowledge of resource management techniques in edge computing, including task scheduling algorithms, resource allocation algorithms, and load balancing algorithms.
CO4	Apply performance analysis and optimization techniques to evaluate the effectiveness and efficiency of edge computing solutions.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Unit 1: Overview of edge computing and its significance in distributed systems. Edge computing architectures, models, and platforms. Comparison of edge computing with cloud computing and fog computing. Case studies of edge computing applications	8
II	Unit 2: Resource management in edge computing and its challenges. Resource management techniques for edge computing, including task scheduling algorithms, resource allocation algorithms, and load balancing algorithms. Case studies and applications of resource management in edge computing, such as mobile edge computing, and autonomous vehicles.	8
III	Unit 3: Metrics for measuring performance in edge computing: latency, throughput, and energy efficiency. Case studies of performance analysis and optimization in edge computing, such as edge-based video streaming, smart transportation systems, and healthcare IoT devices. Emerging trends in edge computing: edge intelligence, serverless computing, edge security, and hybrid cloud and edge architectures.	8

Text and Reference Books:

1. Xin Sun and Amin Vahdat, "Edge Computing: A Primer", CRC Press, 2019.
2. Daniel Situnayake, Jenny Plunkett, "AI at the Edge", O'Reilly Media, Inc, 2023.
3. Rajkumar Buyya and Satish Narayana Srirama, "Fog and Edge Computing Principles and Paradigms", John Wiley & Sons, Inc.

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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:

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.

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BCA3673: BIG DATA LAB

Course Outcome (CO)

CO1	Understand Big Data concepts and ecosystem	
CO2	Work with Hadoop and Spark tools	
CO3	Perform data processing and analysis	
CO4	Implement data analytics techniques	
CO5	Evaluate big data solutions and results	

DETAILED SYLLABUS

S.No.	Topic	Hours												
	Experiments: 1. Install Apache Hadoop 2. Develop a MapReduce program to calculate the frequency of a given word in agiven file. 3. Develop a MapReduce program to find the maximum temperature in each year. 4. Develop a MapReduce program to find the grades of student's. 5. Develop a MapReduce program to implement Matrix Multiplication. 6. Develop a MapReduce to find the maximum electrical consumption in each year give electrical consumption for each month in each year. 7. Develop a MapReduce to analyze weather data set and print whether the day is shinny or coo day. 8. Develop a MapReduce program to find the number of products sold in each country b considering sales data containing fields like <table><tr><td>Tranction Date</td><td>Prod uct</td><td>Pri ce</td><td>Payment _Type</td><td>Na me</td><td>Ci ty</td><td>St ate</td><td>Cou ntry</td><td>Account_ Created</td><td>Last_L ogin</td><td>Latit ude</td><td>Long tude</td></tr></table>	Tranction Date	Prod uct	Pri ce	Payment _Type	Na me	Ci ty	St ate	Cou ntry	Account_ Created	Last_L ogin	Latit ude	Long tude	
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BCA3672: DEEP LEARNING LAB

Course Outcome (CO)

CO1	Understand basics of Deep Learning
CO2	Implement neural network models
CO3	Use frameworks like TensorFlow/Keras
CO4	Train models for image/text data
CO5	Evaluate deep learning models

DETAILED SYLLABUS

S.No.	Topic			Hour #																																	
	<table><tr><th>S. NO.</th><th>DATE</th><th>NAME OF THE EXPERIMENT</th></tr><tr><td>1.</td><td></td><td>Implement simple vector addition in TensorFlow.</td></tr><tr><td>2.</td><td></td><td>Implement a regression model in Keras.</td></tr><tr><td>3.</td><td></td><td>Implement a perceptron in TensorFlow/Keras Environment.</td></tr><tr><td>4.</td><td></td><td>Implement a Feed-Forward Network in TensorFlow/Keras.</td></tr><tr><td>5.</td><td></td><td>Implement an Image Classifier using CNN in TensorFlow/Keras.</td></tr><tr><td>6.</td><td></td><td>Improve the Deep learning model by fine tuning hyper parameters.</td></tr><tr><td>7.</td><td></td><td>Implement a Transfer Learning concept in Image Classification</td></tr><tr><td>8.</td><td></td><td>Using a pre trained model on Keras for Transfer Learning</td></tr><tr><td>9.</td><td></td><td>Perform Sentiment Analysis using RNN</td></tr><tr><td>10.</td><td></td><td>Implement an LSTM based Autoencoder in TensorFlow/Keras</td></tr></table>	S. NO.	DATE	NAME OF THE EXPERIMENT	1.		Implement simple vector addition in TensorFlow.	2.		Implement a regression model in Keras.	3.		Implement a perceptron in TensorFlow/Keras Environment.	4.		Implement a Feed-Forward Network in TensorFlow/Keras.	5.		Implement an Image Classifier using CNN in TensorFlow/Keras.	6.		Improve the Deep learning model by fine tuning hyper parameters.	7.		Implement a Transfer Learning concept in Image Classification	8.		Using a pre trained model on Keras for Transfer Learning	9.		Perform Sentiment Analysis using RNN	10.		Implement an LSTM based Autoencoder in TensorFlow/Keras			
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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 Behaviour 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.	
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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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**BCA (AI) 4th Year
7th Semester**



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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	List the various sources of research design, information for literature review and data collection.	
CO4	Discuss the different sampling techniques	
CO5	Construct disciplined research under supervision in an area of their choosing	

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. USA.
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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BCA4709: ANDROID APPLICATION DEVELOPMENT

Course Outcome (CO)

CO1	Ability to use an open source and Linux-based Operating System for mobile devices such as smart phones and tablet computers.	
CO2	Define the application development for mobile devices	
CO3	Demonstrate the Programming experience of Android application development	
CO4	Describe the SQLite Database in Application development	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
1	Introduction to ANDROID: What is Android? Features of Android, Android Applications, Android: Environment Setup, Architecture, Applications, Components, Hello world Example, Organizing & accessing the resources, Activities, Services, Broadcast receivers, Content providers, Fragments, Intents & Filters.	8
2	Android – UI Layouts, UI Controls, Event Handling, Styles & Themes, Custom Components, Drag & Drop, Notifications, Location-Based Services, Sending e-mail, Sending SMS, Phone Calls, Publishing Android application, Alert Dialog.	8
3	Android – Animations, Audio Capture, Audio Manager, Autocomplete, Bluetooth, Camera, Clipboard, Custom Fonts, Data Backup, Developer Tools, Emulator, Facebook Integration, Gestures, Google Maps, Image Effects, Image Switcher, Internal Storage, Jetplayer	8
4	Android – Loading Spinner, Localization, Login Screen, Media Player, Multitouch, Navigation, Network Connection, PHP/MySQL, Progress Circle, Progress Bar Using Progress Dialog, Push Notification	8
5	Android – SDK Manager, Sensors, Session Management, Sqlite Database, Support Library, Testing, UI Design, UI Patterns, UI Testing, Android – Webview	8

Suggested Reading:

1. Android Application Development, Black Book, Dreamtech Press
2. Android Programming: The Big Nerd Ranch Guide, 4th Edition by Bill Phillips, Chris Stewart, Kristin Marsicano, Brian Gardner (O'REILLY)
3. Android Programming for Beginners - Second Edition: Build in-depth, full-featured Android 9 Pie apps starting from zero programming experience, 2nd Edition by John Horton
4. Jerome DiMarzio, "Beginning Android Programming with Android Studio", 4 thEdition.
5. Pradeep Kothari, "Android Application Development (With Kitkat Support)", Black Book 2014.

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BCA4710: CLOUD COMPUTING (EL)		
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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BCA4711: DIGITAL IMAGE PROCESSING (EL)		
Course Outcome (CO)		
CO1	To become familiar with digital image fundamentals.	
CO2	To get exposed to simple image enhancement techniques in Spatial and Frequency domain	
CO3	To learn concepts of degradation function and restoration techniques	
CO4	To study the image segmentation and representation techniques.	
CO5	To become familiar with image compression and recognition method	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	DIGITAL IMAGE FUNDAMENTALS: Steps in Digital Image Processing – Components Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.	8
II	IMAGE ENHANCEMENT : Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.	8
III	IMAGE RESTORATION : Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering	8
IV	IMAGE SEGMENTATION: Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.	8
V	IMAGE COMPRESSION AND RECOGNITION: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.	8
Suggested Readings:		
1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing Pearson, Third Edition, 2010 2. Anil K. Jain, Fundamentals of Digital Image Processing Pearson, 2002. 3. Kenneth R. Castleman, Digital Image Processing Pearson, 2006. 4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB Pearson Education, Inc., 2011. 5. D.E. Dudgeon and R.M. Mersereau, Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.		

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BCA4712: 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 Lawrance Pfleeger, "Analysing 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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BCA3771: 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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BCA3772:(INTERNSHIP)/ MINOR PROJECT LAB

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	

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	teachers who are teaching the courses will be responsible for completing their respective lab assignments.	
	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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BCA3773: ANDROID APPLICATIONS DEVELOPMENT LAB

Course Outcome (CO)

CO1	Design and develop Android applications using various UI components.	
CO2	Implement event handling and manage activity lifecycles.	
CO3	Use databases and APIs for data storage and retrieval.	
CO4	Develop applications with networking capabilities and security features.	
CO5	Deploy and test Android applications on different devices.	

DETAILED SYLLABUS

Sr. N	Topic	Hours
	Introduction to Android Development: 1. Installation and setup of Android Studio 2. Creating a simple "Hello World" application 3. Understanding project structure and manifest file UI Components and Layouts: 1. Create an interactive UI with different views 2. Implementing event handling in a login form 3. Creating a simple calculator app Activities, Intents, and Fragments: 1. Creating a multi-activity application with explicit intent 2. Using implicit intent for calling, messaging, and opening web pages 3. Implementing a simple fragment-based application Storage, Databases, and Networking: 1. Storing user preferences using Shared Preferences 2. Creating a SQLite-based application for storing user details 3. Fetching and displaying JSON data from an API Advanced Topics and Deployment: 1. Implementing a background service 2. Sending push notifications using Firebase 3. Deploying an Android app on an emulator and a real device	

Suggested Readings:

1. "Android Programming: The Big Nerd Ranch Guide" by Bill Phillips and Chris Stewart
2. "Head First Android Development" by Dawn Griffiths & David Griffiths
3. "Professional Android" by Reto Meier
4. "Android Application Development for Dummies" by Donn Felker
5. "Android Design Patterns and Best Practices" by Kyle Mew

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Syllabus

**BCA (AI) 4th Year
8th Semester**



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BCA3806: AUGMENTED REALITY (AR) & VIRTUAL REALITY (VR)		
Course Outcome (CO)		
CO1	Understand the basic concepts and applications of AR and VR.	
CO2	Identify different AR & VR hardware and software technologies.	
CO3	Develop basic AR & VR applications using popular frameworks.	
CO4	Apply user interaction techniques in AR & VR experiences.	
CO5	Analyze future trends, challenges, and career opportunities in AR & VR.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction to AR & VR :Overview of Augmented Reality (AR) & Virtual Reality (VR); Differences Between AR, VR, and Mixed Reality (MR); History and Evolution of AR & VR Technologies; Applications of AR & VR in Various Fields (Gaming, Healthcare, Education, Retail, etc.); Basic Hardware & Software Components of AR & VR	8
II	AR & VR Devices and Technologies :AR Hardware: Mobile Devices, Smart Glasses (Microsoft HoloLens, Magic Leap); VR Hardware: Head-Mounted Displays (HMDs), VR Controllers, Motion Tracking Sensors; Input Devices: Haptic Devices, Hand Tracking, Eye Tracking; AR Development Technologies: ARCore (Google), ARKit (Apple), Vuforia; VR Development Technologies: Unity3D, Unreal Engine, WebVR	8
III	AR & VR Development Basics :Introduction to AR Development (Using Unity & AR SDKs); Introduction to VR Development (Basic Scene Creation in Unity/Unreal); Understanding 3D Environments, 3D Models, and Interactions; Rendering & Graphics in AR & VR; Introduction to Scripting for AR & VR (Basic C# for Unity)	8
IV	AR & VR Applications & User Interaction :User Interface (UI) & User Experience (UX) Design for AR & VR; Gesture-Based Interaction and Voice Commands; Tracking & Navigation in AR & VR (SLAM, GPS-Based, Marker-Based); AR in Mobile Applications (AR Filters, AR Shopping, AR Navigation); VR Simulations & Training Applications	8
V	Future Trends & Challenges in AR & VR :Emerging Trends: AI in AR/VR, 5G & AR/VR, Metaverse; Ethical Considerations in AR & VR (Privacy, Security, Health Risks); Challenges in AR & VR Development; Career Opportunities in AR & VR Development; Case Studies: Popular AR/VR Applications (Pokémon GO, Oculus Quest, Google Lens)	8
Suggested Readings:		
1. Prof. K. S. Ramaswamy – Augmented and Virtual Reality: The Next Big Thing in Tech 2. Dr. B. R. Mamatha&Dr. P. Sharmila – Augmented Reality and Virtual Reality: Emerging Technologies 3. Arun Solanki &Basant Agarwal – Augmented and Virtual Reality in Industry 4.0 4. Ramesh Bang, Pramod Kumar &Rajkumar – Virtual Reality and Augmented Reality in Industry 5. Tushar Sharma – Augmented Reality & Virtual Reality with Unity and Unreal		

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BCA3873: AUGMENTED REALITY (AR) AND VIRTUAL REALITY (VR) LAB

Course Outcome (CO)

CO1	Understand the fundamental concepts of AR and VR technologies.	
CO2	Develop interactive AR/VR applications using Unity, Unreal Engine, and relevant SDKs.	
CO3	Implement AR/VR interaction techniques and optimize performance.	
CO4	Integrate AR/VR applications with AI, IoT, and cloud technologies.	
CO5	Analyze and design innovative solutions using AR/VR for various industries.	

DETAILED SYLLABUS

Sr. N	Topic	Hours
	Introduction to AR and VR: 1. Setting up Unity/Unreal Engine for AR/VR development. 2. Creating a simple VR environment in Unity. Augmented Reality Development: 1. Developing an AR application using Vuforia/ARCore. 2. Implementing real-world object tracking in AR. 3. Gesture-based interaction in an AR application. Virtual Reality Development: 1. Creating a simple VR scene with navigation and interaction. 2. Implementing teleportation and hand interactions in VR. 3. Developing a small interactive VR game. AR/VR Application Development: 1. Building a simple AR-based educational application. 2. Creating an industry-based VR training simulation. 3. Developing a collaborative VR environment. Future Trends and Research in AR/VR: 1. Research paper presentation on an AR/VR topic. 2. Prototype an AR/VR concept with a final project. 3. Evaluate and test AR/VR applications using UX feedback.	

Suggested Readings:

1. Alan B. Craig – Understanding Augmented Reality: Concepts and Applications (Morgan Kaufmann)
2. Steven M. LaValle – Virtual Reality (Cambridge University Press)
3. Tony Parisi – Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile (O'Reilly)
4. Dietrich Paulus & Tobias Hollerer – Augmented Reality: Principles & Practice (Addison-Wesley)
5. Grigore C. Burdea & Philippe Coiffet – Virtual Reality Technology (Wiley)

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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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