

**GNSU Handbook
of
BCA with Specialization in Data Science and Artificial
Intelligence in collaboration with IBM
3-Years Programme**



AY-2024-25

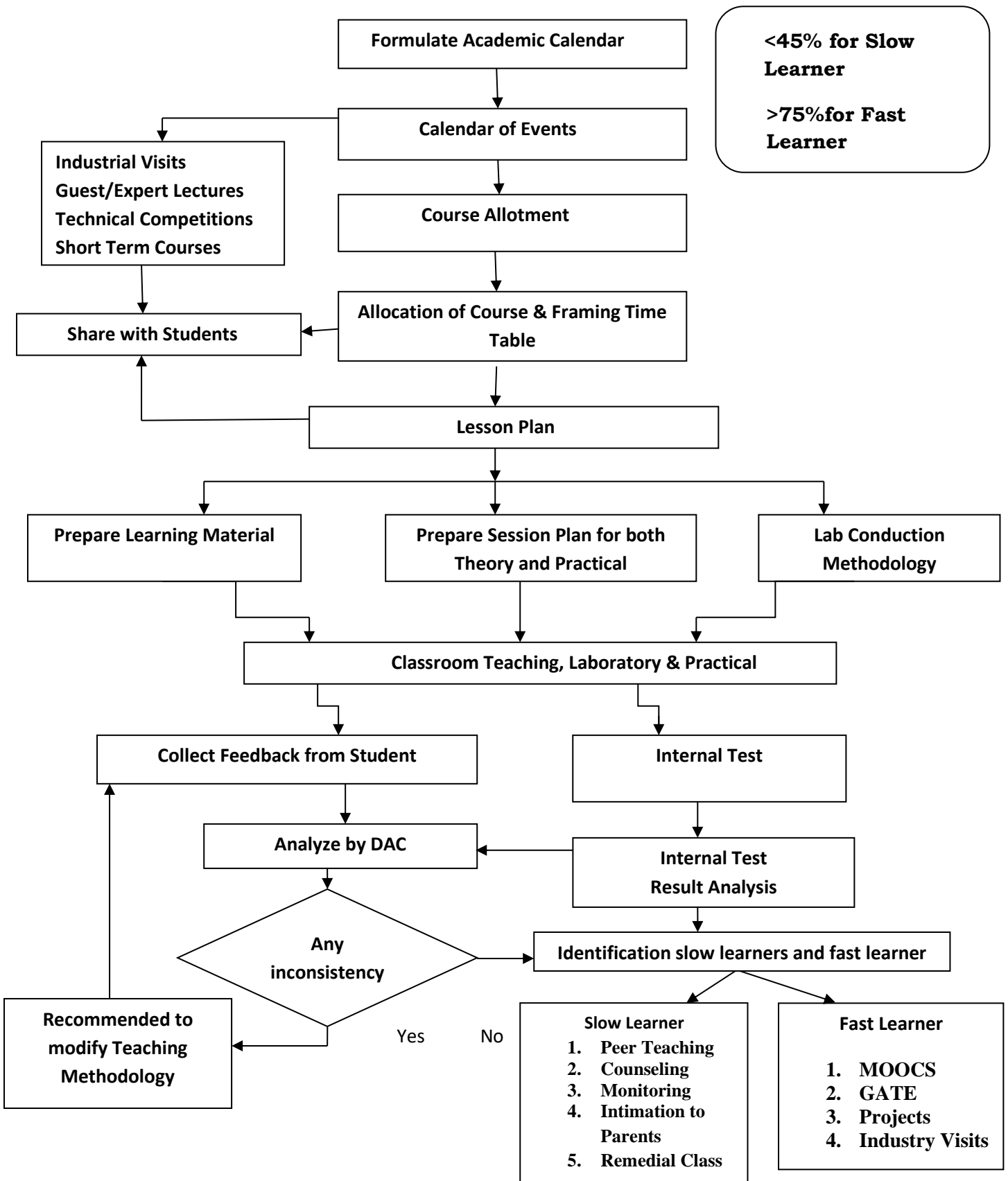
August-2024

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1.1	<p>Program Educational Objectives:</p> <p>PEO1: To facilitate in development of strong basic fundamentals of Computer Applications towards beginning a professional career in industry</p> <p>PEO2: To develop programming skills in learners by using fundamental knowledge of computer science</p> <p>PEO3: To apply new designs and solutions to complex real-life problems using existing and/or novel technologies.</p> <p>PEO4: Be effective and inspiring leader for fellow professionals and face the challenges of the rapidly changing multi-dimensional, contemporary world</p>
1.2	<p>Program Outcomes-</p> <p>PO 1. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.</p> <p>PO 2. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.</p> <p>PO 3. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.</p> <p>PO 4. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.</p> <p>PO 5. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.</p> <p>PO 6. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.</p> <p>PO 7. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes</p> <p>PO 8. Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.</p>
1.3	<p>Program Specific Outcomes-</p> <p>PSO 1. Knowledge of Computing Systems: An ability to understand the principles and working of computer systems.</p> <p>PSO 2. Project Development Skills: An ability to understand the structure and development methodologies of software systems.</p> <p>PSO 3. Software Development Skills: Familiarity and practical competence with a broad range of programming language and open-source platforms.</p> <p>PSO 4. Mathematical Skills: An ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm.</p>
1.4	<p>Teaching and Learning Process: The whole process/system for Teaching and Learning Quality Improvement is shown below. The Academic Calendar of the Faculty of Information Technology is based on Syllabus prescribed by the University. The calendar of events of the academic calendar incorporates various industrial visits, guest lectures, technical competitions and short-term courses. The calendar of events is incorporated in framing the Timetable.</p>

1.5 Teaching Learning Process- Flowchart



	<p>The academic calendar events and time table are shared with the students. The faculty prepares the lesson plan for the allotted subject. For better delivery of teaching learning process, the faculty prepares the course plan and learning methodology for the allotted subject.</p> <p>The faculty conducts the classes as per the lecture and course plan. Online feedback from the students are collected and analysed by the Departmental Academic committee (DAC). If any inconsistencies are found by DAC in the teaching learning process, the concerned faculty are advised to modify the teaching methodology and also attend Faculty development programmes.</p> <p>Two internal assessments are conducted for a particular subject per semester. The attainment of COs are analysed for taking remedial actions. Remedial actions include identification of slow, and fast learners.</p> <p>For the slow learners (≤45% marks in class test) the following methods of improvement are adopted- Peer teaching, Counselling, mentoring, intimation to parents and conducting extra classes.</p> <p>Fast learners (>75% marks in class test) are motivated to continue the achieve excellency and they are encouraged to participate in co-curricular and extra-curricular activities.</p>		
<p>2</p>	<p>Admission Guidelines. Eligibility Criteria A candidate shall be eligible for appearing in the Entrance Test leading to admission to BCA(Bachelor of Computer Applications) Semester I, if he/she has passed the following:</p> <table border="1" data-bbox="288 1189 1501 1536"> <tr> <td data-bbox="288 1189 624 1536"> <p>Admission to 3-Year programme BCA with Specialization in Data Science and Artificial Intelligence in collaboration with IBM</p> </td> <td data-bbox="624 1189 1501 1536"> <p>45% marks or equivalent grade in "10+2" examination (any discipline) from any recognized board preferably Mathematics/ any subject in Computer Science. OR A pass in diploma in Commercial Practice or equivalent (The University will offer suitable bridge courses such as Mathematics etc., forthe students coming from diverse backgrounds to prepare Level playing field and desired learning outcomes of the programme</p> </td> </tr> </table>	<p>Admission to 3-Year programme BCA with Specialization in Data Science and Artificial Intelligence in collaboration with IBM</p>	<p>45% marks or equivalent grade in "10+2" examination (any discipline) from any recognized board preferably Mathematics/ any subject in Computer Science. OR A pass in diploma in Commercial Practice or equivalent (The University will offer suitable bridge courses such as Mathematics etc., forthe students coming from diverse backgrounds to prepare Level playing field and desired learning outcomes of the programme</p>
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<p>3</p>	<p>BCA - with Specialization in Data Science and Artificial Intelligence in collaboration with IBM (3 Years-6 Semester) guidelines:</p> <ol style="list-style-type: none"> Admission in BCA(DS & AI), I-Semester programme of study shall be made on merit in the Entrance Test. The Faculty shall have an Admission Committee for BCA undergraduate admission, constituted under the provisions of Ordinances and consisting of the Dean or his nominee and two senior-most members of the teaching staff of the Faculty. Admission shall be made in accordance with these ordinances and the rules made there under. Admission cannot, however, be claimed by any candidate as a matter of right. The admission or re-admission of a candidate shall be entirely at the discretion of the Admission Committee 		

which may refuse to admit any student without assigning any reason there for.

- d. On his/her selection for admission to the BCA(DS&AI) Semester I programme, the candidate shall, within the time fixed by the Dean, Faculty of Information Technology and Engineering deposit the fees prescribed for the programme. If the candidate fails to deposit fees within the stipulated time, his/her selection shall automatically stand cancelled.
- e. Reservation in admission will be made as Govt. of Bihar rules

Intake

Course	Intake
BCA(DS & AI) (3-years,6 Semesters)	60

Documents Required

- Scanned copies of academic details.
- Scanned passport size photograph of the candidate in JPG/JPEG format
- Scanned clear signature of the candidate in JPG/JPEG format
- A valid e-mail ID.
- Scanned copies of Category certificate, PwD certificate, if applicable.
- Migration certificate
- Transfer certificate
- Character certificate
- **Other documents if any

Academic Calendar - Each academic session is divided into two semesters of approximately an Odd semester (July- December) and Even semester (January-June).

4.

MOOCS & MAR (Mandatory Additional Requirements) guidelines-

Mandatory Additional Requirement (MAR) for earning BCA-DS&AI degree will be incorporated which would be effective from the upcoming semester (ODD-2024-25). 1st Year starting from the academic year-2024-25 onwards BCA(DS & AI), minimum points to be earned for earning Degree will be 75. Each academic year 25 points have to be earned.

- MAR points for MOOCs courses already part of syllabus will also not be applicable.
- Any MOOCS already done or registered before the introduction of MAR system is not to be considered again for awarding activity points for MAR. Those courses should not be taken into consideration with retrospective effect.
- A student can also select MOOCs from the MOOCs basket/repository as designed by the Faculty of IT and Engineering for earning activity points for MAR. There should not be any overlapping of MOOCs with regard to MAR.
- If any student is unable to get certificate from MOOCs platform after auditing the course, the Faculty of IT and Engineering will extend facility for awarding point after evaluation in consultation with the University.
- In addition to SWAYAM/NPTEL/Coursera the names of all available MOOCs can be included. At present, SWAYAM/NPTEL/Coursera have only been mentioned.
- MOOCs Basket and Online Certification portals will be notified by the Faculty of IT & Engineering at the start of the semester/Academic Year.
- Every student has to compulsorily attain minimum qualifying MAR marks and submit the MAR certificates/ documents to their concerned Mentors.
- Mentors have to advise the Mentee students regarding the MAR rules, regulations and guidelines as applicable from time to time and motivate the students accordingly.

	<ul style="list-style-type: none"> • Mentors (Faculty) will have to collect the MAR Document (against each MAR activity) of each student in scanned Soft and Hard copy and submit it to the Examination cell before the completion of the even semester (i.e. end of Academic Year). • Reasoning and Aptitude classes will be conducted in the Faculty of IT and Engineering in 3rd, 4th, 5th Semesters of BCA(DS & AI) • All the 5th Semester students are expected to appear for TCS-NQT. • For students of pre-final year (Even Sem) BCA(DS & AI), for Reasoning and Aptitude marks (Compulsory in nature) are to be earned via - <i>Online certifications namely Coursera/any other</i> (as notified by the Faculty of IT at the start of the semester). Completion certificates have to be produced as a valid proof for giving MAR points. If any student is unable to get certificate from online platform, the Faculty of IT and Engineering will extend facility for awarding points after evaluation in consultation with the University. Regular Reasoning & Aptitude classes will be conducted in the department for training the students in pre-final and final year of BCA(DS&AI). • For final year students of (ODD Sem) BCA(DS & AI), Online certification(TCS NQT test will be preferable). TCS-NQT score will be valid and will earn points for MAR Grades. • Minimum MAR points have to be compulsorily earned for completion of the Degree. If MAR documents are not submitted then the result of the even semester will be withheld. • Digital versions of all certificates regarding MAR should be uploaded in the Examination portal. A provision for it may be created in online Examination portal. • MAR points will be displayed in the marksheet of the Even Semester (only) i.e. Academic Year once. e.g. Minimum Marks-25, Maximum Marks Scored-XXX • Once a student attains the Maximum score in a particular activity, the activity gets blocked, i.e. no further score is allowed in that particular activity in further semesters. • The mentors are required to maintain a list of activities completed with scores for each student under them. • The Faculty of IT and Engineering is also pleased to introduce new activities as part of MAR, which would encourage entrepreneurship ability of the students. • MAR activities listed in Annexure-1.
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5.	General Course Structure & Theme-
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5.1 Definition of Credit:	
1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (P) per week	1 Credit

<p>5.2. Range of Credits: Credit Requirements: The candidates shall complete courses equivalent to a minimum of</p> <p>➤ 142 credits to become eligible for the Bachelor in Computer Applications(DS & AI) Degree(3-Years,6 semesters) co-branded with IBM</p>
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<p>5.3 Course level coding scheme: Three-digit number (odd numbers are for the odd semester courses and even numbers are for even semester courses) used as suffix with the Course Code for identifying the</p>
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level of the course. Digit at hundred's place signifies the year in which course is offered.
 e.g. 101, 102 ... etc. for first year. 201, 202 etc. for second year. 301, 302 ... for third year.
 Sessional (Project, Seminar, etc) e.g. BC24-SEC-681..i.e 6-Sixth Sem, 8-Project/Sessional, 1- sequence.
 Laboratory- BC24-AEC-192..i.e 6-Sixth Sem,9-Laboratory, 1- sequence
Total credit for BCA(DS&AI) (3 Years) to be awarded- 142

5.4 Mandatory Induction Program: The Essence and Details of Induction program can also be understood from the 'Detailed Guide on Student Induction program', as available on AICTE Portal, (Link: <https://www.aicteindia.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf>).

Induction program(mandatory)	Three-week duration
Induction program for students to be offered right at the start of the first year.	<ul style="list-style-type: none"> • Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

5.5 Credit Distribution:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
CC	Core Courses
AEC	Ability Enhancement Courses
MDE	Multi-Disciplinary Elective course
VAC	Value added Courses
SEC	Skill Enhancement courses
DSE	Discipline Specific Elective
OE	Open Elective

Semester	Core Courses	Ability Enhancement Courses	Multi-Disciplinary Elective course	Value added Courses	Skill Enhancement courses	Discipline Specific Elec- tive	Total
I	6	14	-	-	-	-	20
II	6	22	-	-	-	-	28
III	20	4	-	-	-	-	24
IV	12	-	-	4	6	-	22
V	22	-	-	-	-	4	26
VI	4	-	4	4	6	4	22
Credits	70	40	4	8	12	8	Total-142

6 Semester-wise subject structure of B.C.A (DS & AI) (3 years-6 semesters)

1st Semester-Theory							Credit	
1	BC24-AEC-101	Digital Electronics	3	1	0	4		20
2	BC24-AEC-102	Software Foundation and Programming (with C)	3	1	0	4		
3	BC24-AEC-103	Mathematics for Data-Science	3	1	0	4		
4	BC24-CC-101	Data Visualization	3	1	0	4		
1st Semester-Laboratory							28	
5	BC24-AEC-192	Software Foundation and Programming (with C) Lab	0	0	4	2		
6	BC24-CC-191	Data Visualization laboratory	0	0	4	2	24	
2nd Semester-Theory								
1	BC24-AEC-201	Computer Architecture & Organization	3	1	0	4		
2	BC24-CC-201	Data Structures using C	3	1	0	4		
3	BC24-AEC-202	English Language and Communication	3	1	0	4		
4	BC24-AEC-203	Front End Development	3	1	0	4		
5	BC24-AEC-204	Programming with Java	3	1	0	4		
2nd Semester-Laboratory								
6	BC24-CC-291	Data Structures using C Laboratory	0	0	4	2		
7	BC24-AEC-292	Business Presentation and Language Laboratory	0	0	4	2		
8	BC24-AEC-293	Front End Development laboratory	0	0	4	2		
9	BC24-AEC-294	Programming with Java Laboratory	0	0	4	2	22	
3rd Semester Theory								
1	BC24-CC-301	Software Engineering	3	1	0	4		
2	BC24-CC-302	Operating Systems	3	1	0	4		
3	BC24-AEC-301	Management and Accounting,	3	1	0	4		
4	BC24-CC-303	Predictive Analytics Modeler	3	1	0	4		
5	BC24-CC-304	Programming with Python	3	1	0	4		
3rd Semester Laboratory								
6	BC24-CC-393	Predictive Analytics Modeler Laboratory	0	0	4	2		
7	BC24-CC-394	Programming with Python Laboratory	0	0	4	2	26	
4th Semester Theory								
1	BC24-CC-401	Database Management Systems	3	1	0	4		
2	BC24-VAC-401	Values and Ethics in Profession	3	1	0	4		
3	BC24-SEC-401	Spark and Scala	3	1	0	4		
4	BC24-CC-402	Cloud Fundamentals	3	1	0	4		
4th Semester Laboratory								
5	BC24-CC-491	Database Management Systems laboratory	0	0	4	2		
6	BC24-SEC-491	Spark and Scala Laboratory	0	0	4	2		
7	BC24-CC-492	Cloud Fundamentals Laboratory	0	0	4	2		
5th Semester Theory								
1	BC24-CC-501	Computer Networks	3	1	0	4		
2	BC24-CC-502	Design and Analysis of Algorithms	3	1	0	4		
3	BC24-CC-503	Data Science	3	1	0	4		
4	BC24-CC-504	Artificial Intelligence	3	1	0	4		
5	BC24-DSE-501A/B/C	Elective-1	3	1	0	4		

5th Semester Laboratory							
6	BC24-CC-591	Computer Networks laboratory	0	0	4	2	
7	BC24-CC-593	Data Science Laboratory	0	0	4	2	
8	BC24-CC-594	Artificial Intelligence Laboratory	0	0	4	2	
6th Semester Theory							
1	BC24-VAC-601	Environment and Ecology	3	1	0	4	22
2	BC24-CC-601	Deep Learning (Application Building using AI)	3	1	0	4	
3	BC24-DSE-601 A/B/C	MOOCs-Electives preferably be opted from the NPTEL/SWAYAM Platform*.	3	1	0	4	
4	BC24-MDE-601A/B/C	MOOCs- Electives preferably be opted from the NPTEL/SWAYAM Platform*.	3	1	0	4	
6th Semester Laboratory							
5	BC24-SEC-681	Project- Deep Learning (Application Building using AI)	0	0	12	6	
List of Electives in the 5th and 6th Sem BCA							
	BC24-DSE-501A	Image Processing	3	1	0	4	
	BC24-DSE-501B	Pattern Recognition	3	1	0	4	
	BC24-DSE-501C	Compiler Design	3	1	0	4	
	BC24-DSE-601A/B/C	MOOCs basket will be declared at the start of the semester e.g. Cryptography and Network Security, Web and Social Media Analytics, Data Mining	3	1	0	4	
	BC24-MDE-601A/B/C	MOOCs basket will be declared at the start of the semester e.g. E-Commerce and ERP, Introduction to Digital Marketing, Business Communication & Value Science	3	1	0	4	
Total credit for BCA 3 years to be awarded= 142							
7. Mandatory Course-Non Credit							
1	MC-VAC-401	Environmental Sciences	2	0	0	Non-Credit	
1	MC-VAC-501	Constitution of India/ Essence of Indian Knowledge & Tradition	1	0	0	Non-Credit	
<p>*MOOCs Regarding: MOOCs basket will be declared at the beginning of the semester by Dean Faculty of Information Technology and Engineering based on emerging technologies. The courses has to be chosen from the basket.</p> <p>[1] While opting for a course for pursuing the Open Elective, a student needs to ensure that:</p> <p>i) The duration of the course must minimum of 12-Weeks.</p> <p>ii) The course must not be covered in previous semesters of the program.</p> <p>iii) Date of Exam and publication of result should be within the tenure of the BCA(DS&AI) 6th Semester i.e. January to June of every Year.</p> <p>[2] The student should register and submit the details of the course at the time of enrolment of 6th Sem.</p>							

8.	Evaluation Scheme:																																				
	<p>Since assessment rubrics are not generic in nature and depend on courses, topics, assessment strategies of individual faculties etc., it is suggested that Faculty of Information Technology & Engineering will follow the following rubrics for Theory, Laboratory and Sessional evaluation.</p> <p>a. Rubrics for Theory Courses: The internal assessment will be of 30 marks and end semester examinations will be of 70 marks. For passing the subject the students should obtain at least 40 marks out of 100 (Internal assessment and end semester assessment).</p> <p>Suggestive rubrics for Internal Assessment: Calculation of Internal assessment number will be Average of Best of three CA plus 5 marks of Attendance.</p> <table border="1" data-bbox="504 640 1457 931"> <thead> <tr> <th>Continuous Assessment</th> <th>Activities</th> </tr> </thead> <tbody> <tr> <td>CA1</td> <td>Quiz/ Assignment</td> </tr> <tr> <td>CA2</td> <td>Internal test (Pen and paper)</td> </tr> <tr> <td>CA3</td> <td>PPT presentation/ Group Discussion</td> </tr> <tr> <td>CA4</td> <td>Internal test(Pen and paper)</td> </tr> </tbody> </table>	Continuous Assessment	Activities	CA1	Quiz/ Assignment	CA2	Internal test (Pen and paper)	CA3	PPT presentation/ Group Discussion	CA4	Internal test(Pen and paper)																										
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	<p>b. Rubrics for Practical Courses: The internal assessment will be of 40 marks and end semester laboratory examinations will be of 60 marks. For passing the subject the students should obtain at least 50 marks out of 100 (Internal assessment and end semester assessment).</p> <p>Sessional Exams- (Project, Seminar, Group Discussion, Internship, Training etc.) end semester examinations will be held for 100 marks. For passing the subject the students should obtain at least 50 marks out of 100 . Evaluation will be based on work done, quality of report, performance in viva-voice, presentation etc. for which rubrics may be designed based on course outcomes. The Project Viva and practical examinations will preferably have external examiners as per rules of the University.</p> <p>c. Mapping of Marks to Grades Each course (Theory/Practical) is to be assigned 100 marks, irrespective of the number of credits, and the mapping of marks to grades may be done as per the following table:</p> <table border="1" data-bbox="309 1397 1501 1890"> <thead> <tr> <th>Classification</th> <th>Letter Grade</th> <th>Score on 100 percentage point</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td>Outstanding</td> <td>O</td> <td>100 to 90</td> <td>10</td> </tr> <tr> <td>Excellent</td> <td>E</td> <td>89 to 80</td> <td>9</td> </tr> <tr> <td>Very Good</td> <td>A</td> <td>79 to 70</td> <td>8</td> </tr> <tr> <td>Good</td> <td>B</td> <td>69 to 60</td> <td>7</td> </tr> <tr> <td>Fair</td> <td>C</td> <td>59 to 50</td> <td>6</td> </tr> <tr> <td>Below Average</td> <td>D</td> <td>49 to 40</td> <td>5</td> </tr> <tr> <td>Failed</td> <td>F</td> <td>Below 40</td> <td>2</td> </tr> <tr> <td>Incomplete</td> <td>I</td> <td>-----</td> <td>2</td> </tr> </tbody> </table>	Classification	Letter Grade	Score on 100 percentage point	Points	Outstanding	O	100 to 90	10	Excellent	E	89 to 80	9	Very Good	A	79 to 70	8	Good	B	69 to 60	7	Fair	C	59 to 50	6	Below Average	D	49 to 40	5	Failed	F	Below 40	2	Incomplete	I	-----	2
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Incomplete	I	-----	2																																		

d. Promotional Policy: Candidates will be eligible for promotion to the next semester without clearing all end semester theory courses of earlier semesters if,

- a. Candidate has minimum attendance percentage of 75% in the previous semester
- b. Candidates must have appeared for all internal examinations and has secured marks in Continuous Assessments, Sessional Examinations, Practical Examinations
- c. Candidates must have applied for appearing in the end semester examinations and have valid admit card in previous semester

Candidates failed to achieve the minimum benchmarks as mentioned in (a), (b), (c) for promotion will not be eligible for promotion to the next higher semester.

Candidates will appear in the end semester theory examinations as back log candidate in corresponding semester, of subsequent academic year. Marks scored in Continuous Assessments, Sessional Examinations, Practical Examinations during attending regular semester with minimum qualifying attendance would be carried all through. Backlog candidates would be allowed to appear in the end semester examinations. **For 5th and 6th Semester backlog students, backlog examinations will be conducted after two months from the date of result publication.**

If any candidate fails to secure minimum qualifying marks (pass marks) in sessional or practical examinations would suffer year lag and they have to continue the semester concerned afresh in the next academic year. In the internal examination of 30 marks -Cumulative Assessment 25 plus 5 marks for attendance.

The marks of a backlog paper will be determined from the marks obtained in theory examination and marks of the continuous evaluation of the regular semester. No up-gradation of internal/continuous assessment marks would be allowed.

If any candidates fail to achieve any of the three conditions above (a, b & c) in any semester (say, 1st semester), they would not be allowed to continue their study in the next semester (i.e., 2nd semester) and they have to fulfill the academic regulations by enrolling them in the next academic year from the discontinued semester (i.e. 1st semester) and so on.

However, there would not be any limit of number of back papers to continue their study in subsequent semester as regular candidate.

e. Calculation of DGPA, CGPA for one, two, three and four year programmes.

- Result Status: X=Not eligible for Semester Promotion/Degree; XP=Eligible for Promotion with Backlogs; P=Passed and Promoted.
- The method of calculation of Grade Point Average is as follows
- **SGPA (Semester Grade Point Average)** = $\frac{\text{Credit Index}}{\sum \text{Credits}}$
- **YGPA (Yearly Grade Point Average)** = $\frac{\text{Credit Index Odd Semester} + \text{Credit Index Even Semester}}{\sum \text{Credits Odd Semester} + \sum \text{Credits Even Semester}}$
- For final **Degree Grade Point Average (DGPA)** the calculation is as under

$$\text{DGPA} = \frac{\text{YGPA 1} + \text{YGPA 2} + 1.5 * \text{YGPA 3} + 1.5 * \text{YGPA 4}}{5}$$

(For 4 Year Course)

$$\text{DGPA} = \frac{\text{YGPA2} + 1.5 * \text{YGPA3} + 1.5 * \text{YGPA4}}{4}$$

(For Lateral Entry Students)

$$\text{DGPA} = \frac{\text{YGPA 1} + \text{YGPA2} + \text{YGPA3}}{3}$$

(For 3 Year Course)

$$\text{DGPA} = \frac{\text{YGPA 1} + \text{YGPA2}}{2}$$

(For 2 Year Course)

$$\text{DGPA} = \text{YGPA1}$$

(For 1 Year Course)

CUMULATIVE GRADE POINT AVERAGE (CGPA)

$$\text{CGPA} = \frac{\sum_{k=1}^{K=n} \text{Credit Index of } k^{\text{th}} \text{ semester}}{\sum_{k=1}^{k=n} \text{Credit of } k^{\text{th}} \text{ Semester}}$$

Where

n = 4 for 2 years programme

n=6 for 3 years programme

n = 8 for 4 years programme

n = 10 for 5 years programme

9.

Student Roll No.....

Student Name:



Academic year: 2023-24
Internal Examinations-I
B.C.A ,2023 Batch
1st Semester

Subject Code:

| Subject Name

Time: 1 hours

Max. Marks: 25

This template is recommended for courses with 4 COs and two In-Sem Tests. Can also be followed for courses with five COs. The COs can be altered in the template depending on the test being conducted.

(Assume any missing data suitably and design adequate hypothesis, if required)

Part-A		(3X 1M=3M)
Answer Any Three Questions		
Q. No. 1, 2 from CO1 Preferred to be at lower BTL than the Max BTL of CO1		
Q. No 3, 4 from CO2 Preferred to be at lower BTL than the Max BTL of CO2		
1.		
2.		
3.		
4.		
Part-B		(2 X 4M=8M)
Answer Any Two Questions		
Q. No. 5, 6 from CO1 Preferred to be at lower BTL than the Max BTL of CO1		
Q. No 7, 8 from CO2 Preferred to be at lower BTL than the Max BTL of CO2		
5.		
6.		
7.		
8.		
Part-C		(2 X 7M=14M)
Answer ALL Questions		
Q. No. 9,10 from CO1 and have a internal choice between Q.No.9 and Q.No.10		
Q. No. 11,12 from CO2 and have a internal choice between Q.No.11 and Q.No.12		
9.	Q. No. 9 from CO1 Preferred to be at lower BTL than the Max BTL of CO1, At least one sub question must be of Max. BTL of the CO1, max 2 sub questions.	
(Or)		
10.	Q. No.10 from CO1 Preferred to be at lower BTL than the Max BTL of CO1, At least one sub question must be of Max. BTL of the CO1, max 2 sub questions.	
11.	Q. No.11 from CO2 Preferred to be at lower BTL than the Max BTL of CO2, At least one sub question must be of Max. BTL of the CO1, max 2 sub questions.	
(Or)		
12.	Q. No.12 from CO2 Preferred to be at lower BTL than the Max BTL of CO2, At least one sub question must be of Max. BTL of the CO1, max 2 sub questions.	

Student Roll No.....

Student Name.....



Academic year: 2023-24
Internal Examinations-II
B.C.A, 2023 Batch
1st Semester

Subject Code:**Subject Name****Time: 1 hours****Max. Marks: 25**

This template is recommended for courses with 4 COs and two In-Sem Tests. Can also be followed for courses with five COs. The COs can be altered in the template depending on the test being conducted.

(Assume any missing data suitably and design adequate hypothesis, if required)

Part-A		(3X 1M=3M)
Answer Any Three Questions		
Q. No. 1, 2 from CO3 Preferred to be at lower BTL than the Max BTL of CO3		
Q. No 3, 4 from CO4 Preferred to be at lower BTL than the Max BTL of CO4		
1.		
2.		
3.		
4.		
Part-B		(2 X 4M=8M)
Answer Any Two Questions		
Q. No. 5, 6 from CO3 Preferred to be at lower BTL than the Max BTL of CO3		
Q. No 7, 8 from CO4 Preferred to be at lower BTL than the Max BTL of CO4		
5.		
6.		
7.		
8.		
Part-C		(2 X 7M=14M)
Answer ALL Questions		
Q. No. 9,10 from CO3 and have a internal choice between Q.No.9 and Q.No.10		
Q. No. 11,12 from CO4 and have a internal choice between Q.No.11 and Q.No.12		
9.	Q. No. 9 from CO3 Preferred to be at lower BTL than the Max BTL of CO3, At least one sub question must be of Max. BTL of the CO3, max 2 sub questions.	
(Or)		
10.	Q. No.10 from CO3 Preferred to be at lower BTL than the Max BTL of CO3, At least one sub question must be of Max. BTL of the CO3, max 2 sub questions.	
11.	Q. No.11 from CO4 Preferred to be at lower BTL than the Max BTL of CO4, At least one sub question must be of Max. BTL of the CO4, max 2 sub questions.	
(Or)		
12.	Q. No.12 from CO4 Preferred to be at lower BTL than the Max BTL of CO4, At least one sub question must be of Max. BTL of the CO4, max 2 sub questions.	

Student Roll No.....

Student Name:.....



Academic year: 2023-24
Sem-End Examinations, Nov-Dec 2023
B.C.A , 2023 Batch
1st Semester

Subject Code:**Name of the Course:****Time: 3 hours****Max. Marks: 70***(Assume any missing data suitably and design adequate hypothesis, if required)*

Part-A		(8 X 4M=32M)
Answer ALL Questions		
Q. No. 1.a to 1.h Preferred to be at lower BTL than the Max BTL, No sub questions		
1 a.	Q. No. 1.a from CO1 with Lower BTL Level	
1 b.	Q. No. 1.b from CO1 with Lower BTL Level	
1 c.	Q. No. 1.c from CO2 with Lower BTL Level	
1 d.	Q. No. 1.d from CO2 with Lower BTL Level	
1 e.	Q. No. 1.e from CO3 with Lower BTL Level	
1 f.	Q. No. 1.f from CO3 with Lower BTL Level	
1 g.	Q. No. 1.g from CO4 with Lower BTL Level	
1 h.	Q. No. 1.h from CO4 with Lower BTL Level	
Part-B		(4 X 7M=28M)
Answer ALL Questions		
Q. No. 2 to 4 Preferred to be at lower BTL than the Max BTL, No sub questions and have a internal choice		
2.a	Q. No. 2.a from CO1 with BTL Level	
[OR]		
2.b	Q. No. 2.b from CO1 with BTL Level	
3.a	Q. No. 3.a from CO2 with BTL Level	
[OR]		
3.b	Q. No. 3.b from CO2 with BTL Level	
4.a	Q. No. 4.a from CO3 with BTL Level	
[OR]		
4.b	Q. No. 4.b from CO3 with BTL Level	
5.a	Q. No. 5.a from CO4 with BTL Level	
[OR]		
5.b	Q. No. 5.b from CO4 with BTL Level	
Part-C		(1 X 10M=10M)
Answer ANY ONE Question		
Q. No.6 and 7 preferably be Max BTL and maximum four sub questions with equal marks and may have a link between those questions.		
<i>(Question must be based on comprehensive knowledge of course and interconnection of courses)</i>		
6	Combination of all CO's	
7	Combination of all CO's	

10 S.N	Annexure-1 -Name of the MAR Activity	Points	Maximum Points Allowed
1(a).	Reasoning and Aptitude tests via online platform/others **Mandatory for 4 th Sem BCA(DS & AI)	10 (per course)	20
1(b)	Mandatory-Online certifications/TCS-NQT **preferable for 5 th Sem BCA(DS & AI)	20	20
2.	Tech Fest/Fest/Teachers' Day/Fresher's Welcome		
	a) Organizer	5	10
	b) Participant	3	6
3.	Tree Plantation and up keeping (per tree)	1	10
4.	Participation in Relief Camps		
	a) Collection of funds/materials for the Relief Camp	5	20
	b) To be a part of the Relief Work team	10	
5.	Participation in Debate/Group Discussion/Tech Quiz/Quiz	10	20
6.	Publication of Wall Magazine in institutional level (magazine/article/internet)	10	20
7.	Publication in Newspaper, Magazine and Blogs	10	20
8.	Research Publication (per publication)	15	30
9.	Innovative Projects (other than course curriculum)	30	60
10.	Blood donation	8	16
	Blood donation camp organization	10	20
	Participation in Sports/Games		
11.	a) College level	5	10
	b) University level	10	20
	c) District level	12	24
	d) State level	15	30
	e) National/International Level	20	20
12.	Cultural Programme (Dance, Drama, Elocution, Music etc.)	10	20
13.	Member of Professional Society	10	20
14.	Student Chapter	10	20
15.	Relevant Industry Visit & Report	10	20
16.	Activities in different Clubs (Photography Club, Cine Club)	5	10
17.	Participation in Yoga Camp (Certificate to be submitted)	5	10
18.	Community Service & Allied Activities	10	20
	Self-Entrepreneurship Programme		
19.	a) To Organize Entrepreneurship Workshop and Programmes	10	20
	b) To take part in Entrepreneurship Workshop and get certificate	5	10
	c) Video Film-Making on Entrepreneurship	10	20
	d) Submit Business Plan on any Project	10	20
	e) To work for start-up/as entrepreneur	20	40

11 **Annexure 2: Detailed Syllabus Semester –I to Semester VI**

Course Title: Digital Electronics

Course code: BC24-AEC-101

LTP: 3-1-0

Credit : 4

Unit 1. Data and number systems; Binary, Octal and Hexadecimal representation and their conversions; BCD, ASCII, EBCDIC, Graycodes and their conversions; Signed binary number representation with 1's and 2's complement methods, Binary arithmetic. Venn diagram, Boolean algebra; Various Logic gates- their truth tables and circuits; Representation in SOP and POS forms; Minimization of logic expressions by algebraic method, K-map method

Unit 2. Combinational circuits- Adder and Subtractor circuits; Applications and circuits of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator. [5] Memory Systems: RAM, ROM, EPROM, EEROM, Design of combinational circuits-using ROM, Programming logic devices and gate arrays. (PLAs and PLDs)

Unit 3. Sequential Circuits- Basic memory element-S-R, J-K, D and T Flip Flops, various types of Registers and counters and their design, Irregular counter, State table and state transition diagram, sequential circuits design methodology.

Unit 4. Different types of A/D and D/A conversion techniques. Logic families-TTL, ECL, MOS and CMOS, their operation and specifications.

Course title: Mathematics for Data Science

Course code: BC24-AEC-103

LTP: 3-1-0

Credit: 4

Module No.	Description of Topic
I	Set Theory - Number system, Sets and their operations, Relations and functions – Relations and their types, Functions and their types.
II	Basic Probability: Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient
III	Probability Function and Distributions: Continuous random variables and their properties, Probability density and distribution functions, Moments, Normal distributions and Exponential distributions

IV	<p>Basic Statistics:</p> <p>Measures of Central tendency and dispersion, Moments, Skewness and Kurtosis, Pearson Correlation and Rank correlation. Univariate ,bivariate and multivariate data analysis. Variance analysis.</p>
V	<p>Sampling Theory : Sampling distribution , type of sampling standard error, principal of validity, biased and unbiased error, testing of hypothesis</p> <p>Graph Theory: Representation of graphs, Breadth-first search, Depth-first search, Applications of BFS and DFS; Directed Acyclic Graphs - Complexity of BFS and DFS, Topological sorting.</p> <p>Longest path, Transitive closure, Matrix multiplication Graph theory Algorithms - Single-source shortest paths, Dijkstra's algorithm, Minimum cost spanning trees, Prim's algorithm, Kruskal's algorithm.</p>

Course Outcomes:

The students will be able to:

- Learn the ideas of probability and random variables, various discrete and continuous probability distributions with their properties and their applications in physical and engineering environment.
- Understand the basic ideas of statistics with different characterisation of a univariate and bivariate data set.
- Apply statistical tools for analyzing data samples and drawing inference on a given data set.
- Graphs are used in Neural Networks where vertices represent neurons and edges represent the synapses between them. Neural networks are used to understand how our brain works and how connections change when we learn.

Learning Resources:

Text Books:

1. Reena Garg, Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
3. S. Ross, A First Course in Probability, Pearson Education India
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley.

Reference Books:

1. John E. Freund, Ronald E. Walpole, Mathematical Statistics, Prentice Hall.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
3. N.G. Das, Statistical Methods (Combined Volume), Tata-McGraw Hill.

Course title: Computer Architecture & Organization

Course code: BC24-AEC-201

LTP: 3-1-0

Credit: 4

Revision of basics in Boolean logic and Combinational/Sequential Circuits.

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit.

Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

Data representation: Signed number representation, fixed and floating point representations, character representation.

Computer arithmetic: Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic, IEEE 754 format.

Introduction to x86 architecture.

CPU control unit design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU.

Memory system design: Semiconductor memory technologies, memory organization.

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O Transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes

– Role of interrupts in process state transitions, I/O device interfaces – SCII, USB.

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Text Books:

1. Computer System Architecture M. M. Mano:, 3rd ed., Prentice Hall of India, New Delhi, 1993.
2. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.
3. Computer Organization and Embedded Systems, Carl Hamacher.

Reference Books:

1. Computer Architecture and Organization, John P. Hayes.
2. Computer Organization and Architecture: Designing for Performance, William Stallings.
3. Computer System Design and Architecture, Vincent P. Heuring and Harry F. Jordan

Course code: BC24-CC-201	Category:
Course Title: Data Structure using C	Semester: II
L-T-P : 3-1-0	Credit: 4

Detailed Contents

Basic Terminologies and Introduction to Algorithm & Data Organisation: Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction

Linear Data Structure: Array, Stack, Queue, Linked-list and its types, Various Representations, Operations & Applications of Linear Data Structures

Non-linear Data Structure: Trees (Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, Splay Tree) and Graphs (Directed, Undirected), Various Representations, Operations & Applications of Non-Linear Data Structures

Searching and Sorting on Various Data Structures: Sequential Search, Binary Search, Comparison Trees, Breadth First Search, Depth First Search, Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heap sort, Introduction to Hashing

File Organization (Sequential, Direct, Indexed Sequential, and Hashed) and various types of accessing schemes.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Text Books:

1. Fundamentals of Data Structures, E. Horowitz, S. Sahni, S. A-Freed, Universities Press.
2. Data Structures, R.S. Salaria, Khanna Book Publishing, Delhi.
3. Data Structures and Algorithms, A. V. Aho, J. E. Hopcroft, J. D. Ullman, Pearson.
4. Expert Data Structures with C, R.P. Patel, Khanna Publishing House.

Reference Books:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth.
2. Design and Analysis of Algorithms, Gajendra Sharma, Khanna Book Publishing
3. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson,

Course Code : BC24-AEC-202	Category :
Course Title : English Language and Communication	Semester : Second
L-T-P : 3-1-0	Credit:4
Pre-Requisites:	

Detailed contents

1. Vocabulary Building

- 1.1 The concept of Word Formation: Compounding, Backformation, Clipping, Blending.
- 1.2 Root words from foreign languages and their use in English
- 1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
- 1.4 Synonyms, antonyms, and standard abbreviations: Acronyms

2. Basic Writing Skills

- 2.1 Sentence Structures & Types: Simple, Compound, Complex
- 2.2 Use of phrases and clauses in sentences: Transformation of sentences, active, passive, narration
- 2.3 Importance of proper punctuation
- 2.4 Creating coherence: Arranging paragraphs & Sentences in logical order
- 2.5 Creating Cohesion: Organizing principles of paragraphs in documents
- 2.6 Techniques for writing precisely

3. Identifying Common Errors in Writing

- 3.1 Subject-verb agreement
- 3.2 Noun-pronoun agreement

- 3.3 Misplaced modifiers
- 3.4 Articles
- 3.5 Prepositions
- 3.6 Redundancies
- 3.7 Clichés

4. Nature and Style of sensible Writing

- 4.1 Describing
- 4.2 Defining
- 4.3 Classifying
- 4.4 Providing examples or evidence
- 4.5 Writing introduction and conclusion

5. Writing Practices

- 5.1 Comprehension
- 5.2 Précis Writing
- 5.3 Essay Writing
- 5.4 Business Letter, Cover Letter & CV; E-mail

Learning Resources:

- (i) Kulbushan Kumar, R S Salaria, Effective Communication Skills, Khanna Publishing House, Delhi.
- (ii) Practical English Usage. Michael Swan. OUP. 1995.
- (iii) Remedial English Grammar. F.T. Wood. Macmillan. 2007
- (iv) On Writing Well. William Zinsser. Harper Resource Book. 2001
- (v) Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
- (vi) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
- (vii) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
- (viii) Universal English Prof. Prasad Kataria Publications, 2019.
- (ix) "Communication Skills for Professionals"-Nira Konar, Prentice Hall of India 2nd edition, New Delhi, 2011
- (x) Gajendra Singh Chauhan, Smita Kashiramka and L. Thimmesha. Functional English. Cengage , 2019.

Course Outcomes

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Course code: BC24-CC-291	Category:
Course Title: Data Structure using C Laboratory	Semester: II
L-T-P : 0-0-4	Credit: 2

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

List of Practical:

1. Implementation of searching and sorting techniques.
2. Implementation of linked list.
3. Implementation of push and pop operation on stack
4. Implementation of enqueue and dequeue operation.
5. Write a program to solve the problems using iteration/recursion
6. Write a program to implement Merge Sort
7. Write a program to implement Bubble Sort
8. Program for storing data as tree structure and implementation of various traversal techniques
9. Program for storing data as graph structure and implementation of various traversal techniques
10. Write a program to implement Linear Sort
11. Write a program to implement Binary Sort

**** Faculty may add or remove experiments as per syllabus requirements.**

Course Title : Business Presentation and Language Laboratory

Course code: BC24-AEC-292

LTP: 0-0-4

Credit: 2

- 1) Honing 'Listening Skill' and its sub skills through Language Lab Audio device;
- 2) Honing 'Speaking Skill' and its sub skills
- 3) Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/Voice modulation/ Stress/ Intonation/ Pitch & Accent) of connected speech
- 4) Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone, Mobile phone & Role Play Mode)
- 5) Introducing 'Group Discussion' through audio –Visual input and acquainting them with key strategies for success
- 6) G D Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies & other soft skills) of GD
- 7) Honing 'Reading Skills' and its sub skills using Visual / Graphics/ Diagrams /Chart Display/Technical/Non Technical Passages/Learning Global / Contextual / Inferential Comprehension;
- 8) Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; Practice Sessions

Course Outcomes

- The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Course Title : Software Engineering

Course code: BC24-CC-301

LTP: 3-1-0

Credit: 4

Unit	Content
1	Introduction: Programming in the small vs. programming in the large; software project failure and importance of software quality and timely availability; of software engineering towards successful execution of large software projects; emergence of software engineering as a discipline, Software Engineering Historical Development from Jackson Structured Programming to Agile Development.
2	Software Project Management: Basic concepts of life cycle models – different models and milestones; software project planning – identification of activities and resources; concepts of feasibility study; techniques for estimation of schedule and effort; software cost estimation models and concepts of software engineering economics; techniques of software project control and reporting; introduction to measurement of software size; introduction to the concepts of risk and its mitigation; configuration management.
3	Software Quality Management and Reliability: Software quality; Garvin's quality dimension; McCall's quality factor, ISO 9126 quality factor; Software Quality Dilemma; Introduction Capability Maturity Models (CMM and CMMI); Introduction to software reliability reliability models and estimation.
4	Software Requirements Analysis, Design and Construction: Introduction to Software Requirement Specifications (SRS) and requirement elicitation techniques; techniques for requirement modelling – decision tables, event tables, state transition tables Petrinets; requirements documentation through use cases; introduction to UML, introduction to software metrics and metrics-based control methods; measure of code and design quality.
5	Object Oriented Analysis, Design and Construction: Concepts -- the principles of abstraction, modularity, specification, encapsulation and information hiding; concepts of abstract data type; Class Responsibility Collaborator (CRC) model; quality of design; design measurements; concepts of design patterns; Refactoring; object-oriented construction principles; object oriented metrics.

6	Software Testing: Introduction to faults and failures; basic testing concepts; concepts of verification and validation; black box and white box tests; white box test coverage – code coverage, condition coverage, branch coverage; basic concepts of black-box tests – equivalence classes, boundary value tests, usage of state tables; testing use cases; transaction based testing; testing for non-functional requirements – volume performance and efficiency; concepts of inspection; Unit Testing, Integration Testing, System Testing and Acceptance Testing.
7	Agile Software Engineering: Concepts of Agile Methods, Extreme Programming; Agile Process Model - Scrum, Feature; Scenarios and Stories

Course code: BC24-CC-302	Category:
Course Title: Operating Systems	Semester: III
L-T-P : 3-1-0	Credit: 4

Detailed Content

Unit I.

Overview of Operating Systems: OS and the Computer System, Efficiency, System Performance and User Convenience, Classes of Operating Systems, Batch Processing Systems, Multiprogramming Systems, Time Sharing Systems, Real Time Operating Systems, Distributed Operating Systems, Modern Operating Systems.

Unit II.

Processes and Threads: Processes and Programs, Programmer view of Processes, OS view of Processes, Threads, Case studies of Processes and Threads.

Scheduling: Preliminaries, Non-preemptive Scheduling Policies, Preemptive Scheduling Policies, Scheduling in Practice, Real Time Scheduling, Scheduling in Unix, Scheduling in Linux, Scheduling in Windows, Performance Analysis of Scheduling Policies.

Unit III.

Memory Management: Managing the Memory Hierarchy, Static and Dynamic Memory Allocation, Memory Allocation to a Process, Reuse of Memory, Contiguous Memory Allocation, Noncontiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, Kernel Memory Allocation, Virtual Memory: Virtual Memory Basics, Demand Paging, Page Replacement Policies, Memory Allocation to a Process, Shared Pages, Memory Mapped Files, Unix Virtual Memory, Linux Virtual Memory, Virtual Memory using Segmentation.

Unit IV.

Security and Protection: Overview of Security and Protection, Goals of Security and Protection, Security Attacks, Formal and Practical aspects of Security, Encryption, Authentication and Password Security, Access

Descriptors and the Access Control Matrix, Protection Structures, Capabilities, Unix Security, Linux Security, WindowsSecurity

TEXT BOOK:

- Silberschatz et.al.-Operating System Concepts , 6th Edition, John Wiley Inc., 2003
- H.M. Deitel -Operating Systems , 6th Edition, Pearson Education, 2006
- Robbins- Linux Programming by Example- Pearson Education, New Delhi- 2005
- Sumitabh Das : Your UNIX The Ultimate Guide; TMH

REFERENCE BOOKS:

- D.M. Dhandhare - Operating Systems, 2nd Edition, Tata McGraw Hill, New Delhi, 2006
- J.Goerzen- Linux Programming Bible, IDG Books, New Delhi- 2001
- N.Mathew & R.Stones- Beginning Linux Programming Wiley Publishing India, 2004.
- S.E. Mandnick & J.J. Donovan : Operating System; TMH

Course Title : Management and Accounting

Course code: BC24-AEC-301

LTP: 3-1-0

Credit: 4

Basics of management; Planning, scheduling, organising, staffing, directing, controlling
Managerial economics and financial management, productivity management

Financial accounting, financial statements and analysis Conceptual framework of cost
accounting

Cost-volume profit relationship, budgeting, cost accumulation system, variable and absorption
costing system Financial accounting computer packages

Financial Management-Finance functions in Business. Relation of finance with other functions.

Source of finance long term and short term. Financial institution – IDBI, ICICI, IFCI and
Commercial Banks.

Conceptual framework of Cost-Accounting- Basic cost concept. Cost determination process,
costing for materials, labour and overheads. Profitability Analysis – budgeting – application of
Capital budgeting techniques for decision making.

Books:

- 1.Management Accounting,M.E.Thukaram Rao,New Age International
- 2.Management Accounting, Khan & Jain, TMH

3. Cost Accounting-An Introduction, Nigam & Jain, PHI 4. Management Accounting, Pande, VIKAS

Accounting and Financial Management for MCA & MBA students, SCITECH

Management Accounting, A.P. Rao. EPH.

Cost & Management Accounting, Inamdar. EPH

Course Title: Data Base Management Systems

Course code: BC24-CC-401

LTP:3-1-0

Credit: 4

Detailed content

UNIT-I: Database system architecture:

Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Unit-II: Relational query languages and Relational algebra and calculus:

Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQLserver.

Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Unit-III: Storage strategies: Indices, B-trees, hashing.

Unit-IV TRANSACTION PROCESSING:

Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Unit-V Database Security:

Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Unit-VI Advanced topics:

Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

Course Title: Values and Ethics in Profession

Course code: BC24-VAC-401

LTP: 3-1-0

Credit: 4

Science, Technology and Engineering as Knowledge and as Social and Professional Activities (2 lectures)

Effects of Technological Growth: Rapid Technological growth and depletion of resources. Reports of the Club of Rome. Limits of growth; sustainable development(2 lectures)

Energy Crisis; Renewable Energy Resources (2 lectures)

Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations. Environmental Ethics(4 lectures)

Appropriate Technology Movement of Schumacher: later developments (2 lectures)

Technology and developing nations. Problems of Technology transfer. Technology assessment, impact analysis (4 lectures)

Human Operator in Engineering projects and industries. Problems of man machine interaction. Impact of assembly line and automation. Human centered Technology(4 lectures)

Ethics of Profession

Engineering profession: Ethical issues in engineering practice. Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond. Case studies. (8 lectures)

Profession and Human Values Value Crisis in contemporary society (2 lectures)

Nature of values: Value Spectrum of a 'good' life (2 lectures)

Psychological values: Integrated personality; mental health (2 lectures)

Societal values: The modern search for a 'good' society, justice, democracy, secularism, rule of law; values in Indian Constitution. (4 lectures)

Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity (2 lectures)

Moral and ethical values: Nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility

Books:

- Ethics in Mgmt & Indian Ethos, Ghosh, VIKAS
- Business Ethics, G.Pherwani, EPH.
- Ethics, Indian Ethos & Mgmt, Balachandran, Raja & Nair, SHROFF Publishers

Course Title: Database Management System Laboratory

Course code: BC24-CC-491

LTP:0-0-4

Credit: 2

Structured Query Language

1. Creating Database

- Creating a Database
- Creating a Table
- Specifying Relational Data Types
- Specifying Constraints
- Creating Indexes

2. Table and Record Handling

- INSERT statement
- Using SELECT and INSERT together
- DELETE, UPDATE, TRUNCATE statements
- DROP, ALTER statements

3. Retrieving Data from a Database

- The SELECT statement
- Using the WHERE clause
- Using Logical Operators in the WHERE clause
- Using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING Clause
- Using Aggregate Functions
- Combining Tables Using JOINS
- Subqueries

4. Database Management

- Creating Views
- Creating Column Aliases

5. Creating Database Users and using Grant and Revoke

Course code: BC24-CC-501	Category:
Course Title: Computer Networks	Semester: V
L-T-P : 3-1-0	Credit: 4

Detailed content

Unit 1:

Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

Unit 2:

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.

Unit 3:

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Unit 4:

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Unit 5:

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.

Course Title: Design and Analysis of Algorithms

Course code: BC24-CC-502

LTP:3-1-0

Credit: 4

1	Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters’ theorem
2	Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving, Bin Packing, Knap Sack TSP. Heuristics –characteristics and their application domains.
3	Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search(BFS); Shortest Path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm. Tractable and Intractable Problems: Computability.
4	Design of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook’s theorem, Standard NP-complete problems and Reduction techniques.

6	Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE
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Text books/ reference books:

- Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, RonaldL Rivestand Clifford Stein, MIT Press/McGraw-Hill.
- Fundamentals of Algorithms – E. Horowitz et al.
- Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
- Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition,Michael T Goodrich and Roberto Tamassia, Wiley.
- Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading,MA
- Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House (AICTE Recommended Textbook – 2018)
- Algorithms Design and Analysis, Udit Agarwal, Dhanpat Rai

Course Title: Computer Networks Laboratory

Course code: BC24-CC-591

LTP:0-0-4

Credit: 2

1. NIC Installation & Configuration (Windows/Linux).
2. Understanding IP address, subnet etc.

Familiarization with

- Networking cables (CAT5, UTP)
- Connectors (RJ45, T-connector)
- Hubs,Switches

TCP/UDP-Socket Programming

- Simple, TCP based, UDP based
- Multicast & Broadcast Sockets
- Implementation of a Prototype Multithreaded Server

Implementation of

- Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
- Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
- Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)
- Server Setup/Configuration : FTP, Telnet, NFS, DNS, Firewall

List of Experiments-

1. Implement the data link layer framing methods such as character, character stuffing and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP 15
3. Implement Dijkstra’s algorithm to compute the Shortest path thru a graph.
4. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm
5. Take an example subnet of hosts. Obtain broadcast tree for it.
6. Take a 64 bit playing text and encrypt the same using DES algorithm.
7. Write a program to break the above DES coding
8. Using RSA algorithm Encrypt a text data and Decrypt the same

Course Title: Environment and Ecology

Course code: BC24-VAC-601

LTP: 3-1-0

Credit: 4

Introduction , components of the environment, environmental degradation

Ecology: Elements of Ecology ; Ecological balance and consequences of change, principles of environmental impact assessment

Air Pollution and Control: Atmospheric composition, energy balance, climate, weather, dispersion, sources and effects of pollutants, primary and secondary pollutants, green house effect, depletion of ozone layer, standards and control measures.

Water Pollution and Control: Hydrosphere, natural water, pollutants: their origin and effects, river / lake / ground water pollution, standards and control.

Land Pollution: Lithosphere, pollutants (municipal, industrial, commercial, agricultural, hazardous solid wastes); their origin and effects, collection and disposal of solid waste, recovery and conversion methods.

Noise Pollution: Sources, effects, standards and control.

Books:

- Environmental Science, Cunningham, TMH
- Environmental Pollution Control Engineering, C.S.Rao, New Age International
- Environmental Science, Wright & Nebel, PHI
- Environmental Pollution Analysis, S.M.Khopkar, New Age International
- Environmental Mgmt, N.K. Oberoi, EXCEL
- Environmental Mgmt, Mukherjee, VIKAS
- Ecosystem Principles & Sustainable Agriculture, Sithambaranathan, Scitech

Course Title: Image Processing

Course code: BC24-DSE-501A

LTP: 3-1-0

Credit: 4

Unit	Content
1	Introduction Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.
2	Digital Image Formation A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization -Uniform & Non uniform.

3	<p>Mathematical Preliminaries Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform.</p>
4.	<p>Image Enhancement Spatial Domain Method, Frequency Domain Method, Contrast Enhancement - Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.</p>
5	<p>Image Restoration Degradation Model, Discrete Formulation, Algebraic Approach to Restoration Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation Spatial Transformation, Gray Level Interpolation.</p>
6	<p>Image Segmentation Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection - Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.</p>

TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition.
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition.

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition.
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

Course Title: Pattern Recognition
Course code: BC24-DSE-501B
LTP: 3-1-0
Credit: 4

Unit	Content
1.	Basics of pattern recognition
2.	Bayesian decision theory-Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions Discrete features
3.	Parameter estimation methods -Maximum-Likelihood estimation Gaussian mixture models Expectation- maximization method Bayesian estimation
4.	Hidden Markov models for sequential pattern classification Discrete hidden Markov models Continuous density hidden Markov models
5.	Dimension reduction methods Fisher discriminant analysis, Principal component analysis, Parzen-window method, K-Nearest Neighbour method
6.	Non-parametric estimation techniques for Density estimation
7.	Linear discriminant function based classifier Perceptron Support vector machines
8.	Non-metric methods for pattern classification Non-numeric data or nominal data Decision trees
9.	Unsupervised learning and clustering Criterion functions for clustering Algorithms for clustering: K-means, Hierarchical and other methods

Course Title: Compiler Design
Course code: BC24-DSE-501C
LTP: 3-1-0
Credit: 4

Objective:

1. To understand and list the different stages in the process of compilation.
2. Identify different methods of lexical analysis
3. Design top-down and bottom-up parsers
4. Identify synthesized and inherited attributes
5. Develop syntax directed translation schemes
6. Develop algorithms to generate code for a target machine

Unit 1: Introduction to Compiling

Compilers, Analysis of the source program, The phases of the compiler, Cousins of the compiler.

Unit 2: Lexical Analysis

The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of a token, Finite automata, from a regular expression to an NFA, From a regular expression to NFA, From a regular expression to DFA, Design of a lexical analyzer generator (Lex).

Unit 3: Syntax Analysis

The role of a parser, Context free grammars, Writing a grammar, Top down Parsing, Non- recursive Predictive parsing (LL), Bottom up parsing, Handles, Viable prefixes, Operator precedence parsing, LR parsers (SLR, LALR), Parser generators (YACC). Error Recovery strategies for different parsing techniques.

Unit 4: Syntax directed translation

Syntax director definitions, Construction of syntax trees, Bottom-up evaluation of S attributed definitions, L attributed definitions, Bottom-up evaluation of inherited attributes.

Unit 5: Type checking

Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions.

Unit 6: Run time environments

Source language issues (Activation trees, Control stack, scope of declaration, Binding of names), Storage organization (Subdivision of run-time memory, Activation records), Storage allocation strategies, Parameter passing (call by value, call by reference, copy restore, call by name), Symbol tables, dynamic storage allocation techniques

Unit 7: Intermediate code generation

Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).

Unit 8: Code optimization

Introduction, Basic blocks & flow graphs, Transformation of basic blocks, Dag representation of basic blocks, The principle sources of optimization, Loops in

flow graph, Peephole optimization.

Unit 9: Code generations

Issues in the design of code generator, a simple code generator, Register allocation & assignment.

Text book and Reference books:

1. Aho, Sethi, Ullman - "Compiler Principles, Techniques and Tools" - Pearson Education.
2. Holub - "Compiler Design in C" - PHI.

Course Outcomes:

- On completion of the course students will be able to
- Understand given grammar specification develop the lexical analyser
- Design a given parser specification design top- do and bottom-up parsers
- Develop syntax directed translation schemes
- Develop algorithms to generate code for a target machine