श्रीचन्द्रशेखरेन्द्रसरस्वतीविश्वमहाविद्यालयः
SRI CHANDRASEKHARENDRA SARASWATHI
VISWA MAHAVIDYALAYA
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CURRICULUM AND SYLLABUS
BCA (BACHELOR IN COMPUTER APPLICATIONS)
DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS
(Regulations Effective from Academic Year 2025-2026 onwards)

SRI CHANDRASEKHARENDRA SARASWATHI VISWA MAHA VIDYALAYA

DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

Bachelor in Computer Applications

REGULATIONS

(Effective from the Academic Year 2025-2026)

The Department of Computer Science and Applications was established during 1996 with the vision of Empower every student to be innovative, creative and productive in the field of Computer Science by imparting quality education, developing skills and inculcating human values. The Department of Computer Science offers the following Programmes.

- B.Sc. in Computer Science
- BCA
- MCA

As per the NEP 2020 Policy, The Department offers the following UG 4-Year Honours Programmes with an exit option at the end of the 3rd year, 2nd year and 1st year from the year 2023-2024.

- B.Sc. in Computer Science
- BCA

As per the NEP 2020 Policy, The Department offers the following UG 4-Year Honours Programmes with an exit option at the end of the 3rd year, 2nd year and 1st year from the year 2024-2025.

- B.Sc. in Data Science
- B.Sc. in Cyber Security

SALIENT FEATURES OF FOUR YEARS UNDER GRADUATE PROGRAMMES

1. It is a Choice Based Credit System under Semester Scheme.
2. The Programmes comprise of about 50% Discipline Specific Core Courses as Major subjects, 20% Discipline Specific Core Courses / Multi-Discipline Specific Courses as Minor courses, and remaining 30% Ability Enhancement Compulsory Courses, Skill Enhancement Courses along with Open Elective Courses.
3. The relative importance of Courses of the study is measured in terms of credits.
4. The declaration of result is based on Aggregate Percentage of marks obtained and Cumulative Grade Point Average (CGPA) earned.
5. The candidate has an option to exit after TWO, FOUR and SIX semesters of the Programme and shall be awarded Certificate, Diploma, and General Degree, respectively with a provision to reenter and complete the degree.

I. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Graduates from the Bachelor of Computer Science and Applications are expected to achieve the following PEOs

PEO1: To develop skilled manpower in the various areas of Information Technology like Software Development, Database Management, Computer Languages and Web Based applications etc.

PEO2: To prepare the students to start the career as an Application Developer, Network Administrator, Software Tester, Web Developer etc.

PEO3: To encourage the students for research activities and entrepreneurial skills by inculcating interactive quality teaching and organizing symposiums, conferences, seminars, workshops, etc.

PEO4: To provide students with an academic environment that fosters excellence, transparency, leadership and promote awareness of life-long learning.

II. PROGRAMME LEARNING OUTCOMES (PLOs)

The graduates of Bachelor of Computer Science and Applications will be able to:

PLO1: Knowledge: (Cognitive)

Identify the programming and technical knowledge acquired in the current industrial demands

PLO2: Critical Thinking Skills (Cognitive)

Analyze the complex problems and identify solutions through critical thinking skills

PLO3: Practical Skills: (Psychomotor)

Adapt to the latest tools and techniques used to develop domain based innovative solutions with the acquired technical and operational skills

PLO4: Teamwork Skills: (Affective)

Function and contribute as a team in the diversified environment in taking competitive decision.

PLO5: Communication Skills: (Affective)

Communicate effectively with the computing community as well as society to comprehend effective documentation and presentation

PLO6: Digital Skills: (Affective)

Incorporate advanced digital skills in designing, developing, managing and deploying in media and technical field.

PLO7: Leadership Skills: (Affective)

Articulate leadership skills in motivating the team towards the target in a multidisciplinary environment

PLO8: Lifelong Learning Skills: (Affective)

Recognize the need and ability to involve independent and lifelong learning in the changing era of technology

PLO9: Entrepreneurial Skills: (Affective)

Interpret the impact of professional business solutions on business environment for sustainable environment

PLO10: Ethics and Professional Skills: (Affective)
Follow ethical principles and commit to professional responsibilities for a relevant technical practice.

III. PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Ability to understand the programming concepts, methodologies and algorithm to solve computational problems

PSO2: Ability to apply emerging software development techniques and tools in providing real-time solutions

MAPPING OF PEOs TO PLOs

	PEO1	PEO2	PEO3	PEO4
PLO1	3	3	2	2
PLO2	3	3	2	2
PLO3	3	3	2	3
PLO4	2	2	3	3
PLO5	2	3	2	2
PLO6	2	3	2	2
PLO7	2	3	3	3
PLO8	3	2	2	3
PLO9	3	3	3	2
PLO10	2	3	2	3

MAPPING OF PEOs TO PSOs

	PSO1	PSO2
PEO1	3	2
PEO2	2	2
PEO3	2	3
PEO4	3	3

3 – Strong, 2 – Medium, 1 – Low

ELIGIBILITY FOR ADMISSION

Candidates for admission to the first year of the Degree of **Bachelor in Computer Applications** shall be required to have passed the Higher Secondary Examination conducted by the Government of Tamil Nadu or an Examination accepted as equivalent thereof by the University authorities, with Mathematics / Business Mathematics / Statistics / Computer Science or Equivalent / Commerce / Accountancy as one of the subjects in XII Std. The upper age limit to join the first year is 19.

For Lateral Entry to II year, Candidates for admission to the Second year of the Degree of **Bachelor in Computer Applications** shall be required to have passed the Diploma in Computer Technology Examination conducted by the Government of Tamil Nadu, or an Examination accepted as equivalent thereof by the University Authorities The upper age limit to join the second year is 21.

DURATION OF THE COURSE

The duration of the UG Programme is 4 years or 8 semesters. Students who desire to undergo a 3-year UG Programme will be allowed to exit after completion of the 3rdyear. If a student wants to leave after the completion of the first or second year, the student will be given a UG Certificate or UG Diploma, respectively, provided they secure the prescribed number of credits. Students who exit with a UG certificate or UG diploma are permitted to re-enter within three years and complete the degree Programme.

Students may be permitted to take a break from the study during the period of study but the total duration for completing the Programme shall not exceed 7 years.

REGISTRATION OF COURSE

A newly admitted student will automatically be registered for all the courses prescribed for the first semester without option. Every student shall submit a completed registration form indicating the list of courses intended to be credited during the second to final semester. This registration will be done a week before the last working day of the current semester.

CHOICE BASED CREDIT SYSTEM

The University follows the '**Choice Based Credit System (CBCS)**'for all its Programmes. Each course is normally assigned one credit per lecture per week and one credit for two periods of tutorials or part thereof or laboratory or practical per week.

STRUCTURE OF THE COURSE AND EVALUATION PATTERN

Internal Marks: 40 - External Marks: 60

The duration of University examination for both theory and practical subjects shall be 3 hours. The maximum marks for each theory and practical course is 100. Continuous Internal Assessment (CIA) will be for 40. The university theory examination will be conducted for 100 marks, which will be then converted to 60 in order to add with continuous internalassessment to make 100 marks for the course. For the conduct of University examinationsin practical, the question paper for the practical examination will be set by both internal and external examiners appointed by the University.

S. No.	L-T-P	Credits	Continuous Assessments (40 marks)			End Semester Examinations (60 marks)	
			Theory	Practical	Assignments & Attendance	Theory	Practical
1	3-1-4	6	20 marks	10 marks	10 marks	40 marks	20 marks
2	3-1-2	5	24 marks	6 marks	10 marks	50 marks	10 marks
3	4-1-0	5	30 marks	--	10 marks	60 marks	--
4	3-1-0	4	30 marks	--	10 marks	60 marks	--
5	2-0-0	2	100 marks	--	--	--	--
6	1-0-0	1	100 marks	--	--	--	--

PROCEDURES FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

The break-up of assessment and examination marks for theory subjects is as follows.

First Assessment (Test)	:	15 Marks
Second Assessment (Test)	:	15 Marks
Assignment & Attendance	:	10 Marks
Internal Assessment	:	40 Marks
University Examination	:	60 Marks
Total	:	100 Marks

The break-up of assessment and examination marks for theory cum practical subjects with 6 Credits (3-1-4) is as follows.

First Assessment (Test for Theory)	:	10 Marks
Second Assessment (Test for Theory)	:	10 Marks
Model Practical Examination	:	10 Marks
Assignment & Attendance	:	10 Marks
Internal Assessment	:	40 Marks
University Examination (Theory)	:	40 Marks
University Examination (Practical)	:	20 Marks
Total	:	100 Marks

The break-up of assessment and examination marks for theory cum practical subjects with 5 Credits (3-1-2) is as follows.

First Assessment (Test for Theory)	:	12	Marks
Second Assessment (Test for Theory)	:	12	Marks
Model Practical Examination	:	6	Marks
Assignment & Attendance	:	10	Marks
Internal Assessment	:	40	Marks
University Examination (Theory)	:	50	Marks
University Examination (Practical)	:	10	Marks
Total	:	100	Marks

The break-up of assessment (**Internal Assessment Only**) for all Internal courses is as follows:

Assignment	:	10	Marks
First Internal Test	:	30	Marks
Second Internal Test	:	30	Marks
Seminar	:	10	Marks
Quiz/Objective type test	:	10	Marks
Attendance	:	10	Marks
Total	:	100	Marks

REQUIREMENTS FOR THE COMPLETION OF THE SEMESTER

The candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirements for the completion of the semester.

1. He/ She secures not less than 80% of overall attendance in that semester taking into account the total number of periods in all courses put together attended by the candidate as against the total number of periods in all courses offered during that semester.
2. Condonation of attendance up to 10% is permitted on medical grounds. Relaxation in attendance is permitted up to 10% for the student who represents the university in sports and games. The above two relaxations cannot be taken concurrently.
3. Candidates with 69% - 40% attendance will not be permitted to write the examination (including practical) in the current semester **(Sem-Carry)** and he / she can write the same on the subsequent semester.
4. Candidates with less than 40% attendance will not be permitted to write the end semester examination (including practical) and are not permitted to go for the next semester **(Detained)**. Such candidate required to repeat the incomplete semester in the next academic year, after paying the fee for the break of study as prescribed by the University from time to time.

REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER

1. Candidates shall register their name for the First Semester Examination after the admission in the U.G. course.
2. Candidates shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester examinations subject to the condition that the candidates should register for all the arrear subjects of earliersemesters along with current (subsequent) semester subjects.
3. Candidates shall be eligible to go to subsequent semester, only if they earn sufficient attendance as prescribed thereof by the University from time to time.

STUDENT MENTOR

To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student Mentor for those students throughout their period of study. Such student Mentor shall advise the students, given preliminary approval for the courses to be taken by the students during each semester and obtain the final approval of the Head of the Department.

CLASS COMMITTEE

The composition of the class committees will be as follows.

- Course coordinators of the courses, if any, who shall be appointed by theHead of the Department and the staff members teaching the course.
- Teaching staff of other individual courses.
- One professor, preferably not teaching the concerned class, appointed by the Head of the Department.
- The Head of the Department may opt to be a member or the Chairman.
- All student of the class, and the Head of the Department (if not alreadya member) or any staff member nominated by the Head of the Department may optto be special invitees.
- The class committee shall meet three times during the semester.
- The first meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.
- The second meeting will be held within a week after the completion of the second assessment to review the performance and for follow-up action.
- The third meeting will be held after all the assessments are completed for all the courses, and at least one week before the commencement of the examinations. During this meeting the assessment on a maximum of 40 marks will be finalized for every student and tabulated and submitted to the head of the department.

WITHDRAWAL FROM A COURSE

A student can withdraw from a course at any time with the approval of the Dean and the recommendation of the Head of the Department.

DISCIPLINE

Every student is required to observe disciplined and decorous behavior both inside and outside the college. They do not indulge in any activity which will tend to bring down the prestige of the University. Boys should wear decent dresses. No casual wear like T – shirts or Jeans pant is permitted. Girls shall wear decent dresses like Chudidhar with Dupatta or Saree.

REVISION OF REGULATION AND CURRICULUM

The university may revise, amend or change the Regulations, Scheme of Examination and Syllabus as found necessary.

AUTHORITY OF BOARD OF STUDIES

The Board of Studies has the full authority to change the syllabus any time according to IT trend and industry needs.

SUBSTITUTE ASSESSMENT

A student who has missed one or more of assessment tests of a course other than the examinations for genuine reasons as accepted by the Head of the Department may take a substitute assessment for any one of the missed assessment. A student who wishes to have a substitute assessment for missed assessment must apply to the Head of the Department within two weeks from the date of the missed assessment.

EXAMINATIONS

1. The end semester examinations will ordinarily be conducted during November to December in the odd semesters and during April to May in the even semesters. For all the theory courses, question papers will be set by external examiners and valued by external and/or internal examiners.
2. All practical examinations including software development lab will be conducted by Internal & External examiners appointed by the University

PASSING AND DECLARATION OF EXAMINATION RESULTS:

PASSING MINIMUM

1. A candidate shall be declared to have passed in each paper / practical if he / she secures not less than 40% of marks (the continuous internal assessment (CIA) and the University examinations (External) put together), provided a minimum of 35% of marks secured in the University examination.

   For Theory cum Practical courses if he / she secures not less than 40% of marks (the continuous internal assessment (CIA) and the University examinations (External) put together), provided a minimum of 35% of marks secured in the University theory examination and a minimum of 35% of marks secured in the university practical examination.
2. If a candidate fails to secure a pass in a particular course, it is mandatory that he/she shall register and reappear for the examination in that course during the

next semester. He / She should continue to register and reappear for the examination till he/she secures a pass. However, the internal assessment marks obtained by the candidate in the first attempt shall be retained and considered valid for all subsequent attempts.

1. Assessments of all the courses on absolute marks will be considered and passed by the Results – Passing- Board in accordance with the rules of the University. Thereafter, the Controller of Examinations shall convert the marks of each course to the corresponding letter grade as stated below. In addition, the grade point average and the cumulative grade point average calculated. Based on these, the grade cards will be prepared.

Marks	Letter Grade	Grade Point
90-100	S	10
80-89	A	9
70-79	B	8
60-69	C	7
50-59	D	6
40-49	E	5
<40	F	0
	Ab (Absent)	0

2. A Student who obtains less than 40 marks out of 100 in the examination (Put Together Internal and External) will be awarded the "**F"** grade and absent for the examination will be awarded the **"Ab"** grade. A Student who earns a grade of "S**", "A", "B", "C", "D", or "E"** in a course is declared to have successfully completed that course and earned the respective credits for that course. Such a course cannot be repeated by the student.
3. A Student who obtains a letter grade **"F"** or **"Ab"** in a course is to reappear for the examinations in that course.
4. The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

   "**S**" – 10; **"C" –** 07; **"F" – 0**;
   "**A" –** 09; **"D" –** 06; "Ab**" - 0;**
   "B" – 08; **"E" –** 05;

5. A Student can apply for revaluation of one or more of her/his examination answer papers within a week from the date of display of the result on payment of the prescribed fee. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.
6. After the results are declared, grade cards will be issued to the student. The grade cards will contain the list of courses registered during the year/ semester, the grades scored and the grade point average (GPA) for the year/ semester.
7. GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the course for the year/semester, divided by the sum of the number of credits for all courses taken in that year/semester.

CGPA is similarly calculated by considering all the courses taken from the time of admission.

8. After successful completion of the programme, the degree will be awarded with the following classification based on CGPA.
   a) **First class with Distinction** will be awarded, if the student passed all the courses in the first attempt and obtained a minimum CGPA of 8.25.
   b) **First class** will be awarded, if the student earned a minimum CGPA of 6.5 within five years for **Bachelor in Computer Applications with Honours : BCA(HONOURS) / Bachelor in Computer Applications Honours with Research: BCA(HONOURS with RESEARCH)**, four years for **Bachelor in Computer Applications : BCA**, three years for **Diploma** and two years for **Certificate course** from the time of admission.
   c) **Second Class** will be awarded, if the student completed the course beyond the above said period of the respective course.
      - The total credits for **Bachelor in Computer Applications with Honours : BCA(HONOURS) / Bachelor in Computer Applications Honours with Research: BCA(HONOURS with RESEARCH)** course are 175.
      - The total credits for **Bachelor in Computer Applications: BCA** course are 135.
      - The total credits for **Under Graduate Diploma in Computer Applications** course are 92.
      - The total credits for **Under Graduate Certificate in Computer Applications** are 46.

ELIGIBILITY FOR THE AWARD OF THE DEGREE

1. The candidate shall be declared to be eligible for the award of Degree of **Bachelor in Computer Applications with Honours : BCA(HONOURS) / Bachelor in Computer Applications Honours with Research: BCA(HONOURS with RESEARCH) ,** if He / She has successfully completed the course requirements and has passed all the prescribed examinations in all the eight semesters with a minimum of 170 credits within a maximum period of sevenyears reckoned from the commencement of the first semester to which the candidate was admitted.
2. The candidate shall be declared to be eligible for the award of Degree of **Bachelor in Computer Applications: BCA,** if He / She exits at the end of third year and has successfully completed the course requirements and has passed all the prescribed examinations in all the six semesters with a minimum of 130 credits within a maximum period of five years reckoned from the commencement of the first semester to which the candidate was admitted.
3. The candidate shall be declared to be eligible for the award of **Under Graduate Diploma in Compute Applications,** if He / She exits at the end of second year and has successfully completed the course requirements and has passed all the prescribed examinations in all the four semesters with a minimum of 86 credits within a maximum period of four years reckoned from the commencement of the

first semester to which the candidate was admitted.

4. The candidate shall be declared to be eligible for the award of **Under Graduate Certificate in Compute Applications,** if He / She exits at the end of first year and has successfully completed the course requirements and has passed all the prescribed examinations in all the two semesters with a minimum of 46 credits within a maximum period of twoyears reckoned from the commencement of the first semester to which the candidate was admitted.

PATTERN OF QUESTION PAPER (THEORY):

Time: 3hours **Max Marks:**100

A typical examination paper is divided into three sections:

1. **Section A (Short Answer Questions): (10x2 = 20 marks)**
   - ❖ Contains 10 questions.
   - ❖ Two questions from each unit
   - ❖ Each question carries 2 marks.
   - ❖ Answers should be concise, typically under 50 words.
   - ❖ Q. No. 1 to 10

2. **Section B (Medium Answer Questions): (5 x 7 = 35 marks)**
   - ❖ Comprises 5 questions out of 8 questions)
   - ❖ At least One question from each Unit
   - ❖ Remaining three questions from Unit III, Unit IV and Unit V (One from each)
   - ❖ Each question carries 7 marks.
   - ❖ Answers should be around 200 words.
   - ❖ Q. No.11 to 18

3. **Section C (Long Answer Questions): (3x15 = 45 marks)**
   - ❖ Includes 3 questions out of 5 questions
   - ❖ At least one and not more than two question from each unit
   - ❖ Each question carries 15 marks.
   - ❖ Answers should be detailed, approximately 500 words.
   - ❖ Q. No.19 to 23

SECTION – A	-	20 MARKS	-	20 %
SECTION – B	-	35 MARKS	-	35%
SECTION – C	-	45 MARKS	-	45%

Marks secured by the candidate will be converted to 60 to make the aggregate 100, while adding with Continuous Internal Assessment 40.

For Theory Cum Practical courses with 6 credits, Marks secured by the candidate will be converted to 40 to make the aggregate 100, while adding with Continuous Internal Assessment 40 and External Practical Examination 20.

For Theory Cum Practical courses with 5 credits, Marks secured by the candidate will be converted to 50 to make the aggregate 100, while adding with Continuous Internal Assessment 40 and External Practical Examination 10.

PATTERN OF QUESTION PAPER (PRACTICAL)

Time: 3 Hours **Max :** 60 Marks.

One compulsory lab exercise (may contain sub divisions) should be solved within 3 hours. The External Examiner will set a question paper on the spot with the help of the question bank or list of exercise. The evaluation pattern as follows

Program and output	- 40 Marks
Record	- 10 Marks
Viva- Voce	- 10 Marks.

No more than threecandidates should get the same question in a batch.

GENERAL COURSE STRUCTURE & CREDIT DISTRIBUTION SEMESTER WISE CREDITS

3 Years BCA Program	I	II	III	IV	V	VI	TOTAL CREDIT
CREDITS	23	23	22	25	25	23	141

SEMESTER WISE CREDIT DISTRIBUTION

Semester	Core Courses	Ability Enhancement Courses	Multi-Disciplinary Elective Course	Value added Courses	Skill Enhancement courses	Discipline Specific Elective	Online Course (NPTEL/ SWAYAM)	Total
I	9	6	1	1	6	-	**-**	**23**
II	8	6	2	1	6	-	**-**	**23**
III	4	-	4	1	7	6	**-**	**22**
IV	4	-	4	1	8	6	**2**	**25**
V	10	-	-	-	3	10	**2**	**25**
VI	10	-	-	-	4	9	**-**	**23**
TOTAL	**45**	**12**	**11**	**4**	**34**	**31**	**4**	**141**

A. 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

B. Course code and definition:

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

B.C.A. DEGREE - CURRICULUM STRUCTURE

SEMESTER I

S.No.	Subject Code	Course Code	Category	Course Title	Hrs	L	T	P	C	Maximum Marks		
										CIA	EA	Total
1	CLEF251T20	AEC101	Ability Enhancement Course	Communicative English	3	2	1	0	3	40	60	100
2	CLTS251T10 / CLHF251T10/ CLSF251T10	AEC102	Ability Enhancement Course	Additional Course – Tamil -I/ Hindi-I /Sanskrit-I	3	2	1	0	3	40	60	100
3	UCAF251T30	CC101	Core Course	Mathematical Foundations for Computer Science	4	3	1	0	4	40	60	100
4	UCAF251T40	CC102	Core Course	Computer Architecture	6	3	1	2	5	40	60	100
5	UCAF251T50	SEC101	Skill Enhancement course	Problem Solving Techniques	7	3	1	3	6	40	60	100
6	ICSF251T60	MDE101	Multi-Disciplinary Elective course	Indian Culture	1	1	0	0	1	100		100
7	UCAF251T70	VAC101	Value added Course	Environmental Science and sustainability	1	1	0	0	1	100		100
TOTAL					**25**	**15**	**5**	**5**	**23**			

SEMESTER II

S.No.	Subject Code	Course Code	Category	Course Title	Hrs	L	T	P	C	Maximum Marks		
										CIA	EA	Total
1	CLEF252T20	AEC103	Ability Enhancement Course	Functional English	3	2	1	0	3	40	60	100
2	CLTS252T10/ CLHF252T10/ CLSF252T10	AEC104	Ability Enhancement Course	Additional Course – Tamil -II/ Hindi-II /Sanskrit-II	3	2	1	0	3	40	60	100
3	UCAF252T30	CC103	Core Course	Probability and Statistics	4	3	1	0	4	40	60	100
4	UCAF252T40	CC104	Core Course	Data Structures and Algorithms	6	3	1	2	5	40	60	100
5	UCAF252T50	SEC102	Skill Enhancement course	Object Oriented Programming in Java	7	3	1	3	6	40	60	100
6	UCAF252IKS	MDE102	Multi-Disciplinary Elective course	Introduction to Indian Knowledge System	1	1	0	0	1	100		100
7	UCAF252ICT	VAC102	Value added Course	Indian Constitution	1	1	0	0	1	100		100
TOTAL					**25**	**15**	**5**	**5**	**23**			

SEMESTER III

S.No.	Subject Code	Course Code	Category	Course Title	Hrs	L	T	P	C	Maximum Marks		
										CIA	EA	Total
1	BCA253T10	SEC103	Skill Enhancement courses	Python Programming	4	3	1	0	4	40	60	100
2	BCA253T20	CC105	Core Courses	Operating Systems	4	3	1	0	4	40	60	100
3	BCA253T30	MDE103	Multi-Disciplinary Elective course	Principles and Practices of Management	4	3	1	0	4	40	60	100
4	BCA253TPE12	SEC105	Skill Enhancement courses	Python - Lab	3	0	0	3	2	40	60	100
5	BCA253TPE11 BCA253TPE12	DSE104	Discipline Specific Elective	**PROFESSIONAL ELECTIVE – I** **From Group - Data Science** 1. Basics of Data Analytics using Spreadsheet **From Group - Artificial Intelligence and Machine Learning** 2. Feature Engineering	7	3	1	3	6	40	60	100
6	BCA253I70	SEC104	Skill Enhancement courses	Soft Skill - I	2	1	1	0	1	100	0	100
7	BCA253I80	VAC103	Value added Courses	Yoga	1	0	0	1	1	100	0	100
				TOTAL	**25**	**13**	**5**	**7**	**22**			

SEMESTER IV

S.No.	Subject Code	Subject Code	Category	Course Title	Hrs	L	T	P	C	Maximum Marks		
										CIA	EA	Total
1	BCA254T10	SEC106	Skill Enhancement courses	Relational Data Base Management System	4	3	1	0	4	40	60	100
2	BCA254T20	CC106	Core Courses	Data Communication and Network	4	3	1	0	4	40	60	100
3	BCA254T30	MDE104	Multi-Disciplinary Elective course	Principles of accounting with computerized accounting systems	4	3	1	0	4	40	60	100
4	BCA254P60	SEC108	Skill Enhancement courses	RDBMS Lab	3	0	0	3	2	40	60	100
5	BCA254TPE21 BCA254TPE22	DSE105	Discipline Specific Elective	**PROFESSIONAL ELECTIVE – II** **From Group - Data Science** 1. Introduction to Data Science **From Group - Artificial Intelligence and Machine Learning** 2. Introduction to ML	7	3	1	3	6	40	60	100
6	BCA254I70	SEC107	Skill Enhancement courses	Soft Skill – II	2	1	1	0	1	100	0	100
7	BCA254I80	SEC108	Skill Enhancement courses	Design Thinking and Innovation	1	1	0	0	1	100	0	100
8	BCA254I90	VAC103	Value added Courses	Industry specific course (self-study)					1	100	0	100
9			Online Courses	NPTEL/SWAYAM/ any Online Courses					2		100	100
TOTAL					**25**	**14**	**5**	**6**	**25**			

SEMESTER V

S.No	Subject Code	Course Code	Category	Course Title	Hrs	L	T	P	C	Maximum Marks		
										CIA	EA	Total
1	BCA255T10	CC107	Core Courses	Software Engineering	4	3	1	0	4	40	60	100
2	BCA255T20	CC108	Core Courses	Web Technologies	4	3	1	0	4	40	60	100
3	BCA255TPE31 BCA255TPE32	DSE106	Discipline Specific Elective	**PROFESSIONAL ELECTIVE – III** **From Group - Data Science** 1. Data Visualization **From Group - Artificial Intelligence and Machine Learning** 2. Neural Network	6	3	1	2	5	40	60	100
4	BCA255TPE41 BCA255TPE42	DSE107	Discipline Specific Elective	**PROFESSIONAL ELECTIVE – IV** **From Group - Data Science** 1. Time Series Analysis **From Group - Artificial Intelligence and Machine Learning** 2. Digital Image Processing	6	3	1	2	5	40	60	100
5	BCA255P60	CC109	Core Courses	Web Technologies Lab	3	0	0	3	2	40	60	100
6	BCA255I70	SEC109	Skill Enhancement courses	Entrepreneurship and Startup Ecosystem	2	1	1	0	1	100	0	100
7		SEC110	Industry Internship course	Internship					2		100	100
8			Online Courses	NPTEL/SWAYAM / any Online Courses					2		100	100
TOTAL					**25**	**13**	**5**	**7**	**25**			

SEMESTER VI

S.No.	Subject Code	Course Code	Category	Course Title	Hrs	L	T	P	C	Maximum Marks		
										CIA	EA	Total
1	BCA256T10	CC110	Core Courses	Full Stack Development	4	3	1	0	4	40	60	100
2	BCA256T20	CC111	Core Courses	Artificial Intelligence	4	3	1	0	4	40	60	100
3	BCA256T30	DSE108	Discipline Specific Elective	A. Cyber Security and Cyber Law B.Ethical Hacking	4	3	1	0	4	40	60	100
4	BCA256TPE51 BCA256TPE52	DSE109	Discipline Specific Elective	**PROFESSIONAL ELECTIVE – V** **From Group - Data Science** 1. Big Data Analytics **From Group - Artificial Intelligence and Machine Learning** 2. Deep Learning	6	3	1	2	5	40	60	100
5	BCA256P60	CC112	Core Courses	Full Stack Development Lab	4	0	0	4	2	40	60	100
7	BCA256P70	SEC111	Skill Enhancement courses	Project (DS or ML)	3	0	0	3	4	40	60	100
				TOTAL	**25**	**12**	**4**	**9**	**23**			

CLEF251T20	COMMUNICATIVE ENGLISH	L	T	P	C
		2	1	0	3

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To differentiate and apply receptive and productive language skills in day-to-day communication.
- To use grammar elements like phrasal verbs and concord accurately in speech and writing.
- To enhance listening comprehension for academic and general purposes.
- To develop oral fluency through structured conversations and short descriptions.
- To write coherent paragraphs and official letters using appropriate format and cohesion.

COURSE OUTCOMES

- Apply receptive and productive communication strategies in routine contexts.
- Use appropriate grammar structures to construct accurate sentences.
- Understand and interpret spoken messages in academic and general situations.
- Demonstrate oral fluency through guided conversation and descriptive practice.
- Compose coherent paragraphs and official letters using appropriate vocabulary and format.

SYLLABUS

Unit I: Language Skills

Receptive (Listening & Reading), Productive (Speaking & Writing), Interpersonal, Intrapersonal

9 Hrs.

Unit II: Grammar and Usage

Phrasal Verbs, Concord, Spotting Errors (identifying grammatical errors), (Modifiers, qualifiers, quantifiers), Tenses

9 Hrs.

Unit III: Listening Skills

Types of listening, Listening strategies, Focused listening, Listening for Details, Lectures, Announcements

9 Hrs.

Unit IV: Speaking Skills

Conversation Starters, participating in a small talk, conversation (formal), group discussion, making presentation – describing a product, interpreting charts, branding a product.

9 Hrs.

Unit V: Technical Writing

Types of writing, Writing emails, minutes, proposals (plan of action), reports.

9 Hrs.

REFERENCE:

1. Carter, Ronald & McCarthy, Michael. *Cambridge Grammar of English*. Cambridge UP, 2006.

CLTS251T10	LANGUAGE – I (TAMIL – I)	L	T	P	C
		2	1	0	3

(For Students admitted from 2025 onwards)

நோக்கம்:

PREAMBLE:

Encouraging personality development and confidence in language skills

முன்னுரை

ஆளுமை மேம்பாடு மற்றும் மொழித்திறன் மற்றும் தன்னம்பிக்கையைத் தூண்டுதல்

முதற்பருவம்

Objective-1	தமிழ் இலக்கிய, இலக்கண வரலாறு அறிமுகம் தமிழ் இலக்கியப் போக்குகளையும், இலக்கணங்களையும் மாணவர் அறியுமாறு செய்து அவர்களின் படைப்பாற்றலைத் தூண்டுதல்
Objective-2	அற இலக்கியம் வாழ்வை மேம்படுத்தும் அற சிந்தனைகளை நீதி இலக்கியம் வழி ஒழுக்கங்களை கற்றுக் கொள்ளுதல்
Objective-3	பக்தி இலக்கியம் பக்தி இலக்கியங்கள் வழி சமயச் சான்றோர்களையும் பக்தி நெறிகளை உணர்த்து கொள்ளுதல்
Objective-4	உலகளாவிய மனித மதிப்புகள் மாணவர்களின் வாழ்க்கையில், தனிப்பட்ட முறையிலும், தொழில் ரீதியாகவும், மதிப்புகளின் முக்கியத்துவத்தை வலியுறுத்துவதன் மூலம் அவர்களின் முழுமையான வளர்ச்சியை வளர்க்கிறது .
Objective-5	மொழிப் பயிற்சி மொழியினைப் பிழையின்றி கற்றுக் கொள்ளுதல்

போடத்திட்டங்கள்

அலகு-1 தமிழ் இலக்கிய, இலக்கண வரலோறு அறிமுகம்

1. **இலக்கணம்**
   அ. ததோல்கோப்பியம் இறையனோர் களவியல் உறர ம்பியகப் தபோருள், புைப்தபோருள் தவண்போமோறல , ன்னூல் தண்டியலங்கோரம் யோப்பருங்கலக்கோரிறக (அறிமுகம்)
   ஆ. தமோழிப் பயிை்சி ஞ்றுப்பிறழ தவிர்த்தல்
   - வல்லினம் மிகும் இடங்கள்-வல்லினம் மிகோ இடங்கள்-ஈதரோை்று வரும் இடங்கள்-ஒருஓர்வரும் இடங்கள்-அF, அஃF வரும் இடங்கள்-தோன் தோம் வரும் இடங்கள்

   பயிை்சி வல்லினம் மிகும் இடங்கள், மிகோ இடங்கள் தவோக வரும் வறகயில் ஒரு பத்தி தகோடுத்F ஞ்றுப் பிறழ திருத்தி எழுதச் தசய்தல்
2. சங்க இலக்கியம் - எட்டுத்ததோறக, பத்Fப்போட்டு
3. அை இலக்கியம் - பதிதனண்கீழ்கணக்கு நூல்கள்
4. கோப்பிய இலக்கியம் - ஐப்தபருங் கோப்பியங்கள், ஐஞ்சிறு கோப்பியங்கள் சமயக் கோப்பியங்கள்
5. பக்தி இலக்கியமும் (பன்னிரு திருமுறைகள், ோலோயிர திவ்விய பிரப ்தம் – பகுத்தறிவு இலக்கியமும் (சித்தர் இலக்கியங்கள்)

அலகு-2 அை இலக்கியம்

1. திருக்குை்ள் - அைன் வலியுறுத்தல், ததரி ்F தசயல்வறக அதிகோரம்
2. ோலடியோர் போடல்: 100, 139

3. ஆசோரக்நகோறவ - 1,4,10
4. தகோன்றை நவ ்தன் (1-20 போடல்கள்) கறத எழுFதல்
5. ஆத்திச்சூடி (போரதியோர்) (1-20 போடல்கள்) கறத எழுFதல்

அலகு -3 பக்தி இலக்கியம்

1. சமயங்கள் அறிமுகம்
2. கோஞ்சி மகோதபரியவர் - ததய்வத்தின் குரல்
    - குலத்ததய்வ வழிபோடு
    - பச்சரிசி மோவில் நகோலமிடுதலின் சிைப்பு
3. றசவம் :
    - திரு ோவுக்கரசர் (தசோை்றுறண நவதியன் நசோதி வோனவன்)
    - திருஞோனசம்ப ்தர் – (நகோளோறு பதிகம் - நவயுறு நதோளிபங்கன்)
    - சு ்தரர் – பித்தோபிறை சூடி போடல்
    - மோணிக்கவோசகர் (அம்றமநய! அப்போ! ஒப்பு இலோ மணிநய!)
4. றவணவம்:
    - தபோய்றகயோழ்வோர் (றவயத் தகளியோ வோர்கடநல)
    - பூதத்தோழ்வோர் (அன்நப தகளியோ)
    - நபயோழ்வோர் (திருக்கண்நடன் தபோன்நமனி கண்நடன்)

அலகு – 4 உலகளோவிய மனித மதிப்புகள்

1. இலக்கியங்கள் கூறும் மனித மதிப்புகள்
2. மனித உைவுகள் அறிமுகம்
3. ததோல்கோப்பியம் கோட்டும் மனித உைவுகள்
4. சங்க இலக்கியங்களில் மனித உைவுகள்
5. பதிதனண்கீழ்க்கணக்கு நூல்களில் மனித உைவுகள்
6. இக்கோல இலக்கியங்களில் மனித உைவுகள்

அலகு 5 தமோழிப் பயிை்சி

1. தசோல் நவறுபோடு /பிறழ தவிர்த்தல்
    - வோசிப்பF-வோசிப்பவர்
    - சுவர்- சுவரில்
    - வயிறு வயிை்றில்
    - நகோயில் நகோவில்
    - கறுப்பு கருப்பு
    - இயக்கு ர் - இயக்குனர்
    - சில்லறை சில்லற
    - மனம் மனசு மனF
    - அருகில்-அருகோறமயில்
    - அக்கற அக்கறை
    - மங்கலம் மங்களம்.
2. பயிை்சி

    அ) தகோடுக்கப்பட்டுள்ள பக்திகறளப் படித்F மூன்றில் ஒரு பங்கோக சுருக்கி எழுதவும்.

    ஆ) லகர, ளகர, ழகர பிறழகறள ீக்கி எழுதச் தசய்தல்.

    இ) ணகர, னகர, கர பிறழகறள ீக்கி எழுதச் தசய்தல்.
3. ததோடர் பிறழ ீக்கி எழுFதல்

பாடநூல் :

1. ஸ்ரீ ச ்திரநசகநர ்திர சரஸ்வதி விஸ்வ மகோ வித்யோலயோ - தபோFத்தமிழ் -முதல் பருவம்

பார்வை நூல்

1. மு.வரதரோசன், தமிழ் இ லக்கிய வரலோறு, சோகித்ய அகோடமி, புFதடல்லி.
2. மF.ச.விமலோன ்தன், தமிழ் இலக்கிய வரலோறு, மீனோட்சி புத்தக ிறலயம், மFறர.
3. தமிழண்ணல், புதிய ந ோக்கில் தமிழ் இலக்கிய வரலோறு, மீனோட்சி புத்தக ிறலயம், மFறர.
4. ததய்வத்தின் குரல் - கோஞ்சி மகோதபரியவர்
5. தமிழ் இலக்கிய வரலோறு -முறனவர்.சிை்பி போலசுப்ரமணியம், முறனவர்.தசோ.நசFபதி
6. புதிய தமிழ் இலக்கிய வரலோறு- முறனவர்.சிை்பி போலசுப்ரமணியம், ீல.பத்ம ோபன்
7. தமிழ் இலக்கிய வரலோறு டோக்டர்.அ.கோ.தபருமோள்
8. தமிழ் இலக்கிய வரலோறு -முறனவர். ப.ச.ஏசுதோசன்
9. வறகறம ந ோக்கில் தமிழ் இலக்கிய வரலோறு-போக்கியநமரி
10. தமிழ் இலக்கணம் - இரோ. த டுஞ்தசழியன்

WEB REFERENCES:

1. https://www.chennailibrary.com
2. https://www.sirukathaigal.com
3. https://www.tamilvirtualuniversity.org
4. https://www.noolulagam.com
5. https://www.katuraitamilblogspot.com

CLHF251T10	LANGUAGE – I (HINDI – I)	L	T	P	C
		2	1	0	3

(For Students admitted from 2025 onwards)

UNIT – I REFLECTION ON HINDI LANGUAGE:

a) Importance of Hindi learning & the place of Hindi as National language.
b) Cultural contexts of Hindi : an introduction &Various functional forms of Hindi
c) Hindi Phonetics – Vowels and Consonants
d) Barahkhadi & Dwitvakshar and Samyuktakshar
e) Often wrong spelt words and correction

UNIT – II HINDI VOCABULORY: made easy

a) Greetings and Introductory words
b) Basic words for daily usage – spoken purpose in particular.
c) Introduction to parts of speech in Hindi
d) Adjective noun agreements, Oblique and expressions of possession (APNA)

UNIT – III HINDI GRAMMAR: for Syntax Understanding

a) Gender and Number
b) Infinitive Verbs : commands and requests
c) Partsof speech - sentence making
d) Verb usage variations
e) Karakchihn – Introduction

UNIT – IV WRITING AND READING SKILLS OF HINDI

a) Application of case-endings in sentences
b) Sentence formation (Gender specified)
c) Sentence formation (Number specified)
d) Changing the sentence according to the instructions (using '*Be* form')
e) Hindi – reading and writing exercises (Short stories, paragraphs etc.)

UNIT – V THE FOUNDATION FOR HINDI SPEAKING

a) Introduction of Tenses
b) Present Tense and it's variations
c) Future Tense and it's variations
d) Transcription of Paragraph
e) Overall Review of What We Learned so Far

TEXT BOOKS:

1. **HINDI SOURABH,** Prepared by Department of Hindi, SCSVMV

REFERENCES:

1. "Come Let us Learn Hindi" : Dr. Alok Pandey, Published by Milind Prakashan, Hyderabad 2013
2. Pankhudiyan 1&2: Dr. Madhu Dhawan, Lekhan Prakashan, New Delhi 2011
3. SABARI HINDI BODHINI, Published by Shabari Prakasan, Selam, 2012

CLSF251T10	LANGUAGE – I (SANSKRIT – I)	L	T	P	C
		2	1	0	3

(For Students admitted from 2025 onwards)

UNIT – I भागः - क

1. Vowels & Consonants
2. Words begin with vowels
3. Words begin with **क**to**ण**
4. Words begin with **त**to**ह**

UNIT - II भागः - ख

1. Words begin with **क** to **झ** with the combination of Vowels.
2. Words begin with **ट**to **न** with the combination of Vowels.
3. Words begin with **प** to **ह**with the combination of Vowels.
4. Combined Letters.
5. Simple Sentences.

UNIT - III भागः - ग

1. Lessons from text book 1-6.

UNIT – IV भागः –घ

1. Lessons from text book 7-12.

UNIT - V भागः - ङ

1. शब्दरूपाणण

1. देवः	**5. गो**	**9. धेनुः**	**13. युष्मद्**
2. मुणनः	**6. छात्रा**	**10. मातृ**	**14. तद्**
3. गुरः	**7. मणतः**	**11. वनम्**	**15. एतद्**
4. णपतृ	**8. गौरी**	**12. अस्मद्**	**16. इदम्**
			17. णकम

2. धातुरूपाणण(Present tense, Past tense and Future tense) परस्मैपद-आत्मनेपदधातवः

1. **भूधातुः**
2. **पठ्धातुः**
3. **गम्धातुः**

TEXT BOOKS:

1. Samskrita Siksha - Part I & II, Published by Department of Sanskrit and Indian culture, SCSVMV University (Deemed University), Enathur, Kanchipuram.

UCAF251T30	MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES:

- To introduce foundational concepts of discrete mathematics.
- To explore logical reasoning and proof techniques.
- To study algebraic structures and graph theory for computer applications.

COURSE OUTCOME:

- Apply set theory and logic to computer science problems.
- Develop mathematical proofs using induction and logical arguments.
- Analyze recurrence relations and use them in algorithms.
- Understand algebraic structures like groups and subgroups.
- Apply graph theory concepts to model networks and data structures.

SYLLABUS

UNIT I: SET THEORY

Introduction, Sets, Notation and description of sets, subsets, Venn – Euler diagram, Operation on sets, Properties of set operations (only statements), Laws of Algebra of sets, The principle of Duality, Addition Principle.

12

UNIT II: PROPOSITIONAL LOGIC

Symbolic Logic: Logical Operations, Conditional and Biconditional operators, Converse, Inverse, and contrapositive, Tautology and Contradiction, Algebra of propositions, Arguments.

12

UNIT III: **MATHEMATICAL INDUCTION AND RECURRENCE RELATIONS**

Mathematical induction: Techniques of Proof, Mathematical Induction – Recurrence Relations: Recurrence - An Introduction, Recurrence Relations, Solution of finite order homogenous (Linear) relations.

12

UNIT IV: **ALGEBRAIC SYSTEM**

Introduction to Algebraic system: Binary operations, Group, Sub-Groups: Properties of Sub-Groups, Cyclic Groups, Order of a group, Lagrange's theorem, Permutation group (simple problems), Normal Sub-group.

12

UNIT V: GRAPH THEORY

Basic Concepts, Subgraph, Some special classes of Graph, Path, Cycle, and Connectedness, Matrix Representation of the Graph; Trees: Definitions, Spanning Trees, Minimal Spanning trees: Kruskal's Algorithm, Prim's Algorithm; Shortest Path Problem: Dijkstra's Algorithm.

12

TOTAL: 60

TEXT BOOKS:

1. Kenneth H.Rosen, Discrete Mathematics and its Applications, 6th Edition, Tata McGraw Hill, New Delhi (2007)
2. P.R. Vittal, Mathematical Foundations, Margham Publications, Chennai.
   Unit II: Chapter 1.
   Unit IV: Chapter 38, Chapter 39 - Pg. No. (39.51-39.55)
3. M.K. Venkataraman, N.Sridharan, N. Chandarasekaran, Discrete Mathematics, The National Publishing Company , Chennai.
   Unit I: Chapter I
   Unit III: Chapter IV, Chapter V – 1, 3, 4.
   Unit V: Chapter XI

REFERENCES:

1. J.P.Tremblay R. Manohar, Discrete Mathematics Structures with Applications to Computer Science, McGraw Hill International Edition.
2. Srimanta Pal, Subodh C. Bhunia, Engineering Mathematics, Oxford University Press Free online resources available.

UCAF251T40	COMPUTER ARCHITECTURE	L	T	P	C
		3	1	2	5

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To Understand the basics of Digital Electronics and Binary Number System
- To Learn the implementation of Combinational Circuit and Sequential Circuit
- To Understand the Organization of basic computers.
- To Understand the concept of Parallel Processing.
- To understand the concept of memory organization.

COURSE OUTCOMES

- Obtain the knowledge of the basics of Digital Electronics and Binary Number System
- Acquire the Knowledge about Combinational Circuit and Sequential Circuit
- Obtain the Knowledge about Organization of basic computers.
- Obtain the Knowledge about Parallel Processing.
- Acquire the Knowledge about memory organization.

SYLLABUS

UNIT-I

Digital Principles: Definition for Digital signals, Digital logic, Digital computers, Architecture, Boolean Laws and Theorems, K-Map.

Number Systems: Decimal, Binary, Octal, Hexadecimal, Number System Conversions, Binary Arithmetic

12.

UNIT-II

Combinational Circuits: Half Adder and Full Adder, Subtractor, Decoders, Encoder, Multiplexer, Demultiplexer.

Register: 4 bit register with parallel load, Shift Registers- Bidirectional shift register with parallel load Binary Counters.

12

UNIT-III

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions.

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).

12

UNIT-IV

Input-Output Organization: Peripheral Devices, Input-Output Interface, Modes of Transfer, Priority Interrupt, Direct memory Access.

12.

UNIT-V

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory, Virtual Memory.

12.

TOTAL : 60

LIST OF EXPERIMENTS

1. Verify logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and Buffer gates.
2. To study and verify NAND as a Universal Gate
3. To verify De- Morgan's theorem for 2 variables
4. Design and test of an S-R flip-flop using NAND/NOR gate.
5. Convert BCD to Excess-3 code using NAND gate
6. To Convert Binary to Grey Code
7. Verification of Truth Tables of J-K Flip-Flop using NAND/NOR gate
8. Realize Decoder and Encoder circuit using Basic Gates.
9. Design and implement the 4:1 MUX using gates.
10. Implementation of 4-Bit Parallel Adder Using 7483 IC.

TEXT BOOKS

1. D. P. Leach, A. P. Malvino, and G. Saha, "Digital Principles & Applications", India: Tata McGraw Hill Education Private Limited, 2023 ed.,2023
2. M. M. Mano, Computer System Architecture, 6th ed. Pearson/PHI, 2023.

REFERENCE BOOKS

1. William Stallings- "Computer Organization and Architecture", Pearson/PHI, 10th Edition, 2022.
2. Andrew S. Tanenbaum- "Structured Computer Organization", PHI /Pearson 6th Edition, 2016
3. M. V. Subramanyam, "Switching Theory and Logic Design", Laxmi Publications (P) Ltd., 2023 ed., 2023.
4. I. Singh, "Computer Organization Architecture", Khanna Book Publishing, 2023 ed., 2023.

E- REFERENCES

1. https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/
2. https://www.tutorialspoint.com/computer_logical_organization/index.htm
3. https://www.gatevidyalay.com/computer-organization-architecture-notes/
4. https://www.computer-pdf.com/exercises/computer-architecture

UCAF251T50	PROBLEM SOLVING TECHNIQUES	L	T	P	C
		3	1	3	6

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To learn the fundamentals of PST and methodologies which are essential for building good programs
- To help the students to learn programming concepts using C Language
- Design the solution from specification of a problem and write pseudo code of the algorithm using basic building blocks or structured programming constructs
- To demonstrate a thorough understanding of modular programming by designing programs which require the use of programmer-defined functions
- To impart the knowledge about pointers which is the backbone of effective memory handling and demonstrate adeptness of file access in developing solutions to problems

COURSE OUTCOMES

- Learn the fundamental programming concepts and methodologies, which are essential for building good programs.
- Able to translate an algorithm into program
- Understand the modular programming by designing programs, which require the use of control structures, arrays, defined functions and learn about storage classes
- Acquire the knowledge about pointers
- Obtain the knowledge of writing and testing programs

SYLLABUS

UNIT I: PROBLEMS AND PROBLEM INSTANCES

Types of Computational Problems- Classification of Problem- Analysis of Problems- Solution Approaches- Algorithm Development- Analysis of Algorithm - Role of Data Structures in Problem Solving- Problem Solving Steps-Modular Programming.

12

UNIT –II: C FUNDAMENTALS

Character set - Identifier and keywords - data types - constants- Variables - Declarations - Statements - Operators – Expressions – Built in functions – Input and Output Operations.

12

UNIT – III: CONTROL STRUCTURE STATEMENTS AND ARRAYS

Flow of control - if, if else, While, do-while, for loop, Nested control structures - Switch, break and continue, go to statement – Arrays.

12

UNIT – IV: FUNCTIONS & STRUCTURE

Definition - Prototypes – Passing arguments – Recursion- Storage Classes – Structure-Union.

12

UNIT – V: POINTERS AND FILE

Declarations - Structures and Pointers - Passing pointers to Functions - Pointer and Arrays - Arrays of Pointers - Files: Creating, Processing, Opening and Closing a data file- Debugging.

12

TOTAL : 60

LIST OF EXPERIMENTS

1. Converting degrees Celsius to Fahrenheit and vice versa?
2. Write a Program to generate a Fibonacci Series
3. Given a positive integer value n (>= 0) display number, square and cube of numbers from 1 to n in a tabular format?
4. Given an input positive integer number, display odd numbers from in the range [1,n]?
5. Compute character grade from the marks ($0 \leq$ marks ≤ 100) of a subject. Grading Scheme: 80-100: A, 60 - 79: B, 50 - 59: C, 40-49: D, 0-39: F? Solve this using switch case
6. Display following patterns of n rows (n > 0), For the below examples n = 5?

```
$
$$
$$$
$$$$
$$$$$
```

7. Check if a given positive integer number is a palindrome or not?
8. Implement your own string length and string reversal functions?
9. Write a Program to sort an array.
10. Write a Program to find the factorial of an integer using recursion.
11. Write a Program to swap two values using function pointer.
12. Write a Program to store student's information using Structure.
13. Write a Program to perform read and write operation on a file.

TEXT BOOKS:

1. Venkatesh, Nagaraju Y, "Practical C Programming for Problem Solving", Khanna Book Publishing Company, 2024.
2. R.S.Salaria, Programming for Problem Solving (with Lab Manual), Khanna Book Publishing Company, 1st Edition, 2024.
3. Harvey Deitel and Paul Deitel, "C How to Program", Pearson India, 9th Edition, 2015.
4. R G Dromey, "How to Solve It by Computer", Pearson India, 2007.

REFERENCES:

1. Brian W. Kernighan and Dennis Ritchie, “The C Programming Language”, Pearson, 2nd Edition, 2015.

E- REFERENCES

1. https://practice.geeksforgeeks.org/explore/?category[]=C-Programming-Language
2. https://www.codechef.com/practice
3. https://leetcode.com/problemset/all/
4. https://exercism.org/tracks/c

ICSF251T60	INDIAN CULTURE	L	T	P	C
		1	0	0	1

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

In an Endeavour to understand the Ancient Indian systems and Culture in all the parameters, this paper aims to create awareness about the importance of early Indian systemsand traditions. The rich literary heritage of India and various scientific fields in which Indians have made their contributions included in this paper to draw linkages between modern science and rich Vedic scientific heritage.

SYLLABUS

Unit I

Introduction to Vedic Cultures; significance & how it is different from the other cultures. whywe have to follow? Important features.

Unit II

Literary Heritage of India – significance of Indian Literature; Chronology of Indian literature;Literature in Sanskrit and other Indian languages;

Unit III

Early Indian Education – significance & advantages. Gurukulas and Guru-sishya parampara. Learning methods. Evolution of script and languages; important early scripts and writing materials; important early educational centers (ghattikas, universities) & their unique features. Important personalities and their Contribution – Devarishies, Maharishies, Rishies, Seers and contribution of their institutions to protect the cultural heritage.

Unit IV

Scientific thoughts of Early Indian Sages;

Unit V

Importance and significance of Upavedas – Ayurveda, Dhanurveda, Gandhravaveda, stapatya &Arthasastra.

REFERENCES:

1. Joshi,K. 1992(rp). The Veda and Indian Culture. Rastriya Veda Vidya Pratishthana. NewDelhi.
2. Kangle, R.P. 1992 (rp). The Kautilya Arthasastra. Delhi.
3. Kulkarni, R.P. 1983. Geometry according to Sulba Sutra. Samsodhana Mandal. Pune.
4. Majumdar, R.C. 1994 (rp). Ancient India. Motilal Banarsidas Publishers. Delhi.
5. Patel, I.S. (ed). 1984. Science and the Vedas. Bombay.
6. Majumdar, R.C. 1996 (ed) (rp). The History and Culture of the Indian People. Vol I-IV. Bharatriya Vidya Bhavan. Mumbai
7. Radhakrishna, S. 1993(rp). Indian Philosophy. Vol I & II. Oxford University Press. Delhi.
8. Sri Chandrasekarendra Sarasvati Swamihi. 1991. The Guru Tradition. Bharatiya Vidya Bhavan. Bombay.
9. Sri Jayendra Saraswatiji Maharaj. 1951. The Vedas and Vedangas. Prakashan Kendra. Lucknow. Winternize, M. 1996(rp). History of Indian Literature Delhi.

CLEF252T20	FUNCTIONAL ENGLISH	L	T	P	C
		2	1	0	3

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To initiate and sustain dialogues using requests, permissions, and other social expressions.
- To apply skimming and scanning techniques for various academic and non-academic texts.
- To plan and deliver oral presentations with effective use of visual aids.
- To use English in real-life social contexts such as inquiries and giving directions.
- To integrate LSRW skills through interactive classroom activities.

COURSE OUTCOMES

- Engage in structured social conversations using suitable expressions.
- Apply effective reading strategies to locate and understand key information.
- Plan and present oral content with visual and verbal clarity.
- Interact fluently in real-life communication scenarios like giving directions or making inquiries.
- Participate confidently in integrative LSRW-based activities.

SYLLABUS

UNIT I

Conversation Skills (oral & written): Placing a request, asking permissions, registering complaints, describing a process, agreeing & disagreeing.

9

UNIT II

Reading Skills

Types of reading: Intensive & Extensive,
Strategies of reading: skimming, scanning, SQ3R
Comprehending short/long technical texts

9

UNIT III

Presentation Skills: identifying a topic, planning, preparing a presentation, understand the audience.
Type of Presentation: memorized, extempore, impromptu, manuscript
Mechanics of Presentation: Body language, Voice, Engaging Audience, using visual aids

9

UNIT IV

Effective Communication in Social Contexts: making enquiries, asking & giving directions, instructing & recommending

9

UNIT V

Language activities (to be included) role play, mock interview, JAM, Story Building

9

REFERENCE:

1. Kumar, Sanjay. *Communication Skills*. Oxford University Press.

CLTS252T10	LANGUAGE – II (TAMIL – II)	L	T	P	C
		3	0	0	3

(For Students admitted from 2025 onwards)

நோக்கம்:

PREAMBLE:

Encouraging personality development and confidence in language skills

முன்னுரை

ஆளுமை மேம்பாடு மற்றும் மொழித்திறன் மற்றும் தன்னம்பிக்கையைத் தூண்டுதல்

இரண்டாம் பருவம்

Objective-1	புதுக்கவிதை வரலாற்றினை அறிந்து கொள்வர் **பாரதியார் காலம் தொட்டு தற்கால. புதுக்கவிதைகள் வரை கவிதை இலக்கியம் அறிமுகப்படுத்தப்படுவதால் படைப்பாற்றல் திறன் பெறுதல்.**
Objective-2	தொல் பழங்கால வரலாறும் சங்ககால வரலாறும் தமிழக வரலாற்றை அறிந்துகொள்வர்..
Objective-3	கல்வியும் வாணிபமும் தமிழரின் வாழ்வியல் தொன்மையை அறிவர்
Objective-4	தமிழரின் பண்பாட்டுக் கூறுகள், ஐரோப்பியர் கால வரலாறு தமிழரின் பண்பாட்டுக் கூறுகள்
Objective-5	**இலக்கணமும் மொழித்திறனும் மொழியை பிழையின்றிப் பேச எழுத கற்கத் தேவையான தமிழ் இலக்கணத்தின் இன்றியமையாமையை உணர்ந்து கொள்ளுதல்**

போடத்திட்டங்கள்

அலகு 1 : இக்கோல இலக்கியம்

கவிறத :

1. போரதியோர் - போரதம்
2. போரதிதோசன் – ஆலமர கவிறதகள் (குரங்கின் அச்சம்)
3. ோமக்கல் கவிஞர் – கத்தியின்றி.
4. மீரோ – கனவு கைபறன

சிறுகறத :

1. வ.நவ.சு ஐயர் – குளத்தங்கக்கறர அரசமரம்.
2. புFறமப்பித்தன் – எப்நபோF விடி ம்.
3. அம்றப – அம்மோ ஒரு தகோறல தசய்தோள்

அலகு 2: ததோல் பழங்கோல வரலோறும் சங்ககோல வரலோறும்

1. ததோல் தமிழர்
2. பறழய கைக்கோலம்
3. புதிய கைக்கோலம்
4. உநலோகக் கோலம்
5. அகழ்வோரோய்ச்சியில் தமிழும் தமிழரும் (கீழடி வறர)

அலகு 3: கல்வியும் வோணிபமும்

1. திறண வோழ்வியல் (களவு வோழ்கறக கைப்பு வோழ்க்றக உணவு வோணிகம் விறளயோட்டுகள்)
2. கல்வியும் கறலகளும்
3. தமிழ் வளர்த்த சங்கம்

4. சங்ககோல ஆட்சி முறை
5. அயல் ோட்டுத் ததோடர்புகள்

அலகு 4 ஆட்சியர் வரலோறு

1. மூநவ ்தர் வரலோறு
2. பல்லவர் வரலோறு
3. ோயக்கர் ஆட்சி
4. முகமதியர் ஆட்சி
5. மரோட்டியர் ஆட்சி
6. நபோர்த்Fக்கீசியர்
7. டச்சுக்கோரர்கள்
8. பிதரஞ்சுக்கோரர்கள்
9. ஆங்கிநலயர்கள்
10. போறளயக்கோரர்கள்

அலகு 5 . இலக்கணம்

1. எழுத்தின் விளக்கம்
2. எழுத்தின் வறகைள்
3. வினோ எழுத்Fக்கள்
4. சுட்டடழுத்Fக்கள்
5. தசோல் இலக்கணம்
6. வறகைள்
7. தபயர்ச்தசோல்
8. விறனச்தசோல்
9. இறடச்தசோல்
10. உரிச்தசோல்

பாடநூல் :

1. ஸ்ரீ ச ்திரநசகநர ்திர சரஸ்வதி விஸ்வ மகோ வித்யோலயோ - தபோFத்தமிழ் - இரண்டோம் பருவம்

பார்வை நூல் ;

1. தமிழக வரலோறும் பண்போடும் - நக.நக.பிள்றள, உலகத் தமிழோரோய்ச்சி ிறுவனம், தசன்றன,
2. தமிழர் ோகரிகமும் பண்போடும் - அ. தட்சிணோமூர்த்தி, யோழ் தவளியீடு, தசன்றன,.
3. தமிழக வரலோறும் பண்போடும் - நவ.தி. தசல்லம், மணிவோசகர் பதிப்பகம், தசன்றன,
4. ஆதிச்ச ல்லூர் முதல் கீழடி வறர நுநவதோ லூயிஸ், கிழக்குப் பதிப்பகம்,
5. தமிழும் பிை பண்போடும் - தத.தபோ. மீனோட்சி சு ்தரனோர், ியூ தசஞ்சுரி புக் ஹவுஸ், தசன்றன
6. தமிழர் வரலோறும் பண்போடும் ீலகண்ட சோஸ்திரி, ஸ்ரீதசண்பகோ பதிப்பகம், தசன்றன
7. தமிழர் வரலோறும் தமிழர் பண்போடும் மோ.இரோசமோணிக்கனோர்
8. தமிழர் ோகரிக வரலோறு க.த.திரு ோவுக்கரசு, தோல்கோப்பியர் நூலகம், தசன்றன.

WEB REFERENCES:

1. https://www.chennailibrary.com
2. https://www.sirukathaigal.com
3. https://www.tamilvirtualuniversity.org
4. https://www.noolulagam.com
5. https://www.katuraitamilblogspot.com

CLHF252T10	LANGUAGE – II (HINDI – II)	L	T	P	C
		2	1	0	3

(For Students admitted from 2025 onwards)

UNIT –I INTRODUCTION TO HINDI GRAMMAR:

a) Identification of different Tenses
b) Differences of *Sakarmak* & *Akarmak* sentences
c) Correction of Sentences pertaining to different tenses
d) Past Tense with special context to *Ne Pratyay*
e) Future Tense with examples

UNIT – II SPEAKING*Right*HINDI:

a) Conversations at different places and contexts
b) Topics related to different tenses and making sentences
c) Usage of Sentences according to the direction
d) Usage of complex sentences and different styles of expression

UNIT – III LANGUAGE WRITING IN HINDI:

a) Paragraph setting
b) Comprehensive paragraph
c) Paragraph writing
d) Simple translation of sentences

UNIT – IV HINDI LITERATURE – INTRODUCTION TO OLD POETRY:

a) Tulasi Das ke Dohe – Kanthasth evam Vyakhya bhag
b) Rahim ke Dohe- Kanthasth evam Vyakhya bhag
c) Tatparya and Kanthasthikaran
d) Summary and annotation part

UNIT – V HINDI LITERATURE-INTRODUCTION TO POETRY andPROSE:

a) Bharat ki Ekataa : Ramdhari Singh Dinkar
b) "Hum Honge Kamiyab" by Girija Kumar Mathur

TEXT BOOK:

1. **HINDI SOURABH,** (Prepared by Department of Hindi, SCSVMV)

REFERENCES:

1. "Come Let us Learn Hindi" : Dr. Alok Pandey, Published by Milind Prakashan, Hyderabad 2013
2. Pankhudiyan 1&2 : Dr. Madhu Dhawan, Lekhan Prakashan, New Delhi 2011
3. Sabari Hindi Bodhini – Shabari Prakashan, Selam, Tamil Nadu, 2012.

CLSF252T10	LANGUAGE – II (SANSKRIT – II)	L	T	P	C
		2	1	0	3

(For Students admitted from 2025 onwards)

UNIT - I भागः - क

Poetry: सुभाषितमालाI - 1 to 6 Slokas

Prose: Lessons 1 to 3 (From Sanskrit Pravesika)

UNIT - II भागः - ख

Poetry: सुभाषितमालाII - 1 to 8 Slokas

Prose: Lessons 4 to 6 (From Sanskrit Pravesika)

UNIT - III भागः - ग

Grammar:

1.

1.अच्सन्धिः

2. 2.हल्सन्धिः

UNIT - IV भागः - घ

Essays:

1. अस्माकंदेशिः
2. दीपावलीमहोत्सविः
3. संस्कृतप्रचारस्यआवश्यकता

UNIT - V भागः - ङ

Slokas (Verses):

1. Sowndaryalahari (10 Slokas)

TEXT BOOKS:

1. **Subhashitamala**, Prepared by Dept. of Sanskrit and Indian Culture, SCSVMV University.
2. **Sowndaryalahari**

UCAF252T30	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To provide an understanding of probability theory and distributions.
- To equip students with statistical tools for data analysis.
- To introduce hypothesis testing and regression techniques.

COURSE OUTCOMES

- Understand basic concepts in probability and random variables.
- Analyze different probability distributions.
- Compute measures of central tendency and dispersion.
- Perform statistical testing for large and small samples.
- Apply curve fitting and chi-square tests in real-life data analysis.

SYLLABUS

UNIT I: PROBABILITY

Introduction to Probability, Probability spaces, conditional probability, Bayes' Theorem, Discrete and Continuous one dimensional random variables - Expectations, Moments, Variance of a sum, Moment generating function, Tchebyshev's Inequality.

12

UNIT II: PROBABILITY DISTRIBUTIONS

Discrete Distributions – Binomial, Poisson and Negative Binomial distributions, Continuous Distributions - Normal, Exponential and Gamma distributions.

12

UNIT III: STATISTICS:

Measures of Central tendency, Measures of dispersion, co efficient of variation, Moments, Skewness and Kurtosis, Correlation, Rank Correlation and Regression (Bivariate).

12

UNIT IV: TESTING OF HYPOTHESIS-I

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

12

UNIT V: TESTING OF HYPOTHESIS-II

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

12

TOTAL: 60

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

   Unit 1 - Chapter 2 (1,4,5,7,10,11,13)

2. S.P. Gupta, Statistical Methods, 31st edition, Sultan chand and sons, New Delhi, 2002.

   Unit 2 - Chapter 1 - vol 2
   Unit 3 - Chapter 5,6,7 – vol 1
   Unit 4 - Chapter 8,9,10 – vol 1
   Unit 5 - Chapter 14 – vol 1

REFERENCES:

1. Srivastava, U.K., Shenoy, G.V., Sharma, S.C. - Quantitative Techniques for ManagerialDecision - New Age International (P) Ltd, New Delhi
2. T. Veerarajan, Probability, Statistics and Random Processes, Third edition, Tata McGraw- Hill, New Delhi, 2010.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. Loeve, M. (2012). Probability Theory I. United States: Springer New York.

UCAF252T40	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	1	2	5

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To gain knowledge in designing algorithms to solve problems.
- To understand the concept of linear and nonlinear data structures.
- To know the concept of various sorting and searching techniques.
- To apprehend the tree traversal and searching
- To acquire knowledge in graph traversal and searching.

COURSE OUTCOMES

- Compute and Analyze algorithms for efficiency using asymptotic notations.
- Develop knowledge about basic data structures like arrays, linked list, trees.
- Solve problems by applying suitable data structure.
- Define graph and illustrate graph traversal.
- Design and develop projects requiring implementation of the data structure.

SYLLABUS

UNIT – I

Introduction to Data Structures and Algorithms: Definition and Importance of Algorithms - Characteristics of Good Algorithms - Definition of a Data structure - Primitive and Composite Data Types- Arrays - Operations on Arrays.

12 Hrs.

UNIT – II

Sorting and Searching Algorithms: Sorting: Bubble sort - Insertion sort - Selection sort - Searching: Linear search - Binary search.

12 Hrs.

UNIT – III

Linear Data Structure: Stacks – Operations on Stack-Applications of Stack: Infix to Postfix Conversion –Postfix Evaluation - Queues - Operations on Queues.

12 Hrs.

UNIT – IV

Dynamic Linear Data Structure: Introduction to Single and Double Linked lists - Representation – Operations on Singly Linked List - Linked Stack and Linked Queues.

12 Hrs.

UNIT – V

Non Linear Data Structure: Trees - Binary Trees - Binary search trees - Traversal Algorithms - Graph: Definition - Types of Graphs - Graph Traversal: BFS and DFS.

12 Hrs.

TOTAL: 60

LIST OF EXPERIMENTS

1. Program to Search an Element in the Array.
2. Program to Search an Element in the Array using Binary Search.
3. Program to Sort an Array using Bubble Sort.
4. Program to Sort an Array using Selection Sort.
5. Program to Sort an Array using Insertion Sort.
6. Program to Implement a Stack Using Arrays.
7. Program to Implement a Queue Using Arrays
8. Program to Implement a Stack using Linked List
9. Program to Implement a Queue using Linked List
10. Program to Perform Tree Traversal.

TEXT BOOKS

1. Levitin, A. "Introduction to the design and analysis of algorithms", Pearson Education., 3rd Ed., 2017.
2. S. Lipschutz, "Theory and Problems of Data Structures", Tata McGraw-Hill, 2023 ed., 2023.
3. J. P. Tremblay and P. G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw-Hill, 2023 ed., 2023.

REFERENCE BOOKS

1. E. Horowitz and S. Shani, "Fundamentals of Data Structures in C++", Galgotia Publications, 3rd ed., 2023. [Online].
2. R. Kruse, C. L. Tondo, and B. Leung, "Data Structures and Program Design in C", PHI, 4th ed., 2023.

E- REFERENCES

1. https://www.geeksforgeeks.org/advanced-data-structures
2. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
3. https://peterindia.net/Algorithms.html
4. https://www.freecodecamp.org/learn/javascript-algorithms-and-data-structures/

UCAF252T50	OBJECT ORIENTED PROGRAMMING IN JAVA	L	T	P	C
		3	1	3	6

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To introduce the object oriented programming system concepts
- To introduce syntax and semantics of Java programming language
- To develop modular programs using Java
- To setup JDK environment to create, debug and run Java programs
- To develop database applications

COURSE OUTCOMES

- Able to implement Object Oriented Concepts using Java Language.
- Able to develop and deploy applications and applets in JAVA.
- Able to develop and deploy GUI using JAVA Swing and AWT, JDBC.
- Able to develop and deploy web applications.
- Able to implement database applications

SYLLABUS

UNIT I: Fundamentals of Object Oriented Programming: Basic Concepts of Object Oriented Programming (OOP), Benefits and Applications of OOP. Java Evolution: Java Features, Difference between Java, C and C++, Java and Internet, Java Environment. Overview of Java Language: Introduction to Simple Java Program, Use of Comments and Math function, Application of two classes, Java Program Structure, Java Tokens and statements, Implementing Java program and JVM, Command Line Arguments.

12

UNIT II: Constants, Variables and Data Types: Constants, Variables, Data Types, Declaration of Variables, Giving values to Variables, Symbolic Constants, Typecasting. Operators & Expressions: Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment & Decrement operators, conditional operators, Bitwise operators, Arithmetic Expressions, Evaluation of Expressions, Type Conversions in Expressions, Operator Precedence & Associativity. Decision Making, Branching & Looping: Decision Making with Control Statements, looping statements, Jump in loops, Labelled loops

12

UNIT III: Classes, Objects and Methods: Defining Class, Methods Declaration, Constructors, Methods Overloading, Overriding Methods, Inheritance Arrays, Strings and Vectors: 1D arrays, creating an Array, 2D arrays, Strings, Vectors, Wrapper Classes, Enumerated Types Inheritance: Defining, extending classes, and Implementing Interfaces. Multiple inheritance and polymorphism.

12

UNIT IV: Packages: Basics of packages, System packages, Creating and accessing packages, user defined packages, Adding class to a package. Exception Handling: Using the main keywords of exception handling: try, catch, throw, throws and finally; Nested try, Multiple catch statements, Creating user defined exceptions

12

UNIT – V: Database Connectivity: JDBC architecture Establishing connectivity and working with connection interface, Creating, and executing SQL statements. Java applets, AWT controls (Button, Labels, Combo box, list and other Listeners, menu bar) layout manager, string handling (only main functions), Introduction to JAVA Swing, Event Handling

12

TOTAL: 60

LIST OF EXPERIMENTS

1. Class, object, abstract classes and interfaces.
2. Overloading, overriding and various forms of inheritance.
3. Create packages and multiple threads in Java.
4. Input/output and Applets.
5. Exception handling.
6. String handling.
7. Event handling (Mouse and Keyboard events).
8. Layout Manager create different applications.
9. Create and manipulate Text Area, Canvas, Scroll Bars, Frames and Menus using swing/AWT
10. Client Server Interaction with stream socket connections.
11. Read data from disk file.

TEXT BOOKS:

1. A. Goyal, “The Essentials of JAVA”, Khanna Book Publishing Company Private Limited, 2nd ed., 2023.
2. Schildt, H., “Java: The Complete Reference”. McGraw-Hill Education, 12th edition, 2022.

REFERENCE BOOKS:

1. T. Alam, “Core JAVA”, Khanna Book Publishing Company Private Limited, 2nd ed., 2023.
2. Balaguruswamy E. “Programming with JAVA: A Primer”. McGraw Hill Education, 7th ed., India, 2023.
3. Y. D. Liang, “Introduction to Java Programming”, Pearson, 10th ed., 2023.
4. S. Malhotra and S. Choudhary, “Programming in Java”, Oxford University Press, 3rd ed., 2023.

E- REFERENCES:

1. https://www.geeksforgeeks.org/object-oriented-software-engineering/
2. https://www.tutorialspoint.com/object_oriented_analysis_design/index.htm
3. https://www.javatpoint.com/object-oriented-analysis-and-design
4. https://nptel.ac.in/courses/106105191

UCAF252IKS	INTRODUCTION TO INDIAN KNOWLEDGE SYSTEM	L	T	P	C
		1	0	0	1

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To Understand the fundamental principles and sutras of Vedic Mathematics.
- To Apply shortcut methods to perform multiplication, division, squaring, and cubing efficiently.
- To Develop mental calculation techniques using vertical and crosswise, Nikhilam, and Paravartya Sutras.
- To Solve algebraic equations and roots with simplified Vedic methods.

COURSE OUTCOMES

- Use Vedic techniques to multiply numbers quickly, including three- and four-digit numbers.
- Apply one-line formulas like Nikhilam and Vertical & Crosswise for efficient multiplication.
- Perform division of single, double, and triple-digit numbers using Paravartya Sutra.
- Calculate squares and cubes using the Duplex method and identify shortcuts for squaring numbers.

SYLLABUS

UNIT – I

Multiplication- Finding square- Sum of last two digits zero-By one less than the previous-By Nikhilam-Vertical and cross wise-three digit and four digit numbers – Product of three numbers.

UNIT – II

Division- Single, two and three digit divisors- Paravartya sutra (change the sign and add). Squaring and cubing-Duplex method.

UNIT - III

Finding square root, solving simultaneous equation in 2 and 3 variables.

REFERENCES:

1. Vedic Mathematics Part I, S.Haridas, Bhavan's Book University,2000.
2. Discover Vedic Mathematics, Kenneth R Williams, Motilal Banarsidass Publishers, ISBN: 81-208-3097-0,2002.
3. Vedic Mathematics for Schools, J.T.Glover, Motilal Banarsidass Publishers, ISBN: 81- 208-1670-6,1999.

UCAF252ICT	INDIAN CONSTITUTION	L	T	P	C
		1	0	0	1

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To know about Indian constitution
- To know about central and state government functionalities in India
- To know about Indian society.

COURSE OUTCOMES

- Understand the origin and foundational principles of the Indian Constitution.
- Explain the structure and functions of Union and State Governments.
- Analyze the constitutional provisions related to citizens' rights and Indian society.

SYLLABUS

UNIT I

Historical Background – Constituent Assembly of India – Philosophical Foundations of The Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for Citizens.

UNIT II

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

TEXT BOOKS:

1. Durga Das Basu, “Introduction to the Constitution of India “, Prentice Hall of India, New Delhi.
2. R.C.Agarwal, (1997) “Indian Political System”, S.Chand and Company, New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, “Introduction to the Constitution of India”, Prentice Hall of India, New Delhi.

BCA253T10	PYTHON PROGRAMMING	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To provide strong foundation in Python programming
- To develop problem-solving skills using Python
- To introduce file handling and exception handling
- To enable GUI-based application development
- To integrate Python with database systems

COURSE OUTCOMES

- Understand Python fundamentals and syntax
- Apply control structures and data structures
- Implement modular programming using functions
- Develop GUI applications using Tkinter
- Create database-driven applications

SYLLABUS

UNIT I: Fundamentals of Python

Introduction to Python and its features - Python environment setup and execution - Tokens, keywords, identifiers -Data types and variables -Operators and expressions -Input and Output functions -Type conversion - Decision making (if, if-else, nested if) - Looping constructs (for, while) - Jump statements (break, continue, pass) **12**

UNIT II: Data Structures and Functions

Common methods and operations on data structures: Traversal, searching, updating, insertion and deletion: Lists, Tuples, Sets, Dictionaries. Functions: definition, arguments, return values -Recursion -Strings and string manipulation **12**

UNIT III: Package and File Handling

Introduction to modules and packages - Creating and importing modules – standard modules and packages – creating user defined packages – Introduction to OOPS – Class – Object – Inheritance - File Handling: Text files and Binary files - Opening and closing files – Exception handling in file operations (try, except, finally, user-defined exceptions)

12

UNIT IV: GUI Programming using Tkinter

Introduction to GUI programming - Tkinter basics and architecture - Widgets: Label, Button, Entry, Text, Frame - Layout managers (pack, grid, place) - Event handling - Menu and dialog boxes. **12**

UNIT V: Database Programming and Application Development

Introduction to DBMS concepts - SQLite/MySQL connectivity using Python - Executing SQL queries -CRUD operations (Create, Read, Update, Delete) - Python GUI with Database Integration **12**

TOTAL:60

TEXT BOOKS

1. R. N. Rao, Core Python Programming, 3rd ed. New Delhi, India: DreamTech Press,2021.

REFERENCES

1. M. Lutz, Learning Python, 5th ed. Sebastopol, CA, USA: O'Reilly Media, 2013.
2. B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd ed.
3. Sebastopol,CA, USA: O'Reilly Media, 2016.
4. V. Kurama, Python Programming: A Modern Approach. Noida, India: PearsonEducation, 2017.

WEB REFERENCES

1. Python Software Foundation, "Python. Documentation,Available:https://docs.python.org/3/.
2. W3Schools, "Python Tutorial," [Online]. Available:https://www.w3schools.com/python/. [Accessed: Apr. 25, 2026].
3. GeeksforGeeks, "Python Programming Language," [Online]. Available:
4. https://www.geeksforgeeks.org/python-programming-language/.

BCA253T20	OPERATING SYSTEMS	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To impart knowledge on different types of Operating System
- To learn and implement the concept of Process Management
- To observe the concept of storage management
- To understand the concept of I/O and file systems
- To learn the basics of Linux Programming

COURSE OUTCOMES

- Understand the fundamental components of a computer operating system.
- Apply the concepts of CPU scheduling, synchronization and deadlocks in real computing problems.
- Demonstrate the different memory and I/O management techniques used in Operating Systems.
- Design and construct the Memory management systems in the modern operating system.
- Have practical exposure to the concepts of Windows, Linux and shell Programming

SYLLABUS

UNIT – I INTRODUCTION

Introduction - Operating system structures - System components - OS services - System calls - System structure -Resources Processes - Threads - Device management. **12**

UNIT – II PROCESS MANAGEMENT

Processes - Process concepts - Process scheduling - Operations on processes - Cooperating processes - CPU scheduling -Basic concepts -Scheduling criteria - Scheduling algorithms. **12**

UNIT – III SYNCHRONIZATION AND DEADLOCKS

The critical section problem - Semaphores - Classic problems of synchronization - Critical regions - Monitors-Dead locks -Deadlock characterization -Prevention - Avoidance - Detection - Recovery.

12

UNIT – IV MEMORY MANAGEMENT

Storage Management Strategies - Contiguous Vs. Non-Contiguous Storage Allocation - Fixed and Variable Partition Multiprogramming - Paging -Segmentation - Paging/Segmentation Systems - Page Replacement Strategies. **12**

UNIT – V WINDOWS, LINUX ADMINISTRATION

LINUX Security – LINUX Protection System – LINUX Authorization – LINUX Security Analysis – LINUX Vulnerabilities – Windows Security – Windows Protection System – Windows Authorization – Windows Vulnerabilities. **12**

TOTAL: 60

TEXT BOOKS:

1. Abraham Silberschatz, Peter Galvin and Gagne, "Operating System Concepts", Addison Wesley, 10th Edition, 2018. Unit two
2. Modern Operating Systems – 5th Edition (Pearson) Andrew S. Tanenbaum & Herbert Bos — Pearson, 2022 unit one,five
3. Operating Systems: Internals and Design Principles, 9th Edition William Stallings — Pearson, 2021/2022 unit three,four

REFERENCES:

1. Gary Nutt," Operating System, A modern perspective", Addison Wesley, 3rd Edition, 2004.
2. Richard Peterson, "Linux: The Complete Reference", Tata McGraw Hills, 6th Edition, 2008.

WEB REFERENCES

1. https://ics.uci.edu/~ics143/syllabus.html
2. https://os-book.com/OS10-global/slide-dir/index.html
3. https://engineering.purdue.edu/online/courses
4. https://www.kernel.org/doc/html/latest/security
5. https://learn.microsoft.com/en-us/windows/security/

BCA253T30	PRINCIPLES AND PRACTICES OF MANAGEMENT	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES

- To understand the fundamental concepts and functions of management.
- To analyse modern management practices in dynamic business environments.
- To apply leadership, motivation, and decision-making techniques in organizations.
- To understand contemporary trends such as digital transformation, AI, sustainability, and innovation in management.
- To develop managerial and organizational problem-solving skills.

COURSE OUTCOMES

- Explain the basic concepts, functions, and importance of management in organizations. (Blooms Level: Understand)
- Analyze planning processes, strategic management, and decision-making techniques in dynamic business environments. (Blooms Level: Analyse)
- Apply organizing principles, HRM practices, and team management skills in organizational settings. (Blooms Level: Apply)
- Apply leadership styles, motivation techniques, and communication skills in professional and technology-driven organizations. (Blooms Level: Apply)
- Evaluate the role of innovation, entrepreneurship, digital transformation, AI, and sustainability in modern management practices. (Blooms Level: Evaluate)

SYLLABUS

UNIT I: Basics of Management and Organizations

Introduction to Management – Importance of Management – Functions of Management – Levels of Management – Managerial Skills – Types of Organizations – Business Environment – Digital Transformation in Organizations – Ethics and Social Responsibility – Introduction to Green and Sustainable Management **12**

UNIT II: Planning and Decision Making

Planning Process – Types of Plans – Goal Setting – Basics of Strategic Management – Decision Making Process – Problem Solving Techniques – Innovation and Creativity – Risk and Uncertainty in Business – Introduction to Business Analytics – Role of Artificial Intelligence in Decision Making.

12

UNIT III: Organizing and Human Resource Management

Organizational Structure – Authority and Responsibility – Delegation of Work – Team Management – Introduction to Human Resource Management – Recruitment and Selection – Employee Training and Development – Performance Evaluation – Diversity and Inclusion – Remote Work and Hybrid Workplace Management. **12**

UNIT IV: Leadership and Communication Skills

Leadership Concepts and Styles – Motivation Techniques – Team Building – Group Communication – Conflict Management – Emotional Intelligence – Organizational Culture – Digital Communication Tools – Virtual Team Collaboration – Leadership in Technology-Driven Organizations. **12**

UNIT V: Modern Management Practices (9 Hours)

Controlling Process – Quality Management Basics – Entrepreneurship and Innovation – Knowledge Management – Supply Chain and Operations Basics – Business Process Improvement – Startup and IT Industry Management – Global Business Challenges – Emerging Trends in Management – AI and Technology in Modern Business. **12**

TOTAL :60

TEXTBOOKS

1. Gupta, C. B. (2018). Business Management. New Delhi: Sultan Chand & Sons.
2. Prasad, L. M. (2021). Principles of Management. New Delhi: Sultan Chand & Sons.
3. Sundar, K. (2014). Principles of Management. Chennai: Vijay Nichole Imprints Pvt. Ltd.
4. Kumar, P. (2023). Business Organization. New Delhi: Sultan Chand & Sons.
5. Jawadekar, W. S. (2019). Management Information Systems: Text and Cases. McGraw Hill Education India.

REFERENCES

6. D. P. Nagpal. (2021). Management Information Systems. S. Chand Publishing.
7. Basu, C. R. (2020). Business Organisation and Management (4th ed.). New Delhi: Tata McGraw Hill Publishing Company.
8. Pagare, D. (2020). Principles of Management. New Delhi: Sultan Chand & Sons.
9. Sharma, R. K., Gupta, S. K., & Sharma, R. (2011). Business Management. New Delhi: Kalyani Publishers.
10. Singh, B. P., & Chhabra, T. N. (2022). Business Organisation and Management. New Delhi: Dhanpat Rai & Co.

WEB REFERENCES

1. https://nptel.ac.in/courses/110105146
2. https://www.mindtools.com
3. https://nptel.ac.in/courses/110105069
4. https://nptel.ac.in/courses/109107121
5. https://hbr.org/topics

BCA253TPE12	PYTHON LAB	L	T	P	C
		0	0	3	2

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To provide hands-on experience in Python programming
- To develop problem-solving skills through practical exercises
- To implement concepts of control structures, functions, and data structures
- To practice file handling and exception handling techniques
- To design and develop GUI-based applications using Tkinter

COURSE OUTCOMES

- Develop Python programs using basic constructs and control structures
- Apply functions and data structures to solve computational problems
- Implement file handling and exception handling in applications
- Design GUI-based applications using Tkinter
- Develop database-driven applications using Python

LIST OF EXERCISES

1. Basics of Python

- Performing arithmetic operations
- Swapping two numbers
- Finding the largest of three numbers

2. Control Structures

- Checking even or odd numbers
- Calculating factorial using loops
- Generating multiplication tables

3. Looping Applications

- Generating Fibonacci series
- Checking prime numbers
- Calculating sum of digits

4. Functions

- Implementing functions for basic operations
- Recursive implementation of factorial/Fibonacci
- Palindrome checking using functions

5. Strings

- Counting vowels and consonants
- Reversing a string
- Checking anagrams

6. Lists, Tuples, Sets

- Performing list operations
- Removing duplicates using sets
- Working with tuples

7. Dictionaries

- Creating and managing student records
- Sorting dictionary elements
- Counting word frequency

8. File Handling

- Writing data to files
- Reading data from files
- Copying file contents

9. Exception Handling

- Handling runtime errors
- Managing multiple exceptions
- Creating user-defined exceptions

10. Database Programming

- Creating database and tables
- Performing CRUD operations
- Displaying records

11. GUI Programming

- Designing basic forms using Tkinter
- Creating calculator interface
- Designing login interface

REQUIRED SOFTWARE

- Python 3.x
- Tkinter
- SQLite / MySQL IDE (VS Code / PyCharm / IDLE)

BCA253I70	SOFT SKILLS - I	L	T	P	C
		0	1	0	1

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To understand the basic English Grammar usage and Vocabulary.
- To sensitize students, the significance of nonverbal communication and academic writing.
- To improve student's ability to speak fluently and interactively.
- To learn basic concepts of number system
- To understand basic idea about general aptitude

COURSE OUTCOMES

- Use basic grammar in both short conversation and writing.
- Convey information and thoughts in a good manner
- Communicate fluently.
- Able to solve number problems
- Able to understand and solve different quantitative problems

SYLLABUS

UNIT – I: GRAMMAR-I

Parts of Speech-Tenses-Modal Verbs-Vocabulary – One word substitution, Homophones and Homonyms, phrasal verbs

UNIT – II: WRITING AND COMMUNICATION

Forms of Non-Verbal Communication – Kinesics, Proxemics, chronemics and effective use of Body language -Effective use of Audio-visual aides and modes of presentation-Notemaking, Precise writing, structure of paragraph, Review a book/journal

UNIT – III: SPEAKING

Introducing Oneself -Greetings and Introduction-Short Group Conversations-Extempore speech – Practice

UNIT – IV: APTITUDE SKILLS – I

Numbers – H.C.F & L.C.M – Decimal Fractions – Simplifications – Square root & Cube roots

UNIT – V: APTITUDE SKILLS – II

Problems on Ages – Percentage – Surds & Indices – Profit & Loss – Ratio & Proportion

TEXT BOOKS:

1. Greenbaum, Sidney, "The Oxford English Grammar", Clarendon Press, 1996.
2. Hartley and Bruckmann, "Business Communication", Routledge, 2006.

3. R S Aggarwal, “Quantitative Aptitude for Competitive Examinations”, S.Chand Publications,2017

REFERENCES:

1. R S Aggarwal,”A Modern Approach to Non-Verbal Reasoning”, S.Chand Publications,2017.

BCA254T10	RELATIONAL DATA BASE MANAGEMENT SYSTEM	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To introduce the fundamental concepts of data, databases, and Database Management Systems.
- To understand Entity Relationship (ER) modeling and relational database design.
- To develop SQL and PL/SQL programming skills for database creation, manipulation, and retrieval.
- To apply relational algebra and normalization techniques for efficient database design.
- To develop procedural database programming using PL/SQL constructs.

COURSE OUTCOMES

- Explain the architecture, components, and data models of Database Management Systems.
- Design ER diagrams and transform them into relational schemas.
- Develop SQL queries using DDL, DML, joins, subqueries, views, and advanced SQL features.
- Apply relational algebra operations and normalization techniques to design efficient relational databases.
- Develop PL/SQL programs using cursors, procedures, functions, packages, and triggers.

SYLLABUS

UNIT – I: INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

Data and Information – Database and Database Management System (DBMS): Definition, Characteristics, Advantages and Limitations – File System versus DBMS – Database Users – Database Administrator (DBA) – Three-Level Architecture – Database Languages: DDL, DML, DCL and TCL – Data Dictionary – Data Models: Hierarchical, Network, Relational and Object-Oriented Data Models.

12

UNIT – II: DATA MODELING USING ER MODEL

Database Design Process – Entity Relationship (ER) Model – Entities, Entity Sets, Attributes and Relationships – Types of Attributes – Types of Relationships – Cardinality and Participation Constraints – Keys: Super Key, Candidate Key, Primary Key, Alternate Key, Composite Key and Foreign Key – Weak Entity – ER Diagram – Mapping ER Model to Relational Schema.

12

UNIT – III: SQL and ADVANCED SQL

Structured Query Language (SQL): SQL Fundamentals – Data Types – Constraints – DDL Commands (CREATE, ALTER, DROP, TRUNCATE) – DML Commands (INSERT, UPDATE, DELETE) – SELECT Statement – Aggregate Functions (COUNT(), SUM(), AVG(), MIN(), MAX()) – Operators – Predicates (LIKE, BETWEEN, IN, DISTINCT, IS NULL) – Clauses (WHERE, GROUP BY, HAVING, ORDER BY) – Joins: Inner Join, Left

Outer Join, Right Outer Join, Full Outer Join, Natural Join, Self Join, Cross Join and Equi Join – Subqueries – Views – Indexes.

12

UNIT – IV: RELATIONAL ALGEBRA AND NORMALIZATION

Introduction to Relational Algebra – Basic Operations: Selection, Projection, Union, Intersection, Difference, Cartesian Product and Rename – Join Operations – Division Operation – Derived Operations – Functional Dependencies – Closure of Functional Dependencies – First Normal Form (1NF) – Second Normal Form (2NF) – Third Normal Form (3NF) – Boyce-Codd Normal Form (BCNF) – Multivalued Dependencies – Fourth NormalForm(4NF)–Denormalization.

12

UNIT – V: PL/SQL PROGRAMMING

Introduction to PL/SQL – Structure of a PL/SQL Block – Variables, Constants and Data Types – Operators – Control Structures: Conditional Statements (IF, CASE), Iterative Statements (LOOP, WHILE, FOR) – Exception Handling – Cursors: Implicit and Explicit Cursors – Stored Procedures – Functions – Packages – Triggers.

12

TOTAL :60

TEXT BOOKS

1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson Education, 2017 (Unit I – IV).
2. Ivan Bayross, SQL, PL/SQL: The Programming Language of Oracle, BPB Publications, Latest Edition. – Unit -V

REFERENCES

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, 7th Edition, McGraw-Hill Education, 2020.
2. Carlos Coronel and Steven Morris, Database Systems: Design, Implementation and Management, 14th Edition, Cengage Learning, 2024.
3. Thomas Connolly and Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation and Management, 6th Edition, Pearson Education.
4. Steven Feuerstein, Oracle PL/SQL Programming, 6th Edition, O'Reilly Media.

WEB REFERENCES

1. https://docs.oracle.com/en/database/
2. https://www.geeksforgeeks.org/dbms/dbms/
3. https://www.tutorialspoint.com/dbms/index.htm
4. https://www.w3schools.com/sql/

BCA254T20	DATA COMMUNICATION AND NETWORK	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To study about the physical arrangement of networks, types and modes of networks, data conversions and transmission medium.
- To study the detection and correction of errors, link control and link protocols of data link layer.
- Understanding the error checks and deduction methods in Data link layer.
- To study about the access method and implementation of different networks, types of Routing.
- To study the logic of link mechanisms used in networks and different layers of TCP/IP.

COURSE OUTCOMES:

- Describe the building blocks of Computer Networks.
- Describe the various signal and switching Techniques used in transmission.
- To implement the error checks and deduction methods in Data link layer.
- Determine the Logical addressing and various types of transmission protocol and services.
- Illustrate the generation of telecommunication systems in wireless networks.

SYLLABUS

UNIT – I DATA COMMUNICATION

Introduction: Networks – Components- Data Representation-Data Flow-Physical structures-Network Types-Switching-The Internet-Internet Standards and Administration-TCP/IP Protocol Suite-Addressing- The OSI Model.

12

UNIT – II PHYSICAL LAYER

Data and signals -Digital Signals-Transmission Impairment-Digital to Digital conversion-Analog to Digital Conversion- Multiplexing and De Multiplexing-Transmission media-Guided media -Unguided Media-Circuit Switching-Message Switching-Packet Switching.

12

UNIT – III DATA LINK LAYER

Introduction-Link Layer Addressing-Error Detection and Correction-Cyclic codes-DLC Services-Data Link Layer protocols-HDLC-Point to point Protocol-Media Access control (MAC)-Channelization-Standard Ethernet-ATM-IEEE 802.11 Project-Bluetooth-WiMAX Virtual LANS. **12**

UNIT – IV NETWORK AND TRANSPORT LAYER

Introduction to Network Layer-Packet Switching-IPV4 Addresses-Internet Protocol-ICMPv4-

Mobile IP-Routing Algorithms-Unicast and Multicast Routing-Transport Layer-Introduction-

Transport layer Protocols-User Datagram Protocols-Transmission Control Protocols-Services.

12

UNIT – V WIRELESS COMMUNICATION

Introduction - Spread Spectrum: Transmission. Medium Access Control: Motivational for a Specialized MAC - Space Division Multiple Access (SDMA) - Frequency Division Multiple Access (FDMA) - Time Division Multiple Access (TDMA) - Code Division Multiple Access (CDMA).Mobile Telecommunication Systems: GSM Architecture, Services and Protocols.

12

TOTAL: 60

TEXT BOOKS:

1. Behrouz A. Forouzan, "Data communication and Networking", Fifth Edition, Tata McGraw
Hill publishing Company, New Delhi, 2018.

REFERENCES:

1. William Stallings. "Data and computer Communication", 8th Edition, Pearson Education, 2013 / PHI.
2. Andrew Tannenbaum.S. "Computer Networks", Pearson Education, 4th Edition, 2013 / PHI.
3. Schiller Jochen, "Mobile Communications", 2nd Edition, Pearson Education, New Delhi, 2012.

WEB REFERENCES:

1. NPTEL, *Computer Networks*, IIT Madras. https://www.nptel.ac.in/courses/106106091
2. NPTEL, *Computer Networks and Internet Protocol*, IIT Kharagpur. https://www.nptel.ac.in/courses/106105183
3. William Stallings, *Data and Computer Communications* – Online Resources. https://williamstallings.com/DataCommunications/
4. Pearson, *Data and Computer Communications*. Pearson Education
5. Cisco, *Networking Basics*. Cisco Networking Basics

BCA254T30	PRINCIPLES OF ACCOUNTING WITH COMPUTERIZED ACCOUNTING	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- Understand the fundamental concepts and principles of accounting.
- Prepare financial statements and analyze financial transactions.
- Apply cost accounting techniques for business decision making.
- Use computerized accounting systems and accounting software effectively.
- Understand digital accounting practices in modern business organizations.

COURSE OUTCOMES:

- Apply accounting principles and prepare accounting records systematically.
- Prepare and analyze financial statements for business organizations.
- Use cost accounting techniques for cost control and managerial decisions.
- Operate computerized accounting systems and generate accounting reports.
- Understand digital accounting technologies and financial information systems.

SYLLABUS

UNIT – I: Principles of Accounting

Introduction to Accounting – Meaning, Objectives and Functions - Basic Accounting Concepts and Conventions - Double Entry System- Journal, Ledger and Trial Balance - Preparation of Simple Final Accounts of Sole Proprietorship.

12

UNIT – II : Financial Accounting and Management Accounting

Meaning and Objectives Depreciation – Straight Line and Written Down Value Methods - Introduction to Financial Statements - Ratio Analysis (Simple Liquidity and Profitability Ratios). **12**

UNIT – III : Cost Accounting

Introduction to Cost Accounting - Preparation of Cost Sheet - Elements of Cost – Material (FIFO and LIFO Only - Marginal Costing – Break-Even Analysis. **12**

UNIT – IV : Computerized Accounting Systems

Introduction to Computerized Accounting - Features of Accounting Software - Company Creation and Ledger Creation - Voucher Entry - GST Accounting (Basic Concepts) - Generation of Financial Reports. **12**

UNIT – V : Digital Accounting and Financial Applications

E-Accounting and Digital Transactions - Online Banking and Electronic Payment Systems - E-Filing of GST and Income Tax (Overview) - Financial Data Analysis using Spreadsheets - Introduction to FinTech - Cybersecurity in Digital Financial Systems. **12**

TEXT BOOKS:

1. Gupta, R. L. & Radhaswamy, M. (2024). *Financial Accounting*. New Delhi: Sultan Chand & Sons.
2. Jain, S. P. & Narang, K. L. (2025). *Cost Accounting: Principles and Practice*, New Delhi: Kalyani Publishers.

REFERENCES

1. Farooq, M. (2025). *Computer Accounting with Tally Prime* (1st ed.). Iterative International Publishers.
2. Weverka, P. (2023). *Microsoft Office 2021 All-in-One*. Wiley India Pvt. Ltd.
3. Mishra, B. & Uppal, R.K. (2024). Modern Banking in India: Dimensions & Risks. New Delhi: New Century Publications

WEB REFERENCES

1. https://nptel.ac.in/courses/110105077 (Accounting Fundamentals)
2. https://www.tallysolutions.com (Tally Official Website)
3. https://www.gst.gov.in (GST Portal India)
4. https://www.incometaxindia.gov.in (Income Tax Department)
5. https://www.mca.gov.in (Ministry of Corporate Affairs)

BCA254I70	SOFT SKILL – II	L	T	P	C
		2	0	0	2

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To familiarize students, the importance and appropriate usage of grammatical structures.
- To impart knowledge on various interpersonal, intrapersonal communication and the qualities of leadership.
- To introduce students to various technologies that influence our communication conduct in order to achieve targeted communication goals and objectives.
- Effort has been made to accommodate fundamental, mathematical aspects to instill confidence among students
- To demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions

COURSE OUTCOMES

- Use grammatical structures in extended conversations and discussions
- Comprehend the significance of various types of communication and its application.
- Interact effectively and uprightly.
- Use their logical thinking and analytical thinking to solve quantitative questions
- Enhance the aptitude round clearing ability in interview process

SYLLABUS

UNIT – I: REMEDIAL ENGLISH GRAMMAR AND USAGE

Prepositions and words followed by Prepositions-Concord (Agreement of the Verb with the Subject) - Error Analysis (Correction of Errors in a given sentence - errors in the use of words -Errors of Indianisms - use of slang - errors in punctuation)-Words Commonly Misspelt-Often confused words

UNIT – II: SOFT SKILLS FOR LEADERSHIP AND TEAM MANAGEMENT

Qualities of a Good Leader - Decision Making- Intrapersonal skills - Interpersonal skills Problem solving - Critical thinking - Negotiation skills

UNIT – III: ELECTRONIC COMMUNICATION

Internet, e-mail - Video conferencing - Blogging and Websites - Phone calls and Voice messages - Text Messages

UNIT – IV: APTITUDE SKILLS – III

Problems on Numbers – Partnership – Time & Work – Time & Distance – Problems on Trains

UNIT – V: APTITUDE SKILLS – IV

Permutation & Combination – Probability – True Discounts – Banker's Discount – Odd Man out & Series

TEXT BOOKS:

1. Raman Meenakshi and Prakash Singh, “Business Communication”, 2nd Edition, Oxford Press, 2012.
2. Simon Sweeney, “English for Business Communication”, Cambridge University Press, 2003.
3. R S Aggarwal, “Quantitative Aptitude for Competitive Examinations”, S.Chand Publications, 2017

REFERENCES:

1. Jaggan Saneja, “Quantitative Aptitude Simplified”, 1st Edition, Notion Press, 2017

BCA254P60	RDBMS LAB	L	T	P	C
		0	0	4	2

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To understand the fundamentals of databases and Database Management Systems.
- To design relational databases using Entity Relationship (ER) modeling.
- To develop SQL skills for database definition, manipulation, and querying.
- To apply relational algebra and normalization techniques for efficient database design.
- To develop PL/SQL programs using control structures, cursors, procedures, functions, packages, and triggers.

COURSE OUTCOMES

- Explain the concepts, architecture, and data models of Database Management Systems.
- Design ER diagrams and transform them into relational database schemas.
- Construct SQL queries using DDL, DML, joins, subqueries, views, and indexes.
- Apply relational algebra operations and normalization techniques to design efficient relational databases.
- Develop PL/SQL applications using control structures, cursors, procedures, functions, packages, and triggers for database programming.

LIST OF EXERCISES

1. Database Creation and Table Definition – Create database tables using DDL commands (CREATE, ALTER, DROP, TRUNCATE) with appropriate constraints.
2. Data Manipulation and Retrieval – Perform data manipulation using DML commands (INSERT, UPDATE, DELETE, SELECT), operators, functions, and clauses.
3. SQL Joins and Subqueries – Implement INNER, OUTER, NATURAL, SELF, CROSS, and EQUI joins along with nested queries.
4. Views and Indexes – Create, modify, retrieve, and delete views and indexes.
5. PL/SQL Blocks and Control Structures – Develop PL/SQL programs using variables, IF-ELSE, CASE, LOOP, WHILE LOOP, and FOR LOOP.
6. PL/SQL Cursors and Exception Handling – Implement implicit and explicit cursors with exception handling.
7. PL/SQL Procedures – Create and execute stored procedures with parameters.
8. PL/SQL Functions – Create and execute user-defined functions.
9. PL/SQL Triggers – Create row-level and statement-level triggers for INSERT, UPDATE, and DELETE operations.
10. PL/SQL Packages – Create and execute PL/SQL packages containing procedures and functions for modular database programming.

SOFTWARE REQUIREMENTS

- Oracle Database Express Edition (Oracle XE) / Oracle 21c XE
- Oracle SQL Developer

BCA254I80	DESIGN THINKING AND INNOVATION	L	T	P	C
		1	0	0	1

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To Acquire a comprehensive understanding of the concepts related to design thinking.
- To gain basic knowledge about fundamentals of Design Thinking and innovation
- To learn how to design thinking techniques for solving problems.
- To study about basic idea about value of creativity
- To gain knowledge about Analyze to work in a multidisciplinary environment.

COURSE OUTCOMES

- Define the concepts related to design thinking
- Explain the fundamentals of Design Thinking and innovation
- Apply the design thinking techniques for solving problems in various sectors
- Evaluate the value of creativity
- Analyze to work in a multidisciplinary environment.

SYLLABUS

UNIT-I

Introduction to Design Thinking: Introduction to elements and principles of Design, basics of design - dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT-II

Design Thinking Process: Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development.

UNIT-III

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

UNIT-IV

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications.

UNIT-V

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business.

TEXT BOOKS

1. Tim Brown, Change by design, 1st Ed., Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1st Ed., Adams Media, 2014.

REFERENCES

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1st Ed., Norton Press, 2018
3. William lidwell, Kritinaholden, & Jill butter, Universal principles of design, 2nd Ed., Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

WEB RESOURCES

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview
4. https://onlinecourses.nptel.ac.in/noc22_de16/previ

BCA255T10	SOFTWARE ENGINEERING	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To provide insight into the process of the Software Development Life Cycle (SDLC).
- To gain basic knowledge about the prerequisites for planning a software product.
- To learn how to design software.
- To study the basic ideas of architectural design.
- To gain knowledge about software testing strategies.

COURSE OUTCOMES

- Apply various phases of the software development lifecycle to address a given problem.
- Analyze requirements systematically and develop the corresponding model.
- Demonstrate the ability to design and implement software projects effectively.
- Exhibit skills in designing and developing software architecture.
- Develop and apply various software testing strategies to ensure quality and functionality.

SYLLABUS

UNIT–I SOFTWARE AND SOFTWARE ENGINEERING

Introduction – The Nature of Software – Software Process – Software Engineering Practice – Software Myths - Software Process Models: Waterfall Model, Prototype Model, Increment Model, Spiral Model, RAD model, Win-Win model, Agile Model **12**

UNIT – II UNDERSTANDING REQUIREMENTS AND REQUIREMENTS MODELING

Requirements engineering, Requirement Elicitation Techniques - Software Requirement Specification – Data Modeling Concepts - Flow Oriented modeling – Creating a Behavioral Model.

12

UNIT–III DESIGN ENGINEERING

Design within the context of software engineering–Design Process and Design Quality- Design Concepts – The Design Model **12**

UNIT–IV CREATING AN ARCHITECTURAL DESIGN

Software Architecture – Data Design – Architectural Styles and Patterns– Architectural Design – Transform Flow Mapping – Transaction Flow Mapping

12

UNIT–V SOFTWARE TESTING

Software Testing fundamentals, Whitebox testing - Black box testing - A Strategic Approach to Software Testing - System Testing. **12**

TEXTBOOKS:

1. Roger S. Pressman,"Software Engineering:A Practitioners Approach",7th Edition, Tata McGraw Hill, 2010.

REFERENCES:

1. Richard Fairley, Software Engineering Concepts–TataMcGrawHill,2010.
2. Wamans Jawadekar, Software Engineering Principles & Practices, Tata McGraw Hill, 2010.

WEB REFERENCES:

1. GeeksforGeeks Software Engineering Tutorial
2. Tutorialspoint Software Engineering Guide: Units II, III, and IV
3. Agile Alliance Official Resource Library: Covers Unit I

BCA255T20	WEB TECHNOLOGIES	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To understand the structure and design of web pages
- To develop static and responsive web pages using HTML and CSS
- To implement client-side scripting using JavaScript
- To build server-side applications using PHP
- To develop database-driven dynamic web applications

COURSE OUTCOMES

- Design structured web pages using HTML
- Apply CSS for layout and responsive design
- Develop interactive web pages using JavaScript
- Implement server-side scripting using PHP
- Create database-driven web applications

SYLLABUS

UNIT I: HTML Fundamentals

Introduction to Internet, WWW, Web browsers and servers - Structure of HTML document - Text formatting tags: headings, paragraphs, bold, italic, lists - Hyperlinks: internal, external, email links - Images: image formats, attributes, image maps - Multimedia elements: audio and video embedding - Semantic HTML elements (header, footer, section, article) **12**

UNIT II: HTML Forms & CSS

Tables: structure, attributes, styling - Forms: input types, labels, buttons, validation basics - Introduction to CSS: inline, internal, external styles - CSS selectors: element, class, id, group, universal - CSS properties: colors, fonts, text styling - Box model: margin, padding, border - Layout design: float, display, positioning - Introduction to responsive design and media queries. **12**

UNIT III: JavaScript

Introduction to JavaScript and its role in web pages -Variables, data types, operators- Control structures: if, switch, loops - Functions and event handling - Form validation techniques – DOM manipulation: accessing and modifying elements.

12

UNIT IV: PHP Programming

Introduction to PHP and server-side scripting - Embedding PHP in HTML - Variables, constants, data types -Operators and control structures -Functions and scope - Form handling using GET and POST methods - Sessions and cookies for state management - File handling in PHP.

12

UNIT V: PHP with Database

Introduction to MySQL database - Creating database and tables - Connecting PHP with MySQL (mysqli/PDO)- CRUD operations (Insert, Select, Update, Delete) - Form validation and database interaction - Building dynamic web pages - Introduction to simple web application development. **12**

TOTAL:60

TEXT BOOKS

1. Robin Nixon, Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5, 6th Edition, O'Reilly Media, 2021.
2. Luke Welling and Laura Thomson, PHP and MySQL Web Development, 5th Edition, Addison-Wesley, 2016.

REFERENCES

1. J. Duckett, HTML and CSS: Design and Build Websites. Hoboken, NJ, USA: Wiley, 2011.
2. Jon Duckett, JavaScript and JQuery: Interactive Front-End Web Development, 1st Edition, Wiley, 2014.
3. Jennifer Niederst Robbins, Learning Web Design, 5th Edition, O'Reilly Media, 2018.

WEB REFERENCES

1. https://www.w3schools.com/
2. https://developer.mozilla.org/
3. https://www.php.net/
4. https://dev.mysql.com/doc/
5. https://www.geeksforgeeks.org/web-technology/

BCA255P60	WEB TECHNOLOGIES LAB	L	T	P	C
		0	0	2	2

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To provide hands-on experience in designing web pages using HTML and CSS
- To develop skills in creating interactive web pages using JavaScript
- To introduce server-side scripting using PHP
- To enable handling of form data and session management
- To develop database-driven web applications using PHP and MySQL

COURSE OUTCOMES

- Design and develop static web pages using HTML and CSS
- Implement client-side scripting using JavaScript for interactivity and validation
- Develop server-side applications using PHP
- Create and manage database-driven web applications
- Build complete dynamic websites by integrating front-end and back-end technologies

LIST OF EXERCISES

1. Design a simple web page using headings, paragraphs, and text formatting tags.
2. Create a web page with internal/external links and display images with attributes.
3. Design a web page to display student details using HTML tables.
4. Create an HTML form with various input elements (text, radio, checkbox, submit).
5. Apply inline, internal, and external CSS to style a web page.
6. Design a webpage layout using CSS box model and positioning.
7. Write a JavaScript program demonstrating variables, operators, and control structures.
8. Develop a web page with form validation using JavaScript.
9. Write a PHP program demonstrating variables, operators, and control structures.
10. Develop a PHP program to process form data using GET and POST methods.
11. Create a PHP program to connect to MySQL and perform CRUD operations.
12. Develop a dynamic web application integrating HTML, CSS, JavaScript, PHP, and database

BCA255I70	ENTREPRENEURSHIP AND STARTUP ECOSYSTEMS	L	T	P	C
		1	0	0	1

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To understand Entrepreneurship and its types
- To understand that not all ideas can be turned into viable business models and guestimate business potential of an idea
- To understand different type of finances available and financing methods
- To be able to draft business plans on an identified idea
- To understand the nuances of operating a startup – low budget marketing, stabilizing operations, build a team from scratch and scaling the business

COURSE OUTCOMES

- On Successful completion of this course, the students will be able to:
- Understand basic building blocks of creating a venture.
- Know the legacy of family businesses and key differentiations from entrepreneurship.
- Be able to identify a business opportunity and translate it into a viable business model.
- Identify the elements of the Indian entrepreneurship ecosystem and take relevant benefits from the constituents.
- Understand the various funding sources and its operations.

SYLLABUS

UNIT I: Understanding Entrepreneurship

Definition – Role of Entrepreneur - Reasons for Growth of Entrepreneurship- Entrepreneurial Characteristics and Skills – Types of Entrepreneurs.

UNIT –II: Family Business

Family Business in India – Succession – Best Practices.

UNIT – III: Evaluating Business opportunity

Recognizing Opportunities and Generating Ideas – Feasibility Analysis

UNIT – IV: Building Blocks of starting ventures

Preparing the Proper Ethical and Legal Foundation – Assessing a New Venture's Financial Strength and Viability.

UNIT – V: Start-up Ecosystem

Know the components of the start-up ecosystem including Incubators, Accelerators, Venture Capital Funds, Angel Investors.

TEXT BOOKS

5. Rajeev Roy, "Entrepreneurship", Rajeev Roy, 3rd Edition, Oxford University Press, 2020.
6. Bruce R. Barringer & R. Duane Ireland, "Entrepreneurship: Successfully Launching New Ventures", 6th Edition, Pearson, 2019.
7. Entrepreneurship: Successfully Launching New Ventures by R. Duane Ireland Bruce R. Barringer, Pearson Publishing

REFERENCES

1. Rajiv Agarwal, "Family Business Management", SAGE Publications Pvt Ltd. 2022
2. Ramachandran, K, "Indian Family Businesses: Their survival beyond three generations", ISB Working Paper Series
3. Startup India Leaning Program by Start Up India available at www.startupindia.gov.in Model curriculum for UG Degree in BCA

BCA256T10	FULL STACK DEVELOPMENT	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- Understand the architecture and components of the MEAN (MongoDB, Express.js, Angular, and Node.js) stack for full-stack web application development.
- Design and manage NoSQL databases using MongoDB, including data modeling and CRUD operations.
- Develop scalable server-side applications and RESTful web services using Node.js and Express.js.
- Build responsive and dynamic single-page applications (SPAs) using Angular with routing, forms, and HTTP services.
- Integrate frontend and backend technologies to develop, test, secure, and deploy complete full-stack web applications following industry best practices.

COURSE OUTCOMES

- Explain the architecture, components, and workflow of the MEAN stack and apply MongoDB concepts for data storage and management.
- Design and implement MongoDB databases and perform CRUD operations using appropriate query techniques.
- Develop RESTful APIs and server-side applications using Node.js and Express.js with middleware and error handling.
- Build interactive Angular applications using components, services, routing, forms, and HTTP client to consume REST APIs.
- Develop, integrate, secure, test, and deploy a complete MEAN stack web application using modern development tools and best practices.

SYLLABUS

UNIT I – Introduction to MEAN Stack and MongoDB

Introduction to Full-Stack Development-MEAN Stack Overview-Client-Server Architecture-Web Application Architecture-Setting up Development Environment -MongoDB Basics **12**

UNIT II – Node.js and Express.js

Introduction to Node.js -Installing Node.js -npm Package Manager -Modules -File System Module -Events -Asynchronous Programming Express.js Fundamentals-Express Installation -Routing -Middleware. **12**

UNIT III – Angular Development

Angular Fundamentals -Angular CLI -Project Structure -Components -Modules -Templates -Angular Features-Data Binding -Directives -Pipes -Services -Dependency Injection.

12

UNIT IV – Full Stack Application Development

Connecting Angular and Express -Client-Server Communication -CRUD Application -JSON Data Exchange –Authentication-User Registration -Login -JWT Authentication -Password Hashing using bcrypt

12

UNIT V – Deployment and Project

Deployment -Production Build -MongoDB Atlas -Hosting Node Applications -Hosting Angular Applications -Version Control-Git Basics -GitHub Repository

12

TOTAL: 60

TEXT BOOKS

1. Getting MEAN with MongoDB, Express, Angular, and Node – Simon Holmes, Manning Publications, 2022. **(Primary Textbook)**
2. Web Development with Node and Express – Ethan Brown, O'Reilly Media, 2019.
3. Angular: Up and Running – Shyam Seshadri, O'Reilly Media, 2022.
4. MongoDB: The Definitive Guide – Shannon Bradshaw, Eoin Brazil, and Kristina Chodorow, O'Reilly Media, 2019.

REFERENCES

1. Getting MEAN with Mongo, Express, Angular, and Node, Simon Holmes and Clive Harber, Manning Publications, 2019. *(Comprehensive reference for MEAN Stack development.)*
2. Modern Angular, Armen Vardanyan, Manning Publications, 2024. *(Covers modern Angular features, standalone components, signals, and current best practices.)*
3. Web Development with Node and Express, Ethan Brown, O'Reilly Media, 2019. *(Practical guide to building web applications and REST APIs with Node.js and Express.)*
4. MongoDB: The Definitive Guide, Shannon Bradshaw, Eoin Brazil, and Kristina Chodorow, O'Reilly Media, 2019. *(Comprehensive reference for MongoDB administration and application development.)*
5. Node.js Design Patterns, Mario Casciaro and Luciano Mammino, Packt Publishing, 2024. *(Advanced concepts, architecture, scalability, and best practices for Node.js applications.)*
6. Mastering MEAN Stack, Pinakin Ashok Chaubal, BPB Publications, 2024. *(Hands-on guide covering MongoDB, Express.js, Angular, and Node.js for full-stack application development.)*

WEB REFERENCES

1. https://www.geeksforgeeks.org/websites-apps/fullstack-web-development/
2. https://www.w3schools.com/whatis/whatis_fullstack.asp
3. https://aws.amazon.com/what-is/full-stack-development/
4. https://mrcet.com/downloads/digital_notes/CSE/III%20Year/AIML/Full%20Stack%20Development-Digital%20Notes.pdf
5. https://www.jaroeducation.com/blog/full-stack-web-development

BCA256T20	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- Understand the fundamentals of Artificial Intelligence and Generative Models
- Learn the working principles of Large Language Models (LLMs)
- Explore text, image, and code generation techniques
- Apply Generative AI tools in real-world applications
- Understand ethical, legal, and societal implications of Generative AI

COURSE OUTCOMES

- Explain core concepts of Generative AI and its evolution
- Describe architectures of generative models and LLMs
- Apply prompt engineering techniques for content generation
- Develop simple Generative AI applications
- Analyze ethical and security challenges in Generative AI

SYLLABUS

UNIT I – Introduction to Artificial Intelligence and Generative AI

Artificial Intelligence – History and Evolution – Narrow AI vs General AI – Machine Learning vs Deep Learning – Introduction to Generative AI – Generative vs Discriminative Models – Applications of Generative AI in Education, Healthcare, Business, and Software Development.

12

UNIT II – Foundations of Generative Models

Probability and Statistics Basics – Neural Networks – Deep Learning Concepts – Autoencoders – Variational Autoencoders (VAE) – Generative Adversarial Networks (GANs) – Use cases of GANs.

12

UNIT III – Large Language Models (LLMs)

Natural Language Processing Basics – Language Models – Transformer Architecture – Attention Mechanism – Pre-training and Fine-tuning – Examples of LLMs (GPT, BERT, Gemini) – Limitations of LLMs.

12

UNIT IV – Generative AI Tools and Applications

Text Generation – Image Generation – Code Generation – Prompt Engineering – Chatbots – AI Assistants – Integration of Generative AI with Applications – APIs and Cloud-based AI Tools.

12

UNIT V – Ethics, Security, and Future of Generative AI

Ethical Issues in Generative AI – Bias and Fairness – Data Privacy – Intellectual Property – Deepfakes – AI Regulations and Guidelines – Responsible AI – Future Trends in Generative AI.

12

TOTAL: 60

TEXT BOOKS

1. Ian Good fellow et al., *Deep Learning*, Adaptive Computation and Machine Learning series MIT Press,2016.
2. Stuart Russell & Peter Norvig, *Artificial Intelligence: A Modern Approach*, Pearson Education,4th Edition,2020.

REFERENCES

1. Chollet, F., *Deep Learning with Python*, Manning publications,2 nd Edition ,2017.
2. Brown et al., *Language Models are Few-Short Learners*, Open AI, proceedings of NeurIPS 2020.
3. NVIDIA Generative AI Documentation, NVIDIA AI Enterprise,2024.

WEB REFERENCES

1. https://openlearning.mit.edu/news/13-foundational-ai-courses-resources-mit
2. https://microsoft.github.io/AI-For-Beginners/

BCA256T30	CYBER SECURITY AND CYBER LAW	L	T	P	C
		3	1	0	3

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- The objectives of this course are to:
- Introduce the fundamental concepts of cybersecurity and cyber threats.
- Familiarize students with common cyber attacks and preventive security practices.
- Provide knowledge of network, web, and data security basics.
- Develop awareness of cyber laws, cyber ethics, and digital rights.
- Enable students to adopt safe computing practices and understand legal issues in cyberspace.

COURSE OUTCOMES

- Explain the fundamentals of cybersecurity, cyber threats, and security principles.
- Identify common cyber attacks and recommend appropriate preventive measures.
- Describe the basics of network, web, and data security mechanisms.
- Understand cyber laws, cyber crimes, digital evidence, and ethical issues in cyberspace.
- Apply cybersecurity best practices for securing personal and organizational digital assets.

SYLLABUS

UNIT I – INTRODUCTION TO CYBER SECURITY

Introduction to Cyber Security – Need for Cyber Security – Information Security Concepts – CIA Triad (Confidentiality, Integrity, Availability) – Cyber Threats and Vulnerabilities – Types of Hackers – Cyber Attacks – Malware (Virus, Worm, Trojan Horse, Ransomware, Spyware) – Cyber Security Best Practices – Safe Internet Usage.

12

UNIT II – NETWORK AND WEB SECURITY

Introduction to Computer Networks – Network Security Concepts – Firewalls – Antivirus Software – Intrusion Detection Systems (Basic Concepts) – Password Security – Multi-Factor Authentication – Secure Browsing – Email Security – Phishing, Smishing, and Vishing – Social Engineering – Secure Wi-Fi Practices.

12

UNIT III – DATA SECURITY AND EMERGING TECHNOLOGIES

Data Security and Privacy – Data Backup and Recovery – Encryption (Basic Concepts) – Digital Signatures – Public Key Infrastructure (Overview) – Cloud Security Basics – Mobile Device Security – Internet of Things (IoT) Security (Introduction) – Cyber Security in E-Commerce and Digital Payments.

12

UNIT IV – CYBER LAW AND CYBER ETHICS

Introduction to Cyber Law – Need for Cyber Law – Cyber Crimes – Identity Theft – Online Fraud – Cyber Stalking – Cyber Bullying – Intellectual Property Rights – Copyright,

Trademark, and Patent (Overview) – Information Technology Act, 2000 and Major Amendments – Digital Evidence – Cyber Ethics – Privacy and Data Protection.

12

UNIT V – CYBER SECURITY PRACTICES AND CASE STUDIES

Cyber Security Policies – Risk Management (Basic Concepts) – Incident Response – Digital Forensics (Introduction) – Security Awareness Programs – Cyber Security Standards (Overview) – Case Studies on Recent Cyber Attacks – Safe Use of Social Media – Career Opportunities in Cyber Security – Mini Project/Presentation on Cyber Security Awareness.

12

TOTAL : 60

TEXT BOOKS

1. Nina Godbole and Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India, 2nd Edition.
2. Charles P. Pfleeger and Shari Lawrence Pfleeger, Security in Computing, Pearson, 6th Edition.

REFERENCES

1. William Stallings, Cryptography and Network Security: Principles and Practice, Pearson, 8th Edition.
2. Michael E. Whitman and Herbert J. Mattord, Principles of Information Security, Cengage Learning.
3. Joseph Migga Kizza, Guide to Computer Network Security, Springer.
4. Debra Littlejohn Shinder, Scene of the Cybercrime, Syngress.
5. The Government of India, Information Technology Act, 2000 (with Amendments).

SUGGESTED PRACTICAL ACTIVITIES

- Creating strong passwords and enabling multi-factor authentication.
- Identifying phishing emails and fraudulent websites.
- Safe web browsing and browser security settings.
- Basic file encryption and password protection.
- Data backup and recovery practices.
- Security settings for Windows/Linux operating systems.
- Awareness of cyber crime reporting portals.
- Case study presentations on major cyber attacks.
- Mini project on cyber security awareness or cyber law.

BCA256P60	FULL STACK DEVELOPMENT LAB	L	T	P	C
		0	0	4	2

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- Understand the fundamentals of web technologies and develop static web pages using HTML5 elements and semantic tags.
- Apply CSS and Bootstrap to create responsive, visually appealing, and user-friendly web interfaces.
- Develop interactive client-side web applications using JavaScript and DOM manipulation techniques.
- Build dynamic server-side web applications using PHP with session management, file handling, and database connectivity.
- Integrate front-end and back-end technologies to design and implement complete database-driven web applications.

COURSE OUTCOMES

- Design and develop structured web pages using HTML5 semantic elements, text formatting, lists, images, hyperlinks, tables, and forms.
- Create responsive and visually consistent web pages using CSS, Bootstrap components, Flexbox/Grid layouts, and external stylesheets.
- Develop interactive client-side applications using JavaScript by implementing variables, control structures, functions, event handling, DOM manipulation, and form validation.
- Build server-side web applications using PHP by implementing control structures, arrays, cookies, sessions, and file handling techniques.
- Design and implement database-driven web applications by integrating PHP with MySQL to perform CRUD (Create, Read, Update, Delete) operations.

LIST OF EXERCISES

1. Creation of MongoDB databases and collections; perform CRUD operations using MongoDB Shell/Compass.
2. Develop MongoDB queries using filtering, projection, sorting, indexing, and aggregation.
3. Develop web applications using Express.js with routing and middleware.
4. Design and implement RESTful APIs for Create, Read, Update, and Delete (CRUD) operations.
5. Test and validate REST APIs using Postman.
6. Create Angular applications using Angular CLI, components, modules, and templates.
7. Implement data binding, directives, and pipes in Angular applications.
8. Integrate Angular frontend with Express.js backend and MongoDB database.

SOFTWARE / TOOLS REQUIRED

- Visual Studio Code / Sublime Text
- Apache Server (XAMPP / WAMP)
- MySQL / MariaDB
- Modern Web Browser (Chrome / Firefox)
- Install Node js and NPM
- Install Postman

BCA256P70	PROJECT (DS OR ML)	L	T	P	C
		0	0	3	2

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To provide an idea of decomposing the given problem into Analysis, Design, Implementation, Testing and Maintenance phases.
- To provide an idea of using various process models in the software industry according to given circumstances.
- To understand basic knowledge about data dictionary, Data Flow Diagram, E-R Diagram and so on.
- To understand need and importance of modularity
- To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project

COURSE OUTCOMES

- Understand the software engineering methodologies involved in the phases for project development
- Discuss and Analyses how to develop software requirements specifications for a given problem.
- Students will be able to decompose the given project
- Able to apply latest programming techniques
- Ability to develop product- startups implementing software process models in software engineering methods.

A Possible set of applications may be the following

1. Web Based Applications
2. Mobile Based Applications
3. Automation of Banking, Electricity Bill, Departmental Store and so on
4. Online Booking System
5. Security Based Applications
6. IoT /Cloud based/Machine Learning/Artificial Intelligence
7. 7. Block Chain Technologies

BCA253TPE11	Professional Elective – I From Group - Data Science BASICS OF DATA ANALYTICS USING SPREADSHEET	L	T	P	C
		3	1	4	6

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To Understand the Role of Spreadsheets in Data Analytics.
- To Introduce Key Spreadsheet Functions for Data Computation.
- To Develop Skills for Cleaning and Preparing Data for Analysis.
- To Enable Customization and Formatting of Charts for Clarity.
- To Explore Pivot Tables and Pivot Charts for Summarizing Data.

COURSE OUTCOMES

- Define the Purpose and Applications of Spreadsheets in Analytics.
- Use Various Functions to Manage and Analyze the Data
- Clean and Prepare Raw Data for Analysis.
- Customize Charts for Professional and Clear Visualizations.
- Utilize Pivot Tables And Pivot Charts for Data Summarization.

SYLLABUS

UNIT I

Introduction to Data Analysis and Excel: Data Analysis Definition – Process – Types – Applications. Spreadsheet Applications: Introduction - Terminologies of Spreadsheet Applications: Ribbon, Row, Column, Cell, Worksheet, Workbook, Cell Address, Data Range, Formula Chart - Understanding Data: Quantitative Data- Discrete Data, Continuous Data - Qualitative Data- Categorical Data, Ordinal Data.

12

UNIT II

Excel Functions and Formulas: Date and Time Functions- DATE, DAY, MONTH, YEAR - Logical Functions - IF Statements for Conditional Logic, AND, OR and NOT for Complex Conditions - Math and Trigonometry Functions- SUM, AVERAGE, COUNT, MIN, MAX, SIN, COS, TAN, SEC, COT - Lookup Functions: VLOOKUP, HLOOKUP

12

UNIT III

Cleaning and Preparing Data: Removing Blank Cells-Techniques for Cleaning Empty Cells, Using the Go To Feature to Locate and Delete Blank Cells- Text Functions: Cleaning Text Data with TRIM, UPPER, And LOWER Functions, Merging Text with CONCATENATE and TEXTJOIN Functions - Handling Missing Data: Identifying Missing or Null Values, Filling or Replacing Missing Data - Using Find and Replace to Clean Data: Using Find and Replace for Bulk Changes, Advanced Options for Replacing Text and Values. **12**

UNIT IV

Visualizing Data with Charts: Benefits of Visualizing Data- Common Chart Types and Their Uses - Creating Basic Charts: Column, Bar, Line, and Pie Charts - Formatting and Customizing Charts: Adding Titles, Labels and Legends, Adjusting Axis Scales and Gridlines Using Sparklines for Mini Visualizations: Inserting Sparklines for Trend Analysis - Formatting Sparklines for Clarity.

12

UNIT V

Tables and Pivot Tables: Creating Tables and Formatting Data-Converting Data Ranges into Tables-Applying and Customizing Table Styles- Sorting And Filtering Within Tables: Sorting By Multiple Columns, Applying Advanced Filters- Introduction To Pivot Tables: Definition and Benefits of Using Pivot Tables for Analysis - Building and Customizing Pivot Tables: Grouping Data by Categories or Dates, Adding Calculated Fields and Values-Adding Pivot Charts for Visualization: Linking Pivot Charts To Pivot Tables, Customizing Chart Layouts and Styles. **12**

TOTAL: 60

TEXT BOOKS

1. Alexander, M., Kusleika, R., & Walkenbach, J. (2019). *Microsoft Excel 2019 Bible: The Comprehensive Tutorial Resource*. John Wiley & Sons Inc.
2. Walkenbach, J. (2016). *Microsoft Excel 2016 Bible: The Comprehensive Tutorial Resource*. Wiley.
3. Miller, J. D. (2011). *Excel Made Easy: A Beginner's Guide to Data Analysis*.
4. Artymiak, J. (2011). *Beginning OpenOffice Calc: From Setting Up Simple Spreadsheets to Business Forecasting* (1st Ed.).

REFERENCES:

1. Lalwani, L. (2019). *Excel 2019 All-in-One*. McGraw Hill Education (India).
2. Khan, A. (2018). *Advanced Excel in 8 Hours*. HPH Publications.
3. Suman, H. (2017). *Excel Formulas and Functions: The Complete Guide for Beginners*. BPB Publications.

WEB REFERENCES

1. https://www.libreoffice.org/discover/calc/
2. https://help.libreoffice.org/latest/en-US/text/scalc/main0000.html
3. https://www.w3schools.com/excel/
4. https://www.tutorialspoint.com/excel/index.htm
5. https://www.geeksforgeeks.org/excel-tutorial/

BCA253TPE11	BASICS OF DATA ANALYTICS USING SPREADSHEET LAB	L	T	P	C
		0	0	3	2

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To improve proficiency in data cleaning and preparation techniques using Excel.
- To Use advanced Excel functions to solve analytical problems.
- To apply charting tools and customize visuals to represent and analyze data.
- To gain hands-on experience with pivot tables data summarization and transformation.
- To learn techniques for performing in-depth analysis using complex formulas.

COURSE OUTCOMES

- Acquire Knowledge in advanced data cleaning, formatting, and manipulation techniques using Excel functions and tools.
- Able to perform complex data analysis using advanced Excel functions.
- Able to develop the skills to create meaningful and customized visualizations to represent data insights clearly.
- Gain experience with pivot tables to summarize and analyze large datasets efficiently.
- Able to use Excel's advanced features to model data and create interactive reports.

LIST OF EXERCISES

1. Find the total and average of 5 subject marks for 10 students in a class in the board exam.
2. Calculate the Maximum mark, minimum mark, mean, median, standard deviation and variance for each subject. (Input : 5 Subject Marks of 10 Students)
3. Consider the problem of preparing a stationary order for the month of March. The item description, quantity and cost per item are available. The total cost per item is to be calculated and the final cost per item involves a sales tax of 2% over the total cost. The gross total and the net total are to be displayed.
4. Find the Grade of the student each student by considering the total. (Input : 5 Subject Marks of 10 Students)
5. Consider a table containing the consignments of different fruits from different suppliers as shown in the figure below. You have the fruit names in column A, supplier's names in column B, and quantity in column C. Find out how many quantities of each fruit is received.
6. Consider the table containing item, category and price. Use VLOOKUP to find the price of a particular item and also find the category based on item.
7. Consider two tables Table1 and Table 2. Fetch the elements from Table2 and fill in the Table1 by matching the key field.
8. Consider the table with county name and Five years revenue data. Find the revenue amount for a Country for the given Year. (Use VLOOKUP and HLOOKUP Functions)
9. Consider the table which consists of monthly sales of 10 different fruits. Create a line chart and Pie chart for the above said table.

10. Use Power Pivot to connect multiple tables and create a model for sales, customers, and products.

Sales Table: Transactionid, Customerid, Productid, Date, Salesamount
Customers Table : Customerid, Customername, Region
Products Table : Productid, Productname, Category

BCA253TPE12	Professional Elective – I From Group - Artificial Intelligence and Machine Learning FEATURE ENGINEERING	L	T	P	C
		3	1	4	6

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- Understand the concepts, significance, and workflow of feature engineering in machine learning and apply appropriate data preprocessing techniques to prepare high-quality datasets.
- Apply feature transformation, encoding, and feature creation techniques to improve the representation and quality of data for machine learning models.
- Analyze and select relevant features using statistical and machine learning methods, and perform basic dimensionality reduction and time-based feature engineering.
- Develop feature engineering techniques for text and numerical datasets using suitable extraction, aggregation, and transformation methods.
- Implement feature engineering workflows using Python libraries and evaluate feature importance to enhance machine learning model performance.

COURSE OUTCOMES

- Explain the importance of feature engineering, data preprocessing, and data cleaning techniques used in machine learning.
- Apply feature transformation, scaling, encoding, and feature creation techniques to prepare datasets for machine learning applications.
- Analyze datasets using feature selection methods, dimensionality reduction techniques, and time-based feature engineering approaches.
- Implement text and numerical feature engineering techniques, including feature extraction, aggregation, and multicollinearity handling, using Python tools.
- Evaluate feature importance and develop complete feature engineering pipelines using Pandas, NumPy, and Scikit-learn to improve predictive model performance.

SYLLABUS

UNIT – I: INTRODUCTION TO FEATURE ENGINEERING

Definition and importance in Machine Learning - Role in improving model performance - Types of data: structured, semi-structured, unstructured - Overview of data preprocessing pipeline, **Data Cleaning and Preparation:** Handling missing values (mean/median/mode, imputation techniques) - Dealing with outliers (Z-score, IQR methods) - Data consistency and normalization - Removing duplicates and noise. **12**

UNIT – II: FEATURE TRANSFORMATION

Scaling techniques: Min-Max Scaling, Standardization - Log, square root, and Box-Cox transformations - Handling skewed data - Discretization and binning: **Encoding Categorical Variables:** Label Encoding - One-Hot Encoding - Ordinal Encoding - Binary and Target Encoding (basic introduction) , **Feature Creation :** Creating new features from existing data - Polynomial features - Interaction features - Domain-specific feature construction. **12**

UNIT – III: FEATURE SELECTION TECHNIQUES

Filter methods (correlation, chi-square test) - Wrapper methods (forward, backward selection) - Embedded methods (LASSO, decision tree importance) - Dimensionality reduction basics (PCA – introductory), **Handling Date and Time Features :** Extracting components (day, month, year, weekday) - Time-based aggregations - Lag features and rolling statistics (basic)

12

UNIT – IV:TEXT FEATURE ENGINEERING (INTRODUCTION)

Tokenization - Stop-word removal - Bag of Words (BoW) - TF-IDF (basic concept), **Feature Engineering for Numerical Data :** Aggregation (sum, mean, count, group-based features) - Feature scaling revisited - Handling multicollinearity

12

UNIT – V: Introduction to feature extraction using pre-trained models - **Feature Evaluation and Importance:** Feature importance using models - Correlation analysis - Model-based evaluation, **Tools and Practical Implementation :** Feature engineering using **Python (Pandas, NumPy, Scikit-learn)** - Introduction to pipelines

12

TOTAL: 60

TEXT BOOKS

1. Feature Engineering for Machine Learning, Feature Engineering for Machine Learning: Principles and Techniques for Data Scientists, O'Reilly Media, First Edition, 2018.
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media, 3rd Edition, 2022.
3. Python Data Science Handbook, O'Reilly Media, 2nd Edition, 2023.

REFERENCES

1. Data Preparation for Data Mining, Morgan Kaufmann Publishers, 1999.
2. Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, 4th Edition, 2016.
3. Pattern Recognition and Machine Learning, Springer, 2006.

WEB REFERENCES

1. Scikit-learn Documentation
   - Feature preprocessing, encoding, pipelines, PCA, feature selection, and machine learning utilities.
2. Pandas Documentation
   - Data cleaning, transformation, aggregation, handling missing values, and feature engineering.
3. NumPy Documentation
   - Numerical computing and array operations for feature engineering.
4. Kaggle Learn – Feature Engineering Course
   - Practical tutorials and hands-on exercises in feature engineering.
5. Machine Learning Mastery – Feature Engineering Tutorials
   - Beginner-friendly articles and implementation examples.

6. Analytics Vidhya – Feature Engineering Articles
    - Industry-oriented tutorials and case studies on feature engineering.
7. Towards Data Science
    - Articles covering practical feature engineering techniques and machine learning workflows.
8. Official Python Documentation
    - Python language reference and standard libraries.

BCA254TPE21	Professional Elective – III From Group - Data Science INTRODUCTION TO DATA SCIENCE	L	T	P	C
		3	1	2	6

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- Understand the fundamental concepts, workflow, and applications of Data Science.
- Learn the methods of collecting, preparing, and managing data for analysis.
- Apply basic statistical and exploratory data analysis techniques using Python.
- Understand introductory machine learning concepts and their applications.
- Develop problem-solving skills using Python-based Data Science tools and real-world datasets.

COURSE OUTCOMES

- Explain the fundamentals, life cycle, and applications of Data Science.
- Perform data acquisition, preprocessing, and transformation using appropriate techniques.
- Apply descriptive statistics and exploratory data analysis to understand datasets.
- Demonstrate basic machine learning concepts and evaluate simple predictive models.
- Use Python libraries to analyze, visualize, and communicate insights from data.

SYLLABUS

UNIT I: Fundamentals of Data Science

Introduction to Data Science: Evolution of Data Science - Data Science Process - Data Science Life Cycle - Data Science vs Artificial Intelligence vs Machine Learning - Data Science Team and Roles - Types of Data - Sources of Data - Structured, Semi-Structured and Unstructured Data - Applications of Data Science. **12**

UNIT II – Data Collection and Data Preprocessing

Data Acquisition and Preparation : Data Collection Methods - Data Sources - Data Quality -Data Cleaning - Missing Values - Noise and Outliers - Data Integration -Data Transformation - Data Normalization - Data Reduction - Feature Selection (Introduction) - Introduction to NumPy and Pandas. **12**

UNIT III – Exploratory Data Analysis and Statistics

Exploring and Understanding Data : Introduction to Exploratory Data Analysis (EDA) - Descriptive Statistics - Data Visualization Concepts - Histograms - Box Plots - Scatter Plots - Correlation Heat Maps -Introduction to Matplotlib and Seaborn - Interpreting Data . **12**

UNIT IV – Introduction to Machine Learning

Machine Learning Fundamentals : Types of Machine Learning - Supervised Learning - Unsupervised Learning - Reinforcement Learning (Overview) - Classification - Regression - Clustering - Model Training - Model Testing - Performance Evaluation - Overfitting and Underfitting - Introduction to Scikit-learn.

12

UNIT V – Emerging Trends and Applications in Data Science

Introduction to Big Data - Cloud Computing for Data Science - Internet of Things (IoT) and Data Science - Artificial Intelligence and Data Science - Deep Learning (Overview) - Natural Language Processing (NLP) – Introduction - Generative AI and Large Language Models (Overview) – Applications of Data Science in Healthcare, Finance, Agriculture, Education, and Smart Cities.

12

TOTAL :60

TEXT BOOKS

1. Laura Igual and Santi Seguí, Introduction to Data Science: A Python Approach **to** Concepts, Techniques and Applications, Springer International Publishing, First Edition.

REFERENCES

1. Joel Grus, Data Science from Scratch: First Principles with Python, 2nd Edition, O'Reilly Media.
2. Jake VanderPlas, Python Data Science Handbook, O'Reilly Media.
3. Cathy O'Neil and Rachel Schutt, Doing Data Science, O'Reilly Media.
4. Wes McKinney, Python for Data Analysis, 3rd Edition, O'Reilly Media.
5. Foster Provost and Tom Fawcett, Data Science for Business, O'Reilly Media.

WEB REFERENCES

Python Programming

- Python Official Documentation
  https://docs.python.org/3/
- Jupyter Notebook
  https://jupyter.org/

Python Data Science Libraries

- NumPy Documentation
  https://numpy.org/doc/
- Pandas Documentation
  https://pandas.pydata.org/docs/
- Matplotlib Documentation
  https://matplotlib.org/stable/
- Seaborn Documentation
  https://seaborn.pydata.org/
- Scikit-learn Documentation
  https://scikit-learn.org/stable/

Learning Resources

- Kaggle Learn
  https://www.kaggle.com/learn
- Google Machine Learning Crash Course
  https://developers.google.com/machine-learning/crash-course
- IBM SkillsBuild – Data Science
  https://skillsbuild.org/

Laboratory Activities

Students should perform the following practical exercises:

1. Install Python, Jupyter Notebook and Anaconda.
2. Read datasets using Pandas.
3. Perform data cleaning and preprocessing.
4. Calculate descriptive statistics.
5. Visualize datasets using Matplotlib.
6. Create statistical graphs using Seaborn.
7. Perform exploratory data analysis.
8. Implement simple classification using Scikit-learn.
9. Analyze a real-world dataset.
10. Mini Project: End-to-end data analysis using Python.

BCA254TPE22	Professional Elective – II From Group - Artificial Intelligence and Machine Learning INTRODUCTION TO MACHINE LEARNING	L	T	P	C
		3	1	2	6

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- Understand the fundamental concepts, workflow, and applications of Machine Learning.
- Explain supervised, unsupervised, reinforcement learning, and emerging Generative AI techniques.
- Apply machine learning algorithms to solve classification, regression, clustering, and prediction problems.
- Evaluate the performance of machine learning models using appropriate evaluation metrics.
- Develop and implement machine learning models using Python and standard machine learning libraries.
- Understand the fundamentals of Large Language Models (LLMs), prompt engineering, and AI agents for modern AI applications.

COURSE OUTCOMES

- Explain the concepts, workflow, data types, and evaluation methods of Machine Learning
- Apply supervised learning algorithms for regression and classification problems using suitable datasets.
- Analyze unlabeled datasets using clustering and dimensionality reduction techniques.
- Demonstrate reinforcement learning concepts and evaluate agent performance using appropriate metrics
- Explain the architecture, applications, and ethical considerations of Large Language Models and Generative AI.

SYLLABUS

UNIT I – Introduction to Machine Learning : Definition, Evolution and Applications – Types of Data : Structured, Semi-structured and Unstructured Data – Types of Machine Learning: Supervised, Unsupervised, Semi-supervised and Reinforcement Learning – Machine Learning Workflow: Data Collection, Data Preprocessing, Feature Engineering, Model Building and Prediction – Training, Validation and Testing – Cross Validation – Model Evaluation Metrics

12

UNIT II – Supervised Learning : Introduction – Characteristics and Applications – Labeled Datasets – **Learning Process:** Data Preparation, Model Training, Prediction and Evaluation. Supervised Learning Algorithms- Linear Regression - Logistic Regression - Naïve Bayes – K-Nearest Neighbors (KNN) - Decision Tree - Ensemble Learning: Random Forest and Gradient Boosting – Model Selection and Hyperparameter Tuning.

12

UNIT III – Unsupervised Learning : Introduction – Characteristics and Applications – Unlabeled Datasets – Clustering and Dimensionality Reduction – Similarity and Distance Measures. K-Means – Hierarchical Clustering – DBSCAN – Cluster Validation Measures – Principal Component Analysis (PCA) – Introduction to Association Rule Mining (Apriori) – Anomaly Detection Concepts

12

UNIT IV – Reinforcement Learning - Introduction – Characteristics and Applications – Agent, Environment, State, Action and Reward – Exploration vs. Exploitation – Markov Decision Process (MDP) (Introduction) - Reinforcement Learning Algorithms - Q-Learning - SARSA - Deep Q-Network - Evaluation Metrics**:** Cumulative Reward, Average Reward, Episode Length, Success Rate, and Convergence Rate. **12**

UNIT V – Large Language Models and Generative AI : Introduction to Generative AI – Natural Language Processing Basics – Transformer Architecture – Large Language Models : Concepts and Applications – Prompt Engineering – Fine-tuning vs. Prompting – Retrieval-Augmented Generation (RAG) Basics – AI Agents (Introduction) – Limitations of LLMs: Hallucination, Bias, Privacy and Responsible AI.

12

TOTAL : 60

TEXT BOOKS

1. Ravi Chopra, Machine Learning, Khanna Book Publishing Co (P) Ltd., 2nd Edition, 2025.
2. Aurélien Géron, **Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow**, 3rd Edition, O'Reilly Media, 2023. **ISBN:** 978-1098125974.
3. Ethem Alpaydin, **Introduction to Machine Learning**, 5th Edition, MIT Press, 2024. **ISBN:** 978-0262546805.
4. Jay Alammar and Maarten Grootendorst, **Hands-On Large Language Models**, O'Reilly Media, 2024. **ISBN:** 978-1098150969.

REFERENCES

1. Christopher M. Bishop and Hugh Bishop, **Deep Learning: Foundations and Concepts**, Springer, 2024. **ISBN:** 978-3031664700.
2. Kevin P. Murphy, **Probabilistic Machine Learning: An Introduction**, MIT Press, 2022. **ISBN:** 978-0262046824.
3. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, **The Elements of Statistical Learning**, 2nd Edition, Springer (Reprint). **ISBN:** 978-0387848570.

WEB REFERENCES

1. https://www.libreoffice.org/discover/calc/
2. https://help.libreoffice.org/latest/en-US/text/scalc/main0000.html
3. https://www.w3schools.com/excel/
4. https://www.tutorialspoint.com/excel/index.htm
5. https://www.geeksforgeeks.org/excel-tutorial/

LIST OF EXPERIMENTS

1. Installation and familiarization with Python, Jupyter Notebook, NumPy, Pandas, Matplotlib,
   and Scikit-learn.
2. Data preprocessing, cleaning, feature engineering, and visualization using real-world datasets.
3. Implementation of Linear Regression and Logistic Regression models.
4. Classification using Naïve Bayes, K-Nearest Neighbors (KNN), and Decision Tree algorithms.
5. Ensemble learning using Random Forest and Gradient Boosting; hyperparameter tuning using Grid Search.
6. Clustering using K-Means, Hierarchical Clustering, and DBSCAN.
7. Dimensionality Reduction using Principal Component Analysis (PCA) and Association Rule Mining using Apriori.
8. Basic Reinforcement Learning using Q-Learning to solve a simple Grid World or OpenAI Gym environment.
9. Introduction to Generative AI: Prompt engineering and inference using a pre-trained Large Language Model (LLM).
10. **Mini Project:** Design, implement, evaluate, and present a machine learning solution using a real-world dataset.

Software Tools

- Python 3.x
- Jupyter Notebook / JupyterLab
- Anaconda Distribution
- Google Colab
- NumPy
- Pandas
- Matplotlib
- Scikit-learn
- TensorFlow/Keras (Introductory)
- OpenAI API or Hugging Face Transformers (for LLM demonstrations)

BCA255TPE31	Professional Elective – II From Group - Data Science DATA VISUALIZATION	L	T	P	C
		3	1	4	6

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- Understand the importance of data visualization in data analysis and decision-making.
- Learn the principles and best practices of effective data visualization.
- Develop interactive dashboards and reports using Microsoft Power BI.
- Create visual analytics and dashboards using Tableau.
- Apply visualization techniques to communicate insights from real-world datasets.

COURSE OUTCOMES

- Explain the fundamentals, principles, and importance of data visualization.
- Prepare, transform, and visualize data using Microsoft Power BI.
- Design interactive dashboards and reports using Power BI for business decision-making.
- Create visualizations, dashboards, and stories using Tableau.
- Apply appropriate visualization techniques to analyze and present real-world data effectively.

SYLLABUS

UNIT I – BASICS OF DATA VISUALIZATION

Introduction to Data Visualization: Importance of Data Visualization - Data Types: Categorical, Numerical, Time Series, Geographic - Characteristics of Effective Visualizations - Data Visualization Process - Data Storytelling - Principles of Visual Perception - Common Charts - Applications of Data Visualization in Business and Data Science

12

UNIT II – MICROSOFT POWER BI: FUNDAMENTALS

Introduction to Power BI : Components of Power BI - Power BI Interface - Connecting to Data Sources - Importing Excel and CSV Files - Data Cleaning using Power Query - Data Transformation - Data Types - Data Modeling Basics - Relationships between Tables - Creating Simple Visualizations - Formatting Charts - Saving and Publishing Reports

12

UNIT III – Microsoft Power BI: Dashboards and Reports

Power BI Visualization and Dashboard Design: Creating Interactive Reports - Slicers and Filters - Drill Down and Drill Through - Cards, KPI and Gauge Visuals - Maps and Geographic Visualizations - Matrix and Table Visuals - Basic DAX Functions - Calculated Columns - Measures - Dashboard Design Principles - Sharing and Publishing Dashboards

12

UNIT IV – Tableau Fundamentals

Introduction to Tableau : Introduction to Tableau Desktop - Tableau Interface - Connecting to Data Sources - Data Preparation - Dimensions and Measures - Creating Worksheets - Sorting and Filtering Data - Creating Basic Charts - Formatting Visualizations

12

UNIT V – Tableau Dashboards and Storytelling

Tableau Dashboard Development : Creating Dashboards - Interactive Filters - Parameters - Calculated Fields - Hierarchies - Maps - Story Points - Dashboard Actions - Best Practices in Dashboard Design - Publishing Dashboards - Tableau Public

12

TOTAL :60

TEXT BOOKS

1. Ramesh Behl, *Data Visualization: Using Power BI and Tableau*, McGraw Hill Education, Latest Edition.

REFERENCES

1. Cole Nussbaumer Knaflic, Storytelling with Data: A Data Visualization Guide for Business Professionals, Wiley.
2. Claus O. Wilke, Fundamentals of Data Visualization, O'Reilly Media.
3. Alberto Cairo, The Truthful Art: Data, Charts and Maps for Communication, New Riders.
4. Stephen Few, Information Dashboard Design, Analytics Press.
5. Andy Kirk, Data Visualization: A Handbook for Data Driven Design, Sage Publications.

WEB REFERENCES

Microsoft Power BI

- Microsoft Learn – Power BI Documentation
  https://learn.microsoft.com/power-bi/
- Microsoft Power BI Community
  https://community.powerbi.com/
- Power BI Guided Learning
  https://learn.microsoft.com/training/powerplatform/power-bi/

Tableau

- Tableau Learning Portal
  https://www.tableau.com/learn
- Tableau Public
  https://public.tableau.com/
- Tableau Help Documentation
  https://help.tableau.com/

Data Visualization

- Data Visualization Catalogue
  https://datavizcatalogue.com/
- Storytelling with Data Blog
  https://www.storytellingwithdata.com/

- Our World in Data
  https://ourworldindata.org/

Laboratory Activities

Students should perform practical exercises such as:

1. Import data from Excel into Power BI.
2. Clean and transform data using Power Query.
3. Create Bar, Pie, Line, Scatter and Map charts.
4. Create interactive Power BI dashboards.
5. Use filters, slicers and drill-down reports.
6. Import data into Tableau.
7. Create worksheets and dashboards in Tableau.
8. Build storyboards in Tableau.
9. Publish dashboards on Tableau Public.
10. Mini Project: Interactive dashboard using a real-world dataset.

BCA255TPE32	Professional Elective – III From Group - Artificial Intelligence and Machine Learning NEURAL NETWORKS	L	T	P	C
		3	1	4	6

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

The objectives describe what the course aims to teach the students:

- Understand the fundamentals of neural networks
- Develop knowledge of network architectures
- Gain practical skills in training neural networks
- Apply neural networks to real-world problems
- Recognize ethical considerations in neural network applications

COURSE OUTCOMES

The outcomes describe What students will be able to do after finishing the course

- Explain the architecture and functioning of different neural networks
- Design and train neural network models for supervised and unsupervised tasks
- Develop practical applications of neural networks
- Evaluate and optimize neural network performance
- Apply deep learning frameworks to implement neural network solutions

SYLLABUS

UNIT I Introduction to Neural Networks

Basics of neural networks and human brain, Models of a neuron, Neural Network viewed as Directed Graphs, Feedback, Network Architectures, Knowledge Representation, Learning Processes, Learning Tasks.

12

UNIT II Introduction to Neural Network Mathematical Foundations

Linear algebra: vectors, matrices, eigenvalues, Calculus: derivatives, gradients, Probability and statistics basics Optimization techniques: gradient descent, stochastic gradient descent, Computer Experiment: Pattern Classification, The Minimum. **12**

UNIT III Perceptron

Single-layer perceptron model, Perceptron learning algorithm. Activation functions: step, sigmoid, tanh, ReLU, Limitations: XOR problem. The Perceptron Convergence Theorem, Relation between the Perceptron **12**

UNIT IV Multilayer Perceptron

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, The Hessian and Its Role in On-Line Learning, Optimal Annealing and Adaptive Control of the Learning Rate. **12**

UNIT V Self-Organizing Maps

Introduction, Two Basic Feature-Mapping Models, Self-Organizing Map, Properties of the Feature Map, Contextual Maps, Hierarchical Vector Quantization, Kernel Self-Organizing Map, Relationship between Kernel SOM and Kull back-Leibler Divergence. **12**

TOTAL : 60

TEXT BOOKS

1. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Michael Nielsen, Neural Networks and Deep Learning, 2018

REFERENCES

1. Neural Networks and Learning Machines – Simon Haykin
2. Introduction to Artificial Neural Networks and Deep Learning – Sandhya Samarasinghe
3. Neural Networks and Deep Learning, Aggarwal, Charu C., c Springer International Publishing AG, part of Springer Nature 2018
4. Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms (1st. ed.). Nikhil Buduma and Nicholas Locascio. 2017. O'Reilly Media, Inc.

WEB REFERENCES

1. http://www.pearsonhighered.com/haykin
2. https://archive.org/details/neuralnetworksle0000hayk
3. https://www.google.com/search?q=http://dai.fmph.uniba.sk/courses/NN/
4. https://www.bibsonomy.org/bibtex/

BCA255TPE32	NEURAL NETWORKS LAB	L	T	P	C

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- Imparting good sound theoretical basis and wide-ranging practical experience to the Students for fulfilling the upcoming needs of the Society in the various fields of Computer Science and Application.
- Offering the Students an overall background suitable for making a Successful career in Industry/Research/Higher Education in India and abroad.
- Providing opportunity to the Students for Learning beyond Curriculum and improving Communication Skills.
- Engaging Students in Learning, Understanding and Applying Novel Ideas.

COURSE OUTCOMES

- Understand the architectural concepts of biological and artificial neural networks.
- Implement and evaluate single-layer and multi-layer perceptron learning algorithms.
- Design and train feedforward neural networks (FNN) using backpropagation.
- Apply deep learning models (e.g., Convolutional Neural Networks - CNN) for pattern recognition and image processing.
- Analyze the impact of hyper parameters (learning rate, batch size, activation functions) on network performance.

LIST OF EXPERIMENTS

1. To study about MATLAB.
2. Write a program to perform the basics matrix operations.
3. Write a program to plot the Straight line.
4. Write a program to plot the Sine curve.
5. How the weight & bias value effects the output of neurons.
6. How the choice of activation function effect the output of neuron experiment with the following function purelin(n), bimary threshold(hardlim(n) haradlims(n)), Tansig(n) logsig(n).
7. How the weight and biased value are able to represent a decision boundary in the feature space.
8. How the Perceptron Learning rule works for Linearly Separable Problem.
9. How the Perceptron Learning rule works for Non-Linearly Separable Problem.
10. Write a program to draw a graph with multiple curve.

BCA255TPE41	Professional Elective – IV From Group - From Group - Data Science **Time Series Analysis**	L	T	P	C
		3	1	2	6

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- Understand the fundamentals of time series data and its characteristics.
- Learn methods for visualization, decomposition, and preprocessing of time series data.
- Apply statistical techniques for analyzing trends, seasonality, and stationarity.
- Build basic forecasting models using classical time series techniques.
- Evaluate forecasting models and apply time series analysis to real-world data science applications.

COURSE OUTCOMES

- Explain the concepts, components, and characteristics of time series data.
- Perform exploratory analysis, decomposition, and preprocessing of time series datasets.
- Analyze stationarity and identify suitable models using autocorrelation techniques.
- Develop forecasting models using moving averages, exponential smoothing, and ARIMA.
- Evaluate forecasting accuracy and apply time series analysis using Python for practical data science problems.

SYLLABUS

UNIT I – Introduction to Time Series Analysis

Introduction to Time Series - Types of Time Series Data - Applications in Data Science - Components of Time Series - Trend - Seasonal - Cyclical - Irregular Components, Time Series vs Cross-sectional Data , Time Series Visualization , Time Series Data Formats.

12

UNIT II – Time Series Preprocessing and Decomposition

Time Series Data Collection - Handling Missing Values - Resampling Time Series Data - Rolling Statistics - Time Series Smoothing - Trend Estimation - Seasonal Decomposition - Additive and Multiplicative Models - Data Transformation - Log Transformation - Differencing - Scaling

12

UNIT III – Stationarity and Correlation Analysis

Concept of Stationarity - Important - Types of Stationarity - White Noise Process - Random Walk - Differencing Techniques - Autocorrelation Function (ACF) - Partial Autocorrelation Function (PACF) - Lag Plots - Introduction to Statistical Tests - Augmented Dickey-Fuller (ADF) Test (Concept only)

12

UNIT IV – Forecasting Methods

Forecasting Fundamentals - Forecast Accuracy Measures - MAE - MSE - RMSE - MAPE - Moving Average Forecasting - Weighted Moving Average - Simple Exponential Smoothing

- Holt's Linear Trend Method - Holt-Winters Seasonal Method - Introduction to ARIMA - Model Selection (Basic Concept)

12

UNIT V – Time Series Applications using Python

Time Series Workflow - Model Building - Model Validation - Train-Test Split for Time Series - Forecast Interpretation - Time Series Case Studies - Sales Forecasting - Weather Prediction - Stock Price Trend Analysis - Energy Consumption - Website Traffic Analysis - Introduction to Prophet (Overview) - Ethical Considerations in Forecasting

12

TOTAL : 60

TEXT BOOKS

1. Practical Time Series Analysis, O'Reilly Media, 2019.
2. Introduction to Time Series and Forecasting, Springer, 3rd Edition, 2016.
3. Forecasting: Principles and Practice, 3rd Edition.

REFERENCES

1. Time Series Analysis: Forecasting and Control, Wiley, 5th Edition.
2. Hands-On Time Series Analysis with Python, Packt Publishing.
3. Python for Data Analysis, O'Reilly Media, 3rd Edition.
4. Time Series Analysis and Its Applications, Springer.

LIST OF EXPERIMENTS

Practical Components (Integrated)

Students should perform experiments using Python covering:

- Loading and visualizing time series datasets
- Trend and seasonal decomposition
- Stationarity testing
- ACF and PACF analysis
- Moving average forecasting
- Exponential smoothing
- Basic ARIMA forecasting
- Forecast evaluation using error metrics

1. Introduction to Python Libraries:
    1. NumPy
    2. Pandas
    3. Matplotlib
2. Practical using Python:
    - Reading time series datasets
    - Plotting trend and seasonality
    - Decomposition using Python
3. Python Applications:

- Stationarity checking
- ACF and PACF plotting

4. Python Applications:
   - Forecasting using Statsmodels
   - Forecast visualization
5. Mini Project:
   - Develop a simple forecasting model using a real-world dataset.

BCA255TPE42	Professional Elective – IV From Group - Artificial Intelligence and Machine Learning DIGITAL IMAGE PROCESSING	L	T	P	C
		3	1	4	6

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- Provide the student with the fundamentals of digital image processing.
- Give the students a taste of the applications of the theories taught in the subject. This will be achieved through the project and some selected lab sessions.
- Introduce the students to some advanced topics in digital image processing.
- Give the students a useful skill base that would allow them to carry out further study should they be interested and to work in the field

COURSE OUTCOMES

- Have an appreciation of the fundamentals of Digital Image Processing including the topics of filtering, transforms and morphology, and image analysis and compression.
- Be able to implement basic image processing algorithms in MATLAB.
- Have the skill base necessary to further explore advanced topics of Digital Image Processing.
- Be in a position to make a positive professional contribution in the field of Digital Image Processing.

SYLLABUS

UNIT I Digital image fundamentals & Image Transforms: - Digital Image fundamentals, Sampling and quantization, Relationship between pixels. Image Transforms: 2-D FFT, Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Discrete Wavelet Transform. **12**

UNIT II Image enhancement (spatial domain) : Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Operation, Types of Point Operation, Histogram Manipulation, gray level Transformation, local or neighborhood operation, median filter.

12

UNIT III Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration. **12**

UNIT IV Image segmentation: Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region oriented segmentation Morphological Image Processing.

12

UNIT V Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression.

12

TOTAL : 60

TEXT BOOKS

1. Digital Image Processing- Rafeal C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson 2008
2. Digital Image Processing- S Jayaraman, S. Essakkirajan, T. Veerakumar TMH,2010

REFERENCES

1. Digital Image Processing and analysis-human and computer vision application with using CVIP Tools – Scotte Umbaugh,2nd Ed, CRC Press,2011.
2. Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology.
3. Fundamentals of Digital Image Processing-A.K. Jain, PHI,1989.
4. Digital Image Processing and computer Vision-Somka, Halavac, Boyle - Cengage learning (Indian edition)2008.
5. Digital Image Processing using Matlab, Rafeal C. Gonzalez, Richard E. Woods, Steven L. Eddins, Pearson Education.
6. Introduction to Image Processing & Analysis-John C. Russ, J. Christian Russ, CRC Press, 2010
7. Digital Image Processing with MATLAB & Labview - Vipula Singh Elsevier.

WEB REFERENCES

1. http://www.imageprocessingplace.com/
2. https://nptel.ac.in/courses/117105079
3. https://ocw.mit.edu/courses/6-011-signals-systems-and-inference-spring-2018/
4. https://www.geeksforgeeks.org/digital-image-processing-basics/
5. https://homepages.inf.ed.ac.uk/rbf/HIPR2/hipr_top.htm

BCA255TPE42	DIGITAL IMAGE PROCESSING LAB	L	T	P	C

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

The **Digital Image Processing (DIP) Lab** provides hands-on experience in manipulating and analyzing digital images. Its primary objective is to bridge theoretical concepts (like image enhancement, segmentation, and compression) with practical implementations using computational software.

- Understand the fundamentals of digital image acquisition, sampling, quantization, and color space models.
- Implement point processing, spatial filtering, and frequency domain filtering for image enhancement and restoration.
- Apply various image segmentation techniques (edge detection, thresholding) and morphological operations (erosion, dilation).
- Analyze different image compression and coding techniques to optimize storage and data transmission.
- Develop and design small-scale real-world projects (e.g., medical image processing, pattern recognition) using standard tools.

COURSE OUTCOMES

- Applying mathematical foundations and computational science to understand image processing algorithms.
- Identifying, formulating, and solving complex image degradation, noise, and restoration problems.
- Creating and analyzing image models using industry-standard software like MATLAB.
- Recognizing the need for continuous learning as image/video processing evolves into AI and deep learning

LIST OF EXPERIMENTS

1. Image sampling and quantization.
2. Image sampling and quantization.
3. Analysis of spatial and intensity resolution of images.
4. Intensity transformation of images.
5. DFT analysis of images Transforms (Walsh, Hadamard, DCT, Haar).
6. Histogram Processing.
7. Image Enhancement-Spatial filtering.
8. Image Enhancement- Filtering in frequency domain.
9. Image segmentation – Edge detection, line detection and point detection.
10. Basic Morphological operations.
11. Basic Thresholding functions.
12. Analysis of images with different color models.

BCA256TPE51	Professional Elective – V From Group - Data Science BIG DATA ANALYTICS	L	T	P	C
		3	1	3	5

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To introduce the fundamental concepts of Big Data, its characteristics, types, analytics models, and real-world industry applications.
- To explain the architecture and components of the Hadoop ecosystem, including HDFS and the Map Reduce programming model for large-scale data processing.
- To familiarize students with NoSQL data management concepts and MongoDB, emphasizing differences from traditional relational database systems.
- To provide conceptual and practical knowledge of distributed storage systems such as HBase and Cassandra, including their architectures, data models, and query mechanisms.
- To expose students to high-level Big Data processing tools and cloud-based Big Data analytics platforms, enabling understanding of scalable and serverless analytics solutions.

COURSE OUTCOMES

- Explain Big Data concepts, architectures, analytics types, and identify suitable Big Data technologies for various business and industry scenarios.
- Demonstrate the working of Hadoop and HDFS, and develop simple Map Reduce programs for processing large datasets in a distributed environment.
- Analyze and manage semi-structured and unstructured data using NoSQL databases, and perform data operations using MongoDB query language.
- Compare and apply HBase and Cassandra data models, architectures, and CRUD operations for high-performance distributed data storage solutions.
- Utilize high-level Big Data tools and cloud platforms such as Apache Pig and cloud-based services for scalable and serverless Big Data analytics.

SYLLABUS

UNIT I

Overview of Big Data – Big Data types – Types of Analytics – Industry examples of Big Data – Big Data Technologies – The Evolution of Big Data Architecture – Selecting Big Data Technologies – Benefits of Big Data – Mobile Business Intelligence.

12

UNIT II

HADOOP Architecture – Components of Hadoop framework – Analyzing Big Data with Hadoop – Distributed application concept – Hadoop distributed file system (HDFS) – Architecture of Apache Hadoop HDFS – HDFS File commands – Processing data with Hadoop - MapReduce Programming Model - Writing and Running a Simple MapReduce Program.

12

UNIT III

NO SQL Data Management and MongoDb : NoSQL data management – types of NoSQL databases - Classification of NoSQL databases - Introduction to MongoDB – Advantages of MongoDB over RDBMS – MongoDB query Language.

12

UNIT IV

HBase and Cassendra : Introduction to HBase – Row oriented and Column oriented data stores – HDFS Vs HBase Vs RDBMS – Hbase Architecture – Hbase data model – Hbase shell basics – CRUD operations - Introduction to Apache Cassandra – Components of Cassandra - Cassandra Data Model - Cassandra query language. **12**

UNIT V

PIG and Cloud-based Big Data Analytics : Introduction to PIG – Components of PIG – Data formats and Models – Data types in PIG – Execution models of PIG – Relational operators – Eval function - Big Data on Cloud overview - AWS Big Data ecosystem (EMR, Glue – overview) Azure Synapse Analytics - Google BigQuery- Serverless Big Data analytics.

12

TOTAL : 60

TEXT BOOKS

1. V.K.Jain, Big Data & Hadoop, Khanna Book Publishing Co(P) Ltd., New Delhi. Second Edition, 2023.
2. Seema Acharya, Subhashini Chellappan, Wiley India Pvt. Ltd., New Delhi, Second Edition, 2019.

BCA256TPE51	BIG DATA ANALYTICS LAB	L	T	P	C

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To introduce students to the fundamental concepts and architecture of Hadoop and HDFS for distributed data storage and processing.
- To develop practical skills in creating databases, collections, and performing queries using MongoDB.
- To familiarize students with HBase and enable them to perform CRUD operations on distributed NoSQL databases.
- To provide hands-on experience in Cassandra Query Language (CQL) for creating keyspaces, tables, and managing data.
- To develop practical knowledge of Apache Pig and its relational operators for processing and analyzing large datasets.

COURSE OUTCOMES

- Explain the architecture of Hadoop and the functions of major HDFS and YARN components.
- Create and manage MongoDB databases and collections and execute queries using comparison operators.
- Perform CRUD operations on HBase tables using HBase Shell commands.
- Implement database operations using Cassandra Query Language, including data insertion, retrieval, updating, and deletion.
- Apply Apache Pig Latin operators to load, filter, transform, group, sort, and analyze large datasets.

LIST OF EXPERIMENTS

1. **Study of Hadoop Architecture and HDFS Components**
   Install Hadoop in pseudo-distributed mode (or use a Hadoop sandbox environment). Study the Hadoop architecture and explain the functions of key components, including NameNode, DataNode, Secondary NameNode, Resource Manager, and Node Manager. Draw the Hadoop architecture diagram and describe the flow of data between these components.

2. **MongoDB Database Creation and Query Processing**
   Install MongoDB and MongoDB Shell (mongosh). Create a database named **StudentDB** and a collection named **Students**. Perform basic database operations, display the available databases and collections, and execute queries using MongoDB comparison operators.

3. **HBase Table Creation and CRUD Operations**
   Start HBase and access the HBase Shell. Create a table named **Student** with the column families **Personal** and **Academic**. Perform Create, Read, Update, and Delete (CRUD) operations on the table and verify the results using appropriate HBase commands.
4. **Database Operations Using Cassandra Query Language (CQL)**
   Create a Keyspace named **CollegeDB** and a table named **Students** using Cassandra Query Language (CQL). Insert records into the table, retrieve records using **SELECT** statements, update and delete records using CQL commands, and display the final contents of the table.
5. **Data Processing Using Apache Pig**
   Install or access Apache Pig in local mode and load a sample dataset. Apply Pig Latin relational operators such as **LOAD, FILTER, FOREACH, DISTINCT, GROUP,** and **ORDER**. Display and analyze the results produced by each operation.

Mini Project: Cloud-Based Big Data Analytics

Develop a mini project demonstrating the application of Big Data analytics using cloud platforms such as **Amazon Web Services (AWS)**, **Microsoft Azure**, or **Google Cloud Platform (GCP)**. The project should involve data storage, processing, analysis, and presentation of results using appropriate Big Data tools and services.

These laboratory exercises provide practical exposure to **Hadoop, MongoDB, HBase, Cassandra, Apache Pig, and Cloud-Based Big Data Analytics platforms**, enabling students to gain hands-on experience with modern Big Data technologies.

BCA256TPE52	Professional Elective – V From Group - Artificial Intelligence and Machine Learning DEEP LEARNING	L	T	P	C
		3	1	3	5

(For Students admitted from 2025 onwards)

COURSE OBJECTIVES

- To understand the basic concepts and techniques of Deep Learning and the need of Deep Learning techniques in real-world problems.
- To understand CNN algorithms and the way to evaluate performance of the CNN architectures.
- To apply RNN and LSTM to learn, predict and classify the real-world problems in the paradigms of Deep Learning.
- To understand learn and design GANs for the selected problems.
- TounderstandtheconceptofAuto-encodersandenhancingGANsusingauto-encoders.

COURSEOUTCOMES

- UnderstandthebasicconceptsandtechniquesofDeepLearningandtheneedofDeepLearningtechniquesinreal-worldproblems.
- Understand CNN algorithms and the way to evaluate performance of the CNN architectures.
- Apply RNN and LSTM to learn, predict and classify the real-world problems in the paradigms of Deep Learning.
- Understand, learn and design GANs for the selected problems.
- Understand the concept of Auto-encoders and enhancing GANs using auto encoders.

SYLLABUS

UNIT I INTRODUCTION TO DEEPLEARNING

Historical Trends in Deep Learning, Why DL is Growing, Artificial Neural Network, Non-linear classification example using Neural Networks: XOR/XNOR, Single/Multiple Layer Perceptron, Feed Forward Network, Deep Feed- forward networks, Stochastic Gradient – Based learning, Hidden Units, Architecture Design, Back- Propagation.

12

UNIT II CONVOLUTION NEURAL NETWORK (CNN)

Introduction to CNNs and their applications in computer vision, CNN basic architecture, Activation functions-sigmoid, tanh, ReLU, Softmax layer, Types of pooling layers, Training of CNN in Tensor Flow, various popular CNN architectures: VGG, Google Net, ResNet etc, Dropout, Normalization, Data augmentation. **12**

UNIT III RECURRENT NEURAL NETWORK (RNN)

Introduction to RNNs and their applications in sequential data analysis, Back propagation through time (BPTT), Vanishing Gradient Problem, gradient clipping Long Short Term Memory (LSTM) Networks, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs.

12

UNIT IV GENERATIVE ADVERSARIAL NETWORKS (GANS):

Generative models, Concept and principles of GANs, Architecture of GANs (generator and discriminator networks), Comparison between discriminative and generative models, Generative Adversarial Networks (GANs), Applications of GANs. **12**

UNIT V AUTO-ENCODERS

Auto-encoders, Architecture and components of auto-encoders (encoder and decoder), Training an auto-encoder for data compression and reconstruction, Relationship between Auto encoders and GANs, Hybrid Models: Encoder-Decoder GANs.

12

TOTAL :60

TEXT BOOKS

1. Deep Learning: An MIT Press Book by Ian Good fellow and Yoshua Bengio Aaron Carville.
2. Michael Nielson, Neural Networks and Deep Learning,DeterminationPress,2015.
3. SatishKumar, Neural networks:Aclassroom Approach,TataMcGraw-HillEducation, 2004.

REFERENCES

1. Deep Learning with Python, Francois Chollet, Manning publications,2018
2. Advanced Deep Learning with Keras, Rowel Atienza, PACKT Publications, 2018.

WEB REFERENCES

1. https://www.deeplearningbook.org/
2. https://nptel.ac.in/courses/106106184
3. https://www.coursera.org/specializations/deep-learning
4. https://machinelearningmastery.com/what-are-generative-adversarial-networks-gans/
5. https://lilianweng.github.io/posts/2018-08-12-vae/

LIST OF EXPERIMENTS

1. Design a single unit perceptron for classification of a linearly separable binary dataset without using pre-defined models. Use the Perceptron() from sklearn.
2. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets. Vary the activation functions used and compare the results.
3. Build a Deep Feed Forward ANN by implementing the Backpropagation algorithm and test the same using appropriate data sets. Use the number of hidden layers >=4.
4. Design and implement an Image classification model to classify a dataset of images using Deep Feed Forward NN.
5. Design and implement a CNN model (with 2 layers of convolutions) to classify multi category image datasets.
6. Design and implement a CNN model (with 4+ layers of convolutions) to classify multi category image datasets. Use the MNIST, Fashion MNIST, CIFAR-10 datasets.
7. Design and implement a CNN model (with 2+ layers of convolutions) to classify multi category image datasets.
8. Design and implement a CNN model (with 4+ layers of convolutions) to classify multi category image datasets. Use the concept of regularization and dropout while designing the CNN model.
9. Use the concept of Data Augmentation to increase the data size from a single image.
10. Design and implement a CNN model to classify CIFAR10 image dataset. Use the concept of Data Augmentation while designing the CNN model. Record the accuracy corresponding to the number of epochs.