-: પરિપત્ર :-

કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખા હેઠળની સંલગ્ન બી.સી.એ.નો અભ્યાસક્રમ ચલાવતી કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, NEP - 2020 અંતર્ગત શૈક્ષણિક વર્ષ ૨૦૨૪–૨૫ થી અમલમાં આવનાર B.C.A. Sem.- 3 & 4 નો પેટાસમિતિ દ્વારા તૈયાર કરવામાં આવેલ અભ્યાસક્રમ કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસ સમિતિના ચેરમેનશ્રીએ અભ્યાસ સમિતિવતી અને કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાના અધ્યક્ષશ્રીએ વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિદ્યાશાખાવતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૦૧/૦૩/૨૦૨૪ ની સભાના ઠરાવ ક્રમાંક : ૧૦૪ અન્વયે માન.કુલપતિશ્રીને આપેલ સત્તા અંતર્ગત માનનીય કુલપતિશ્રી દ્વારા મંજૂર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

બિડાણ: ઉપર મુજબ

ક્રમાંક : એસ./સિલેબસ/પરિપત્ર/૯૨૪૫/૨૦૨૪
તા.૨૬–૦૪–૨૦૨૪

કુલસચિવ

પ્રતિ,

૧)કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખા હેઠળની સંલગ્ન બી.સી.એ.નો અભ્યાસક્રમ ચલાવતી કોલેજોના આચાર્યશ્રીઓ.

........આપશ્રીની કોલેજના સંબંધિત શિક્ષકોને તથા વિદ્યાર્થીઓને જાણ કરી અમલ કરવા સારૂ.

૨) ડીનશ્રી, કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખા.

૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

........તરફ જાણ તેમજ અમલ સારૂ.

Veer Narmad South Gujarat University, Surat

Computer Science and Information Technology Faculty

Syllabus for (Semester-III and Semester-IV) of B.C.A.(Honours)

As per NEP-2020

To be implemented from

Academic Year: June, 2024-2025

(Including Winter Session)

: Submitted By:

Syllabus Committee

1) Dr. Snehal K. Joshi (Chairman)

2) Dr. Ashok Solanki

3) Dr.Bharat Patel

4) Dr.Jagin Patel

5) Prof. Dhananjay Patel

6) Dr. Vaibhav Desai

7) Dr. Jaimin Shukla

8) Dr. Kavita Ahuja

9) Prof. Pratiksha K. Patel

10) Mr. Indravadan Sadhwani

Veer Narmad South Gujarat University, Surat
Bachelor of Computer Application (B.C.A.(Honours))
Under the Faculty of
Computer Science and Information Technology

Name of Program:	Bachelor of Computer Application (Honours)
Abbreviation:	B.C.A.(Honours): Four-year Integrated Program. With Multi-Level Entry and Exit option
Multi-level Exit Criteria:	i) Under Graduate Certificate in Computer Application: If the student wish to exit after completion of First year (Semester-1 and Semeter-2) without any back-log and secure additional 4 credits from work based skill oriented university approved courses /vocational courses / summer internship / Apprenticeship in addition to 6 credits from skill-based courses earned during first and second semester. ii) Diploma in Computer Application: If the student wish to exit after completion of Second year (Semester-1 to Semeter-4) without any back-log and secure additional 4 credits from work based skill oriented university approved courses /vocational courses / summer internship / Apprenticeship offered at end of first or second year in addition to 6 credits from skill-based courses earned during first four semesters. iii)B.C.A. (Bachelor's in Computer Application): If the student wish to exit after completion of Third year (Semeste-1 to semester-6) without any back-log and secure additional 4 credits from work based skill oriented university approved courses /vocational courses / summer internship / Apprenticeship offered at end of first or second year in addition to 6 credits from skill-based courses earned during first four semesters.
Multi-Level Entry Criteria:	As per the norms of the Veer Narmad South Gujarat University.
Duration:	4 year of B.C.A.(Honors) degree program with multi level exit options at 1st, 2nd and 3rd Year to obtain Certificate, Diploma, Degree and Honours Degree in Computer Application respectively.
Eligibility:	Candidate must have passed standard 12th (H.S.C.) Examination in Science (Any Group) / Commerce / vocational / General stream from Gujarat Higher Secondary Board (G.H.S.E.B.) or any other equivalent board (C.B.S.E. / I.C.S.E. etc. which must be approved and possess equivalence certificate from Veer Narmad South Gujarat University) with English as one of the subject. In case of candidates passed out from 12th Board from General Stream; Statistics/Economics/Business Mathematics/Accountancy must be one of the subjects. In case of Students passed out with 12th (H.S.C.) vocational stream, Computer and English must be one of the subject.
Objective of the Program:	Bachelor of Computer Application (BCA)(Honours) is undergraduate degree program in computer application area. Objective of the program is to open a channel of admission for courses in the field of Computer Science,

	Applications and all relevant fields of information technologies to build career for students who have completed standard 12th (H.S.C.) and are interested in taking computing/computer Application and Information Technology as a career. Main objective is to equip the students with strong foundation in computer programming languages, coding, database handling, software application developments, problem-solving skills and development of analytical and logical skills. The focus is to introduce various programming languages on different platforms and operating systems, interaction with databases available on various platforms, software testing, development and deployment techniques. It also aim to provide knowledge in latest trends and advancements in field of computer technologies. The program caters to the needs of the students aspiring to excel in the field of computer science, applications and technologies. The program is designed to develop computer professionals versatile in almost all field of computer application. It also aim to enhance communication and interpersonal skills.
Program Outcome:	**PO1:** Ability to analyze a problem, identify and define the Computing requirements appropriate to its solution. **PO2:** Enhancing the problem solving, logical, reasoning and analysis capabilities of a problem and integrate the ability with the coding using specific computer programming languages. **PO3:** To generate Understanding regarding the core and fundamental ideas about the computer platforms, operating systems, software design concepts, networking concepts and advanced and emerging technologies. **PO4:** Design, implement and evaluate a computer-based system, processing, component or program to meet desired goal with the help of various programming languages, application software, packages, tools, databases on various platforms. **PO5:** An ability to apply design and development principles in construction of software systems of varying complexity using various algorithmic principles, modeling, coding and design of computer-based systems. **PO6:** Prepare the aspiring students to become computer software professionals who can work in corporate/software industry at entry to advanced level as well as independent developers. Overall, the program outcomes aim to produce graduates who are: (a) competent in computer application, development and design. (b) Adapt to changing technology and industry trends. (c) Can make significant contributions to the software applications coding, designing, database managements, testing, deployments and ready to adapt any upcoming technologies.

Program Specific Outcome:	**PSO1:** Developing understanding about the fundamentals of core concepts of logic developments, critical thinking and problem solving capabilities. Emphasis on effective communication.		

PSO2: Improving analytical and applied concepts using various technologies, coding concepts and implementation of coding to solve the problems.

PSO3: Development of team building concepts and working in team with positive approach, enhancing the mindset to contribute as an individual to the team. Improving interpersonal skills.

PSO4: Improving student's Understanding related to technical problems and enhancing their capabilities to address the problems to turn into solutions through various possible ways by enhancing critical thinking ability.

PSO5: Develop students to capabilities for self-learning, skill development through self-practicing and problem solving abilities.

PSO6: Develop students to address and work on the real-world problems as an individual and as part of team. Understand the business problems and ability to work on their solutions by applying various software technologies.

PSO7: To enhance development skills at various level including problem analysis, data analysis, logical and critical analysis of the problems and implementing the solutions by imparting various recent and upcoming technologies.

PSO8: Enhance the passion among the students for updating knowledge, innovative ideas, upskilling and implementing the knowledge in applied areas and research areas by understanding the real world problems, addressing the real world problems and their possible solutions that lead to build a successful Professional career.

PO and PSO mapping:		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	PO1								
	PO2								
	PO3								
	PO4								
	PO5								
	PO6								

Medium of Instruction:	English
Program Structure:	Semester-wise Breakup of the course is given as follows :

Veer Narmad South Gujarat University, Surat
Program Structure: S.Y.B.C.A. (SEM – 3 and SEM – 4)
(w.e.f. Academic Year June, 2024-2025)
Bachelor of Computer Application (B.C.A.) – Three Year Program
Bachelor of Computer Application (B.C.A.(Hon.)) – Four Year Integrated Program

Program Structure		Semester-wise break up for the courses :				
SEMESTER – 3						
Course Code	Course Title	Course Category	Level of Course	Course Credits	Teaching Hours/week	
				Th.+Pra.	Theory	Practical/ Fieldwork /Project/ Internship
301	Modern Indian Language (AEC-03) [Modern Indian Language (MIL)]	Ability Enhancement Course (AEC)	100-199 Introductory Level Course	2	2	0
302	Statistical Methods and Analysis (Student will opt any one course of multi-disciplinary nature from other than the computer Science and Application faculty).	Multi-Disciplinary Course (MDC)	200-299 Intermediate Level Course	4	4	0
303	Database handling using Python	Major Course	300-399 Higher Level Courses	4	3	2
304	OOPs and Data Structures	Major Course	300-399 Higher Level Course	4	2	4
305-01	Web Designing – I	Major Course	300-399 Higher Level Course	4	2	4
OR						
305-02	Mobile Application Development – I	Major Course	300-399 Higher Level Course	4	2	4
	Practical (Based on Course Code 303,304 & 305 Equally divided)	No separate credits allocated for practical. The Practical exam/viva-voce will be based on Course 303,304 and 305				
306	**Skill Enhancement Course-III (SEC-03)** [The student will undergo field training/ internship training OR Select minimum one University approved and recognized 2 credit certificate course from the skill based courses list offered by the respective institute department.] (The student need to enrol separately and pay the fees as decided by the respective institute/department)	Skill Enhancement Course	200-299 Intermediate Level Course	2	2	–
307	**Value Addition Course – III (VAC-03)** [The student will select minimum one University approved and recognized 2 credits certificate course from the Value Addition courses list offered by the respective institute department.] (The student need to enrol separately and pay the fees as decided by the respective institute/department)	Value Addition Course	200-299 Intermediate Level Course	2	2	–
Other Activities	The student is expected to participate in activities related to National Service Scheme (NCC), National Cadet Corps (NCC), adult education/literacy initiatives, mentoring school students, Elderly literacy program/ Environment preservation activities and other similar activities.			–	–	–
Total				22	17	10

Course Code	Course Title	Course Credit	University Exam Type	Exam Duration	External Marks	Internal Marks	Total Marks
301	Modern Indian Language (AEC-03)	2	Presentation & Viva-voce	1 Hours	25	25	50
302	Statistical Methods and Data Analysis (MDC: Multi-Disciplinary Course) (Student will opt any one course of multi-disciplinary nature from other than the computer Science and Application faculty)	4	Theory/ Written	2 Hours	50	50	100
303	Database handling using Python (Major Course)**	4	Theory/ Written : Practical :	1 Hours 2 Hours	25 25	25 25	100
304	OOPs and Data Structures** (Major Course)	4	Theory/ Written : Practical :	1 Hours 2 Hours	25 25	25 25	100
305-01	Web Designing - I** (Major Course)		Theory/ Written : Practical :	1 Hours 2 Hours	25 25	25 25	100
305-02	Mobile Application Development-I** (Major Course)	4					
306	Skill Enhancement Course-III# (SEC-03)	2	-	-	25	25	50*
307	Value Addition Course-III# (VAC-03)	2	-	-	25	25	50*
Total		22			275	275	550

For Practical and Project:

- Batch Size – 40 Maximum (Desirable). Maximum 45 students can be accommodated in a batch. Separate batch should be considered if the student strength exceed 45 numbers.
- Practical includes Practical sessions for course-303, course-304 and course-305. **Minimum** Ten Practical hours (2 Hours for course-303, 4 hours for course-304 and 4 hours for course-305) per week should be allocated per batch. Out of which 8 hours will be in supervised mode and balance hours in un-supervised mode.
- The journal must be certified by the concerned faculty and by the Head of the Department, failing which the student will not be allowed to appear for External Practical Examination. Student will submit softcopy of Minor Project duly certified by the internal guide.

Internship: A student who wish to exit after successfully completion of Second year (Semester-3 and Semester-4) without any backlog is required to obtain Four credits at the end of the year either through the summer internship or university approved skill based certificate courses(two courses of 2-credits each or one 4-credit course). Student is required to enrol for the certificate courses separately by paying the course fees as decided by the college/institute. For summer training, the Institute/college will grant the permission and evaluate the training outcomes. Based on satisfactory completion of the summer training, the Institute head will recommend to the university to grant four credits for summer training. The Internship/summer training/skill based certificate courses will be an audit course.[The internship cost/fees will be bear by the student.]

Skill Enhancement Course : As per NEP(National Education Policy-2020), it is mandatory for students to select a 2 credit skill enhancement course out of the choices given by the college/institute (From available basket of courses as per University norms). It will be mandatory for the student to opt minimum one 2-credit Skill enhancement course out of offered courses recognised by University during semester-1 to semester-5.
(The student need to enrol separately and pay the fees as decided by the respective institute/department)

Value Addition Course: As per NEP(National Education Policy-2020), it is mandatory for students to select a 2 credit Value Addition Course out of the choices given by the college/institute (From available basket of courses as per University norms). It will be mandatory for the student to opt minimum one 2-credit Value Addition Course out of offered courses recognised by the University during semester-1 to semester-4.
(The student need to enrol separately and pay the fees as decided by the respective institute/department)

 # Marks: : The students will enrol for the course from the given university approved list of certificate courses offered by the respective college/department. The student will select and enrol separately for any of the offered list of courses at college/department/institute and obtain respective credits. The institute will evaluate the performance (preferably continuous evolution) as per the SOP of certificate courses and on successfully completion of the course, the student

will be eligible to obtain respective credits for the course. These credits will be considered and reflect in student's mark-sheet as well as in ABC(Academic Bank of Credit). These courses are mandatory and student is required to obtain the specified credits in process to acquire the certificate/diploma/degree.

[The student is required to pay separately for these courses as prescribed by the college. The college will decide the fees for these courses based on the University norms of certificate course/credit fees.]

** Major Practical based Subjects: Course 303,304 and 305 are major courses consists of two components: Theory and Practical. These courses are carrying 4 credits.

For Course-303 : 3 Hours of Theory and 2 hours of practical per week are allocated.

For Course 304 and 305, 2 Hours of theory and 4 hours of practical per week are allocated. Major courses carry 100 marks of exam weightage (50 theory and 50 practical). External and Internal distribution of marks are in ratio of 50:50 respectively. Students are required to acquire minimum passing marks from theory and practical collectively. Practical exams for course-303 (2 hours duration), course-304(2 hours duration) and course-305(2 hours duration) will be conducted.

External Theory/Practical exam marks (25 marks each for course-303, course-304 and course-305)

Division of marks for External Practical: Exam evaluation: 20 marks + Viva-voce: 5 Marks.

Students are required to pass in both components (Theory and Practical) collectively for course 303,304 and 305 as combined head (Theory + Practical) for each major course. It is mandatory for Students to appear for internal and external theory and practical exams for all courses. Similarly, In case a student remain absent in any of the component of Theory or Practical of major subject, the student will be considered fail.

Program Passing Rules:	As per University rules.
Program Fees : (Per Semester) (One time fees and exam fees are additional as prescribed by the university) (w.e.f. Academic Year : 2023-24)	Semester Tuition Fees : As per norms of University Semester Laboratory Utilization fees : Rs. 1,500/- [Other one time /affiliation /exam fees, will be as per the norms of the University] [The fees for all certificate courses, Skill Enhancement Courses and Value Addition Courses; fees will be as per the prescribed limit for per credit as per the SOP of certificate courses decided by the university.]
Internal Marks Distribution :	For All Theory subjects (Out of 25): Home Assignment (3 marks) + Class Assignment (3 Marks) + Attendance (4 Marks) + Internal Test (15 marks) For All Practical subjects (Out of 25): Lab. work (3 marks) + Lab. Journal (3 Marks) + Attendance (4 Marks) + Internal Test (15 marks) For All Theory subjects (Out of 50): Home Assignment (6 marks) + Class Assignment (6 Marks) + Attendance (8 Marks) + Internal Test (30 marks) For All Practical subjects (Out of 50): Lab. work (6 marks) + Lab. Journal (6 Marks) + Attendance (8 Marks) + Internal Test (30 marks)

SEMESTER – 4

Course Code	Course Title	Course Category	Level of Course	Course Credits	Teaching per week	
					Theory	Practical/ Fieldwork/P roject/ Internship
401	Organizational Soft-skills in Software Industry [Ability Enhancement Course-IV] (AEC-04)" [Modern Indian Language (MIL) & English language focused on language and communication skills.]	Ability Enhancement Course	200-299 Intermediate level	2	2	0
402-01 402-02	Internet of Things (IoT) User Interface and User Experience Design (UI/UX Design) (Student will opt any one minor course from the courses listed here)	Minor Course	200-299 Intermediate Level Course	4	4	0
403	Java Programming Language	Major Course	300-399	4	3	2
404	.NET Programming	Major Course	300-399 Intermediate Level Course	4	2	4
405-01 405-02	Web Designing-2 Mobile Application Development 2	Major Course	300-399 Intermediate Level Course	4	2	4
	Practical (Based on Course Code 403,404 & 405 : Equally Divided)	No separate credits allocated for practical. The Practical exam/viva-voce will be based on Course 403, 405 and 405-01/405-02.				
406	**Skill Enhancement Course-IV (SEC-04)** [The student will undergo field training/ internship training OR Select minimum one University approved and recognized 2 credit certificate course from the skill based courses list offered by the respective institute/department.] (The student need to enrol separately and pay the fees as decided by the respective institute/department)	Skill Enhancement Course	200-299 Intermediate Level Course	2	2	-
407	**Value Addition Course – IV (VAC-04)** [To be selected minimum one University approved and recognized 2 credit certificate course from the Value Addition Courses list offered by the respective institute/department.] (The student can select and enrol separately for the course offered by the respective institute/department and need to pay separately as decided by the institute as per norms of university for certificate courses.)	Value Addition Course	200-299 Intermediate Level	2	2	-
Other Activities	The student is expected to participate in activities related to National Service Scheme (NCC), National Cadet Corps (NCC), adult education/literacy initiatives, mentoring school students, Elderly literacy program / Environment preservation activities and other similar activities.			-	-	-
Total				22	17	10

Course Code	Course Title	Course Credit	University Exam Type	Exam Duration	External Marks	Internal Marks	Total Marks
401	Organizational Softskills in Software Industry Ability Enhancement Course (AEC -02)*	2	Presentation & Viva-voce	-	25	25	50
402-01	Internet of Things (IoT)	4	Theory/Written	2 Hours	50	50	100
402-02	User Interface and User Experience Design (UI/UX Design)						
403	Java Programming Language	4	Theory/ Written	1 Hours	25	25	100
			Practical	2 Hours	25	25	
404	.NET Programming	4	Theory/ Written	1 Hours	25	25	100
			Practical	2 Hours	25	25	
405-01	Web Designing – 2	4	Theory/ Written	1 Hours	25	25	100
405-02	Mobile Application Development-2		Practical	2 Hours	25	25	
406	Skill Enhancement Course – IV (SEC-04)#	2	Theory/Written/Practical/Presentation/ Viva-voce	1 Hours	25	25	50*
407	Value Added Course – IV (VAC-04)#	2	-	1 Hours	25	25	50*
Total		22			275	275	550

For Practical and Project:

- Batch Size – 40 Maximum (Desirable). Maximum 45 students can be accommodated in a batch. Separate batch should be considered if the student strength exceed 45 numbers.
- Practical includes Practical sessions for course-403, 404 and course-405-01/405-02. **Minimum** Ten Practical hours(2 Hours for course-403, 4 hours for course-404 and 4 hours for course-405) per week should be allocated per batch. Out of which 8 hours will be in supervised mode and balance hours in un-supervised mode.
- The journal should be certified by the concerned faculty and by the Head of the Department, failing which the student should not be allowed to appear for External Practical Examination. Student will submit softcopy of Minor Project duly certified by the internal guide.

Major Course : Major discipline is the main focus (Core) dominant subject and the degree will be awarded in that discipline. Students must secure a prescribed number of credits (50% of total credits) through core courses in the major discipline. Students can choose the courses from the pool of courses. The number of courses (subjects) in Major may vary from semester to semester.

Minor Course : Minor discipline is the broader understanding course beyond the major discipline course. It contains generic-electives for students to choose from the pool of courses. It helps students to gain broader knowledge in addition to relevant major disciplines courses as per their choices. Minor subjects may be from same or different disciplines. Student may make choices according to their interest/need, from ODL courses also.

Interdisciplinary/Multidisciplinary/Allied Courses: This is constituent discipline of the major courses and it helps learners to acquire core competence in relevant or any other independent courses of their choices. This course may be major specific or other discipline specific. Learner shall have option to choose the course from available basket of approved courses provided by the university or from any other institutions as the learner's choice. The Credit allocated for these courses is 12 credits of total credits for 3 years' bachelor's degree and four years' bachelor's degree programme.

Internship: A student who wish to exit after successfully completion of first year (Semester-1 and Semester-2) without any backlog is required to obtain Four credits at the end of the year either through the summer internship or university approved skill based certificate courses(two courses of 2-credits each or one 4-credit course). Student is required to enrol for the certificate courses separately by paying the course fees as decided by the college/institute. For summer training, the Institute/college will grant the permission and evaluate the training outcomes. Based on satisfactory completion of the summer training, the Institute head will recommend to the university to grant four credits for summer training. The Internship/summer training/skill based certificate courses will be an audit course.[The internship cost/fees will be bear by the student.]

Ability Enhancement Course (AEC): To be offered to students to achieve competency in a Modern Indian Language and English Language focused on language and communication skills. It may be a major specific course. The Credit allocated for these courses is 10 credits of total credits for 3 years' bachelor's degree and four years' bachelor's degree programme. The courses can be selected by the college/institute from available basket of approved 2-credit certificate courses provided by the university.

Skill Enhancement Course : As per NEP(National Education Policy-2020), it is mandatory for students to select a 2 credit skill enhancement course out of the choices given by the college/institute (From available basket of courses as per University norms). It will be mandatory for the student to opt minimum one 2-credit Skill enhancement course out of offered courses recognised by University during semester-1 to semester-5.

(The student need to enrol separately and pay the fees as decided by the respective institute/department)

Value Addition Course: As per NEP(National Education Policy-2020), it is mandatory for students to select a 2 credit Value Addition Course out of the choices given by the college/institute (From available basket of courses as per University norms). It will be mandatory for the student to opt minimum one 2-credit Value Addition Course out of offered courses recognised by the University during semester-1 to semester-4.

(The student need to enrol separately and pay the fees as decided by the respective institute/department)

 # Marks: : The students will enrol for the course from the given university approved list of certificate courses offered by the respective college/department. The student will select and enrol separately for any of the offered list of courses at college/department/institute and obtain respective credits. The institute will evaluate the performance (preferably continuous evolution) as per the SOP of certificate courses and on successfully completion of the course, the student will be eligible to obtain respective credits for the course. These credits will be considered and reflect in student's mark-sheet as well as in ABC(Academic Bank of Credit). These courses are mandatory and student is required to obtain the specified credits in process to acquire the certificate/diploma/degree.

[The student is required to pay separately for these courses as prescribed by the college. The college will decide the fees for these courses based on the University norms/SOP for certificate course/credit fees.]

** Major Practical based Subjects: Course 403,404 and 405-01/405-02 are major courses consists of two components: Theory and Practical. These courses are carrying 4 credits.

For Course-403 : 3 Hours of Theory and 2 hours of practical per week are allocated.

For Course 404 and 405-01,405-02, 2 Hours of theory and 4 hours of practical per week allocated.

Major courses carry 100 marks of exam weightage (50 theory and 50 practical). External and Internal distribution of marks are in ratio of 50:50 respectively. Students are required to acquire minimum passing marks from theory and practical collectively.

Practical exams for course-403 (2 hours duration), course-404(2 hours duration) and course-405(2 hours duration) will be conducted. External Theory/Practical exam marks (25 marks each for course-403, course-404 and course-405-01/405-02)

Division of marks for External Practical: Exam evaluation: 20 marks + Viva-voce: 5 Marks.

Students are required to pass in both components (Theory and Practical) collectively for course 403,404 and 405-01/405-02 as combined head (Theory + Practical) for each major course. It is mandatory for Students to appear for internal and external theory and practical exams for all courses. Similarly, In case, a student remain absent in any of the component of Theory or Practical of major subject, the student will be considered fail.

Program Passing Rules:	As per University rules.
Program Fees : (Per Semester) (One time fees and exam fees are additional as prescribed by the university) (w.e.f. Academic Year : 2023-24)	Semester Tuition Fees : As per the norms of University Semester Laboratory Utilization fees : Rs. 1,500/- [Other one time /affiliation /exam fees, will be as per the norms of the University] [For all certificate course fees, Skill Enhancement Courses and Value Addition Courses fees will be as per the prescribed limit for per credit as per the SOP of certificate courses decided by the university.]

Course Code: 301
Course Title: The Prominent Gujarati Literary Texts
(પ્રસિદ્ધ ગુજરાતી સાહિત્યિક કૃતિઓ)

Course Category: A.E.C. (Ability Enhancement Course)

Course Code	301
Course Title	**The Prominent Gujarati Literary Texts** (પ્રસિદ્ધ ગુજરાતી સાહિત્યિક કૃતિઓ) [The student is independent to select any other course as per the NEP standards (online/MOOC/Recognized university approved AEC course) or from courses offered by college/institute out of the course basket offered by the University under the Ability Enhancement courses (AEC) basket.]
Credits	2
Course Category	**(AEC) Ability Enhancement Course**
Level of Course	100-199 (Foundation / Introductory)
Course Intake	As per the division intake allocated by University
Course Resource Person:	The institute can invite a professional/expert resource person of the concerned field from any other institute.
Course Fees:	-
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2024-2025
Purpose of Course	The prominent Gujarati Literary Texts aims to deepen participants' understanding of the rich literary heritage of Gujarat. This program focuses on exploring the prominent literature and characters within Gujarati novels, fostering a nuanced appreciation for cultural nuances, historical contexts, and literary techniques. By delving into the intricacies of Gujarati literature, participants can enhance their analytical and critical thinking skills while gaining a broader cultural perspective. [Modern Indian Language (MIL) & English language focused on language and communication skills.]
Course Objective	1) **Cultural Appreciation:** Foster a deep appreciation for the cultural heritage of Gujarat by studying prominent literature and characters in Gujarati texts, allowing participants to understand the societal values, traditions, and historical contexts depicted in the literary works. 2) **Literary Analysis Skills:** Develop participants' analytical and critical thinking skills through an in-depth examination of the narrative structures, themes, and character developments found in Gujarati texts, thereby enhancing their ability to critically assess and interpret literature. 3) **Historical Contextualization:** Provide participants with the necessary historical background to comprehend the evolution of Gujarati literature, enabling them to connect literary movements and periods with the societal changes and influences that shaped the works. 4) **Communication Proficiency:** Enhance participants' communication skills by encouraging them to articulate their interpretations and analyses of Gujarati literature effectively, fostering the ability to express complex ideas and perspectives both verbally and in writing. 5) **Cultural Sensitivity:** Promote cultural sensitivity and cross-cultural understanding by exploring the diverse characters and narratives within Gujarati texts, encouraging participants to recognize and appreciate the pluralistic nature of Gujarati literature and its reflections on society.
Pre-requisite	Knowledge of Gujarati (Reading, Writing and Speaking)

Course Outcomes	**CO1: Comprehensive Knowledge of Prominent Gujarati Novels:** Students will gain a deep understanding of the historical context, cultural nuances, and literary themes of four prominent Gujarati texts that explore historical facts and events. This outcome aims to foster a critical appreciation of the literature's connection to historical narratives. **CO2: Analysis of Key Characters in Gujarati Novels:** Students will analyze and evaluate the main characters in the selected Gujarati texts, examining their motivations, development, and significance within the historical context. This outcome encourages students to delve into character studies and understand the author's portrayal of individuals against the backdrop of historical events. **CO3: Cultural Sensitivity and Contextual Awareness:** Through the exploration of Gujarati texts, students will develop cultural sensitivity and contextual awareness, gaining insights into the social, political, and historical aspects that influence the literature. This outcome aims to enhance students' ability to interpret literature within its broader cultural and historical framework. **CO4: Critical Evaluation of Literary Techniques:** Students will critically evaluate the literary techniques employed by prominent Gujarati novelists, examining narrative structures, symbolism, and stylistic choices. This outcome encourages students to develop a discerning eye for the artistic elements that contribute to the richness of Gujarati literature. **CO5: Understanding Mahatma Gandhi's Autobiography in Gujarati Literature:** By studying Mahatma Gandhi's autobiography written in Gujarati, students will gain insights into his life, philosophy, and the socio-political landscape of the time. This outcome aims to connect the literary exploration of historical events with the personal narrative of one of the most influential figures in history, fostering a holistic understanding of the period.

Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	▓				▓		▓	
CO2	▓			▓			▓	▓
CO3			▓					
CO4	▓			▓		▓		
CO5	▓							

Course Content

Unit-1: "જય સોમનાથ " - લેખક : કનૈયાલાલ મુન્શી
- પરિચય અને ઐતિહાસિક સંદર્ભ: નવલકથાના પ્લોટ અને થીમસની ઝાંખી સોમનાથ મંદિરની ઐતિહાસિક પૃષ્ઠભૂમિ અને પાત્રોનું વિશ્લેષણ અને તેમનું ઐતિહાસિક મહત્ત્વ.
- ગુજરાતનું સાંસ્કૃતિક વિહંગલોકન : નવલકથામાં દર્શાવવામાં આવેલા સાંસ્કૃતિક તત્વોનું અન્વેષણ. નવલકથા અને સમકાલીન ગુજરાતમાં સાંસ્કૃતિક વ્યવહારનો તુલનાત્મક અભ્યાસ.
Unit-2 : "સત્યના પ્રયોગો" - લેખક: મહાત્મા ગાંધી
- સાહિત્યિક સ્વરૂપ તરીકે આત્મકથા: ગાંધીજીની વર્ણન શૈલીનું મહત્ત્વ. ગાંધીજીની ફિલસૂફી પર વ્યક્તિગત અનુભવોની અસરનું વિશ્લેષણ.
- નૈતિક અને તાત્વિક પ્રતિબિંબ: સત્ય અને અહિંસા સાથે ગાંધીજીના પ્રયોગોનું અન્વેષણ.સમકાલીન સમાજમાં ગાંધીવાદી સિદ્ધાંતોની સુસંગતતા પર ચર્ચા.
Unit-3 : "સિંહપુરુષ" - લેખક : ડૉ. શરદ ઠાકર
- પરિચય અને ઐતિહાસિક સંદર્ભ: સ્વતંત્રતા આંદોલન અને સ્વાધીનતા સંગ્રામ ના વિવિધ પાસા.
- વીર સાવરકરની જીવનયાત્રા અને વિચારો.
- કાળાપાણીની સજા અને આંદામાન-નિકોબારની જેલમાં વિતાવેલ કઠિન સમય.
- જીવન ચરિત્ર અને સ્વતંત્રતા માટેની દ્રઢતા.
Unit-4: "પેલે પાર નો પ્રવાસ" : લેખક : રાધાનાથ સ્વામી
- આધ્યાત્મિક અને વ્યક્તિગત વૃદ્ધિ: સ્વામી રાધાનાથની ભારત યાત્રા .

	- સ્વ ની ખોજ માટે ભારતના તત્વજ્ઞાન અને આધ્યાત્મિક જ્ઞાન માટે ના અનુભવો.
	- સ્વ-શોધની ભૂમિકા પર ચર્ચા
	- આંતર-સાંસ્કૃતિક અનુભવો
	- વિવિધ સંસ્કૃતિઓના નવલકથાના ચિત્રણનું વિશ્લેષણ, વિવિધતામાં એકતા સંબંધિત તત્વનું અન્વેષણ.
	- ભારત પ્રવાસ દરમ્યાન થયેલ અનુભવો.
	Unit-5: "મહા-માનવ સરદાર " - લેખક: દિનકર જોશી
	- જીવન ચરિત્ર અને ઘડતર.
	- લોહપુરુષ ની જીવન યાત્રા અને આઝાદી ની ચળવળમાં ભૂમિકા.
	- આઝાદ ભારતના શિલ્પી અને રાજ્યોનું એકત્રીકરણ
	- આધુનિક ભારત અને ભવિષ્યના ભારત અંગેના વિચારો.
Reference Books	1) "મહા-માનવ સરદાર " - લેખક: દિનકર જોશી , ISBN: 9788177907032 (ISBN10: 8177907034), Pravin Prakashan
	2) "Pele Parno Pravas" (Gujarati Of The Journey Home), Radhanath Swami, Publisher: Tulasi Books, ISBN: 9788191035537
	3) "સિંહપુરુષ" - લેખક : ડૉ. શરદ ઠાકર, Publisher: Navbharat sahity Mandir, ISBN-10: 8190240897 ; ISBN-13: 978-8190240895.
	4) "Saty na prayogo", લેખક : Mahatma Gandhi, Publisher: Navjivan Trust ,ISBN(13): 978-8172290429.
	5) "જય સોમનાથ " - લેખક : કનૈયાલાલ મુન્શી, ISBN(13): 978-9351751328
Teaching Methodology	Class Work, Discussion, Self-Study, Case-Study, Seminars , Assignments
Evaluation Method	50% Internal assessment. - Attendance, Class and home Assignment, - One presentation by the student on given topic, - A book review report on given topic of the book and participation in group discussion. 50% External assessment. Seminar exam will be conducted by the two appointed examiners by the college/institute (Criteria for examiner appointment: Similar to the practical examiners appointed at graduation level who are expert in the subject.) - Final review report consist of minimum 3000 words will be prepared and presented by the student on one of the book selected from the five books of the syllabus. (40% weightage) - Student will also prepare detailed critical analysis of any two characters from the available books in the syllabus and prepare a presentation and report(minimum 600 words on each character selected by the student.) (40% weightage) - The examiners can also conduct Viva-voce on the presentation given by the student interaction with the student to evaluate student's understanding about the books and characters. (20% weightage)

Course Code: 302
Course Title: Statistical Methods and Data Analysis

Course Code	302
Course Title	**Statistical Methods and Data Analysis**
	(Multi-Disciplinary Course – 03)
	[Title of the course will be the one selected by the student from courses offered by college/institute out of the
	course basket offered by the University under the Multi-Disciplinary courses or Inter-disciplinary courses.]
Credits	4
Course Category	Multidisciplinary Course (MDC-03)
Level of Course	200-299 (Intermediate Level Course)
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2024-2025
Purpose of Course	To equip students with the fundamental principles and techniques necessary to analyze and interpret data across various disciplines. Through hands-on experience and theoretical understanding, students will gain proficiency in statistical methods essential for making informed decisions and drawing meaningful insights from complex datasets, fostering interdisciplinary problem-solving skills. [Student will opt any one course of multi-disciplinary nature from other than the computer Science and Application faculty. The course will be offered by the institute/college passed by the Board of Studies of University faculties other than the computer science and application faculty.]
Course Objective	1. Develop fundamental level knowledge of statistical data analysis, including data manipulation, visualization, and modelling using R programming language. 2. Understand and apply basic statistical concepts and techniques such as descriptive statistics. 3. Gain practical experience in cleaning, exploring, and preparing datasets for analysis, emphasizing reproducible research practices. 4. Enhance critical thinking and problem-solving skills by applying statistical methods to real-world datasets and interpreting results effectively using R.
Pre-requisite	Knowledge of Fundamentals of Statistics and Mathematics of 10th Grade Level
Course Outcomes	**CO1:** Understand foundational statistical concepts including descriptive statistics, probability theory, and basic inferential statistics. **CO2:** Apply statistical techniques such as hypothesis testing, confidence intervals, and correlation analysis to analyze and interpret data accurately. **CO3:** Demonstrate proficiency in data visualization methods to effectively communicate statistical findings and insights. **CO4:** Utilize basic statistical software tools or programming languages like R or Python to perform data analysis and visualization tasks. **CO5:** Develop critical thinking skills to assess the validity and reliability of statistical analyses and draw appropriate conclusions from data. **CO6:** Apply statistical reasoning to real-world scenarios and make informed decisions based on data-driven insights.

Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1	▓							
	CO2		▓		▓				
	CO3							▓	
	CO4		▓			▓			
	CO5					▓	▓	▓	
	CO6	▓							▓

Course Outcome	After studying the course, students will be able to Implement acquired skills in writing codes using programming languages.

Course Content	**Unit-1: Basic concepts of statistic** 1.1 Population vs. sample,variables (categorical vs. numerical), datatypes. 1.2 Descriptive statistics: measures of central tendency (mean, median, mode). 1.3 Measures of dispersion (range, variance, standard deviation) **Unit-2: Data Representation and Sampling technique** 2.1 Graphical representation of data (histograms, box plots, scatter plots) 2.2 Probability theory: basic probability concepts 2.3 Probability distributions (binomial, normal distributions) 2.4 Sampling techniques: random sampling, stratified sampling. 2.5 sampling distributions. 2.6 Understanding Bell curve. **Unit-3: Introduction to R and working with Data** 3.1 Overview of R and its applications in data analysis and statistics. 3.2 Installing R and RStudio. 3.3 Basic R syntax, variables, and data types. 3.4 Importing data into R from different file formats (CSV, Excel, etc.). 3.5 read, write and view data using data frames. **Unit-4: Data Filtering and cleaning** 4.1 Subsetting and filtering data. 4.2 Adding, removing, and renaming variables/Attributes. 4.3 Data Cleaning and Transformation 4.4 Identifying and handling missing values. 4.5 Data type conversion and recoding variables. **Unit-5: Working with Data in R** 5.1 Reordering and reshaping data frames. 5.2 Merging and joining data frames. 5.3 Calculating summary statistics (mean, median, mode, standard deviation). 5.4 Generating frequency tables and cross-tabulations. 5.5 Commands to measures of central tendency and dispersion. 5.6 Concepts of normal distribution. 5.7 Commands to explore view data distributions graphically (Bell curve).
Reference Books	1. "An Introduction to Statistical Learning: with Applications in R" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, Publisher: Springer, ISBN: 978-1461471370 2. "R for Data Science: Import, Tidy, Transform, Visualize, and Model Data" by Hadley Wickham and Garrett Grolemund, Publisher: O'Reilly Media, ISBN: 978-1491910399 3. "Discovering Statistics Using R" by Andy Field, Jeremy Miles, and Zoe Field Publisher: SAGE Publications Ltd, ISBN: 978-1446200469 4. "Practical Data Science with R" by Nina Zumel and John Mount Publisher: Manning Publications, ISBN: 978-1617291562 5. "Statistics: Unlocking the Power of Data" by Robin H. Lock, Patti Frazer Lock, Kari Lock Morgan, and Eric F. Lock, Publisher: Wiley, ISBN: 978-1119325572 6. "The Art of R Programming: A Tour of Statistical Software Design" by Norman Matloff, Publisher: No Starch Press, ISBN: 978-1593273842 7. "Introduction to Probability and Statistics Using R" by G. Jay Kerns, Publisher: RStudio, PBC, ISBN: 978-1886529450 8. "Business Analytics – The science of Data-Driven Decision Making" by U.Dinesh Kumar, Publsher: Wiley, ISBN: 978-81-265-6872-2
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course: 303: Database handling using Python

Course Code	303
Course Title	Database Handling using Python
Credit	4
Course Category	Major Course
Level of Course	300 -399 (Higher Level)
Teaching per Week	4 Hrs (3 Hours Theory + 2 Hours Lab.work)
Minimum weeks/ Semester	15 (Including Class work, examination, preparation etc.)
Review / Revision	2023-2024
Implementation Year	A.Y.2024-2025
Medium of Instruction	English
Purpose of Course	- The course is aimed to give knowledge about use of SQLite and handle the dataset using Python. Basic purpose of this course to impart knowledge about database handling, dumping and converting to csv and text file using Python. - It also aims to understand connecting dataset with Python and execute queries using Python.
Course Objective	As an outcome of the subject, it is expected that the students will gain conceptual and practical knowledge about handling database, dump the database, restore database, database interaction with python, important python libraries, and perform basic statistical analysis and basic Data Visualization.
Pre-requisite	- SQLite Installation, setup and configuration should be shown practically as part of the preparation. - DDL-Create, Alter, Drop table, Rename, Column, Vacuum - DML-Insert, Update ,Delete, Replace - Constraints : Keys (Primary, Unique, Foreign), Null, Check Constraint - Views (Create and Drop).
Course Out come	**CO1:** To make students understand working with SQLite. **CO2:** To make students understand various components of database like Triggers. **CO3:** To make students understand handling database and dumping the database to csv and text file as well as converting csv and text files to database. **CO4:** To make students understand the importance of library functions to connect python with SQLite and handle the database using python. **CO5:** To handle csv and excel files using python and use various statistical analysis using Numpy and Pandas library. **CO6:** To make student understand and learn matplotlib functions to perform basic visualization of data.

Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2		▓		▓				
	CO3	▓					▓		
	CO4	▓	▓			▓			
	CO5						▓		

	CO6									

Course Content	**Unit-1: Introduction to SQLite:**

Unit-1: Introduction to SQLite:

1.1 SQLite advantages, features and Fundamentals:

1.1.1　SQLite datatype : (Dynamic type, SQLite manifest typing & type affinity) (NULL, INTEGER, REAL, TEXT, BLOB)

1.1.2　Transaction, Rollback, Commit

1.2 Data Filtering and Triggers

1.2.1 Filtering: Distinct, where, between, in, like, Union, intersect, Except, Limit, IS NULL

1.2.2 Having, Group by, Order by, Conditional Logic (CASE)

1.3 SQLite joins: Inner, left, cross, self, Full outer joins.

1.4 SQLite Trigger:

1.4.1　Concepts of Trigger, Before and After trigger (on Insert, Update, Delete)

1.4.2　Create, Drop trigger, Disable and Enable trigger

Unit-2: Database backup and CSV handling:

2.1 SQLite dump :

2.1.1　Dump specific table into file, Dump only table structure

2.1.2　Dump entire database into file

2.1.3　Dump data of one or more tables into a file

2.2 CSV files handling:

2.2.1　Import a CSV file into a table

2.2.2　Export a CSV file from table

Unit-3: Python interaction with SQLite:

3.1 Module: Concepts of module and Using modules in python.

3.1.1　Setting PYTHONPATH, Concepts of Namespace and Scope

3.1.2　Concepts of Packages in python

3.2 Importing sqlite3 module

3.2.1　connect () and execute() methods.

3.2.2　Single row and multi-row fetch (fetchone(), fetchall())

3.2.3　Select, Insert, update, delete using execute () method.

3.2.4　commit () method.

Unit-4: Python Interaction with text and CSV:

4.1 File handling (text and CSV files) using CSV module :

4.1.1　CSV module , File modes: Read , write, append

4.2 Important Classes and Functions of CSV modules:

4.2.1　Open(), reader(), writer(), writerows(), DictReader(), DictWriter()

4.3 Dataframe Handling using Panda and Numpy:

4.3.1　csv and excel file extract and write using Dataframe

4.3.2　Extracting specific attributes and rows from dataframe.

4.3.3　Central Tendency measures :

4.3.3.1 mean, median, mode, variance, Standard Deviation

4.3.4　Dataframe functions: head, tail, loc, iloc, value, to_numpy(), describe()

	Unit-5: Data Visualization using dataframe: 5.1 importing matplotlib.pyplot and plotting: (only two dimensional Plots) 5.1.1 range() , subplot() , legend(), columns(), len() functions. 5.2 scatter plot: concept of Scatter plot, set title, xlabel and ylabel) 5.3 Line chart : concept of line plot: plot(), set_title(), legend() 5.4 histogram chart : Concepts of histogram hist(),set title, xlabel and ylabel 5.5 Bar Chart : Concepts of Bar chart, bar(),set title, xlabel and ylabel. [Practical implementation for this paper is not specific to any editor or UI .]
Reference Books	1. Learning with Python, Author: Allen Downe Publisher: DreamTech Press, ISBN: 978-9351198147 2. Python: The Complete Reference, Author: by Martin C. Brown, McGraw Hill Education,ISBN:978-9387572942 3. Learning Python: Powerful Object-Oriented Programming: 5th Edition, Author: Lutz M, Publisher: Shroff, ISBN:978-9351102014 4. Python In - Depth, Author: Ahidjo Ayeva , Kamon Ayeva, Publisher: BPB Publication, ISBN:978-9389328424 5. The SQLite Handbook, Author: by Rita Blackburn, Publisher: Emereo Publishing, ISBN:978-1489136459 6. Using SQLite, Author: Jay A. Kreibich, Publisher: O'Reily, ISBN:978-0596521189 7. "Python and SQLite: Build a Data Driven Web App", Author: Michael Driscoll, Publisher: CreateSpace Independent Publishing Platform, ISBN: 978-1484225820 8. "Mastering Python Networking: Your one-stop solution to using Python for network automation, DevOps, and Test-Driven Development", Author: Eric Chou, Publisher: Packt Publishing, ISBN: 978-1784397005 9. "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", Author: Wes McKinney, Publisher: O'Reilly Media, ISBN: 978-1491957660 10. "Head First Python: A Brain-Friendly Guide", Author: Paul Barry , Publisher: O'Reilly Media, ISBN: 978-1491919530 11. "Learning Python: Powerful Object-Oriented Programming", Author: Mark Lutz, Publisher: O'Reilly Media, ISBN: 978-1449355739
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

<div align="center">

Course Code: 304
Course Title: Object Oriented Programming and Data Structures
(OOPs & D.S.)

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Course Code	304
Course Title	Object Oriented Programming and Data Structures (OOPs & D.S.)
Credits	4
Course Category	Major Course
Level of Course	300-399 (Higher Level)
Teaching per Week	4 Hrs. (2 Hours Theory + 4 Hours Practical work)
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	2023-2024
Implementation Year:	A.Y. 2024-2025
Purpose of Course	- Understand Object Oriented Programming Concepts and skills necessary for developing programs using C++. And it is important for a computer programmer to understand the storage representation and implementation of various data structures used in a computer program. This helps a programmer to use various data structures efficiently which in turn makes the program efficient. This course introduces various data structures, their storage representation & implementation. - Data Structure concepts are important concepts to understand and implement. Purpose of the Data structure is to get basic ideas about how user defined data structures can be implemented. Implementation of Data Structure concept is not language specific.
Course Objective	1) This course has been designed for the beginners to help them understand basic to advanced concepts related to C++ Programming language. 2) To make students understand the importance of OOP methodology and techniques. 3) Basic concepts of data structures, role and importance of data structures in computer programming. 4) Distinguish the key difference between storage & implementation of various data structures. 5) Recognize the problem properties and determine the use of appropriate data structures in different scenarios.
Pre-requisite	Knowledge of C programming Language
Course Outcomes	CO1: Students will be able to formulate a computing problem to executable computer program using C++ language. CO2: Understand concepts of class, objects, polymorphism, Inheritance and other important Object oriented concepts. CO3: Understanding about user defined data structures and their importance. CO4: Basic implementations of Stack and Queue. CO5: Concepts of variables, literals, data types, conversions of data types, input and output data and processing of data, inbuilt functions, arrays, header files, conditional and iterative statements.

Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								

Course Content

Unit 1. Concepts of OOPS:
1.1 Difference between procedural programming and OOPS
1.2 Various library(header) files require for C++
1.3 Data types in C++
1.4 Concepts of String:
   1.4.1 character Array
   1.4.2 pointer to character array
   1.4.3 Use of String.h and its important functions:
      (strcmp, strcat, strcpy, strlen, strrev)
1.5 Concepts of Class and Object

Unit 2. Data Encapsulation and inheritance:
2.1 Access controls concepts (Public, Private, Protected) and difference among them
2.2 Declaring simple class, member variables and member functions.
2.3 Concepts and use of enum.
2.4 Concepts of Data hiding, abstraction and encapsulation with examples
2.5 Concepts of Inheritance and Types of Inheritance
2.6 Constructors and Destructors

Unit 3. Polymorphism
3.1 Concepts of Polymorphism
3.2 Compile time and Run time Polymorphism
3.3 Overloading and Overriding:
   Concepts, difference and application
3.4 Concepts of friend function
3.5 Concepts of virtual function and pure virtual function

Unit 4. Data Structure
4.1 Introduction of Data Structure and application areas.
4.2 Recursion concepts
4.3 Difference among Linear and Non-Linear Data Structure
4.4 Stack
   - Concepts of Stack(LIFO)
   - Pop, Push and Display(Peep)
   - Application areas of Stack
    (Infix to postfix, Infix to prefix)

Unit 5. Queue
5.1 Concepts of Queue(FIFO)
   5.1.1 Concepts of Queues and its basic operations
5.2 Implementation of Queue:
   5.2.1 Simple Queue: insert, delete and display
   5.2.2 Double ended Queue: insert, delete and display
   5.2.3 Circular queue: Insert, delete and display.

Reference Books	1. Let us C++, Yaswant Kanitkar - TMH Publication
	2. Programming with C++, E Balaguruswamy - BPB Publication
	3. C++ and Object-Oriented Programming Paradigm, Jana - PHI
	4. The Complete Reference C++, Herbert Schildt - TMH
	5 The C++ Programming Language, Stroustrup – Addison Wesley
	6. OOP in Turbo C++, Robert Lafore - Galgotia Publication
	7. C++ Primer, Lippman – Addison Wesley
	8. Object Oriented Programming Fundamentals & Applications, Probal Sengupta – PHI
	9. An Introduction to Data Structures with applications, Trembley – Tata McGraw Hill.
	10. Algorithms – Data structure programs, Wirth Niclaus - PHI.
	11. Data structures – A Programming Approach with C, Dharmender Singh kushwaha and Arun Kumar Misra – PHI.
	12. Fundamentals of Data structures, Horwitz E. and Sahni – Computer Science Press
	13. Schaum's outline of Data Structure with C++, John R. H. - Tata McGraw Hill.
	14. Expert Data Structure with C, R. B. Patel - Khanna Publication
	15. Data structures - a Pseudocode approach with C++, Richard F. Gilberg and Behrouz A. Forouzan - Thomson books
Teaching Methodology	Class Work, Discussion, Lab work, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course Code: 305-01
Course Title: Web Designing-1

Course Code	305
Course Title	Web Designing-1
Credits	4
Course Category	Major Course
Level of Course	300-399 (Higher Level)
Teaching per Week	4 Hrs. (2 Hours Theory + 4 Hours Practical work)
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	2023-2024
Implementation Year:	A.Y. 2024-2025
Purpose of Course	- Design is the process of collecting ideas, and aesthetically arranging and implementing them, guided by certain principles for a specific purpose. - Web design is a similar process of creation, with the intention of presenting the content on electronic web pages, which the end- users can access through the internet with the help of a web browser. - This course deals with designing of websites.
Course Objective	To make students aware of web terminology and website designing tools. Student can understand and implement the real functions of website development.
Pre-requisite	Basic knowledge of Simple HTML and HTML-5 concepts, windows based applications. Some very basic acquaintance with computers and the www is assumed.
Course Outcomes	**CO1:** Develop proficiency in HTML5 syntax and semantics, and CSS styling techniques for creating visually appealing web pages. **CO2:** Implement Bootstrap framework for rapid prototyping and responsive design, ensuring cross-browser compatibility and scalability. **CO3:** Utilize JavaScript for interactivity and dynamic content manipulation, incorporating libraries like jQuery for streamlined development. **CO4:** Demonstrate the ability to integrate HTML5, CSS, Bootstrap, and JavaScript to create cohesive and engaging web applications. **CO5:** Apply industry-standard practices in web development, including code optimization, version control, and responsive design principles.

Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								

| Course Content | **UNIT-1: Working with HTML5 and CSS:**
1.1 concepts of CSS:
    1.1.1 Adding CSS (Inline,Internal,External)
    1.1.2 HTML Links and attribute.(_self, _blank, _parent, _top)
    1.1.3 Absolute URL and Relative URL in <href>
    1.1.4 <img> tag and its attributes (src, alt, style,width,height)
1.2 HTML forms :
    1.2.1 form Elements and their attributes :
        1.2.1.1 form (action, method, novalidate, autocomplete,target)
        1.2.1.2 label, input (text, radio button, Checkboxes, submit/reset button)
        1.2.1.3 select(id, name,<option>),
        1.2.1.4 textarea (name, rows, cols), |

1.2.1.5 button(type, onclick)
1.2.1.6 datalist
1.2.2 Media : Video, Audio

UNIT-2: Design Web Sites Using Bootstrap4
2.1 Bootstrap Introduction
2.2 Grid Structure
2.3 Table, Colours, Alerts, Form Controls
2.4 Buttons and ButtonGroups
2.5 Images, Media Objects
2.6 Pagination
2.7 Bootstrap Grids
2.8 Bootstrap Themes

UNIT-3: Overview of Java Script
3.1 Overview of Client & Server-Side Scripting
3.2 Structure of Java Script
3.3 Data types and Variables
3.4 Operators (Arithmetic, Assignment, Comparison,
     Logical and Conditional Operator)
3.5 Control Structure
   3.5.1 If...Else, switch..case
   3.5.2 While, Do...While, For Loop
   3.5.3 break, continue
3.6 Java Script String and Events
   3.6.1 Javascript Strings types
   3.6.2 String functions:
      concat(), split(), indexOf(), lastIndexOf(), substring(),
      trim(), slice(), replace(), charAt()
   3.6.3 Javascript Events :
      3.6.3.1 Mouse Events : (click, mouseover, mouseremove,
                 mouseout, mouseup)
      3.6.3.2 keyboard Events : (keyup,keydown)
      3.6.3.3 Form Event : (focus, submit, blur, change)

UNIT-4: JavaScript Objects :
4.1 Creating object :
   (By object literal, By creating instance of Object,
   By using an object constructor)
4.2 Date object :
   4.2.1 Date constructor: Date(), Date(milliseconds),
           Date(dateString), Date(year, month, day, hours,
           minutes, seconds, milliseconds)
   4.2.2 Date Methods: getDate(), getDay(),getMonth(), getHours(),
           setDate, setMonth(),setDay(), toString()
4.3 Document Object Model (DOM):
   4.3.1 DOM concepts
   4.3.2 DOM properties
   4.3.3 DOM methods :
           write(), writeln(),getElementById(),getElementsByName()

UNIT-5: JavaScript Functions:
5.1 JavaScript Functions:
   5.1.1 Defining function (with and without parameters)
   5.1.2 calling function
   5.1.3 return statement
   5.1.4 Page redirection

	5.2 Dialog boxes : Alert, confirm, prompt
	5.3 Form validation :
	5.3.1 Basic validation (All form details are filled)
	5.3.2 Data format validation
	(email, number, string, mobile number, name)
	[All Units carry Equal Weightage]
Reference Books	1. HTML & CSS: The Complete Reference - Thomas Powell - McGraw Hill Education
	2. HTML Unleased, Darnell Rick –Techmedia
	3. HTML, XHTML, and CSS Bible - Steven M. Schafe – Wiley Publications
	4. Cascading Style Sheets- The Definitive Guide, E. A Meyer –O'Reilly
	5. Java Scripting Programming for Absolute Beginner, Harris -PHI
	6. JavaScript Step by Step, Suehring -PHI
	7. Bootstrap in 24 Hours, Sams Teach Yourself - JenniferKyrnin
	8. Learning Bootstrap 4 - Matt Lambert – Packt Publishing
	9. Bootstrap Responsive Web Development - Jake Spurlock - O'Reilly Media.
	10. JavaScript and JQuery (Interactive Front-End Web Development) by Jon Duckett
	11. JavaScript and JQuery (The missing manual) by David Sawyer MCFarland
Teaching Methodology	Class Work, Discussion, Lab work, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment.
	50% External assessment.

Course Code	305-02
Course Title	Mobile Application Development – 1
Credits	4
Course Category	Major Course
Level of Course	300-399 (Higher Level)
Teaching per Week	4 Hrs. (2 Hours Theory + 4 Hours Practical work)
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	2023-2024
Implementation Year:	A.Y. 2024-2025
Purpose of Course	Mobile application development is the process of creating software applications that run on a mobile device, and a typical mobile application utilizes a network connection to work with remote computing resources. Mobile device is used for different purposes ranging from email to online shopping and multiple apps for different reasons. Hence, the mobile development process involves creating installable software bundles, implementing backend services such as data access with an API, and testing the application on target devices. Knowledge about mobile application development on Android platform and gradually on hybrid platform is need of the current era.
Course Objective	1) To understand concepts of Mobile Technology 2) Understand the development process and have edge over mobile user interface (UI) design. 3) Understand various UI development tools, Application design interfaces and creating basic app on Android platform.
Pre-requisite	- Basic knowledge of Simple HTML, concept of Operating system and basics of coding. - This course will be mandatory to pursue Paper-405-02 (Mobile ApplicationDevelopment -2) in Semester-4.
Course Outcomes	CO1 : Students will be able to understand the concepts of Mobile technology. CO2 : Students will have concepts of Android and Android frame work. CO3 : Understand how data can be transferred using XML. CO4 : Understand setting up of Android environment. CO5 : Edge over Android widgets and development of basic Android based Apps.

Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								

Course Content	**Unit-1: Concepts of Android and Setting up Android Environment:**
	1.1 Introduction of Android
	    1.1.1 History, concepts and Features of Android
	    1.1.2 Concepts of API framework

1.2 Intro. of Android Architecture (Software Stack)

        1.2.1 kernel Native Libraries

        1.2.2 Concepts of Native Libraries and Android Runtime(Dalvik VM)

        1.2.3 Application Framework

        1.2.4 Application

1.3 Dalvik Virtual Machine (DVM)

1.4 Android Emulator

        1.4.1 Setting up JDK and Android Studio

        1.4.2 Android SDK manager

1.5 Creating Android Virtual Device (AVD)

Unit-2: Creating basic App

2.1 Creating first App:

        2.1.1 Activity

        2.1.2 Layout

2.2 Basic App using Android studio

        2.2.1 Create new android project

        2.2.2 Write message and run

        2.2.3 Understanding different components.

2.3 Understanding AndroidManifest.xml, R.java

Unit-3: XML (Extensible Markup Language)

3.1 Characteristic and Use of XML

3.2 XML syntax (Declaration, Tags, elements)

3.3 root element, case sensitivity

3.4 XML document:

        3.4.1 Document Prolog Section

        3.4.2 Document element section

3.5 XML declaration and rules of declaration.

Unit-4: Android Widgets(UI):

4.1 Hiding Title bar

4.2 screen Orientation (Portrait, Landscape)

4.3 Form Widget Palette

        4.3.1 Placing text fields and Button

        4.3.2 Button onClick event

4.4 Displaying Notification:

        4.4.1 Toast Class

        4.4.2 Displaying message on Toast

4.5 ToggleButton:

        4.5.1 ToggleButton Attributes:(textOff, textOn)

        4.5.2 Event methods : getTextOff(), getTextOn(), setChecked()

Unit-5: Other Android Widgets(UI):

5.1 CheckBox:

        5.1.1 Event methods: isChecked(), setChecked()

        5.1.2 Default and Custom Checkbox

5.2 RadioButton:

        5.2.1. Event methods of RadioButton

        5.2.2. Dynamic and Custom RadioButton

5.3 Spinner, AlterDialog

    5.4 AutoCompleteTextView, TextWatcher to EditText

Reference Books	1) Android Application Development (With Kitkat Support), Author: Pradeep Kothari, Publisher:DreamTech Press.,ISBN:978-9351194095 2) Android Studio 3.0 Development Essentials: Android 8 Edition , Author: Neil Smyth, ISBN:978-1977540096 3) Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 2, Author: Alessandro Biessek, Packt Publishing House,ISBN:978-1788996082 4) Beginning Flutter: A Hands On Guide to App Development, Author: Marco L. Napoli, Publisher: Wrox, ISBN:978-1119550822 5) Android Programming for Beginners - Second Edition, Author:John Horton, Publisher: Image Short ISBN: 978-1789538502 6) Android 9 Development Cookbook, Author: Rick Boyer, Publisher: Packet Publishing, ISBN:978-1788991216 7) The Dart Programming Language, Author:Bracha, Publisher:Pearson Education India, ISBN:978-9332570368 8) Google Flutter Mobile Development Quick Start Guide: Get up and running with iOS and Android mobile app development, Author:Prajyot Mainkar, Publication:Packt Publishing, ISBN:978-1789344967 9) Practical Flutter: Improve your Mobile Development with Google's Latest Open-Source SDK ,Author: Frank Zammetti, Publisher: Apress, ISBN:978-1484249710
Teaching Methodology	Class Work, Discussion, Lab work, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course code: 306
Course Title: Skill Enhancement Course (SEC-03)

Course Code	306
Course Title	Skill Enhancement Course - III (SEC – 03)
Credit	2
Category of Course	Skill Enhancement Course
Level of Course	200-299 (Intermediate Level)
Teaching per Week	2 Hrs (Any or Combination of Theory/Practical/Fieldwork/Internship/Project)
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2024-2025
Purpose of Course	- As per NEP(National Education Policy-2020), it is mandatory for students to select a 2 credit Skill Enhancement Course out of the choices given by the college/institute. - It will be mandatory for the student to opt minimum one 2-credit Skill Enhancement Course out of the list of offered courses recognised by the University during semester-1 to semester-5. - The student can start an alternative career in the field by obtaining higher degree of knowledge in the area. - It's aimed at imparting practical skills, embedded internship, hands-on training, soft skills, life skills, such approved online courses etc. to enhance the employability of students. This may also include courses as per the need of new evolving technology.
Course Objective	Obtaining skill in particular field along with the regular curriculum of the selected program is essential. It not only enhance the skill but also provide an opportunity to develop skill in particular area where one can pursue career in future. Skill enhancement provides the opportunity and knowledge for an individual to develop and strengthen the necessary skills to gain, maintain, and advance in a chosen area. Skill enhancement programs are focused around training that combines the best practices from varieties of areas. Skill enhancement or training typically uses a combination of cognitive and behaviour problem solving approaches, both of which are used to strengthen a person's positive skill develop.
Pre-requisite	-
Course Content and Implementation road-map.	(i) University has categorised and prepared the basket of the courses including approved online courses that can be offered as Skill Enhancement Course. (ii) The institute/college/department can design and implement skill enhancement course by getting approval from the relevant apex body of the university considering the SOP of the certificate course policies of the University. (iii) The institutes/college/departments can select more than one course out of the given sets of courses and offer them to their students. (iv) The students can select any of the courses offered by the institute/college/department from the given choices and enrol for the course. (v) The institute/college/department will arrange appropriate resource person(s) for the course. (vi) The course evaluation will be taken place at the college/institute/department level based on the nature of the course. (vii) The institute/college/department will assess the student based on the nature of the course. The student will be granted the credits on successful completion of the course.

Reference Books	- The reference materials and books will be decided by the Institutes/Colleges/Departments based on the selected Courses. - Minimum five copies of relevant topics are recommended to keep in the library.
Teaching Methodology	Class Work/ Discussion/ Self-Study/ Seminars/ field works/ practical training/ field work and/or Assignments.
Evaluation Method	50% Internal assessment. 50% External assessment. Maximum Marks: 50 (Evaluation and Assessment will be carried out at institute level. On successful completion of the course, the student will be granted 2 credits. However, the obtained score will not be considered for S.G.P.A./C.G.P.A.)

Course code: 307
Course Title: Value Addition Course-III (VAC-03)

Course Code	307
Course Title	Value Addition Course - III (VAC – 03)
Credit	2
Category of Course	Value Addition Course
Level of Course	200-299 (Intermediate Level Course)
Teaching per Week	2 Hrs (Any or Combination of Theory/Practical/Fieldwork/Internship/Project)
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2024-2025
Purpose of Course	As per NEP(National Education Policy-2020), it is mandatory for students to select a 2 credit Value Addition Course out of the choices given by the college/institute. It will be mandatory for the student to opt minimum one 2-credit Value Addition Course out of the list of offered courses recognised by the University during semester-1 to semester-4. The student can start an alternative career in the field by obtaining higher degree of knowledge in the area.
Course Objective	Obtaining knowledge in all or any of the components/fields like (i) Understanding India (ii) Environmental Science/Education (iii) Digital/Technological solutions (iv) Health & Wellness, Yoga education, sports, and fitness are essential for holistic development (v) Indian Knowledge system (IKS). The course components should be among these five categories/fields and as per the Curriculum and Credit Framework for Undergraduate Programmes of the UGC (Page-22 of the document). The purpose is to impart knowledge and understand the necessities of these aspects in life to make the healthy society and nation. It help in development of a dedicated and responsible citizen of the country by adding value to the life.
Pre-requisite	-
Course outcome	CO1: Student select the area of Value addition as per his/her interest. The choices will be given by the institute/department. CO2: The student acquire basic and fundamental level of knowledge in the field that the student opted. CO3: Understand the insight of the area and possibility of to explore more in the field. CO4: Understand effective representation of problems, solutions and insights of the challenges and problems of the peer subject relevant to value addition. CO5: Learn to upskill and upgrade the knowledge in the area of selected subject.
Course Content and Implementation road-map.	(i) The university has categorised and prepared the list of the courses that can be offered as Value Addition Course. (ii) The institute/college/department can design and implement skill enhancement course by getting approval from the relevant apex body of the university considering the SOP of the certificate course policies of the University. (iii) The institutes/college/departments can select more than one course out of the given sets of courses and offer them to their students. (iv) The students can select any of the courses offered by the institute/college/department from the given choices and enrol for the course. (v) The institute/college/department will arrange appropriate resource person(s) for the course.

	(vi) The evaluation will be taken place at the college/institute/department based on the nature of the course. (vii) The institute/college/department will assess the student based on the nature of the course. The student will be granted the credits on successful completion of the course.
Reference Books	- The reference materials and books will be decided by the Institutes/Colleges/Departments or as per the university guidelines based on the selected Courses. - Minimum five copies of relevant topics are recommended to keep in the library.
Teaching Methodology	Class Work/ Discussion/ Self-Study/ Seminars/ field works/ practical training/ field work and/or Assignments.
Evaluation Method	50% Internal assessment. 50% External assessment. Maximum Marks: 50 (Evaluation and Assessment will be carried out at institute level. On successful completion of the course, the student will be granted 2 credits. However, the obtained score will not be considered for S.G.P.A./C.G.P.A.)

Internship: Student willing to exit the program at the end of the two semesters and to avail the Certificate in Computer Application or exit the program at the end of the first four semesters and to avail the Diploma in Computer Application, it is essential to acquire four credits from internship. A key aspect of the internship is induction into actual work situations. Internships involve working with local industry, government or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in on-site experiential learning. In option to these internships, the student can avail such four credits by availing two 2-credit university approved courses during any of these semesters. The student is required to enroll and avail these 4-credits and produce the evidence in process to opt the multi-level exit option after successfully completion of first year (two semester) or second year(four semesters).

Semester - 4

Course Code: 401
Course Title: Organizational Soft-skills in Software Industry

Course Code	401
Course Title	Organizational Soft-skills in Software Industry Ability Enhancement Course – 04 [In option to this course, the course will be selected by the student and required 2 credits can be opted from the list of courses mentioned in Table-6 (Page number 51 – 52) from NEP-2020 S.O.P. of Gujarat State implementation handbook for NerFr. The credits can be acquired through any valid MOOC, online courses recognized and approved by UGC or from courses offered by college/institute out of the course basket offered by the University under the Ability Enhancement courses]
Credits	2
Course Category	**Ability Enhancement Course (AEC-04)**
Level of Course	200-299 (Intermediate Level)
Teaching per Week	2 Hours
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2024-2025
Purpose of Course	Computer Science professionals work at different levels in the hierarchy of various jobs in IT. It is essential to understand the Organization Structure and behavior. - Integration of Knowledge and Skills: One objective of a multidisciplinary course is to foster the integration of knowledge and skills from different disciplines. By combining various areas of study, students can gain a holistic understanding of a particular topic or problem. This objective aims to break down the traditional boundaries between subjects and encourage students to see connections and relationships across different fields. - Promoting Critical Thinking and Problem Solving: Another objective is to enhance students' critical thinking and problem-solving abilities. Multidisciplinary courses often involve complex real-world issues that require a multifaceted approach. By engaging with diverse perspectives and methodologies, students develop the capacity to analyze problems from multiple angles, think creatively, and propose innovative solutions. - Enhancing Collaboration and Communication Skills: Collaboration and effective communication are essential skills in today's interconnected world. Multidisciplinary courses aim to cultivate these skills by providing opportunities for students to work collaboratively with peers from different disciplines. Through group projects, discussions, and presentations, students learn how to articulate their ideas, listen actively to others, and collaborate effectively to achieve common goals. This objective prepares students for interdisciplinary work environments and encourages the exchange of ideas across disciplinary boundaries.
Course Objective	These courses are designed as combination of Indian Languages (from the Eighth Schedule of the Indian Constitution) and English language courses, with a specific focus on enhancing language and communication skills. The primary objective of these courses is to help students acquire and demonstrate essential soft-skills in discipline specific(software industry), linguistics skills, including critical reading, expository writing and academic writing.

	HEIs have flexibility to introduce courses that are tailored to specific disciplines or are applicable across all undergraduate programmes. A list of a few AEC courses is provided in Table-6 (3.3.4) of Implementation of NEP-2020 for the state of Gujarat S.O.P.
Pre-requisite	Knowledge of English at H.Sc.(10th) Level
Course Outcomes	**CO1:** After completion of the course the student will be aware about the Structure of an organization **CO2:** Also, will have better understanding of human behaviour in an organization **CO3:** Students will understand and develop their attitude **CO4:** Students will learn the importance of motivation **CO5:** Students will be able to understand the leader, skills of leader and leadership styles **CO6:** students will have idea about BPO and call centers

Mapping between Course Outcome(CO) and Program Specific Outcome (PSO):

	PS01	PS02	PS03	PS04	PS05	PS06	PS07	PS08
CO1	X		X					
CO2	X							
CO3						X		
CO4	X				X			X
CO5	X							
CO6		X		X				X

Course Content

Unit 1: Introduction to Software development Organization Structure

1.1 What makes an organization
1.2 Overview of software organizational structure and its importance in software development
1.3 Structure of organization:
1.4 Traditional vs. Agile organizational structures in software development
1.5 Roles and responsibilities within software development teams
1.6 Management in Software Organization : Scope and Role of Management

Unit 2: Writing Skills for Effective Communication in Organizations

2.1 Importance of writing skills in software organizations
2.2 Principles of effective written communication (clarity, conciseness, coherence)
2.3 Techniques for writing professional emails, reports, and documentation
2.4 Best practices for writing technical documents and user manuals in software development

Unit-3 : Software Organizational Hierarchy and team building

3.1 Hierarchy in software development organization and roles of Project manager, System Analyst, System Architect, Business Model Developer, Team Leaders, Coders, Debuggers.
3.2 Managerial Skills (Technical Skills, Human Skills, Conceptual Skills)
3.3 Importance of verbal communication skills in software development teams
  3.3.1 Effective communication in meetings, stand-ups, and presentations
  3.3.2 Active listening techniques for better understanding and collaboration
  3.3.3 Strategies for conveying technical concepts to non-technical stakeholders

Unit 4: Communication Strategies for Collaboration

4.1 Importance of communication in team collaboration and project management.
4.2 Strategies for resolving conflicts and addressing disagreements in software teams.

	4.3 Effective communication techniques for remote and distributed teams. 4.4 Building rapport and fostering team cohesion through effective communication practices. 4.5 Opportunities for automation, intelligent decision-making, and impact on software development teams.
Reference Books	1.) Title: "Software Engineering at Google: Lessons Learned from Programming Over Time", Author: Titus Winters, Tom Manshreck, Hyrum Wright, Publisher: O'Reilly Media, ISBN: 978-1492082798 2.) Title: "The Elements of Style", Author: William Strunk Jr., E.B. White, Publisher: Pearson, ISBN: 978-0205309023 3.) Title: "Writing That Works: How to Communicate Effectively in Business", Author: Kenneth Roman, Joel Raphaelson, Publisher: HarperBusiness, ISBN: 978-0060956431 4.) Title: "Technical Communication: A Reader-Centered Approach", Author: Paul V. Anderson, Publisher: Cengage Learning, ISBN: 978-1305667884 5.) Title: "Crucial Conversations: Tools for Talking When Stakes Are High", Authors: Kerry Patterson, Joseph Grenny, Ron McMillan, Al Switzler, Publisher: McGraw-Hill Education, ISBN: 978-0071771320 6.) Title: "Nonviolent Communication: A Language of Life", Author: Marshall B. Rosenberg, Publisher: Puddledancer Press, ISBN: 978-1892005038. 7.) Title: "The Silent Language", Author: Edward T. Hall, Publisher: Anchor, ISBN: 978-0385055499 8.) Title: "Emotional Intelligence 2.0", Authors: Travis Bradberry, Jean Greaves, Publisher: TalentSmart, ISBN: 978-0974320625 9.) Title: "Leadership and Self-Deception: Getting Out of the Box", Authors: The Arbinger Institute, Publisher: Berrett-Koehler Publishers, ISBN: 978-1576759776 10.) Title: "Difficult Conversations: How to Discuss What Matters Most" Authors: Douglas Stone, Bruce Patton, Sheila Heen, Publisher: Penguin Books, ISBN: 978-0143118442.
Teaching Methodology	Class Work, Discussion, Self-Study, Case-study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment. External Assessment: Each student will be given a case-study of software industry to study organizational structure, hierarchy of the employee structure, environment and interpersonal communication among the teams. Tools and techniques used to interact within the organization and with the clients. The students will create a report/document based on the given case study and give presentation at the end of the semester for final evaluation. The examiner panel will consist of two examiners including one faculty member/resource person who handled the course and one person from the software industry. (Incase the person from software industry is not available, both examiners can be faculty members/resource person of the institute.) Assessment : - Writing skills and report/documentation abilities (20%) - Oral presentations evaluating verbal communication skills (20%) - Viva-voce (20%) - Case study analysis and problem-solving exercises focusing on communication strategies in software organizations (40%)

Course Code : 402-01
Course Title: IoT (Internet of Things)

Course Code	402-01
Course Title	Internet of Things (IoT)
Credit	4
Course Category	Minor Course
Level of Course	200-299 (Intermediate Level)
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation etc.)
Last Review / Revision	A.Y. 2023-2024
Implementation Year:	A.Y. 2024-2025
Medium of Instruction	English
Purpose of Course	The purpose of the "Introduction to IoT" course is to provide students with a foundational understanding of the Internet of Things (IoT) ecosystem. Through this course, students will gain insight into the concepts, technologies, and applications that underpin IoT networks and devices. They will explore the interconnected nature of IoT systems, learn about sensors, actuators, and connectivity protocols, and understand how data is collected, transmitted, and analyzed in IoT environments. Ultimately, the course aims to equip students with the knowledge and skills to comprehend the potential of IoT in various industries, and to critically evaluate IoT solutions for addressing real-world challenges.
Course Objective	To understand the concepts and protocols related to Internet of Things. To get an idea where the application areas are available for the Internet of Things to be applied.
Pre-requisite	Basic Knowledge of Networking
Course Out come	**CO1:** Understand the Concept of IoT: Students will be able to define the Internet of Things (IoT) and explain its significance in connecting physical devices, sensors, and actuators to the internet to enable data exchange and automation. **CO2:** Identify IoT Components and Technologies: Students will be able to identify and describe the key components of IoT systems, including sensors, actuators, microcontrollers, communication protocols, and cloud platforms. **CO3:** Explain IoT Communication Protocols: Students will be able to explain various communication protocols used in IoT networks, such as Wi-Fi, Bluetooth, Zigbee, and MQTT, and understand their strengths, weaknesses, and applications. **CO4:** Analyze IoT Applications and Use Cases: Students will be able to analyze real-world IoT applications and use cases across different industries, such as smart homes, healthcare, transportation, agriculture, and industrial automation. **CO5:** Design and Implement Simple IoT Solutions: Students will be able to design and implement simple IoT solutions using hardware components, microcontrollers, sensors, actuators, and basic programming languages. **CO6:** Evaluate IoT Security and Privacy Considerations: Students will be able to identify and assess security and privacy challenges in IoT

systems, understand common vulnerabilities and threats, and explore strategies for securing IoT devices and data.

Mapping between Course Outcomes (CO) and Program Specific Outcomes (PSO):		PS01	PS02	PS03	PS04	PS05	PS06	PS07	PS08
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								
	CO6								

Course Content

Unit 1: Introduction to Internet of Things

1.1 Definition & Characteristics of IoT
1.2 Introduction to IoT Architecture
1.3 Physical Design of IoT
    1.3.1   Things in IoT
    1.3.2   IoT Protocols (Ethernet , WIFI , WIMAX, LR-WPAN(Wireless personal area network), 2G/3G/4G Mobile Communication, IPV6,6LOWPAN,MQTT, WEB SOCKET)
1.4 Logical Design of IoT
    1.4.1   IoT Functional Blocks
    1.4.2   IoT Communicational Models
- Request – Response
  - Publish –Subscribe
  - Push –Pull
- Exclusive Pair

Unit 2. IoT and M2M

2.1 Introduction M2M
2.2 Introduction to Sensor Technology
2.3 Difference between IoT and M2M,
2.4 Security for IoT
2.5 IoT Enabling Technologies
    2.5.1 Wireless Sensor Networks
    2.5.2 Big Data Analytics,
    2.5.3 Embedded Systems.

Unit 3.Sensors and Actuators in IoT

3.1 Definition of Sensors
3.2 Types of sensors and its usage
(Temperature, Humidity, Gas Detector, Ultrasonic, Fire detector, Light, Sound, IR, Water Level)
3.3 Introduction to Actuators
3.4 Types of Actuators
3.5 Difference between Sensors & Actuators

Unit 4.Introduction to Raspberry pi and Arduiano

4.1 Introduction on IoT Devices
4.2 Basic Building blocks of an IoT Device
4.3 Introduction to Raspberry pi
(Concepts, purpose, Application areas)
4.4 Components of Raspberry pi
4.5 Introduction to Arduiano
(Concept, purpose and Application areas)
4.6 Difference between Raspberry pi and Arduiano

Unit 5. Case Study

5.1 IoT for Smart city applications
5.2 IoT for Smart Home

	5.3 IoT for Health & Lifestyle
Reference Books	1. Internet of Things , A Hands – On Approach, Arshdeep Bahga, Vijay Madisetti published by Arshdeep Bahga& Vijay Madisetti
	2. Internet of Things architecture and Design Principles, Raj Kamal, McGrawhill Education private limited, 2017
	3. Learning Internet of Things, Peter Waher, / Packt Publishing Limited, 2015
	4. The Internet of Things, Hakima Chaouchi, Wiley,2017
	5. Getting started with the Internet of Things: by CunoPfister, O"Reilly Media.
	6. The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
	7. "Building Arduino Projects for the Internet of Things: Experiments with Real-World Applications", Author: Adeel Javed, Publisher:Apress, ISBN:978-1484219393
	8. "Understanding the Internet of Things: A Conceptual and Pragmatic Approach", Author: David Evans,Publisher: O'Reilly Media, ISBN: 978-1491924565
	9. "Designing Connected Products: UX for the Consumer Internet of Things", Author: Claire Rowland, Elizabeth Goodman, Martin Charlier, and Ann Light, Publisher: O'Reilly Media, ISBN: 978-1449372569
	10. "IoT Inc: How Your Company Can Use the Internet of Things to Win in the Outcome Economy", Author: Bruce Sinclair, Publisher:McGraw-Hill Education, ISBN: 978-1260025899
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course Code: 402-02
Course Title: User Interface and User Experience Design
(UI/UX Design)

Course Code	402-02
Course Title	User Interface and User Experience Design (UI/UX Design)
Credits	4
Course Category	Minor Course
Level of Course	200-299 (Intermediate Level)
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2024-2025
Purpose of Course	This course introduces UI/UX design principles, methodologies, and practical skills, preparing students for further exploration and specialization in the field. The purpose of a UI/UX course is to equip students with the knowledge, skills, and techniques necessary to design user interfaces and experiences that are intuitive, engaging, and effective. Through a combination of theoretical understanding and practical application, students learn to create user-centric designs that enhance usability, accessibility, and user satisfaction. The course covers topics such as user research, information architecture, interaction design, visual design, and usability testing, providing a comprehensive foundation in the principles and best practices of UI/UX design. By mastering these skills, students are prepared to pursue careers in various industries, contributing to the creation of seamless and enjoyable digital experiences for users.
Course Objective	i) Understand the Basics of UI/UX Design: Introduction to the fundamental principles and concepts of user interface (UI) and user experience (UX) design, including the difference between UI and UX, the importance of user-centered design, and the role of UI/UX in product development. ii) Learn User Research Methods: Familiarize with basic user research methods, such as user interviews, surveys, and observation techniques, to understand user needs, behaviors, and preferences. iii) Create Wireframes and Prototypes: Learn how to create low-fidelity wireframes and prototypes using simple design tools or pen and paper to visualize the structure and layout of digital interfaces. iv) Explore Interaction Design Principles: Introduction to interaction design principles, including affordances, feedback, and user flows, to design intuitive and responsive user interfaces that facilitate user interaction and navigation. v) Conduct Usability Testing: An overview of usability testing methods and techniques, such as heuristic evaluations and user testing sessions, to evaluate the effectiveness and usability of UI designs and gather feedback for iteration and improvement.
Pre-requisite	-
Course Outcomes	**CO1:** Provide students with a foundational understanding of user interface (UI) and user experience (UX) design principles, including usability, accessibility, and user-centered design.

CO2: Familiarize students with basic user research methodologies, such as user interviews, surveys, and personas, to identify user needs, behaviors, and preferences.

CO3: Develop students' ability to create low-fidelity wireframes and prototypes using industry-standard tools or pen and paper, enabling them to visualize and communicate design concepts effectively.

CO4: Introduce students to interaction design principles, including affordances, feedback, and user flows, to design intuitive and responsive digital interfaces that facilitate user interaction and engagement.

CO5: Explore fundamental principles of visual design, such as typography, color theory, and layout, to create aesthetically pleasing and visually coherent UI designs that enhance user experience.

CO6: Teach students how to plan and conduct usability testing sessions, analyze feedback, and iterate on designs to improve usability and user satisfaction, ensuring that designs meet user needs and expectations.

	PS01	PS02	PS03	PS04	PS05	PS06	PS07	PS08
CO1	✓		✓					
CO2	✓						✓	
CO3					✓			
CO4	✓						✓	✓
CO5	✓		✓		✓			✓
CO6		✓						

Course Content

Unit 1: Introduction to UI/UX Design:
1.1 Overview of UI/UX Design and understanding the role of UI/UX design in product development.
1.2 Introduction to user-centered design principles and methodologies.
1.3 Exploring the significance of UI/UX in enhancing user satisfaction and product success.

Unit 2: User Research and Analysis:
2.1 Importance of user research in informing design decisions.
2.2 Creating user personas to represent target users and their needs.
2.3 Techniques for conducting effective user interviews to gather insights and feedback.
2.4 Overview of usability testing methods and techniques for evaluating design prototypes.

Unit 3: Interaction Design and Information Architecture:
3.1 Principles of Interaction Design (affordances, feedback, and user flows).
3.2 Understanding information architecture and organizing content for intuitive navigation.
3.3 Techniques for creating low-fidelity wireframes and interactive prototypes to visualize design concepts.
3.4 Understanding designing effective navigation systems to facilitate user interaction and exploration.

Unit 4: Visual Design Essentials:
4.1 Basics of Visual Design (typography, color theory, and layout).
4.2 Visual hierarchy to guide user attention and emphasize important content.
4.3 Iconography and Imagery to enhance user understanding and engagement.
4.4 Importance of branding and maintaining consistency across UI elements for a cohesive user experience.

Unit 5: Usability Testing , Iteration and case study:
5.1 Usability Testing Process (planning, conducting, and analyzing usability testing sessions).
5.2 Iterative design process and User feedback for continuous improvement.

	5.3 Designing for accessibility 5.4 Case study
Reference Books	1. "Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability", Author: Steve Krug, Publisher: New Riders, ISBN: 978-0321965516 2. "The Design of Everyday Things: Revised and Expanded Edition", Author: Don Norman, Publisher: Basic Books, ISBN: 978-0465050659 3. "100 Things Every Designer Needs to Know About People", Author: Susan Weinschenk, Publisher: New Riders, ISBN: 978-0321767530 4. "About Face: The Essentials of Interaction Design", Author: Alan Cooper, Robert Reimann, and David Cronin, Publisher: Wiley India, ISBN: 978-8126556744 5. "The Elements of User Experience: User-Centered Design for the Web and Beyond", Author: Jesse James Garrett, Publisher: Pearson India, ISBN: 978-8131707918 6. "Universal Principles of Design, Revised and Updated", Author: William Lidwell, Kritina Holden, and Jill Butler, Publisher: Rockport Publishers India, ISBN: 978-1631596226 7. "The UX Book: Process and Guidelines for Ensuring a Quality User Experience", Author: Rex Hartson and Pardha S. Pyla, Publisher: Pearson India, ISBN: 978-9332518320 8. "Lean UX: Designing Great Products with Agile Teams", Author: Jeff Gothelf and Josh Seiden, Publisher: Wiley India, ISBN: 978-8126561977 9. "Designing for Interaction: Creating Innovative Applications and Devices", Author: Dan Saffer, Publisher: Pearson India, ISBN: 978-8131705648 10. "Designing Interfaces: Patterns for Effective Interaction Design", Author: Jenifer Tidwell, Publisher: O'Reilly India, ISBN: 978-8184045881 11. "Designing Web Interfaces: Principles and Patterns for Rich Interactions", Author: Bill Scott and Theresa Neil, Publisher: O'Reilly India, ISBN: 978-8184045799
Teaching Methodology	Class Work, Discussion, Self-Study, Case-study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course Code: 403
Course Title: Java Programming Language

Course Code	403
Course Title	Java Programming Language
Credits	4
Course Category	Major Course
Level of Course	300-399 (Higher Level)
Teaching per Week	4 Hrs. (3 Hours Theory + 2 Hours Practical work)
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	2023-2024
Implementation Year:	A.Y. 2024-2025
Purpose of Course	To teach Object Oriented Programming (OOP) concepts through Coding using Java as programming language.
Course Objective	1. To make students understand the syntax and Object Oriented Programming (OOP) concepts using Java. 2. To make students understand various inbuilt Java classes and their working. 3. To make students understand the importance of OOP methodology. 4. To make students understand various types of OOP techniques.
Pre-requisite	Prior Knowledge object oriented concepts.
Course Outcomes	**CO1:** Understand the core principles of object-oriented programming (OOP) and apply them proficiently in Java, including classes, objects, inheritance, polymorphism, and encapsulation. **CO2:** Develop the ability to design, implement, and test Java applications, employing OOP concepts to create modular, reusable, and maintainable code. **CO3:** Demonstrate competence in utilizing Java's built-in libraries and frameworks to solve real-world problems efficiently, leveraging object-oriented design patterns where applicable. **CO4:** Analyze and debug Java programs effectively, employing best practices in error handling, exception handling, and debugging techniques to ensure robustness and reliability. **CO5:** Collaborate with peers in team-based Java projects, effectively communicating ideas, contributing to code reviews, and integrating individual contributions into cohesive software solutions.

Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								

| Course Content | **Unit 1. Introduction to Java**
 1.1 Properties of Java
 1.2 Comparison of java with C++
 1.3 Java Compiler, Java Interpreter
 1.4 Identifier, Literals, Operators, Variables, Keywords, Data Types
 1.5 Branching: If – Else, Switch
 1.6 Looping: While, Do-while, For |

1.7 Type Casting

Unit 2. Classes and Objects
2.1 Simple Class, Field
2.2 Access Controls, Object creation
2.3 Construction and Initialization
2.4 Inheritance and Polymorphism in Java
    2.4.1 Data encapsulation, overriding and overloading methods
2.5 this and super keywords
2.6 Static members, static block, static class
2.7 Interfaces:
    2.7.1 Introduction to Interfaces, Interface Declaration.
    2.7.2 Inheriting and Hiding Concepts.
    2.7.3 Inheriting, Overloading and Overriding Methods and constructors.
    2.7.4 Interfaces Implementations.

Unit 3. Basic Concepts of Strings and Exceptions :
3.1 Strings
    3.1.1 Basic String operations, String Comparsion
    3.1.2 String methods (charAt(), concat(), equals(), indexOf(), isEmpty(), join(), lastIndexOf(), length(),split(), substring(),trim())
    3.1.3 StringBuffer class and its constructors.
    3.1.4 StringBuffer methods : (append(),insert(),update(), delete(), reverse(),capacity())
3.2 Introduction to Exceptions:
    3.2.1 Exception Types, User defined Exception
    3.2.2 Throw, Throws
    3.2.3 Try, Catch and Finally

Unit 4. Threads and Packages:
4.1 Thread
    4.1.1 Introduction to Threads, Thread Model
    4.1.2 Priority of Threads
4.2 Package Naming, Type Imports
    4.2.1 Package Access, Package Contents
    4.2.2 Package Object and Specification

Unit 5. Data Structure Implementation using Java Class
5.1 Implementation of Data Structure using Java Class:
    5.1.1 Concepts of singly and singly circular link-list
    5.1.2 Singly Link List : Create, traverse, insert, delete node
    5.1.3 Singly circular link list: create, traverse, insert, delete node.

Reference Books	1. Java Programming Language – Ken Arnold James Gosling, David Holmes: –Addison Wesley (Pearson Education)
	2. Java – The complete reference, – Herbert Schildt: – Tata McGrawHill
	3. Java 2 From Scratch: – Steven Haines: –PHI.
	4. Programming in Java – E-Balaguruswamy: – Tata McGraw Hill
	5. Java: How to Program: – Deitel & Deitel: – PHI
Teaching Methodology	Class Work, Discussion, Lab work, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course Code: 404
Course Title: .NET Programming

Course Code	404
Course Title	.NET Programming
Credits	4
Course Category	Major Course
Level of Course	300-399 (Higher Level)
Teaching per Week	4 Hrs. (2 Hours Theory + 4 Hours Practical work)
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	2023-2024
Implementation Year:	A.Y. 2024-2025
Purpose of Course	This syllabus has been prepared for the beginners to help them understand basic .Net programming. After completing this, students will get a moderate level of expertise in .Net programming from where, they can take themselves to next levels.
Course Objective	- To make students understand .Net as simple, modern, object- oriented computer programming language developed by Microsoftto combine the power of .NET Framework and the CLR with the productivity benefits. - To make students understand basic .Net programming and will also take through various advanced concepts related to .Net programming language.
Pre-requisite	Students are expected have concepts related to Programming techniques using Object Oriented.
Course Outcomes	**CO1:** Understand the fundamentals of .NET framework: Students will gain a solid understanding of the .NET framework, including its architecture, components, and how it supports various programming languages such as C# and Visual Basic.NET. **CO2:** Develop basic programming skills in C#: Students will learn the syntax, data types, control structures, and object-oriented programming concepts in C#, one of the primary languages used in .NET development. **CO3:** Create and manipulate .NET applications: Students will be able to create, compile, debug, and run basic .NET applications using Visual Studio IDE, including console applications, Windows Forms applications, and simple web applications. **CO4:** Utilize .NET framework libraries and APIs: Students will learn to leverage the vast array of libraries and APIs provided by the .NET framework for tasks such as file I/O, database access, error handling, and networking. **CO5:** Gain familiarity with modern software development practices: Students will be introduced to essential software development practices, including version control with Git, debugging techniques, unit testing, and documentation, to build robust and maintainable .NET applications. These outcomes aim to provide beginners with a foundational understanding of .NET programming technology and equip them with the skills needed to start developing simple applications using the .NET framework.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1								
CO2								
CO3								
CO4								
CO5								

Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)

Course Content

Unit 1. Overview of Microsoft .NET Framework
 1.1. The .NET Framework
  1.1.1. Managed Code MSIL, Metadata and JIT Compilation -
   Automatic Memory Management.
 1.2. The Common Language Runtime (CLR)
 1.3. The .NET Framework class Library

Unit 2. Programming in Visual basic .net
 2.1. IDE
 2.2. Variables and Data Types
  2.2.1. Boxing and Unboxing
  2.2.2. Enumerations
  2.2.3. Data Type Conversion Functions
  2.2.4. Statements
 2.3. String & Date Functions and Methods
 2.4. Modules, Procedures and Functions
  2.4.1. Passing variable number of arguments
  2.4.2. Optional arguments
 2.5. Using Arrays and Collections
 2.6. Control Flow Statements
  2.6.1. Conditional Statements
  2.6.2. Loop Statements
  2.6.3. MsgBox and InputBox

Unit 3. Introduction to Windows controls
 3.1. Working with Tool Box Controls
  3.1.1. Common controls - Label, Text Box, Button, Check Box,
   Radio Button, Date Time Picker, List Box, Combo box,
   Picture Box, Rich Text Box, Tree View, Tool Tip, Progress
   bar, Masked Text box, Notify Icon,Link Label, Checked List
   box
  3.1.2. Container Controls
  3.1.3. Data - Data Set, Data Grid
  3.1.4. Component - Image list, error provider, Help provider,Timer
 3.2. Working with Menus and Dialogue Boxes
 3.3. Exception Handling
  3.3.1. Structured Error Handling
  3.3.2. Unstructured Error Handling

Unit 4. Object Oriented Programming
 4.1. Creating Classes, Object Construction & Destruction
  4.1.1. Properties, Methods, Events
  4.1.2. Access Specifiers: Public, Private, Protected, ProtectedFriend
  4.1.3. Me, MyBase and MyClass keywords
 4.2 Abstraction, Encapsulation & Polymorphism
 4.3 Interfaces & Inheritance

Unit 5. Database access using ADO.NET
 5.1. Visual Database Tools
 5.2. ADO .NET Object Model
 5.3. ADO .NET Programming

Reference Books	1. Visual Basic .NET Programming (Black Book) - By Steven Son Holzner, DreamTech Publication 2. Mastering Visual Basic.NET by Evangelos Petroutsos BPB Publication 3. Moving to VB.NET: Strategies, Concepts, and Code - by Dan Appleman – Apress Publication 4. Microsoft Visual Basic .NET Step by Step - by Michael Halvorson,PHI Publication 5. Database Programming with Visual Basic.NET and ADO.NET - by F. Scott Barker – Sams Publication 6. Beginning .NET Web Services Using Visual Basic .NET - by JoeBustos and Karlli Watson, Wrox Publication 7. .NET – Complete Development Cycle - by G. Lenz, T. Moeller, Pearson Education. 8. Professional VB.NET, 2nd Edition - by Fred Barwell, et al – Wrox Publication
Teaching Methodology	Class Work, Discussion, Lab work, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course: 405-01: Web Designing-2

Course Code	405-01
Course Title	Web Designing-2
Credit	4
Course Category:	Major Course
Level of Course:	300- 399 (Higher Course)
Teaching per Week	4 Hrs (2 Hours Theory + 4 Hours of Lab. Work)
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	2023-2024
Implementation Year:	2024-2025
Purpose of Course	Web Design requires designers to create graphics, typography as well as images which are used only on the World Wide Web. While creating any design, web designers need to maintain balance between creating a good design as well as the speed and efficiency for the webpage/ website. This course deals with server-side communication.
Course Objective	To make students aware of web terminology and website designing tools. Student can understand and implement the real functions of website development.
Pre-requisite	Knowledge of HTML5, Bootstrap, JavaScript
Course outcome	CO1: Students will be able to create, organize and design websites. CO2: Students gain formal understanding of XML-based technologies which are used in Web-service. CO3: Students will be able to make dynamic changes to a web pages as well as respond to user and browser events through JQuery CO4: Students will be able to learn cross-browser supports via Ajax and Jason CO5: Students will be able to write asynchronous code using various techniques through Node.js

Mapping between Course Outcome(CO) and Program Specific Outcome (PSO):		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1								
	CO2								
	CO3								
	CO4								
	CO5								

Course Content

Unit-1 : Introduction of XML:
1.1 Characteristic and Use of XML
1.2 XML syntax (Declaration, Tags, elements)
1.3 root element, case sensitivity
1.4 XML document:
   1.4.1 Document Prolog Section
   1.4.2 Document element section
1.5 XML declaration and rules of declaration.

Unit-2: jQuery Fundamentals:
2.1 Introduction and basics:
   2.1.1 Advantage of jQuery and Syntax
   2.1.2 jQuery Selectors:
   2.1.3 jQuery Events (ready(),click(), keypress(),focus(),blur(),change())

2.2 jQuery Effects:
  2.2.1   Show/Hide, Fade, Slide, Stop, Chaining, Callback

2.3 jQuery Manipulation methods:
  2.1.1 Get/Set methods (text(), attr(), html(), val())
  2.1.2 Insert methods: (append(), prepend(),text(), before(), after(), wrap())
  2.1.3 Remove element methods : (remove(),empty(),unwrap())
  2.3.4 Query Get and Set CSS properties using css() method.

Unit-3: JSON: (JavaScript Object Notation)
3.1   Concept and Features of JSON
3.2   Similarities and difference among JSON and XML
3.3   JSON objects(with string and Numbers))
3.4   JSON Arrays and their examples :
  3.4.1 Array of string, Array of Numbers, Array of Booleans
  3.4.2 Array of objects, Multi-Dimensional Arrays
  3.4.3 JSON comments

Unit-4: AJAX (Asynchronous JavaScript and XML):
4.1 Fundamentals of AJAX technology:
  4.1.1   Difference between Synchronous and Asynchronous web application
  4.1.2 XMLHttpRequest technology
4.2 XMLHttpRequest
  4.2.1   Properties :(onReadyStateChange, readyState, responseText, responseXML)
  4.2.2 XMLHttpRequest Methods : (Open(), send(), setRequestHeader())
4.3 Working of AJAX and its architecture

Unit-5: Node.js :
5.1 Concepts, working and Features
  5.1.1 Downloading Node.js
5.2 Setting up Node.js server(HTTP server)
  5.2.1 Installing on window
  5.2.2 Components
    5.2.2.1 Required modules, Create Server(http.createServer())
    5.2.2.2 Request and response
5.3 Built-in Modules
  5.3.1 require() function
  5.3.2 User defined module: create and include
  5.3.3 HTTP module
5.4 Node.js as Web-server:
  5.4.1 createServer() , writeHead() method
  5.4.2 Reading Query String, Split Query String
5.5 File System Module:
  5.5.1 Read Files (readFile())
  5.5.2 Create Files(appendFile(),open(),writeFile())
  5.5.3 Update Files(appendFile(),writeFile())
  5.5.4 Delete Files(unlink())
  5.5.5 Rename Files(rename())

Reference Books	1) JavaScript and JQuery (Interactive Front-End Web Development) by Jon Duckett 2) JavaScript and JQuery (The missing manual) by David Sawyer MCFarland 3) Essential ASP.NET Web Forms Development, Full Stack Programming with C#, SQL, Ajax, and JavaScript, Robert E. Beasley, Publisher: Apress

	4) Foundations of Ajax, Ryan Asleson, Schutla, Publisher: Apres 5) Ajax: The Complete Reference, By Thomas Powell, ISBN: 978-0-07-149216-4 6) Head First Ajax , Author: Rebecca M.Riordan, publisher: O'Reilly 7) Practical Node.js, Author: Azat Mardan,ISBN:978-1-4842-3038-1, Publisher: Apress 8) Node.JS Guidebook, BPB Publication, ISBN: 9789387284432, Author: Dhruti Shah. 9) JavaScript for Modern Web Development, ISBN: 9789389328721, eISBN: 9789389328738, Authors: Abhilasha Sinha, Ranjit Battewad, Alok Ranjan 10) Mastering HTML, CSS & Javascript Web Publishing, Authors:by Laura Lemay,Rafe Colburn, BPB Publication 11) JavaScript by Example, Author: Elitle Quigley, Publication: Prentice Hall, ISBN: 9780137054893, 9780137054893. 12) XML in easy steps, Publication: Tata McGraw Hill 13) XML crash course, Publisher: Tata McGraw Hill, ISBN: 9780071815161, 9780071815161 14) Beginning jQuery: From the Basics of jQuery to Writing your Own Plug-ins, by Jack Franklin Russ Ferguson,978-1484230268
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course: 405-02: Mobile Application Development - 2

Course Code	405-02
Course Title	**Mobile Application Development – 2**
Credit	4
Course	Major Course
Level of Course	300 – 399 (Higher Course)
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	2023-2024
Implementation From	2024-2025 A.Y.
Purpose of Course	Mobile application development is the process of creating software applications that run on a mobile device, and a typical mobile application utilizes a network connection to work with remote computing resources. Mobile device is used for different purposes ranging from email to online shopping and multiple apps for different reasons. Hence, the mobile development process involves creating installable software bundles, implementing backend services such as data access with an API, and testing the application on target devices. Knowledge about mobile application development on Android platform and gradually on hybrid platform is need of the current era.
Course Objective	1) To understand concepts of Mobile Technology 2) Understand the development process and have edge over mobile user interface (UI) design. 3) Understand various UI development tools, Application design interfaces and creating basic app on Android platform. 4) Concepts of DART and introduction of FLUTTER.
Pre-requisite	Basics of Mobile Application Development and designing concepts.
Course outcome	CO1: Students will be able to understand the internal concepts of Android. CO2: Students will have concepts of important Android Widgets(UI) CO3: To learn concepts of DART. CO4: To work on Flutter. CO5: To gain edge over Basic Flutter Widgets.

Mapping between Courses Outcome(CO) and Program Specific Outcome(PSO):

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1								
CO2								
CO3								
CO4								
CO5								

Course Content

Unit-1 : Basic Attributes and Events of Important Android Widgets(UI)

1.1 ListView, Custom ListView

1.2 DatePicker, TimePicker, ProgressBar

1.3 Horizontal and Vertical ScrollView

1.4 AutoCompleteTextView, TextWatcher to EditText

1.5 ImageSlider, ImageSwitcher, SearchView

1.6 TAbLayout and FrameLayout

	Unit-2: Working with DART:
	2.1 DART overview, concept, features and installation
	2.2 Online editor DartPad and dart2js tool
	2.3 Executing Dart basic code using Command line, DartPad and IDE
	2.4 Understanding DART syntax:
	2.4.1 Identifiers, Datatypes, variables, comments
	2.4.2 Decision making (if, if..else, if..else if..., switch..case)
	2.4.3 Iterative statements (for, for...in loop, while, do..while)
	2.4.4 break, continue, label
	2.5 DART function :
	2.5.1 Calling function, deleting function
	2.5.2 Passing arguments to function, lexical scoping.
	Unit-3: Introduction of Flutter:
	3.1 Fundamentals of Flutter:
	3.1.1 Installation and Architecture of Flutter
	3.1.2 Features of Flutter
	3.1.3 Creating basic flutter project using Android Studio
	3.2 Flutter Widget:
	3.2.1 Types of flutter widget:
	3.2.1.1 Visible and Invisible
	3.2.1.2 StatelessWidget, StatefulWidget
	3.2.1.3 Single child widget and Multiple child widget
	UNIT-4: Flutter basic widgets:
	4.1 Visible widget(Constructor and Properties):
	Text, Image, Button, Icon
	4.2 Invisible widget(Constructor and Properties):
	column, row, center, padding, scaffold, stack
	4.3Text, TextField
	4.4 Buttons, Slider
	4.5 Checkbox, RadioButton
	Unit-5: Flutter widget (Constructor, attributes and Properties)
	5.1 Progress Bar, Stack
	5.2 Lists
	5.3 Alert Dialogbox , Tooltip
	5.4 Toast, Switch
	5.5 Charts, Flutter Form.
Reference Books	1) Android Application Development (With Kitkat Support), Author: Pradeep Kothari, Publisher: DreamTech Press.,ISBN:978-9351194095
	2) Android Studio 3.0 Development Essentials: Android 8 Edition , Author: Neil Smyth, ISBN:978-1977540096
	3) Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 2, Author: Alessandro Biessek, Packt Publishing House,ISBN:978-1788996082
	4) Beginning Flutter: A Hands On Guide to App Development, Author: Marco L. Napoli, Publisher: Wrox, ISBN:978-1119550822
	5) Android Programming for Beginners - Second Edition, Author:John Horton, Publisher: Image Short ISBN: 978-1789538502
	6) Android 9 Development Cookbook, Author: Rick Boyer, Publisher: Packet Publishing, ISBN:978-1788991216
	7) The Dart Programming Language, Author:Bracha, Publisher:Pearson

	Education India, ISBN:978-9332570368
	8) Google Flutter Mobile Development Quick Start Guide: Get up and running with iOS and Android mobile app development, Author: Prajyot Mainkar, Publication:Packt Publishing, ISBN:978-1789344967
	9) Practical Flutter: Improve your Mobile Development with Google's Latest Open-Source SDK ,Author: Frank Zammetti, Publisher: Apress, ISBN:978-1484249710
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course code: 406
Course Title: Skill Enhancement Course (SEC-04)

Course Code	406
Course Title	Skill Enhancement Course - IV (SEC – 04)
Credit	2
Category of Course	Skill Enhancement Course
Level of Course	200-299 (Intermediate)
Teaching per Week	2 Hrs (Any or Combination of Theory/Practical/Fieldwork/Internship/Project)
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2024-2025
Purpose of Course	- As per NEP(National Education Policy-2020), it is mandatory for students to select a 2 credit Skill Enhancement Course out of the choices given by the college/institute. - It will be mandatory for the student to opt minimum one 2-credit Skill Enhancement Course from the course baskets of Skill Enhancement courses approved by the university or from any recognized MOOC or from recognised university through online mode subject to transfer of credit through ABC during semester-1 to semester-5. - The student can start an alternative career in the field by obtaining higher degree of knowledge in the area. - It's aimed at imparting practical skills, embedded internship, hands-on training, soft skills, life skills, such approved online courses etc. to enhance the employability of students. This may also include courses as per the need of new evolving technology.
Course Objective	Obtaining skill in particular field along with the regular curriculum of the selected program is essential. It not only enhance the skill but also provide an opportunity to develop skill in particular area where one can pursue career in future. Skill enhancement provides the opportunity and knowledge for an individual to develop and strengthen the necessary skills to gain, maintain, and advance in a chosen area. Skill enhancement programs are focused around training that combines the best practices from varieties of areas as described in NEP-2020 SOP by Gujarat State Higher education Department's SOP. Skill enhancement or training typically uses a combination of cognitive and behaviour problem solving approaches, both of which are used to strengthen a person's positive skill develop.
Pre-requisite	-
Course Content and Implementation road-map.	(i) University has categorised and prepared the basket of the courses including approved online courses that can be offered as Skill Enhancement Course. (ii) The institute/college/department can design and implement skill enhancement course by getting approval from the relevant apex body of the university considering the SOP of the certificate course policies of the University. (iii) The institutes/college/departments can select more than one course out of the given sets of courses and offer them to their students. (iv) The students can select any of the courses offered by the institute/college/department from the given choices and enrol for the course.

	(v)	The institute/college/department will arrange appropriate resource person(s) for the course.
	(vi)	The course evaluation will be taken place at the college/institute/department level based on the nature of the course.
	(vii)	The institute/college/department will assess the student based on the nature of the course. The student will be granted the credits on successful completion of the course.
Reference Books	- The reference materials and books will be decided by the Institutes/Colleges/Departments based on the selected Courses. - Minimum five copies of relevant topics are recommended to keep in the library.	
Teaching Methodology	Class Work/ Discussion/ Self-Study/ Seminars/ field works/ practical training/ field work and/or Assignments.	
Evaluation Method	50% Internal assessment. 50% External assessment. (Evaluation and Assessment will be carried out based on the nature of the course. On successful completion of the course, the student will be granted 2 credits.)	

Course code: 407
Course Title: Value Addition Course-IV (VAC-04)

Course Code	407
Course Title	Value Addition Course - IV (VAC – 04)
Credit	2
Category of Course	Value Addition Course
Level of Course	200-299 (Intermediate)
Teaching per Week	2 Hrs (Any or Combination of Theory/Practical/Fieldwork/Internship/Project)
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2024-2025
Purpose of Course	As per NEP(National Education Policy-2020), it is mandatory for students to select a 2 credit Value Addition Course out of the choices given by the college/institute. It will be mandatory for the student to opt minimum one 2-credit Value Addition Course out of the list of offered courses recognised by the University during semester-1 to semester-4. The student can start an alternative career in the field by obtaining higher degree of knowledge in the area.
Course Objective	Obtaining knowledge in all or any of the components/fields like (i) Understanding India (ii) Environmental Science/Education (iii) Digital/Technological solutions (iv) Health & Wellness, Yoga education, sports, and fitness are essential for holistic development (v) Indian Knowledge system(IKS). The course components should be among these five categories/fields and as per the Curriculum and Credit Framework for Undergraduate Programmes of the UGC (Page-22 of the document). The purpose is to impart knowledge and understand the necessities of these aspects in life to make the healthy society and nation. It help in development of a dedicated and responsible citizen of the country by adding value to the life.
Pre-requisite	-
Course Content and Implementation road-map.	(i) The university has categorised and prepared the list of the courses that can be offered as Value Addition Course. (ii) The institute/college/department can design and implement skill enhancement course by getting approval from the relevant apex body of the university considering the SOP of the certificate course policies of the University. (iii) The institutes/college/departments can select more than one course out of the given sets of courses and offer them to their students. (iv) The students can select any of the courses offered by the institute/college/department from the given choices and enrol for the course. (v) The institute/college/department will arrange appropriate resource person(s) for the course. (vi) The evaluation will be taken place at the college/institute/department based on the nature of the course. (vii) The institute/college/department will assess the student based on the nature of the course. The student will be granted the credits on successful completion of the course.
Reference Books	- The reference materials and books will be decided by the Institutes/Colleges/Departments or as per the university guidelines based on the selected Courses. - Minimum five copies of relevant topics are recommended to keep in the library.

Teaching Methodology	Class Work/ Discussion/ Self-Study/ Seminars/ field works/ practical training/ field work and/or Assignments.
Evaluation Method	50% Internal assessment. 50% External assessment. Maximum Marks: 50 (Evaluation and Assessment will be carried out based on the nature of the course. On successful completion of the course, the student will be granted 2 credits.)

Internship: Student willing to exit the program at the end of the two semesters and to avail the Certificate in Computer Application or exit the program at the end of the first four semesters and to avail the Diploma in Computer Application, it is essential to acquire four credits from Internship. A key aspect of the internship is induction into actual work situations. Internships involve working with local industry, government or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in on-site experiential learning. In option to these internships, the student can avail such four credits by availing two 2-credit university approved courses during any of these semesters. The student is required to enroll and avail these 4-credits and produce the evidence in process to opt the multi-level exit option after successfully completion of first year (two semester) or second year(four semesters).

Guidelines for Question paper style

1) Ideally each unit of the course should carry equal weightage of marks. However, it will vary upon the content of the units of the course.

2) The major and minor course's question papers will be either 50 marks(2 hours duration) or 25 marks(1 hours of duration) for exams.

3) The objective of the written/theory exams for all courses are to analyze the student's understanding about the course contents, assessing the conceptual knowledge about the course contents and ability to explain the concepts in written forms.

4) As the practical exams are conducted separately and viva-voce is also a part of the practical exam, the concepts and practical knowledge can be analyzed through the practical exams.

5) Since the subjects/courses are technical in nature, the major objective is to evaluate conceptual and technical knowledge for major and minor courses instead of expecting student's ability to write lengthy literature writing skills and abilities.

6) 20% of questions are recommended to ask from objective/short questions/MCQ types having weightage of 1 to 2 marks per question. Purpose of such question is to analyze precise understanding for the topics/points/concepts.

7) 30% of questions are expected to ask from short questions to answer in few lines having weightage of 3 to 4 marks. Purpose of such questions are to analyze conceptual understanding for the topics/points/concepts that can be describe in short.

8) 50% of questions are expected to ask from long/descriptive/Short-notes questions to answer using charts/graphs/block diagrams/flowcharts/models having weightage of 5 to 7 marks. Purpose of such questions are to analyze the depth knowledge and ability to explain in detail emphasizing technical knowledge.

9) The evaluation by the examiner is expected to evaluate overall technical understanding of the student, ability to express the technical and conceptual knowledge, clarity of thoughts and understanding of the subject and concepts.