Re-Accredited 'B++' 2.86 CGPA by NAAC
VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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-: પરિપત્ર :-

કોમ્પ્યુટર સાયન્સ વિદ્યાશાખા હેઠળની સંલગ્ન તમામ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવેલ B.Sc. (Data Science & Analytics) Sem.-1 & 2 નાં અભ્યાસક્રમ અંતર્ગત કોમ્પ્યુટર સાયન્સ વિદ્યાશાખાના તત્કાલીન ડીનશ્રીનો અભિપ્રાય ધ્યાને લઈ જોડાણ વિભાગનાં તા.૦૪/૦૬/૨૦૨૪, ક્રમાકઃજોડાણ/બી.એસસી.(ડેટા સાયન્સ)/૧૧૭૧૯/૨૦૨૪ ના પત્ર અંતર્ગત બી.એસસી. (ડેટા સાયન્સ એન્ડ એનાલીટીકસ) અભ્યાસક્રમને સ્થાને અભ્યાસક્રમનું નામકરણ બી.એસસી.(ડેટા સાયન્સ) રાખવા એકેડમિક કાઉન્સિલ વતી માન.કુલપતિશ્રીએ મંજૂરી આપેલ છે. જેની એકેડેમિક કાઉન્સિલની તા.૧૫/૦૬/૨૦૨૪ ની સભાનાં ઠરાવ ક્રમાંકઃ ૯૦ થી નોંધ લેવામાં આવેલ છે. અને સદર અભ્યાસક્રમને બી.એસસી. (ડેટા સાયન્સ) મુજબ ડીગ્રી એવોર્ડ કરવા માટે બોર્ડ ઓફ મેનેજમેન્ટની તા.૨૦/૦૮/૨૦૨૪ની સભાનાં ઠરાવ ક્રમાંકઃ૪ થી મંજૂર કરી યુનિવર્સિટી કાર્યાલયનાં તા.૨૧/૦૮/૨૦૨૪, પરિપત્ર ક્રમાંકઃએસ./ડીગ્રી/૧૮૧૨૪/ ૨૦૨૪ થી પરિપત્રિત કરવામાં આવેલ છે. જે સંદર્ભે શૈક્ષણિક વર્ષ ૨૦૨૫–૨૬ થી અમલમાં આવનાર B.Sc. (Data Science) Sem.-1 & 2 નો આ સાથે સામેલ અભ્યાસક્રમ અમલ કરવા આથી જાણ કરવામાં આવે છે.

બિડાણઃ ઉપર મુજબ

ક્રમાંકઃઓથો./પરિપત્ર/૨૬૮૩૦/૨૦૨૫
તા.૧૦–૧૦–૨૦૨૫

કુલસચિવ (I/c)

પ્રતિ,

૧) યુનિવર્સિટી સંલગ્ન તમામ કોલેજોના આચાર્યશ્રીઓ.
.....આપશ્રીની કોલેજના સંબંધિત શિક્ષકો/વિદ્યાર્થીને જાણ કરી અમલ કરવા સારૂ.

૨) ઈ.ચા.ડીનશ્રી, કોમ્પ્યુટર સાયન્સ વિદ્યાશાખા.

૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.
.....તરફ જાણ તેમજ અમલ સારૂ.

Veer Narmad South Gujarat University, Surat

Faculty of Computer Science

Syllabus for (Semester-I and Semester-II) of

B.Sc.(Data Science)

As per NEP-2020

To be implemented from

Academic Year: June, 2023-2024

(Including Winter Session)

Veer Narmad South Gujarat University, Surat
Bachelor of Science (Data Science) (Honours)

Under the Faculty of Computer Science

Name of Program:	Bachelor of Science (Data Science) (Honours)
Abbreviation:	B.Sc.(Data Science) (Honours): Four-year Integrated Program. With Multi-Level Entry and Exit option
Multi-level Exit Criteria:	i) Under Graduate Certificate in Data Science : 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 Data Science : 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.Sc.(Data Science): 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.Sc.(Data Science)(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 commerce/General Stream; Statistics / Economics / Business Mathematics / Accountancy or equivalent 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.

	Seats Allotment and Matrix : 50% seats for Science Stream(Any group) students and 50% seats for other streams (except Science Stream). Division of seat matrix will be as per the norms of University.
Objective of the Program:	Bachelor of Science (B.Sc.) (Data Science) (Honours) is undergraduate degree program in computer subject with specialization in Data Science area. Objective of the program is to open a channel of admission for courses in the field of Data Science which is an emerging and promising field to build career for students who have completed standard 12th (H.S.C.) and are interested in taking computing/computer Application and data science and analytics as a career. The objective of a graduation program in Data Science is to provide students with the knowledge and skills necessary to work effectively with data and extract meaningful insights from it. Key Objectives: Develop a strong foundation in statistical analysis and data modeling: Students learn the fundamental concepts and techniques of statistics and data modeling, which are crucial for analyzing and interpreting data accurately. Gain expertise in programming languages and tools: Students are trained in programming languages such as Python or R, as well as data manipulation and analysis tools like SQL, Excel, and various data visualization libraries. This enables them to work with large datasets, perform data cleaning and preprocessing tasks, and create visualizations. Develop business acumen and domain knowledge: Students gain an understanding of how data science and analytics can be applied in various industries and domains, such as finance, healthcare, marketing, or e-commerce. They learn to identify and solve business problems using data-driven approaches. Learn data ethics and privacy considerations: Students are introduced to the ethical considerations and privacy concerns associated with working with data. Students understand the importance of data privacy, security, and responsible data handling practices. Overall, the objective of a graduation program in Data Science is to equip students with a comprehensive skill set that enables them to tackle complex data-related challenges, make data-driven decisions, and contribute effectively to the rapidly evolving field of data science.
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: F.Y.B.Sc. (Data Science) (SEM – 1 and SEM – 2) (w.e.f. Academic Year June, 2023-2024)

Bachelor of Science in Data Science (B.Sc.(Data Science)) (Honours)) Four Year Honours Program with multi-level entry and exit Program

Program Structure	Semester-wise break up for the courses :

SEMESTER – 1

Course Code	**Course Title**	**Course Category**	**Level of Course**	**Course Credits**	**Teaching Hours/week**	
				Th.+Pra.	Theory	Practical/ Fieldwork /Project/Tutorial /Internship
101	**Communication Skills (AEC-01)** [Modern Indian Language (MIL) & English language focused on language and communication skills.]	Ability Enhancement Course	100-199 Foundation/ Introductory	2	2	0
102	Inter-Disciplinary course / Multi-Disciplinary Course (MDC-01)	Inter/Multi-Disciplinary	100-199 Foundation/ Introductory	4	4	0
103	Fundamentals of Computers and Data	Minor Course	100-199 Foundation/ Introductory	4	4	0
104	Programming concepts and Programming methodology (PCPM)	Major Course	200-299 Intermediate Level Course	4	2	4
105	Database Fundamentals	Major Course	200-299 Intermediate Level Course	4	2	4
	Practical (Based on Course Code:104 & 105 Equally divided)		200-299 Intermediate Level Course	No separate credits allocated for practical. The Practical exam/viva-voce will be based on Course-104 and 105.		
106	**Skill Enhancement Course-I (SEC-01)** [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	100-199 Foundation / Introductory	2	-	4
107	**Value Addition Course – I (VAC-01)** [The student will select minimum one University approved and recognized 2 credits certificate course/IKS(Indian Knowledge System) 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	100-199 Foundation/ Introductory	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	16	12

Examination and Marks Structure :

Course Code	Course Title	Course Credit	University Exam Type	Exam Duration	External Marks	Internal Marks	Total Marks
101[%]	Communication Skills (AEC-01)	2	Theory/ Written	1 Hour	25	25	50
102	Inter-Disciplinary course/Multi-Disciplinary Course (MDC-01)	4	Theory/ Written	2 Hrs.	50	50	100
103	Fundamentals of Computers and Data	4	Theory/ Written	2 Hrs.	50	50	100
104[**]	Programming concepts and Programming methodology (PCPM)	4	Theory/ Written: Practical :	1 Hour 2 Hrs.	25 25	25 25	100
105[**]	Database Fundamentals	4	Theory/ Written: Practical :	1 Hour 2 Hrs.	25 25	25 25	100
	Practical : (Based on Course Code:104 & 105)	-	Practical Exam will be conducted based on Course-104 and Course-105 separately at the end of the semester. The duration for exam will be 2 hours for each course.				
106	Skill Enhancement Course-I (SEC-01)	2	As per need of course	1 Hour	25	25	50[#]
107	Value Addition Course-I (VAC-01)	2	As per need of course	1 Hour	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 Course-106 includes Practical sessions for course-104 and course-105. **Minimum** Eight Practical hours(4 hours for course-104 and 4 hours for course-105) 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.

Internal/External Evaluation :
CCE (Continuous and Comprehensive Evaluation) : To be conducted by college.
SEE (Semester End Evaluation) : To be conducted by University.

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.

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 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.

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.

 # Marks: The scale on which the students will be evaluated. The evaluation methodology will be continuous evaluation and the score obtained will reflect in mark-sheet but not considered for SGPA or CGPA. These courses are mandatory and student is required to obtain the specified credits in process to acquire the certificate/diploma/degree.
[The college/Institute will decide the fees for SEC and VAC courses based on the University norms for certificate course per credit fees.]

% : Institute/College will offer any one course from given list of Ability Enhancement Courses approved by the University.

** Major Practical based Subjects: Course 104 and 105 are major courses. Both these courses are carrying 4 credits (2 Hours of theory and 4 hours of practical per week). Both these subjects 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-104 (2 hours duration) and course-105(2 hours duration) will be conducted on same day.

Division of Theory internal marks (CCE) :

For courses having 50 marks as Internals :
Class Assignment/Active Learning: 07 marks + Home Assignment/Field Assignment: 08 marks + Attendance: 10 marks + Class Test*: 25 marks
For courses having 25 marks as Internals :
Class Assignment/Active Learning: 03 marks + Home Assignment/Field Assignment: 03 marks + Attendance: 04 marks + Class Test*: 15 marks

For Practical internal marks (CCE) :

For courses having 50 marks Internals :
Attendance: 10 marks + Viva-voce/Quiz: 20 marks + Lab-work Assessment/Practical: 20 marks.
For courses having 25 marks Internals :
Attendance: 5 marks + Viva-voce/Quiz: 10 marks + Lab-work Assessment/Practical: 10 marks.

Division of Practical External exam marks (SEE) :

For 25 marks Externals :
Division of marks are: Exam evaluation: 20 marks + Viva-voce: 5 Marks.

Practical examination will be conducted for course code-104 and course-105 separately on same day.
Students are required to pass in combined head (Theory + Practical) for each course.
Students are required to remain present in internal and external theory and practical exams for course code – 104 and 105 mandatorily.

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 (For SFI programme): Rs. 16,500/- 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.] [Tuition and other fees for Govt. colleges and Grant-in-aid colleges will be as per the norms of University.]

SEMESTER – 2

Course Code	Course Title	Course Category	Level of Course	Course Credits	Teaching per week	
					Theory	**Practical/ Fieldwork/ Project/ Internship**
201	**Ability Enhancement Course-II (AEC-02)** [Modern Indian Language (MIL) & English language focused on language and communication skills.]	Ability Enhancement Course	100-199 Foundation/ Introductory	2	2	0
202	Inter-Disciplinary Course / Multi-Disciplinary Course (MDC-02)	Inter / Multi-Disciplinary	100-199 Foundation/ Introductory	4	4	0
203	Operating System	Minor Course	100-199 Foundation/ Introductory	4	4	0
204	Programming Skills	Major Course	200-299 Intermediate Level Course	4	2	4
205	Concepts of Relational Database Management Systems	Major Course	200-299 Intermediate Level Course	4	2	4
	Practical (Based on Course Code: 204 & 205 : Equally Divided)	-	200-299 Intermediate Level Course	No separate credits allocated for practical. The Practical exam/viva-voce will be based on Course-204 and 205.		
206	**Skill Enhancement Course-II (SEC-02)**	Skill Enhancement Course	100-199 Foundation / Introductory	2	0	4
207	**Value Addition Course – II (VAC-02)** [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	100-199 Foundation / Introductory	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**	**16**	**12**

Course Code	Course Title	Course Credit	University Exam Type	Exam Duration	External Marks	Internal Marks	Total Marks
201	Ability Enhancement Course (AEC -02)[%]	2	Theory/ Written	1 Hour	25	25	50
202	Inter-Disciplinary / Multi-Disciplinary Course (MDC-02)	4	Theory/ Written	2 Hrs.	50	50	100
203	Operating Systems	4	Theory/Written :	2 Hrs.	50	50	100
204**	Programming Skills	4	Theory/Written : Practical :	1 Hour 2 Hrs.	25 25	25 25	100
205**	Concepts of Relational Database Management Systems	4	Theory/ Written: Practical :	1 Hour 2 Hrs.	25 25	25 25	100
	Practical Based on Course Code:204 & 205	-	Practical	Practical Exam will be conducted based on Course-204 and Course-205 separately at the end of the semester. The duration for exam will be 2 hour for each course.			
206	Skill Enhancement Course – II (SEC-02)	2	As per nature of Course	1 Hour	25	25	50[#]
207	Value Added Course – II (VAC-02)	2	As per nature of course	1 Hour	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-204 and course-205. **Minimum** Eight Practical hours(4 hours for course-204 and 4 hours for course-205) 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.

Internal/External Evaluation :

CCE (Continuous and Comprehensive Evaluation) : To be conducted by college.

SEE (Semester End Evaluation) : To be conducted by University.

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.

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. The Credit of Minor subject is 24 credits of total credits for 3 years' bachelor's degree and 32 credits of total credits for four years" bachelor's degree programme

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 2-credit certificate 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 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.

Value Added 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 value added courses as per University norms). These courses aim at enabling the student to acquire and demonstrate knowledge and understanding of contemporary India with its historical perspective. Course may include Environment Science, Public Health, Renewable Energy and Energy Harvesting, Yoga Education, sports and fitness, cultural activities, enhancing interpersonal skills, critical-logical thinking, speech, memory, health, wellness human values, NSS/NCC and Fine/ Applied/ Visual/ Performing Art/ IKS etc. It will be mandatory for the student to opt minimum one 2-credit Value Addition Course out of offered courses recognised by the University under the basket of Value Added Courses during semester-1 to semester-4. This course will be an Audit course*.

 # Marks: The scale on which the students will be evaluated. The evaluation methodology will be continuous evaluation and the score obtained will reflect in mark-sheet but not considered for SGPA or CGPA.

% : Institute/College will offer any one course from given list of Ability Enhancement Courses approved by the University.

** Major Practical based Subjects: Course 204 and 205 are major courses. Both these courses are carrying 4 credits (2 Hours of theory and 4 hours of practical per week). Both these subjects 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-204 (2 hours duration) and course-205(2 hours duration) will be conducted on same day.

Division of Theory internal marks (CCE) :

For courses having 50 marks as Internals :
Class Assignment/Active Learning: 07 marks + Home Assignment/Field Assignment: 08 marks + Attendance: 10 marks + Class Test*: 25 marks
For courses having 25 marks as Internals :
Class Assignment/Active Learning: 03 marks + Home Assignment/Field Assignment: 03 marks + Attendance: 04 marks + Class Test*: 15 marks

For Practical internal marks (CCE) :

For courses having 50 marks Internals :
Attendance: 10 marks + Viva-voce/Quiz: 20 marks + Lab-work Assessment/Practical: 20 marks.
For courses having 25 marks Internals :
Attendance: 5 marks + Viva-voce/Quiz: 10 marks + Lab-work Assessment/Practical: 10 marks.

Division of Practical External exam marks (SEE) :

For 25 marks Externals :
Division of marks are: Exam evaluation: 20 marks + Viva-voce: 5 Marks.
Practical examination will be conducted for course code-204 and course-205 separately on same day.
Students are required to pass in combined head (Theory + Practical) for each course.
Students are required to remain present in internal and external theory and practical exams for course code – 204 and 205 mandatorily.

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 : Rs. 16,500/- 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.]

Semester - 1

Course Code: 101

Course Title: COMMUNICATION SKILLS

Course Code	101
Course Title	Communication Skills
Credits	2
Course Category	Ability Enhancement Course (AEC-01)
Level of Course	100-199 (Foundation / Introductory)
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	2022-2023
Implementation Year:	A.Y. 2023-2024
Purpose of Course	Effective communication is vital for the success in various situations. This course will help students develop and improve English Communication skills.
Course Objective	The course aim at enabling the students to acquire and demonstrate the core linguistic skills, including critical reading and expository and academic writing skills that help students articulate their arguments and present their thinking clearly and coherently and recognize the importance of language as a mediator of knowledge and identity. They would also enable students to acquaint themselves with the cultural and intellectual heritage of the chosen MIL and English language, as well as to provide a reflective understanding of the structure and complexity of the language/literature related to both the MIL and English language. The courses will also emphasize the development and enhancement of skills such as communication, and the ability to participate/conduct discussion and debate.
Pre-requisite	Knowledge of English at H.Sc.(12^{th}) Level
Course Outcomes	CO1 : To make students understand the importance of effective communication skills in personal and professional life. CO2 : student's will be able to enhance their ability in reading ,writing ,listening and speaking as per the demand of corporate world. CO3 : To develop students individual as well as team work efficiency CO4; To enhance the inquisitiveness in students for updating knowledge to solve problems, and lead to build a successful professional career. CO5; Students will be able to understand the importance of digital communication.
Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)	
Course Outcome	After studying the course, students will be able to Implement their skills at their workplace on varied roles such as computer operator and programmer.

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	■				■			
CO2	■			■	■		■	■
CO3			■					
C04	■	■		■		■		
CO5	■	■		■	■			

Course Content	**Unit : 1 : Fundamentals of Communication** 1.1 Definition and Meaning, Overview 1.2 Process of Communication 1.3 Features and Process of Professional communication 1.4 Role of creative and critical thinking in communication 1.5 Different forms of communication 1.6 Communication Network in an Organization 1.7 Barriers to communication **Unit : 2 :Developing Listening skills** 2.1 Listening Vs Hearing 2.2 Effective Listening 2.3 Process of Listening 2.4 Types of Listening 2.5 Barriers to effective listening **Unit : 3 : Speaking Skills** 3.1 Non-verbal Communication 3.2 Group –discussions- Conducting G.D on giventopics(Oral Practical) 3.3 Dynamics of Professional presentation/DraftingPresentation on given topics 3.4 Public speaking 3.5 Conversations and Dialogue writing **Unit : 4 Reading Skills** 4.1 Need for Developing Efficient Reading 4.2 Benefits of Effective Reading 4.3 Basic steps To Effective Reading 4.4 Types of Reading 4.5 Reading Comprehension **Unit : 5 Writing Skills** 5.1 Resume writing 5.2 The art of Condensation 5.3 Business Reports 5.4 E-mail writing 5.5 Blog Writing.
Reference Books	1.Handbook of practical Communication skills – Chrisle W. JAICO 2.Basic Managerial Skills for all – S. J. McGrath - PHI 3.Reading to learn – Sheila Smith & Thomas M. Methuen (London) 4.Communication conversation Practice _ Tata McGraw Hill 5. Communication in English – R. P. Bhatnagar & R. T. Bell – Orient Longman 6. Good English – G. H. Vallins – Rups & Co 7. Let's talk English – M. I. Joshi 8. Essentials of Business Communications – Pat & Sons, S. Chand
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

[Subject code-2511001501044001]

Course Code: 102

Course Title: Multi-Disciplinary / Inter Disciplinary Course

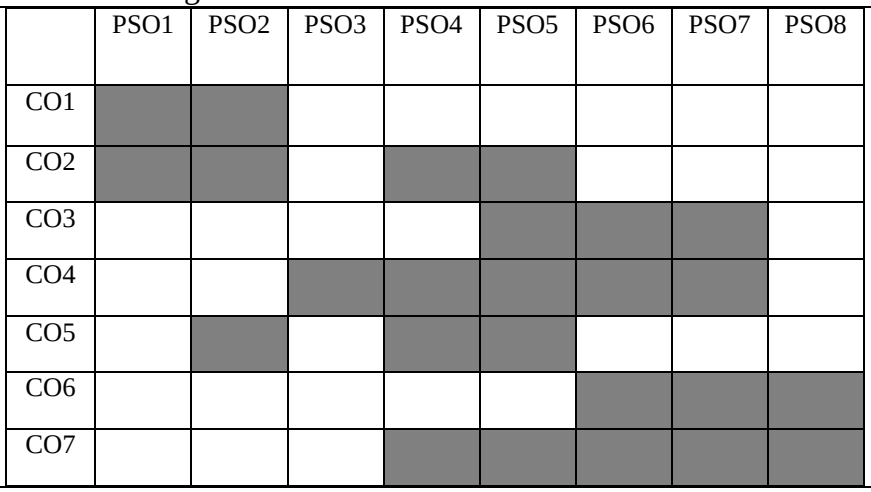
Course Code	102
Course Title	[Title of the course will be the one selected by the student from courses offered by college/institute out of the course basket offered by the University under the Multi-Disciplinary courses or Inter-disciplinary courses.]
Credits	4
Course Category	Multidisciplinary / Inter-Disciplinary Course
Level of Course	100-199 (Foundation / Introductory)
Teaching per Week	4 Hours/week.
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2023-2024
Purpose of Course	- 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 pool of courses or from any other institutions as the learner's choice. - Interdisciplinary course can help to gain the skills needed to adapt to a rapidly changing workplace, combining theory with practice to help students develop valuable transferable skills. - Multi-disciplinary course allows the student to understand the power of new ideas. It helps student to develop a pragmatic attitude by allowing them to decide what subjects they will opt for and what could be their possible benefits. They get time to make a decision by calculating the risks & advantages.
Course Objective	- 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.
Pre-requisite	Fundamentals of knowledge about the subject at 10th Grade Level
Course Outcomes	CO1: Analyze complex societal issues using multiple disciplinary perspectives, fostering a comprehensive understanding of interconnected factors. CO2: Apply interdisciplinary knowledge and skills to propose innovative solutions to real-world problems, demonstrating the practical application of cross-disciplinary approaches.

	CO3: Critically evaluate and synthesize information from diverse sources, developing the ability to integrate and make connections between different disciplinary perspectives. CO4: Collaborate effectively with peers from various backgrounds, demonstrating strong teamwork and communication skills in multidisciplinary settings. CO5: Demonstrate adaptability and flexibility in navigating and addressing interdisciplinary challenges, showcasing the ability to think creatively and embrace diverse viewpoints.
Course Outcome	- The course outcome of a multidisciplinary course is typically to provide students with a comprehensive understanding of a specific topic or problem by integrating knowledge and perspectives from multiple disciplines. This outcome aims to develop critical thinking skills, problem-solving abilities, interdisciplinary collaboration, and the capacity to apply diverse approaches to real-world issues. Ultimately, the course seeks to prepare students for interdisciplinary work environments and equip them with the skills necessary to tackle complex, multifaceted challenges. - The course outcome of an interdisciplinary course is to enable students to integrate knowledge and methodologies from different disciplines in order to gain a holistic understanding of a specific topic or problem. This outcome aims to develop students' ability to think critically across disciplinary boundaries, synthesize information from diverse sources, and apply interdisciplinary approaches to address complex real-world challenges. The course also seeks to enhance students' communication and collaboration skills, preparing them to work effectively in interdisciplinary teams and contribute to cross-disciplinary discussions and solutions.
Course Content	Course content will be based on the selected course from the basket of courses of Multi-Disciplinary courses or Inter-Disciplinary courses.
Reference Books	- As mentioned in the course structure for the selected course.
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

[Subject code-2511001501033001]

Course Code: 103

Course Title: Fundamentals of Computers and Data

Course Code	103
Course Title	Fundamentals of Computers and Data
Credits	4
Course Category	Minor Course
Level of Course	100-199 (Foundation / Introductory)
Teaching per Week	4 Hours/Week
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	2022-2023
Implementation Year:	A.Y. 2023-2024
Purpose of Course	- Concepts and types of computer and various hardware technologies relevant to computer as well as some important peripherals will be covered. - Introduction of computer internal memories, number systems and conversions from decimal to binary. - Exposure of various input and output devices as well as concepts of Internet and relevant gadgets and their application - Understand the Concepts of Data and purpose of storing and managing data.
Course Objective	To provide knowledge of functional units, number System, Devices and memory & its storage, Data, concepts of data science and .
Pre-requisite	-
Course Outcomes	**CO1:** Students will be able to develop interest in using computers for professional work. **CO2:** Students will be able to learn functional units of computers, how they process information with other computing systems and devices. **CO3:** Students will be able to understand basic computer hardware components. **CO4:** Students will be able to express the major concepts of Application software and System Software. **CO5:** Student will be able to learn how the computer represents and stores information using binary number system, and will be able to convert between binary and decimal number system. **CO6:** Students will be able to understand the functions of input output devices, know the different types of I/O Devices, and assess new technology used for I/O devices. **CO7:** Students will be able to understand types of data, processing and effective storage of data.
Mapping between Course Outcomes(CO) with Program Outcomes(PSO)	

Course Outcome	On completion of this course, students will get knowledge about functional units, number System, devices and memory and storage and fundamentals of Data and data storage.
Course Content	**UNIT-1: Introduction** 1.1 Introduction of Computer 1.2 Applications of Computer 1.3 Types of Computers – Super Computers, Mainframes, Mini Computers, Micro computers(Desktop, Laptop, Notebook, Tablet, Smart Phones) 1.4 Block Diagram and functional units of computer 1.5 Concepts of Address Bus and Data Bus 1.6 Concept of virtual memory and cache memory 1.7. Hardware Components 1.7.1. Motherboard 1.7.2. Types of Processor (CPU and GPU) 1.7.3. Memory: RAM(SRAM,DRAM, SDRAM), ROM, EPROM, EEPROM 1.8. Introduction to Software 1.8.1. Purpose and significance of Operating System 1.8.2. Concept of System Software and Application Software **UNIT-2: Number System** 2.1. Introduction of Decimal, Binary, Octal and Hexadecimal number Systems. 2.2 Conversion of Decimal to Binary and Binary to Decimal 2.3 Binary addition & subtraction 2.4 ASCII and ANSI character code **Unit-3: Concepts of Internet** 3.1. Concepts of Internet and WWW 3.1.1 Types of Internet Services 3.1.2 Hardware – Modem, Router, Blue tooth, Fire-Stick 3.1.3 Internet connections using Hotspot, WiFi, cable 3.2 Introduction of Cloud 3.2.1 Concepts of cloud 3.2.2 Purpose and application of Cloud (Example of GoogleDoc) 3.2.3 Concepts of Online Data Backup 3.3 Introduction of Web Browser and relevant terminologies : 3.3.1 URL, Address bar, Domain, Links, Navigation Buttons 3.3.2 Tabbed browsing, Bookmarks, History **Unit-4: Concepts of Data** 4.1 Concepts of Data and information 4.2 Types of Data (Quantitative and Qualitative) 4.3 Difference between structured and un structured data 4.3 Storage and processing concepts of data 4.3.1 Introduction of Data warehouse 4.3.2 Introduction of Data lake 4.3 Concepts of Data Science 4.3.1 Evolution of Data Science 4.3.2 Roles of Data Science 4.4 Applications of Data Science in various fields **UNIT-5: Understanding Data Collection and Data Pre-Processing** 5.1 Introduction of Data and Datasets 5.2 Samples of Data and Datasets 5.3 Data Pre-Processing Overview 5.4 Concepts and need of data pre-process 5.5 Concepts of Data Cleaning

Reference Books	1. How computer work: Ron White – Tech media 2. Introduction to computers: 4th Edition – Peter Norton 3. Fundamentals of Computers: V. Rajaraman 4. Computer Fundamentals: Pradeep K. Sinha & Priti Sinha (BPB) 5. Introduction to Networking RechardMcMohan Tata McGraw Hill Publication 6. HTML Black Book – Steven Holzner – Dreamtech Press 7. Computer Network Fundamentals and application – R S Rajesh Vikas Publication 8. HTML for the World Wide Web, Fifth Edition, with XHTML and CSS-Peachpit Press 9. "Data Science from Scratch: First Principles with Python" by Joel Grus, ISBN: 978-1492041139, Publisher: O'Reilly Media. 10. "Data Science for Business" by Foster Provost and Tom Fawcett, ISBN: 978-1449361327, Publisher: O'Reilly Media 11. "Python for Data Analysis" by Wes McKinney, ISBN: 978-1491957660, Publisher: O'Reilly Media 12. "The Elements of Statistical Learning: Data Mining, Inference, and Prediction" by Trevor Hastie, Robert Tibshirani, and Jerome Friedman, ISBN: 978-0387848, 570, Publisher: Springer
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

[Subject code for theory-2511001501011001]

Course Code: 104

Course Title: **Programming concepts and Programming methodology (PCPM)**

[Subject code for pratical-2511001501011002]

Course Code	104
Course Title	Programming Concepts and Programming Methodology (PCPM)
Credits	4
Course Category	Major Course
Level of Course	200-299 (Intermediate Level)
Teaching per Week	Theory/Lectures: 2 Hours/Week and Lab./Practical Hours: 4 Hours/Week
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2023-2024
Purpose of Course	- Computer programming is a process that leads from an original formulation of a computing problem to executable computer programs. - Programming involves activities such as analysis, developing, understanding, generating algorithms, verification of requirements of algorithms including their correctness, and implementation (commonly referred to as coding) of algorithms in a target programming language. - To emphasis on concepts of Compiler based programming language, structure of code, algorithms, flow-charts, problem solving attitude, concepts of variables and declaration mechanism of different datatypes, simple I/O statements, conditional statements, loops, compound iterations, strings and certain inbuilt functions, header files, concepts of arrays and one dimensional numeric array operations, numeric inbuilt functions and concepts of pointers
Course Objective	To introduce students the essentials of computer Programming concepts and programming methodology using compiler based and interpreter based Programming languages.
Pre-requisite	-
Course Outcomes	CO1: Students will be able to learn fundamental programming concept of compiler based and interpreter based programming language. CO2: Students will be proficient working on conditional statements, iterative Statements and fundamentals of programming concepts using C and Python. CO3: Students will be able to represent compound data using lists, tuples and dictionaries in Python programs. CO4: Students will be able to learn programming methodology. CO5: Students will learn the concepts of interpreter based programming language using Python and its comparison with C programming language.
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** 1.1 Concepts of Programming Languages 1.1.1 Introduction of Source Code, Object Code and executable code 1.1.2 Algorithm and Flowchart 1.1.3 Concepts of Structured Programming Language 1.2 Concepts and comparison of Interpreter and Compiler based languages: 1.2.1 Introduction of Interpreter and Compiler 1.2.2 Comparison of Interpreter and compiler 1.2.3 Introduction of compiler based(C language)program body structure 1.2.4 Introduction of interpreter based (Python) program body structure

1.2.5 Character Set, concepts of variables and constants in C and Python
1.2.6 Identifiers, literals, Key words in C and Python
1.2.7 Data types in C (signed and unsigned) (Numeric : int, short int, long, float, double) , (Character type: char, string) and void.
1.2.8 Primitive Data types in Python
1.2.8 Concepts of source code, object code and executable code.

UNIT-2: Input/Output Statements and Operators (C Programming Language):

2.1 Input/Output statements:
2.1.1 Concepts of Header files (STDIO,CONIO)
2.1.1.1 Concepts of pre-compiler directives.
2.1.1.2 Use of #inlcude and #define
2.2 Input/Output Statements:
2.2.1 Input statements : scanf(), getc(), getch(), gets(), getchar()
2.2.2 Output Statements: printf(), putc(),puts(), putchar()
2.2.3 Type specifiers (formatting strings) : %d, %ld, %f, %c, %s, %lf
2.3 Operators :
2.3.1 Arithmetic operators (+, -, *, /, %, ++, --,)
2.3.2 Logical Operators (&&, ||, !)
2.3.3 Relational Operators (>, =, <=, !=)
2.3.4 Bit-wise operators (&, |, ^ , <>)
2.3.5 Assignment operators (=, +=, -=, *=, /=, %=)
2.3.6 Ternary Operator and use of sizeof() function.
2.4 Important Built-in functions:
2.4.1 Use of : (strlen, strcmp, strcpy, strcat,strrev)
2.4.2 Use of : (abs(), floor(), round(), ceil(), sqrt(), exp(), log(), sin(), cos(), tan(), pow() and trunc())

UNIT-3: Decision Making and Iterative statements in C programming Language:

3.1 if statements :
3.1.1 simple if statements
3.1.2 if…else statements
3.1.3 if…else if….else statements
3.1.4 Nested if statements.
3.2 Switch..case statements
3.2.1 Use of break and default
3.2.2 Difference between switch and if statements.
3.3 Use of goto statement for iteration
3.4 while loop
3.5 do..while loop
3.6 for loop
3.7 Nested while, do..while and for loops
3.8 Jumping statement: (break and continue)

UNIT-4: Concepts of Arrays and pointer in C Programming Language

4.1 Concepts of Single-dimensional Array
4.1.1 Numeric single dimensional Array
4.1.2 Numeric single dimensional array operations:
4.1.2.1 Sorting array in ascending or descending. (Bubble and selection)
4.1.2.2 Searching element from array (Linear Search)
4.1.3 Character Single dimensional Array
4.1.3.1 Character Single dimensional array operations:
4.1.3.2 Use of \0, \n and \t
4.2 Pointers:
4.2.1 Concepts of Pointers
4.2.2 Declaring and initializing int, float, char and void pointers
4.2.3 Pointer to single dimensional numeric array.

	UNIT-5: Concepts of Interpreter based programming language using Python 5.1 Concepts of Interpreter programming language 5.1.1 Start with Python code 5.1.2 Python Variables 5.1.3 Python Data structures 5.1.4 Data types and Data conversion in Python 5.2 Conditional and Iterative Statements 5.2.1 Conditional Statements 5.2.2 Iterative Statements 5.2.3 Python Operators 5.3 Python In-built collections 5.3.1 List 5.3.2 Tuples 5.3.3 Sets 5.3.4 Dictionary [Practical work for Unit-1 to 4 will be carried out for 'C' Programming Language and Unit-5 for 'Python Programming language'.]
Reference Books	1. Programming in C, Balaguruswami – TMH 2. C: How to Program, Deitel & Deitel - PHI 3. C Programming Language, Kernigham & Ritchie - TMH 4. Programming in C, Stephan Kochan - CBS 5. Mastering Turbo C, Kelly & Bootle - BPB 6. C Language Programming – Byron Gottfried - TMH 7. Let us C, Yashwant Kanetkar - BPB Publication 8. Magnifying C, Arpita Gopal - PHI 9. Problem Solving with C, Somashekara - PHI 10.Programming in C, Pradip Dey & Manas Ghosh – Oxford 11. "Learning Python" by Mark Lutz, ISBN: 978-1449355739, Publisher: O'Reilly Media 12. "Python for Data Analysis" by Wes McKinney, ISBN: 978-1491957660, Publisher: O'Reilly Media
Teaching Methodology	Class Work, Discussion, Lab work, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

[Subject code for theory-2511001501022001]

Course Code: 105

Course Title: Database Fundamentals

[Subject code for pratical-2511001501022002]

Course Code	105
Course Title	Database Fundamentals
Credits	4
Course Category	Major Course
Level of Course	200-299 (Intermediate Level)
Teaching per Week	Theory/Lectures: 2 Hours/Week and Lab./Practical Hours: 4 Hours/Week
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2023-2024
Purpose of Course	Understand concepts of Data and storage of data. This course is aimed to impart knowledge about storing data, concepts of database, retrieval of data and manipulation of data. It is aimed to cover effective storage of data, statistical analysis of data and graphical presentation of data. It also covers concepts of database and fundamental of query languages to insert, access, and manipulate data. This course is not spreadsheet or database specific. The course is not software specific. Any open source software can be used for practical.
Course Objective	To learn and obtain the skills related to i) Concepts of data, data storage and statistical manipulation of data. ii) Introduction of spreadsheet and data manipulation using spreadsheet. iii) Concepts of database, storage and manipulation of data using query language.
Pre-requisite	-
Course Outcomes	CO1- Students will learn the concept of data and storage of data CO2- Learn the Concept of Spreadsheet, Using the spreadsheet students will able to learn data manipulation, Statistical analysis of data and graphical presentation of data. CO3-Learn the concept of database and data storage in database CO4-To understand the concept of data storage through the concept of fundamental of query language by learning DDL and DML Statements. COS- To Learn the concept of Queries to manipulate data and handling of database using SQL.
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 worksheet: (Max.Weightage: 15%)

1.1 Fundamentals of Worksheet:

1.1.1 Concepts of workbook, adding worksheet, cell address, formula bar, column, rows, cells, Insert, delete, format cells, cell size (row-height, column weight), rename sheet, protect sheet, lock cell.

1.1.2 Cut, copy, paste, paste special, format painter, font size, font face, fill color, font color, font alignment

1.2 Alignment, indent, Number format, percent style, coma style, increase/decrease decimal

1.2.1 Insert picture, shapes

1.2.2 Insert Textbox, Header & Footer, Symbols

1.2.3 Save, save as, save file as csv, spell check, protect sheet and Workbook, Linking spread sheets.

1.2.4 Print, Quick print, Print preview

1.2.5 Split, Hide and freeze panes in worksheet.

UNIT-2: Formulas, Chart and Data: (Max.Weightage: 15%)

2.1 Charts :
- 2.1.1 Creating 2D and 3D charts (Columns, Line, Pie, Bar, Scatter)
- 2.1.2 Difference among columns, Line and bar charts.

2.2 Formulas:
- 2.2.1 sum, average, count, max, min, sumif, pmt, stddev
- 2.2.2 Logical (if, AND, OR, NOT, TRUE, FALSE)
- 2.2.3 Date and Day function : Date, day, time, now, Hour, Minute, Second, Month, Days360, weekday

2.3 Data :
- 2.3.1 Sort Data, Filter Data
- 2.3.2 Text to columns, Remove Duplication
- 2.3.3 Consolidated Data (sum, count, max, min, average)

UNIT-3: Concepts of Database: (Max.Weightage: 25%)

3.1 Database characteristics:
- 3.1.1 Data Independence (Logical and Physical)
- 3.1.2 Components of Database (User, Application , DBMS, Database)
- 3.1.3 Database Architecture (1-tier, 2-tier, 3-tier)
  - 3.1.3.1 Comparison, advantages and disadvantages.

3.2 Database Models (Hierarchical, Network, E/R, Relational)
- 3.2.1 E/R model : Entity, Relationship, Attribute
- 3.2.2 E/R Diagram : One to one, one to many , many to one, many to many
- 3.2.3 Strong entity, weak entity
- 3.2.4 key attribute, derived attribute, Multi-valued attribute

3.3 Types of keys :
- 3.3.1 Super key, candidate key, Primary key, Composite key, Foreign key, Unique key.

UNIT-4: Normalization and Introduction of SQL: (Max.Weightage: 25%)

4.1 Normalization (Insertion, Updating, Deletion anomalies)

4.2 Normalization Rules:
- 4.2.1 Concepts of Dependency, Transitive Dependency
- 4.2.2 Armstrong Axioms
- 4.2.3 1st Normal Form, 2nd Normal Form, 3rd Normal Form, B.C.N.F.

4.3 Concepts of Structure Query Language (SQL)
- 4.3.1 SQL datatypes : int, float, double, char, varchar, number, varchar2, Text, date

4.4 DDL Statements :
- 4.4.1 Create , Drop, Truncate, Rename, Alter

4.5 DML and DQL(Data Query Language) Statements :
- 4.5.1 Insert, Update, Delete
- 4.5.2 select

UNIT-5: Queries (Single Table only) (Max.Weightage: 20%)

5.1 Using where clause and operators with where clause:
- 5.1.1 In, between , like, not in, =, !=, >, =, <=, wildcard operators
- 5.1.2 Order by, Group by, Distinct
- 5.1.3 AND, OR operators, Exists and not Exists
- 5.1.4 Use of Alias

5.2 Constraints (Table level and Attribute Level)
- 5.2.1 NOT NULL, CHECK, DEFAULT
- 5.2.2 UNIQUE, Primary Key, Foreign Key
- 5.2.3 On Delete Cascade

5.3 SQL Functions :
- 5.3.1 Aggregate Functions: avg(), max(), min(), sum(), count(), first(), last().

	5.3.2 Scalar Functions: ucase(), lcase(), round(), mid(). 5.4 Creating sequence 5.5 Views : 5.5.1 Creating simple view, updating view, dropping view. 5.5.2 Difference between View and Table.
Reference Books	1. OpenOffice.org For Dummies - Gurdy Leete, Ellen Finkelstein, Mary Leete - Wiley Pub. 2. Beginning OpenOffice 3: From Novice to Professional - Andy Channellle - Apress Pub. 3. The OpenOffice.org 2 Guidebook - Solveig Haugland 4. Taming Apache OpenOffice: Getting Started - Jean Hollis Weber - Friends of OpenDocument Inc. 5. Open Office Basic: An Introduction - James Steinberg - Gold Turtle Pub. 6. Database System Concepts: – Henry F. Korth & Abrahim Silberschatz – McGraw Hill Education 7. Introduction to Database Management System– Bipin C. Desai – Galgotia Publication 8. Principles of database systems – Jeffery Ullman – Galgotia Publication 9. An introduction to Database Systems – C. J. Date – Addison Wesley 10. Introduction to database Management – Navin Prakash -TMH 11. Learn Open Office 3.1 Base – AZIMUTH 12. OpenOffice 3.4 Volume III: Base-Christopher N. Cain, Riley W. Walker-Quantum Scientific Publishing 13. Discovering SQL-A Hands-on Guide for Beginner-Alex KriegelWrox Publication 14. A Conceptual Guide to OpenOffice.org 3-R. Gabriel Gurley (Free E-book)
Teaching Methodology	Class Work, Discussion, Lab work, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Practical Exams :
Course code – 104 and course code-105 are theory and practical based courses. For both these courses evaluation will be based on 100 marks for theory and 50 marks for practical. The student is required to obtain minimum 37% score combining theory and practical score for internal and external examination.

Internal Practical Exam :
Internal practical exams will be conducted at college/institute level. The evaluation will be continuous evaluation.
Internal evaluation: 25 marks each for practical based on course-104 and course-105.

External Practical Exams:
The University will conduct external practical exams. The exam question papers will be set by the university. The institute/college will nominate two examiners for batch of 40 students.
Duration and Marks for exam :

2 Hours for Practical exam (Course-104) - 25 Marks
2 Hours for Practical exam (Course-105) - 25 Marks

[Subject code-2511001501066001]

Course code: 106

Course Title: Skill Enhancement Course (SEC-01)

Course Code	106
Course Title	Skill Enhancement Course - I (SEC – 01)
Credit	2
Category of Course	Skill Enhancement Course
Level of Course	100-199 (Foundation / Introductory)
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	2022-2023
Implementation Year:	A.Y. 2023-2024
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 outcome	CO1: Student select the area of skill 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 in terms addressing the problems. CO5: Learn to upskill and upgrade the knowledge in the area of selected subject.
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.

[Subject code-2511001501077001]

Course code: 107

Course Title: Value Addition Course-I (VAC-01)

Course Code	107
Course Title	Value Addition Course - I (VAC – 01)
Credit	2
Category of Course	Value Addition Course
Level of Course	100-199 (Foundation / Introductory)
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. 2023-2024
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.

Internship: Student willing to exit the program at the end of the two semesters and to avail the Certificate in Data Science or exit the program at the end of the first four semesters and to avail the Diploma in Data Science, 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 - 2

Course Code: 201

Course Title: Ability Enhancement Course-02

Course Code	201
Course Title	Ability Enhancement Course – 02
Credits	2
Course Category	Ability Enhancement Course (AEC-02)
Level of Course	100-199 (Foundation / Introductory)
Teaching per Week	2 Hours
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2023-2024
Purpose of Course	This will be an elective course. Can be selected from the list of elective options available under the basket of Ability Enhancement certificate Courses offered by the University.
Course Objective	The course aim at enabling the students to acquire and demonstrate the core linguistic skills, including critical reading and expository and academic writing skills that help students articulate their arguments and present their thinking clearly and coherently and recognize the importance of language as a mediator of knowledge and identity. They would also enable students to acquaint themselves with the cultural and intellectual heritage of the chosen MIL and English language, as well as to provide a reflective understanding of the structure and complexity of the language/literature related to both the MIL and English language. The courses will also emphasize the development and enhancement of skills such as communication, and the ability to participate/conduct discussion and debate.
Pre-requisite	Knowledge of English at H.Sc.(12^{th}) Level
Course Outcomes	The list of Electives are showing individual course's Course Outcomes.
Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)	As per the course outcome (CO) of selected course out of the basket of 2-credit university approved certificate courses offered by University under the category Ability Enhancement Course. Mapping between Course Outcomes(CO) with Program Specific Outcomes (PSO) is based on selected course.
Course Content	As per the selected course out of the basket of approved courses offered by University under the category Ability Enhancement Course.
Reference Books	- The list of reference books will be decided by the Institutes/Colleges/Departments or as per the university guidelines based on the selected Courses. - Minimum five copies of five different titles relevant topics are recommended to keep in the library. Electives are showing individual course's reference books.
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course Code: 202
Course Title: Multi-Disciplinary / Inter Disciplinary Course

Course Code	202
Course Title	[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 / Inter-Disciplinary Course
Level of Course	100-199 (Foundation / Introductory)
Teaching per Week	4 Hours/week.
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2023-2024
Purpose of Course	- 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 pool of courses or from any other institutions as the learner's choice. - Interdisciplinary course can help to gain the skills needed to adapt to a rapidly changing workplace, combining theory with practice to help students develop valuable transferable skills. - Multi-disciplinary course allows the students to understand the power of new ideas. It helps them to develop a pragmatic attitude by allowing them to decide what subjects they will opt for and what could be their possible benefits. They get time to make a decision by calculating the risks & advantages.
Course Objective	- 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.
Pre-requisite	Fundamentals of knowledge about the subject at 10^{th} Grade Level
Course Outcomes	CO1: Analyze complex societal issues using multiple disciplinary perspectives, fostering a comprehensive understanding of interconnected factors.

	CO2: Apply interdisciplinary knowledge and skills to propose innovative solutions to real-world problems, demonstrating the practical application of cross-disciplinary approaches. CO3: Critically evaluate and synthesize information from diverse sources, developing the ability to integrate and make connections between different disciplinary perspectives. CO4: Collaborate effectively with peers from various backgrounds, demonstrating strong teamwork and communication skills in multidisciplinary settings. CO5: Demonstrate adaptability and flexibility in navigating and addressing interdisciplinary challenges, showcasing the ability to think creatively and embrace diverse viewpoints.
Course Outcome	- The course outcome of a multidisciplinary course is typically to provide students with a comprehensive understanding of a specific topic or problem by integrating knowledge and perspectives from multiple disciplines. This outcome aims to develop critical thinking skills, problem-solving abilities, interdisciplinary collaboration, and the capacity to apply diverse approaches to real-world issues. Ultimately, the course seeks to prepare students for interdisciplinary work environments and equip them with the skills necessary to tackle complex, multifaceted challenges. - The course outcome of an interdisciplinary course is to enable students to integrate knowledge and methodologies from different disciplines in order to gain a holistic understanding of a specific topic or problem. This outcome aims to develop students' ability to think critically across disciplinary boundaries, synthesize information from diverse sources, and apply interdisciplinary approaches to address complex real-world challenges. The course also seeks to enhance students' communication and collaboration skills, preparing them to work effectively in interdisciplinary teams and contribute to cross-disciplinary discussions and solutions.
Course Content	Course content will be based on the selected course from the basket of courses of Multi-Disciplinary courses or Inter-Disciplinary courses.
Reference Books	- As mentioned in the course structure for the selected course.
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course Code: 203
Course Title: Operating System

Course Code	203
Course Title	Operating System
Credits	4
Course Category	Minor Course - Minor discipline is the broader understanding course beyond the major discipline course. - Student can opt the course from the available basket with open, generic-electives of the courses offered by the college/institute from the pool of courses offered by University from available basket. - Minor subjects may be from same or different disciplines as per choice of the students. - Student may make choices according to their interest/need, from ODL courses also.
Level of Course	100-199 (Foundation / Introductory)
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	2022-2023
Implementation Year:	A.Y. 2023-2024
Purpose of Course	- An Operating System (OS) is a software that manages computer hardware and software resources and provides common services for computer programs. The operating system is an essential component of the system software in a computer system. Application programs usually require an operating system to function. The course is based on open source operating systems like Linux. - It helps students to gain broader knowledge in addition to relevant major disciplines courses as per their choices.
Course Objective	1. To understand functionality provided by an Operating System. 2. To make aware with basic concepts of Windows O. S. Management. 3. To learn about device management.
Pre-requisite	Basic knowledge of computer fundamentals.
Course Outcomes	**CO1:** Students will learn how operating system is important for computer system and what is the role of an OS, and also learn different types of operating system and their services. **CO2:** Students will be able to understand the structure and organization of file system. **CO3:** To differentiate between windows and linux OS **CO4:** To install and maintain linux workstation and also able to manage user accounts. **CO5:** To understand devices, usage of devices, scheduling algorithms and decide which is the best one. **CO6:** Students will be able to develop application the coordinate with respective OS in a much better way which is an essential.

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

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1								
CO2								
CO3								
CO4								
CO5								
CO6								

Course Content

Unit 1. Operating System Concepts

1.1.Evolution of Operating System & History

1.1.1 Need of an Operating System

1.1.2 Single User & Multi User Operating System

1.2. Elements of an Operating System

1.3. Operating System as a Resource Manager

1.4 Introduction to File System and File Management

1.4.1 File Concept

1.4.2 Operations on File

1.4.3 File Access Methods

1.4.4 Sequential Access and Direct Access)

1.5 Directory Systems File Management Functions.

1.6 File System and Directory Structure organization.

Unit 2: Process and Memory Management

2.1 Process Concepts and States

2.1.1 Concepts of Process Scheduling

2.1.2 Process Synchronization and Deadlocks

2.1.3 Inter-process Communication

2.1.4 Threads and Multithreading

2.2 Memory Management

2.2.1 Memory Hierarchy and Address Binding

2.2.2 Logical and Physical Address Spaces

2.2.3 Memory Allocation Techniques

2.2.4 Virtual Memory Concepts and Paging

Unit 3. Introduction of Linux

3.1.Introduction of Linux versions

3.2.Components of Linux

3.3.Comparison of Windows and Linux

Unit 4. Linux Administration

4.1. Installing Linux

4.2. Installation of Open Source Software

4.3.Maintaining User Accounts

4.4.System Config Services (Package)

Unit 5. Device Management and

5.1.Device Management Function

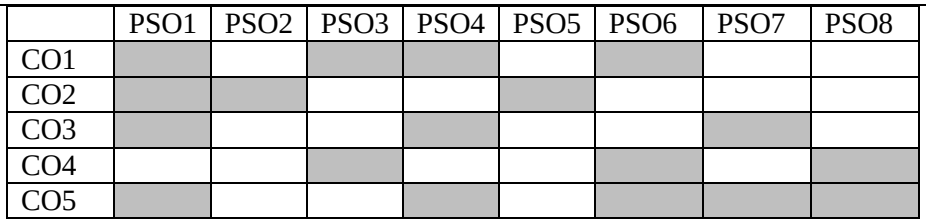
5.2.Device Characteristics

5.3.Disk space Management

5.4.Allocation and Disk Scheduling Methods

Reference Books	1. Operating System Concepts: – James Peterson: – McGraw Hill 2. Operating System: – Stallings - PHI 3. Operating System Principles: – Silberschatz, Galvin, Gagne - Willey, India 4. Operating Systems – A. S. Godbole – Tata McGraw Hill 5. Linux – The Complete Reference – Richard Petersen – Tata McGraw Hill 6. "Operating System Concepts" Author: Abraham Silberschatz, Greg Gagne, Peter B. Galvin ISBN: 978-1118063330 Publisher: Wiley 7. "Linux System Programming: Talking Directly to the Kernel and C Library" Author: Robert Love ISBN: 978-1449339531 Publisher: O'Reilly Media 8. "Linux Bible" Author: Christopher Negus ISBN: 978-1118999875 Publisher: Wiley 9. "Understanding the Linux Kernel" Author: Daniel P. Bovet, Marco Cesati ISBN: 978-0596005658 Publisher: O'Reilly Media 10. "Linux Command Line and Shell Scripting Bible" Author: Richard Blum ISBN: 978-1118983843 Publisher: Wiley
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course Code: 204
Course Title: Programming Skills

Course Code	204
Course Title	Programming Skills
Credits	4
Course Category	Major 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	2022-2023
Implementation Year:	A.Y. 2023-2024
Purpose of Course	- To understand concepts of programming using Compiler based programming language C and Interpreter based programming Language Python. - To compare the code structures of Compiler based programming language 'C' and interpreter based programming language 'Python'. [Python codes can be executed using any open source IDE. This is not IDE specific course.]
Course Objective	i) Advance programming skills using compiler based programming language C. ii) Introduction of Interpreter based Programming language Python. iii) Enhancing basic programming skills using Interpreter based and Compiler based programming languages
Pre-requisite	Fundamental knowledge of computer programming using 'C' language. Knowledge of Python and Python IDE installation is recommended.
Course Outcomes	CO1: Students will be able to learn advanced programming concept of compiler based programming language. CO2: Students will be proficient working on conditional statements, iterative Statements and fundamentals of programming concepts using C and Python. CO3: Students will be able to represent compound data using lists, tuples and dictionaries in Python programs. CO4: Students will be able to develop real world application. CO5: Students will learn important libraries like Numpy, Pandas which are useful in Data analysis, Machine Learning.
Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)	
Course Outcome	- On completion of the course, the Students will be conceptually clear about the two dimensional arrays, structures and unions using 'C' programming language. - Concept of conditional statements, iterative Statements and fundamentals of programming concepts using Python.
Course Content	**UNIT-1: Arrays, Structure & Union and User defined function in C programming Language** 1.1 Concepts of Two-Dimensional Numeric Array 1.1.1 Declaring Two-Dimensional numeric array 1.1.2 Two-Dimensional numeric Array operations (Addition, Subtraction, Multiplication, Transpose)

	1.1.3 Element Address in array(Row major and Column major) 1.1.4 Two-Dimensional Character Array: 1.1.4.1 Declaring& Initializing Two-Dimensional character array 1.1.4.2 Two-Dimensional character Array operations (Searching elements, copying, merging, finding length of given string) 1.2 Concepts of structure and Union 1.2.1 Defining, declaring and Initializing structure and Union 1.2.2 Typedef and accessing structure member 1.2.3 Difference between structure and union 1.3 User defined functions 1.3.1 Function return type, parameter list, local function variables 1.3.2 Passing arguments to function 1.3.3 Calling function from main() function or from other function. 1.3.4 Function with No arguments and no return value, No arguments and are turn value, with arguments and no return value, with arguments and are turn value. 1.3.5 Recursive Function **UNIT-2: Python Fundamentals** 2.1 Concepts of Interpreter based programming language 2.1.1 Structure of Python Programming language. 2.1.2 Python code Indention and execution 2.2 Python Variables 2.2.1 Naming of variables and Dynamic declaration of variables 2.2.2 Comments in Python 2.2.3 Assigning values to multiple variables 2.2.4 Global variables 2.3 Python Data types 2.3.1 Text(str), Numeric Type(int, float, complex),Boolean(bool) 2.3.2 Setting Data types 2.3.3 Type conversion(int, float, complex),casting(int, float, str) 2.4 User defined function. 2.4.1 Defining function, Function with Parameters 2.4.2 Parameter with default value, Function with return value **UNIT-3: Python Strings and Operators** 3.1 Python Strings 3.1.1 Multiline string, String as character array, triple quotes 3.1.2 Slicing string, negative indexing, string length, concatenation 3.1.3 String Methods: (centre, count, join, len, max, min, replace, lower, upper, replace, split) 3.2 Operators 3.2.1 Arithmetic Operators(+,-,*,/,%,**,//) 3.2.2 Assignment Operators(=,+=,-=,/=,*=,//=) 3.2.3 Comparison Operators (==,!=,>,<,>=,<=) 3.2.4 Logical Operators(and, or, not) 3.2.5 Identity and member operators(is, is not, in, not in) **UNIT-4: Python conditional and iterative statements** 4.1 If statement, if..elif statement, if..elif…else statements, nested if

	4.2 Iterative statements 4.2.1 While loop, nested while loop, break, continue statements. 4.2.2 for loop, range, break, continue, pass and Else with for loop, nested for loop. 4.3 List: creating list, indexing, accessing list members, range in list, List methods (append, clear, copy, count, index, insert, pop, remove, reverse, sort). **UNIT-5: Python Collections and Library** 5.1 Python Collections 5.1.1 Tuples: Declaring tuple, indexing tuple, changing tuple values, adding and removing data from tuple, Use of tuple() method to create tuple, count() and index() methods. 5.1.2 Sets: declaring set, access set data, set methods (add, clear, copy, discard, pop, remove, union, update). 5.1.3 Dictionary 5.1.3.1 Creating Dictionary, Adding, Accessing and Removing element 5.1.3.2 Dictionary methods: get(),pop(), popitem(),clear(),copy() 5.2 Introduction to Numpy and Pandas 5.2.1 Overview of numpy 5.2.1.1 Numpy methods (Mean, Median, Mode, Standard Deviation and Variance) 5.2.1.2 Implementation of Numpy methods on numeric data set created using list. 5.2.2 Pandas Dataframe 5.2.2.1 Creating dataframe using list 5.2.2.2 Creating dataframe using dict of equal length list 5.2.2.3 Reading data using csv file(read_csv()) 5.2.2.4 Retrieving rows and columns from data frame using index 5.2.2.5 Retrieving rows and columns using loc and iloc functions.
Reference Books	1.Programming in C, Balaguruswami - TMH 2. C Programming Language, Kernigham & Ritchie - TMH 3. The spirit of C, Cooper H & Mullish H - Jaico Pub. 4. Programming in C, Stephan Kochan - CBS 5. Mastering Turbo C, Kelly & Bootle - BPB 6. C Language Programming, Byron Gottfried –TMH 7. Learning Python -Mark Lutz : O'Reilly Media 8. Core Python Programming – by Wesley J Chun ISBN-13: 978- 0132269933 9. Python for Everybody: Exploring Data in Python 3, by Charles Severance (Author), Aimee Andrion (Illustrator), Elliott Hauser (Editor), Sue Blumenberg (Editor) 10. An Introduction to Python - by van Rossum Guido ISBN: 9780954161767, 0954161769 11. Core Pyhton Application Programming – by Wesley J Chun Prentice Hall
Teaching Methodology	Class Work, Discussion, Lab work, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course Code: 205
Course Title: Concepts of Relational Database Management System

Course Code	205
Course Title	Concepts of Relational Database Management System
Credits	4
Course Category	Major 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	2022-2023
Implementation Year:	A.Y. 2023-2024
Purpose of Course	- Imparting fundamental knowledge of Relational Database. - This course also includes SQL & fundamentals of PL/SQL.
Course Objective	1. To make students understand RDBMS architecture 2. Have edge over Control and Iterative statements of PL/SQL 3. Understanding advanced SQL and various complex queries. 4. To make students aware of cursors and Exception Handling.
Pre-requisite	Basic knowledge of Database Management.
Course Outcomes	**CO1** : Students will learn Fundamental Knowledge of Relational database model . **CO2** : Explain and demonstrate advance and various complex queries using SQL. **CO3** : Student will learn about concept of PL/SQL and concept of logic development in PL/SQL through conditional statement. **CO4** : To understand and impart knowledge in order to have edge over Control and iterative statement of PL/SQL in order to improve the applied concept using coding and implement of coding to solve PL/SQL problems. **CO5** : To explain student about cursors and exception handling and demonstrate the concept by implementing to solve the problems. **CO6** : To understand concepts of data storage , retrieval and administration of the data in Relational Models using SQL and PL/SQL.
Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)	

	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	■	■	■	■	■			
CO2	■	■		■	■			
CO3	■	■		■	■	■		
CO4	■	■		■	■	■		
CO5		■	■	■	■		■	
CO6		■	■		■		■	■

Course Content

Unit-1. Introduction of Relational model

1.1 Codd's Rules

1.2 Relational operations Algebra
(select, project, union, intersection, rename)

1.3 Transaction control language: commit, savepoint, rollback

1.4 Data Control language: Grant, Revoke

Unit-2 Advanced SQL

2.1 Data types (NUMBER, CHAR, VARCHAR, VARCHAR2, CLOB, NCLOB, LONG, DATE, RAW, LONGROW)

2.2 ROWID pseudo column & DUAL table

2.3 DATE Functions (SYSDATE, SYSTIMESTAMP, TO_CHAR, TRUNC, ROUND, NEXT_DAY, LAST_DAY, MONTHS_BETWEEN, ADD_MONTHS)

2.4 Concepts of Index (Create, drop)

	2.5 Join Queries 2.5.1 Inner Join 2.5.2 Outer Join (Left, Right, Full) 2.5.3 Cross Join 2.6 Sub Queries with(Insert, update and Delete) 2.7 Nested queries **Unit-3: PL/SQL and conditional Statements :** 3.1 Introduction to PL/SQL (Definition & Block Structure) 3.2 Variables, Constants and Data Type 3.3 Assigning Values to Variables 3.4 User Defined Record 3.5 Conditional Statements 3.5.1 IF…THEN statement 3.5.2 IF..Else statements 3.5.3 multiple conditions 3.5.4 Nested IF statements 3.5.5 CASE statements **Unit-4 : Iterative Statements :** 4.1 Iterative statements : 4.1.1 Loop..End Loop 4.1.2 For.. Loop 4.1.3 While Loop 4.1.4 EXIT Loop 4.1.5 Continue **Unit-5: Cursors and Exception Handling:** 5.1 Concepts of Cursors 5.1.1 Types of cursors (Implicit & Explicit) 5.1.2 Declare, open, fetch and close cursors. 5.2 Cursor Attributes : (%FOUND,%NOTFOUND,%ISOPEN,%ROWCOUNT) 5.3 Exception Handling in PL/SQL 5.3.1 Types of Exceptions: 5.3.1.1 Named System Exceptions 5.3.1.2 Unnamed System Exceptions 5.3.1.3 User-defined Exceptions 5.3.1.4 User Defined Exceptions 5.3.2 Exception Handling
Reference Books	1. The Complete Reference, George Koch, Kevin Loney – Oracle Press 2. Database Management System, Oracle, SQL and PL/SQL, 2nd ed., Das Gupta & Radha Krishna, PHI 3. Oracle 9 PL/SQL Programming, Scott Urman – Oracle Press 4. Oracle SQL: The Essential Reference, David C. Kreines – O'Reilly 5. SQL, PL/SQL :The Programming Language Of Oracle, Ivan Bayross – BPB 6. Oracle PL/SQL Programming – Feuerstein & Peribyl – SPD O'Reilly 7. Learning Oracle SQL and PL/SQL: A Simplified Guide, Rajeeb Chatterjee 8."Oracle PL/SQL Programming" Authors: Steven Feuerstein, Bill Pribyl ISBN: 978-0596009779 Publisher: O'Reilly Media 9."Oracle SQL Developer Handbook" Authors: Dan Hotka, Sue Harper ISBN: 978-0071484742 Publisher: McGraw-Hill Education 10."Oracle Database 12c PL/SQL Programming" Authors: Michael McLaughlin, John Harper ISBN: 978-0071812436 Publisher: McGraw-Hill Education
Teaching Methodology	Class Work, Discussion, Lab work, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

Course code: 206
Course Title: Skill Enhancement Course (SEC-02)

Course Code	206
Course Title	Skill Enhancement Course - II (SEC – 02)
Credit	2
Category of Course	Skill Enhancement Course
Level of Course	100-199 (Foundation / Introductory)
Teaching per Week	2 Hrs (If theory) /4 Hrs (If Practical/Fieldwork/Internship/Project)
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	2022-2023
Implementation Year:	A.Y. 2023-2024
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 outcome	CO1: Student select the area of skill 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 in terms addressing the problems. CO5: Learn to upskill and upgrade the knowledge in the area of selected subject.
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 performance evaluation of student 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.

Course code: 207
Course Title: Value Addition Course-II (VAC-02)

Course Code	207
Course Title	Value Addition Course - II (VAC – 02)
Credit	2
Category of Course	Value Addition Course
Level of Course	100-199 (Foundation / Introductory)
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	2022-2023
Implementation Year:	A.Y. 2023-2024
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.	(viii) The university has categorised and prepared the list of the courses that can be offered as Value Addition Course. (ix) 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. (x) The institutes/college/departments can select more than one course out of the given sets of courses and offer them to their students. (xi) The students can select any of the courses offered by the institute/college/department from the given choices and enrol for the course. (xii) The institute/college/department will arrange appropriate resource person(s) for the course. (xiii) The evaluation will be taken place at the college/institute/department based on the nature of the course. (xiv) 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.

Internship: Student willing to exit the program at the end of the two semesters and to avail the Certificate in Data Science or exit the program at the end of the first four semesters and to avail the Diploma in Data Science, 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 carry 50 marks and of exam duration as per university norms.**
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 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 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.**