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 :-

યુનિવર્સિટી સંલગ્ન કોમ્પ્યુટર સાયન્સ વિદ્યાશાખા હેઠળની તમામ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૬–૨૭ થી અમલમાં આવનાર B.Sc. Computer Science (Honours) Sem.-5 & 6 નો પેટાસમિતિ દ્વારા તૈયાર કરવામાં આવેલ અભ્યાસક્રમ કોમ્પ્યુટર સાયન્સ વિદ્યાશાખા તથા કોમ્પ્યુટર સાયન્સ વિષય ની અભ્યાસ સમિતિની તા.૧૬/૦૬/૨૦૨૫ ની સંયુકત સભાના ઠરાવ ક્રમાંકઃ૦૨ અને SEC નો અભ્યાસક્રમ અભ્યાસ સમિતિવતી ચેરમેનશ્રીએ અને વિદ્યાશાખાવતી ડીનશ્રી દ્વારા મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૨૪/૧૨/૨૦૨૪ ની સભાનાં ઠરાવ ક્રમાંકઃ૩૫૩ અન્વયે માનનીય કુલપતિશ્રીને આપેલ સત્તા અંતર્ગત એકેડેમિક કાઉન્સિલવતી માન.કુલપતિશ્રીએ મંજૂર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

બિડાણઃ ઉપર મુજબ

ક્રમાંકઃઓથો./પરિપત્ર/૧૧૦૬૩/૨૦૨૬
તા.૦૯/૦૬/૨૦૨૬

કુલસચિવ

પ્રતિ,

(૧) યુનિવર્સિટી સંલગ્ન કોમ્પ્યુટર સાયન્સ વિદ્યાશાખા હેઠળની તમામ કોલેજોના આચાર્યશ્રીઓ.
.....આપશ્રીની કોલેજ/વિભાગના 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

Computer Science, Application and I.T. Faculty

Syllabus for (Semester-V and Semester-VI)

of

B.Sc.(Computer Science) (Honours) as per the NEP-2020

To be implemented from

Academic Year: June, 2026-2027

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

Name of Program:	Bachelor of Science in Computer Science (Honours)
Abbreviation:	B.Sc.(Computer Science): Four-year Integrated Program. With Multi-Level Entry and Exit option
Multi-level Exit Criteria:	i) Under Graduate Certificate in Computer Science: If the student wish to exit after completion of First year (Semester-1 and Semeter-2) withoutany back-log and secure additional 4 credits from work based skill oriented university approved courses /vocational courses / summer internship / Apprenticeship in addition to 6 credits from skill-based courses earned during first and second semester. ii) Diploma in Computer Science: If the student wish to exit after completionof 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. (Bachelor's of Science in Computer Science): If the studentwish 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 / summerinternship / 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.(Computer 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:	As per the norms of Veer Narmad South Gujarat University, Surat.
Objective of the Program:	Bachelor of Science in Computer Science (B.Sc.)(Computer Science)(Honours) is undergraduate degree program in computer application area. Objective of the program is to open a channel of admission for courses in the field of Computer Science, Applications andall relevant fields of information technologies to build career for students who have completed standard 12th (H.S.C.) and are interested in taking computing/computer Application and Information Technology as a career. Main objective is to equip the students with strong foundation in computerprogramming languages, coding, database handling, software application developments, problem-solving skills and development of analytical and logical skills. The focus is to introduce various programming languages on

	Different platforms and operating systems, interaction with databasesavailable on various platforms, software testing, development and deployment techniques. It also aims to provide knowledge in latest trendsand advancements in field of computer technologies. The program caters to the needs of the students aspiring to excel in the field of computer science, applications and technologies. The program is designed to develop computer professionals versatile in almost all field of computer application. It also aims to enhance communication and interpersonal skills.
Program Outcome:	**PO1:** Ability to analyze a problem, identify and define the Computing requirements appropriate to its solution. **PO2:** Enhancing the Understanding related to core ideas of computer, analytical thinking, logical abilities and computational fundamentals. **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:** Foster critical thinking and innovation: The program encourages students to think critically and creatively in the context of computer science. They are challenged to explore innovative approaches to problem- solving, evaluate alternative solutions, and apply logical reasoning to make informed decisions. **PO5:** Develop technical proficiency: The objective is to equip students with practical skills in software development, programming languages, databases, networking, and other relevant technologies. They gain hands-on experience in designing, implementing, and testing software systems using industry-standard tools and techniques. **PO6:** Promote collaboration and communication skills: The programemphasizes the importance of teamwork and effective communication in the field of computer science. Students are encouraged to collaborate withpeers on projects, participate in group discussions, and present their ideasclearly and professionally. These program objectives collectively aim to prepare students for diversecareer paths in the field of computer science, including software development, systems analysis, data analysis, cybersecurity, and research.
Program Specific Outcome:	**PSO 1 :** Develop and Strengthen the fundamental core computer science concepts that are required to solve complex problems. **PSO 2 :** Develop the professional skills that need independent logical and analytical thinking, teamwork for successful computer professionals. **PSO 3 :** Nurture the students for design and development of workable computer application solution for real world problems. **PSO 4 :** Develop students for self-learning and practicing computer science application problem solutions. **PSO 5 :** Develop ability to service and excel in fulfilling the modern day demands with their knowledge and skills. **PSO 6 :** Develop technical project and present them among the users.

PO and PSO mapping:			PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
		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 : T.Y.B.Sc.(Computer Science) (SEM – 5 & SEM – 6)
(w.e.f. Academic Year June, 2026-2027)
B.Sc.(Computer Science) – Three Year Program
B.Sc.(Computer Science)(Honours)) – Four Year Integrated Program

SEMESTER – 5

Course Code	Course Title	Course Category	Level of Course	Course Credits	Teaching Hours/week	
				Th.+Pra.	Theory	Practical/ Fieldwork /Project/ Internship
CS-501	Cloud Computing Fundamentals	Minor Course	200-299 Intermediate Level Course	4	4	0
CS-502	Computer Network	Minor Course	200-299 Intermediate	4	4	0
CS-503	Machine Learning using Python	Major Course	400-499 Intermediate Level Course	4	2	4
CS-504	Web Development Using MEAN Stack	Major Course	400-499 Intermediate Level Course	4	2	4
CS-505	Handling Databases Using Python	Major Course	300-399 Intermediate Level Course	4	2	4
	Practical (Based on Course Code:CS-503 , CS-504 & CS- 505	No separate credits allocated for practical. The Practical exam/viva-voce will based on Course CS-503, CS-504 and CS-505.				
CS-506	SEC-05: Data Analysis and Visualization using BI Tool	Skill Enhancement Course	200-299 Intermediate Level Course	2	-	2
Total				22	14	12

Course Code	Course Title	Course Credit	University ExamType	Exam Duration	External Marks	InternalMarks	Total Marks
CS-501	Cloud Computing Fundamentals	4	Theory/Written	2 Hours	50	50	100
CS-502	Computer Network	4	Theory/Written	2 Hours	50	50	100
CS-503**	Machine Learning using Python	4	Theory/ Written Practical :	1 Hours 2 Hours	25 25	25 25	100
CS-504**	Web Development Using MEAN Stack	4	Theory/Written: Practical :	1 Hours 2 Hours	25 25	25 25	100
CS-505**	Handling Databases Using Python	4	Theory/Written Practical :	1 Hours 2 Hours	25 25	25 25	100
CS-506	Data Analysis and Visualization using BI Tool (Skill Enhancement Course)	2	Practical	2 Hours	25	25	50#
Total		22			275	275	550

For Practical and Project:

- Batch Size – 30 Maximum (Desirable). Maximum 40 students can be accommodated in a batch. Separate batch should be considered if the student strength exceed 25 numbers.
- Practical includes Practical sessions for course- CS-503 CS-504 and course-CS-505. Minimum Twelve Practical hours(4 hours each for course-503 4 hours for course-504 and 4 hours for course-505) 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.

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 enroll for the certificate courses separately by paying the course fees as decided by the college/institute. For summer training, the Institute/college will grant the permission and evaluate the training outcomes. Based on satisfactory completion of the summer training, the Institute head will recommend to the university to grant four credits for summer training. The Internship/summer training/skill based certificate courses will be an audit course.[The internship cost/fees will be bear by the student.]

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.

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/University.

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 503 504 and 505 are major courses. These courses are carrying 4 credits (2 Hours of theory and 4 hours of practical per week).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-503 (2hours duration) , Practical exams for course-504 (2hours duration) and course-505(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 + Class Test*: 25
For courses having 25 marks as Internals :
Class Assignment/Active Learning: 03 marks+Home Assignment/Field Assignment: 03 marks + Attendance: 04 + Class Test*: 15

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-503,504 and course-505 separately on same day.

Practical examination will be conducted for course code-503 504 and course-505 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 – 503 504 and505 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 : 2026-2027)	Semester Tuition Fees : As per University norms. Semester Laboratory Utilization fees : As per University norms. (For Govt. and GIA colleges) : As per University norms. (For Self Finance Institutes) : As per University Norms [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 – 6

Course Code	Course Title	Course Category	Level of Course	Course Credits	Teaching per week	
					Theory	**Practical/ Fieldwork/ Project/ Internship**
CS-601	Data Visualizations	Minor Course	200-299 Intermediate Level Course	4	2	4
CS-602	Internet of Things(IoT)	Major Course	400-499 Advance Level Course	4	4	0
CS-603	Web Development Using ReactJS	Major Course	400-499 Advance Level Course	4	2	4
CS-604	Mobile Application Development	Major Course	400-499 Advance Level Course	4	2	4
CS-605	Project and Interview Presentation Soft Skills (AEC)	AEC [Ability Enhancement Course]	100-199 Foundation Course	2	2	0
CS-606	INTERNSHIP	Internship	400-499 Advance Level Course	4	-	120 hours of Supervised Applied work
Other Activities	The student is expected to participate in activities related to NationalService Scheme (NCC), National Cadet Corps (NCC), adult education/literacy initiatives, mentoring school students, Elderly literacy program / Environment preservation activities and othersimilar activities.			-	-	-
Total				22	14	10

Course Code	Course Title	Course Credit	University Exam Type	Exam Duration	External Marks	Internal Marks	Total Marks
CS-601	Data Visualizations**	4	Theory/Written Practical	1 Hours 2 Hours	25 25	25 25	100
CS-602	Internet of Things(IoT)	4	Theory/Written	2 Hours	50	50	100
CS-603	Web Development Using ReactJS**	4	Theory/Written Practical	1 Hours 2 Hours	25 25	25 25	100
CS-604	Mobile Application Development**	4	Theory/Written: Practical :	1 Hours 2 Hours	25 25	25 25	100
CS-605	Project and Interview Presentation Soft Skills (AEC)	2	Presentation / Seminar	-	25	25	50
CS-606	INTERNSHIP	4		-	50	50	100
Total		22			275	275	550

For Practical and Project:

- Batch Size – 20 Maximum (Desirable). Maximum 25 students can be accommodated in a batch. Separate batch should be considered if the student strength exceeds 25 numbers.
- Practical includes Practical sessions for course 601- 604 and course-605. **Minimum** 12 Practical hours (4 hours for course-602, 4 hours for course- 604 and 4 hours for course-605) per week should be allocated per batch. Out of which 8 hours will be in supervised modeand 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. The number of courses (subjects) in Major may vary from semester to semester.

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

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 program.

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 which must be applied/field training/skill based). Student is required to enroll 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 program. The courses can be selectedby 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

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 recognized by the University during semester-1 to semester-4.
(The student need to enroll separately and pay the fees as decided by the respective institute/department.)

 # 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 creditfees.]

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

** Major and Minor Practical based Subjects: Course 601 ,603 and 604 courses. These courses are carrying 4 credits (2 Hours of theory and 4 hours of practical per week). 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-601, 603, 604 (2 hours duration).
Seminar/Presentation Examination for ourse-605.

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

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.
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 – 602,604 and 605 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 : 2026-2027)	Semester Tuition Fees : As per University norms. Semester Laboratory Utilization fees : (For Govt. and GIA colleges) : As per University norms. (For Self Finance Institutes) : As per University norms. [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.]

[Subject code-2511001005044001]

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
T Y B. Sc. (Computer Science)
Syllabus for T. Y. B. Sc. Semester-V
Effective From: June-2026
Course Code : CS-501
Course Title: Cloud Computing Fundamentals

Course code	CS-501
Course Title	Cloud Computing Fundamentals
Credit	4 Credits (Minor)
Teaching per week	4 hours
Minimum week per semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Implementation year	2026-2027
Purpose of the course	This course imparts the knowledge of Fundamentals of cloud Computing and its services.
Course Objective	Objective-1: *Understand* the foundational concepts, key characteristics, and evolution of cloud computing technologies. Objective-2: *Explain* different cloud service and deployment models along with real-world cloud applications. Objective-3: *Analyze* the architecture of cloud platforms, virtualization technologies, and resource management strategies. Objective-4: *Evaluate* leading cloud platforms (AWS, Azure) in terms of services, security, and compliance features. Objective-5: *Apply* emerging cloud trends such as big data, edge computing, and AI/ML integration in practical scenarios.
Pre-requisite	Basic understanding of operating system and computer network
Course Out come	CO1:Students will understand History and Evolution of cloud computing along with that they will come to know merits and demerits of cloud computing CO2: Students will understand core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing. CO3:Students will get idea of use of commonly used services providers like Amazon Web services and Microsoft Azure CO4:Students will get idea of advanced Cloud Concepts & Future Trends
Mapping between COs with PSOs	

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

Course Content

Unit 1: Basics of Cloud Computing

1.1 Introduction to Cloud Computing
- 1.1.1 Definition and Key Characteristics
- 1.1.2 Evolution and History of Cloud Computing
- 1.1.3 Benefits: Cost-efficiency, Scalability, Flexibility, Reliability
- 1.1.4 Challenges: Security, Compliance, Vendor Lock-in

1.2. Cloud Models
- 1.2.1 Deployment Models: Public, Private, Hybrid, Multi-Cloud
- 1.2.2 Service Models:
  - 1.2.2.1 IaaS, PaaS, SaaS

	1.2.2.2 Additional Models: Network as a Service (NaaS), Database as a Service (DBaaS) 1.3 Cloud Applications and Use Cases 1.3.1 Business Applications 1.3.2 Data Backup and Recovery 1.3.3 Media Streaming, File Sharing **Unit 2: Cloud Architecture and Virtualization** 2.1 Cloud Computing Architecture 2.1.1 Components of Cloud Infrastructure 2.1.2 Front-end and Back-end Architecture 2.1.3 Resource Pooling and Multi-tenancy 2.2 Virtualization Technologies 2.2.1 Concept of Virtualization 2.2.2 Types of Virtualization: Hardware (Full, Para, Emulation) 2.2.3 Hypervisors: Type 1 and Type 2 2.2.4 Role of Virtual Machines in Cloud 2.3 Cloud Planning and Design 2.3.1 Business and IT Architecture 2.3.2 Cloud Transformation Planning 2.3.3 Introduction to Service-Oriented Architecture (SOA) 2.3.4 Utility Computing Concepts **Unit 3: Cloud Platforms and Management (AWS and Azure)** 3.1 Overview of Leading Cloud Platforms 3.1.1 Basic Concepts of AWS, Azure 3.1.2 Global Infrastructure: Regions and Availability Zones 3.2 Compute and Storage Services 3.2.1 AWS EC2 and Azure Virtual Machines 3.2.2 AWS Lambda and Azure Functions (Serverless Computing) 3.2.3 AWS S3 vs Azure Blob Storage 3.2.4 Backup and Archival Services (Amazon Glacier, Azure Backup) 3.3 Databases and Networking 3.3.1 AWS RDS and Azure SQL Database 3.3.2 NoSQL: DynamoDB (AWS), Cosmos DB (Azure) 3.3.3 Basics of Networking: Virtual Private Cloud (VPC), Azure Virtual Network (VNet) 3.4 Cloud Management and Monitoring 3.4.1 AWS CloudWatch, Azure Monitor 3.4.2 Resource Management Tools: AWS CloudFormation, Azure Resource Manager 3.4.3 Identity and Access Management (IAM and AAD) **Unit 4: Cloud Security, Big Data & Emerging Trends** 4.1 Cloud Security and Compliance 4.1.1 Cloud Security Principles 4.1.2 Cloud Security Alliance (CSA) 4.1.3 Role-Based Access Control (RBAC) 4.1.4 Compliance: GDPR, HIPAA, SOC2 4.2 Cloud Operations and Service Agreements 4.2.1 Service Level Agreements (SLAs) 4.2.2 Operational Models 4.2.3 State Management and Automation Tools 4.3 Big Data and Data Lakes 4.3.1 Introduction to Big Data 4.3.2 OLTP vs OLAP 4.3.3 Data Warehouse vs Data Lake 4.3.4 Architecture and Benefits of Data Lakes 4.4 Future of Cloud Computing 4.4.1 Edge Computing and IoT (AWS IoT Core, Azure IoT

	Hub) 4.4.2 Cloud for AI & ML (SageMaker, Azure ML) 4.4.3 Trends: Quantum Computing, Green Cloud
Reference Books:	1. Cloud Computing: Principles and Paradigms – *Rajkumar Buyya, James Broberg, Andrzej Goscinski* , Publisher: *Wiley* 2. Cloud Computing: A Hands-on Approach – *Arshdeep Bahga, Vijay Madisetti* , Publisher: *Universities Press / CreateSpace Independent Publishing* 3. Cloud Computing for Dummies – Judith Hurwitz 4. Microsoft Azure Fundamentals Certification and Beyond – *Steve Miles* ,Publisher: *Packt Publishing* 5. AWS Certified Solutions Architect Official Study Guide – Ben Piper 6. Amazon Web Services in Action – Michael Wittig 5. Exam Ref AZ-900 Microsoft Azure Fundamentals – Jim Cheshire 6. Mastering Microsoft Azure Infrastructure Services – John Savill 7. Cloud Computing Bible - Sosinsky - Wiley - India, 2011 8. Cloud Computing for Science and Engineering – *Ian Foster, Dennis B. Gannon,* Publisher: *MIT Press*
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	50% Internal assessment. 50% External assessment

[Subject code-25110010050550011]

Course code: CS-502
Course Title: Computer Networking

Course code	CS-502
Course Title	Computer Networking
Credit	4 Credits (Minor)
Teaching per week	4 hours
Minimum week per semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Implementation Year	2026-2027
Purpose of the course	This course imparts the knowledge of Fundamentals of Computer Networks.
Course Objective	Objective-1: *Understand* the fundamental concepts, architectures, and topologies of computer networks. Objective-2: *Describe* the functions and protocols of the OSI and TCP/IP models across all network layers. Objective-3: *Apply* basic networking and diagnostic commands to configure and troubleshoot network connectivity. Objective-4: *Analyze* IP addressing schemes, routing methods, and network security mechanisms. Objective-5: *Evaluate* emerging internet technologies and modern networking paradigms like SDN, IoT, and cloud networking.
Pre-requisite	Basic Knowledge of Computer Organization
Course Out come	CO1: Explain students about fundaments of network, types of networks, topologies, Data Communication Fundamentals. CO2: Explain about the OSI models and services of each layer, to make students able to understand working of data transmission from device to device. CO3: Explain TCP/IP protocol suite, class addressing CO4: Explain about method of delivery, ICMP, ARP, Port and Sockets. CO5: Explain in detail about UDP and TCP Protocol. CO6: Explain and train student about DNS, Name Servers, HTTP CO7: Understanding about Email architecture, Services and Email Protocols (SMTP, POP3, IMAP).

Mapping between COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	■		■	■		■		
CO2	■	■			■			
CO3	■			■			■	
CO4			■			■		■
CO5	■			■		■	■	■
C06	■			■		■		
CO7				■			■	■

Course Content

Unit 1: Network Fundamentals & Architecture

1.1 Introduction to Networks
- 1.1.1 Types of networks (LAN, WAN, MAN, PAN)
- 1.1.2 Need, uses, and advantages of networking

1.2 Networking Topologies
- 1.2.1 Bus, Star, Ring, Mesh, Hybrid
- 1.2.2 Advantages and disadvantages of each

1.3 Network Models
- 1.3.1 Client-Server, Peer-to-Peer, Hybrid networks

1.4 Data Communication Basics
- 1.4.1 Signals, Bandwidth, Frequency
- 1.4.2 Transmission modes: Simplex, Half-duplex, Full-duplex
- 1.4.3 Multiplexing techniques (FDM, TDM, WDM)

1.5 Basic Networking Commands (In Linux)
- 1.5.1 ping, traceroute/tracert, netstat, ipconfig/ifconfig, nslookup
- 1.5.2 Case Study: Troubleshooting network connectivity issues

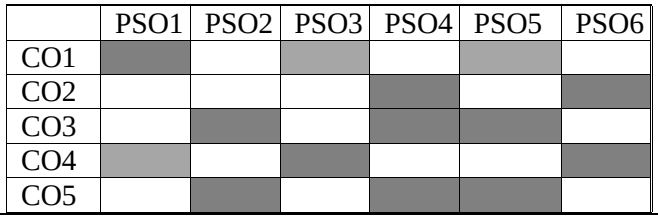
	Unit 2: OSI Model & Network Infrastructure 2.1 OSI Model & Functions of Each Layer 2.2 Physical and Data Link Layer 2.2.1 MAC & LLC sublayers 2.2.2 CSMA/CD, CSMA/CA 2.2.3 IEEE 802 Standards 2.2.4 Transmission media (wired & wireless) 2.2.5 Devices: NIC, Repeaters, Hubs, Bridges 2.3 Network and Transport Layer 2.3.1 Logical addressing, IPv4 vs IPv6 2.3.2 Switching techniques (Circuit, Packet, Message switching) 2.3.2 Routing Basics (Static vs Dynamic) 2.3.3 Layer 2 & Layer 3 switches, Routers 2.4 Application & Upper Layers 2.4.1 Session Layer: Session management, Remote procedure calls 2.4.2 Presentation Layer: Encryption & Compression techniques 2.4.3 Application Layer: FTP, NFS, Proxy, Gateway 2.5 Case Study & Commands (In Linux) 2.5.1 arp, route, ip route, netsh 2.5.2 Case Study: Packet Capture Analysis using Wireshark **Unit 3: TCP/IP & Network Security** 3.1 TCP/IP Protocol Suite 3.1.1 Comparison of OSI and TCP/IP models 3.2 IP Addressing & Routing 3.2.1 IPv4/IPv6, Subnetting, Supernetting 3.2.2 CIDR & VLSM 3.2.3 Routing types (Static, Dynamic – RIP, OSPF, BGP) 3.3 Data Transmission Methods 3.3.1 Unicast, Broadcast, Multicast, Anycast 3.4 Protocols & Network Communication 3.4.1 ICMP, ARP, RARP 3.4.2 Ports & Sockets 3.4.3 TCP vs UDP (Features, Flow control, Congestion control) 3.5 Security & Network Attacks 3.5.1 Common threats: Man-in-the-Middle (MITM), DoS, DDoS 3.5.2 Firewalls & Packet Filtering 3.5.2 IDS & IPS Overview **Unit 4: Internet Technologies & Advanced Topics** 4.1 DNS & Name Resolution 4.1.1 DNS namespace, Resource records, Query resolution, Name servers 4.2 Web Technologies 4.2.1 HTTP/HTTPS Protocols, Web Services, API Calls 4.3 Email Technologies & Protocols 4.3.1 SMTP, POP3, IMAP 4.4 Modern Networking Concepts 4.4.1 Cloud Networking & Edge Computing 4.4.2 SDN (Software-Defined Networking) 4.4.3 IoT Networking
Reference Books:	1. Networking Complete Third edition, BPB Publication 2. Computer Networks- Andrew S. Tanenbaum & David Wetherall – Edition: 5th Edition 3. Data Communications and Networking - Behrouz A. Forouzan – Publisher: McGraw Hill Education Edition: 5th Edition 4. Computer Networking with Internet Protocols - William Stallings – Publisher: Pearson Education

	5. Internetworking with TCP/IP- Douglas E. Comer – Publisher: Pearson Education Edition: 6th Edition 6. The Practice of Network Security Monitoring- Richard Bejtlich – Publisher: No Starch Press 7. Data Communication & Networking- Rajiv Bahadur – Publisher: Laxmi Publications 8. Data Communications and Computer Networks- Prakash C. Gupta – Publisher: PHI Learning 9. Data Communication and Networking- T. L. Singal – Publisher: Cambridge University Press 10. Computer Networks and Communications- S. K. Bhattacharya – Publisher: New Age International
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	50% Internal assessment. 50% External assessment

[Subject code for Theory-2511001005011001]

[Subject code for Practical-2511001005011002]

Course Code: Major CS-503
Course Title: Machine Learning using Python

Corse Code	CS-503
Course Title	Machine Learning using Python
Course Credit	4
Teaching Per Week	2 Hours (Theory) + 4 Hours (Practical)
Minimum Weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Purpose of Course	To equip students with practical and theoretical knowledge of machine learning techniques using Python for real-world data analysis and predictive modelling.
Review/Revision	-
Implementation Year	2026-2027
Course Objective	**Objective-1:** *Understand* core concepts, types, and real-world applications of machine learning. **Objective-2:** *Identify* appropriate machine learning models and Python libraries for solving data-driven problems. **Objective-3:** *Apply* regression and classification techniques using scikit-learn to build predictive models. **Objective-4:** *Analyze* the performance of supervised and unsupervised learning algorithms using evaluation metrics. **Objective-5:** *Evaluate* and improve machine learning workflows by addressing challenges like data leakage and model validation.
Course Outcome	**CO1.** Understand and explain the fundamental concepts and types of machine learning along with real-world applications and tools like Python, Numpy, Pandas, and Matplotlib. **CO2.** Apply linear, multiple, polynomial, and logistic regression techniques for data analysis and prediction. **CO3.** Implement and analyze various supervised learning models including decision trees, support vector machines (SVM), and k-nearest neighbors (KNN). **CO4.** Explore and apply unsupervised learning models such as K-Means, DBSCAN, HDBSCAN, and hierarchical clustering for pattern discovery. **CO5.** Evaluate and validate machine-learning models using appropriate classification and regression metrics and understand common pitfalls such as data leakage.
	
Pre-requisite	Knowledge of Python programming
Course Content :	**Unit – 1 Introduction to Machine Learning** 1.1 What is a Machine Learning 1.1.1Need for Machine Learning. 1.1.2Why & When to Make Machines Learn? 1.1.3Challenges in Machines Learning 1.1.4 Real-world Applications of Machine Learning 1.2 Types of Machine Learning 1.2.1Supervised 1.2.2Unsupervised and Semi-supervised 1.2.3 Reinforcement Learning 1.2.4 Difference between Supervised and Unsupervised learning

	1.3 Machine Learning Workflow 1.5 Basics libraries of Python for Machine Learning (Numpy, Pandas, scikit-learn) **Unit -2 Regression Analysis** 2.1 Introduction to Regression 2.2 Introduction to simple linear regression, Examples on Linear Regression 2.3 scikit-learn library to implement simple linear regression 2.4 Multiple linear regression, Examples on Multiple Linear Regression 2.5 Polynomial and non-linear regression , Examples on Polynomial Regression 2.6 Introduction to logistic regression **Unit – 3 Supervised Learning and Unsupervised Learning Model** 3.1 Introduction to classification, Classification Terminologies in Machine Learning 3.2 Decision trees What is a Decision Tree? Implementation of Decision Tree 3.3 Regression trees 3.4 Supervised learning with SVM. SVM and its implementation 3.5 Supervised learning with KNN. Concepts of KNN. Working of KNN. Implementation of KNN classifier 3.6 Unsupervised Learning Model 3.6.1 Clustering Strategies and real-world applications 3.6.2 Concepts of Clustering and Applications of Clustering Clustering Algorithms 3.6.2 K-Means clustering\ How does K-Means Clustering work? K-Means Clustering algorithm example 3.6.3 Hierarchical Clustering (Hierarchical Clustering Agglomerative Hierarchical clustering and how does it work Woking of Dendrogram in Hierarchical clustering Implementation of Agglomerative Hierarchical Clustering **Unit-4 Evaluation and validating Machine-learning models** 4.1 Classification Metrics and Evaluation Techniques 4.2 Regression Metrics and Evaluation Techniques 4.3 Evaluating unsupervised learning models: Heuristics and techniques 4.4 Data leakage and other pitfalls
Reference Books	1. "Introduction to Machine Learning with Python" by Andreas C. Müller & Sarah Guido (Beginner-friendly, code-focused) 2. "Hands-On Machine Learning with Scikit-Learn, Keras&TensorFlow" by AurélienGéron (Excellent for practical implementation) 3. "Pattern Recognition and Machine Learning" by Christopher M. Bishop (Theoretical foundations – advanced) 4. "Python Machine Learning" by Sebastian Raschka (Good blend of theory and practice) 5. "Data Science from Scratch" by Joel Grus (Great for fundamentals) 6. " Python machine learning : machine learning and deep learning with python, Scikit-learn and tensor flow " by Sebastian Raschka and Vahid Mirjalili
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	50% Internal assessment. 50% External assessment

[Subject code for Theory-2511001005022001]

[Subject code for Practical-2511001005022002]

Course Code: CS-504
Course Title: Web Development Using MEAN Stack

Course Code	CS-504
Course Title	Web Development Using MEAN Stack (Major Course)
Credits	4
Course Category	Major Course
Level of Course	400-499 (Advance Level)
Teaching per Week	2 Hours Theory + 4 Hours Practical
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year	2026-2027
Purpose of Course	The course is aimed to give knowledge about use of latest web development techniques
Course Objective	**Objective-1:** *Understand* the architecture and components of the MEAN stack including MongoDB, ExpressJS, AngularJS, and NodeJS. **Objective-2:** *Perform* basic CRUD operations using MongoDB and Mongoose within a NodeJS environment. **Objective-3:** *Develop* web servers and RESTful APIs using ExpressJS and manage routing and middleware effectively. **Objective-4:** *Build* dynamic front-end interfaces using AngularJS directives, forms, controllers, and filters. **Objective-5:** *Integrate* all MEAN stack components to create a full-stack web application with real-time capabilities.
Pre-requisite	Knowledge of HTML, CSS, Java Script basics.
Course Outcomes	CO1: Learn about the benefits of using MEAN stack and how to install and configure it. CO2: Learn advanced ES6 features in JavaScript and Typescript CO3: Learn about Angular architecture, components, directives, pipes, forms, routing, and services. CO4: Learn about the event loop, asynchronous programming, modules, packages ,and streams. CO5: Learn about the MVC pattern, routing, HTTP requests and responses, middleware, and error handling. CO6: Create a full-stack MEAN stack application and deploy it to a production/local server.
Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	■		■	■		■		
CO2	■	■			■			
CO3	■			■			■	
CO4			■			■		■
CO5	■			■		■	■	■
C06	■			■		■	■	■

Course Content	**UNIT-1: Introduction to JavaScript Frameworks and Working with MongoDB.** 1.1 JavaScript Frameworks & Libraries, 1.2 MEAN.JS i 1.3 1ntroduction, Architecture of MEAN.JS. 1.4 Introduction to Mongo DB 1.5 Installation of MongoDB – MongoDB Server & MongoDB Shell, MongoDB Compass, 1.6 MongoDB Database, Collections, and documents, 1.7 Basic operations using MongoDB – Create, Insert, Update and Delete 1.8 Access MongoDB in Node.js 1.9 setting up mongoose Connecting MongoDB, Insert, update and delete document.

	Unit 2 : Introduction to ExpressJS Framework 2.1 Introduction to ExpressJS 2.2 Installing ExpressJS using NPM 2.3 Advantages of ExpressJS 2.4 Installing Express.js 2.4.1 building web server 2.4.2 configure routes 2.4.3 ExpressJS middleware's 2.4.4 Serve Static Resources using Express.js 2.5 working with HTTP methods of ExpressJS 2.6 ExpressJS routing 2.7 Creating RESTful API. **Unit 3: Introduction to AngularJS.** 3.1 Introduction to AngularJS 3.1.1 Features of AngularJS, 3.1.2 Data Binding in angularJS, 3.1.3 Working with Expressions in angularJS, 3.2 Introduction to Directives 3.2.1 Directive Lifecycle 3.2.2 Using Angular JS built-in directives 3.2.3 Creating a custom directive 3.2.4 Working with $scope, $rootScope, Lifecycle of $scope. 3.3 MVW Architecture 3.3.1 Model-View-Controller and Model-View-View-Model Architecture 3.4 Introduction to AngularJS Modules 3.4.1 Application module & Controller modules, 3.4.2 Attaching Properties and functions to scope, 3.4.3 Controller in external files, 3.4.4 AngularJS Filters, 3.5 working with Angular Forms 3.5.1. Form events 3.5.2. Validating Angular forms. **Unit-4 : NodeJS Fundamentals** 4.1 Introduction to NodeJS 4.1.1 Features of NodeJS, 4.1.2 Traditional web Server Model, Node.js process Model 4.1.3 Installation of NodeJS, working with Node Package Manager 4.1.3.1 Command Line options 4.2 NodeJS modules 4.2.1 Core Modules 4.2.2 Creating Local modules & Exporting Local modules 4.2.3 Third-party modules, 4.3 Creating NodeJS web server.
Reference Books	1. Agus Kurniawan: "AngularJS Programming by Example 2017 Edition", Kindle Edition. 2. Adam Freeman: " Pro AngularJS 2017 Edition", Apress. 3. Krasimir Tsonev: "Node.js By Example", Packt Publishing 4. Ethan Brown: "Web Development with Node and Express", O'REILLY **Web References:** 1. http://www.w3schools.com/angular/default.asp [Tutorial link for AngularJS] 2. http://www.tutorialspoint.com/angularjs/ [Tutorial link for AngularJS] 3. https://www.tutorialspoint.com/angularjs/angularjs_tutorial.pdf [E-book for AngularJS] 4. http://www.tutorialsteacher.com/nodejs/nodejs-modules [Tutorial link for NodeJS]

	5. https://www.javatpoint.com/mean-stack-tutorial [MEAN stack development] 6. http://es6-features.org/ 7. https://www.typescriptlang.org/ 8.https://angular.io/ 9.https://expressjs.com/ 10.https://nodejs.org 11.https://www.geeksforgeeks.org/ 12.https://www.codeproject.com/
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-2511001005033001]

[Subject code for Practical-2511001005033002]

Course Code: CS-505
Course Title: Handling databases Using Python

Course Code	CS-505
Course Title	Handling Databases Using Python (Major Course)
Credits	4
Course Category	Major Course
Level of Course	400-499 (Advance Level)
Teaching per Week	2 Hours Theory + 4 Hours Practical work
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year	2026-2027
Purpose of Course	The course is aimed to give knowledge about use of latest web development techniques
Course Objective	**Objective-1:** *Understand* the fundamentals, classifications, and use cases of NoSQL databases including MongoDB, Cassandra, HBASE, and Neo4j. **Objective-2:** *Perform* CRUD operations and aggregation queries on MongoDB using JavaScript shell and command-line tools. **Objective-3:** *Implement* database operations in Python using the sqlite3 module, including data manipulation and exporting data to files. **Objective-4:** *Handle* CSV file operations to import/export structured data between Python and SQLite databases. **Objective-5:** *Design* interactive GUI applications using Tkinter to connect and manage database functionalities through a user interface.
Pre-requisite	Basics of Database Management Systems and Data Structure
Course Outcomes	CO1: Understand basic concepts regarding data, database systems and various data models CO2: Enhance the knowledge of the processes of Database Development and Administration using MongoDB CO3 Able to understand different types of NoSQL Databases. CO4: Architectures and common features of the basic types of NoSQL and SQLite databases. CO5: Able to design Schema and implement CRUD operations, distributed data operations, and implement various column store internals CO6: Understand basic concepts regarding TKinter library and its widgets to design UI using Python.
Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	■		■	■		■		
CO2	■	■			■			
CO3	■			■			■	
CO4			■			■		■
CO5	■			■		■	■	■
C06	■			■		■	■	■

Course Content	**Unit 1: Introduction to NoSQL** 1.1 Overview and History of NoSQL Databases, Why NoSQL, Features of NOSQL, Taxonomies by Data Model, Aggregate Data Models 1.2 Overview of No-SQL Storage: Key Value, Document-Oriented, Column-Family and Graph storage. 1.3 Techniques and Pattern: CAP Theorem, ACID Vs. BASE properties and Comparison of relational databases to new NoSQL stores. 1.4 Introduction, use and applications of: MongoDB, Cassandra, HBASE, Neo4j 1.5 Working with Document Databases, contrasting document databases with RDBMS, 1.6 Features of MongoDB, advantages of MongoDB over RDBMS,

	1.7 Working with Column-Oriented Databases, 1.8Contrasting Column Databases with RDBMS, **Unit 2: Working and Querying (CRUD operation) with Data using MongoDB** 2.1 Installing and running MongoDB on your System 2.2 Use of JavaScript's shell in MongoDB 2.3 Navigating your databases,Viewing available data and collections 2.5 Inserting data, querying data, using sort, limit and skip functions, retrieving single document 2.6 Using aggregation commands 2.7 Working with condition, updating data, upset and save command, rename a collection **Unit-3 Python interaction with SQLite** 3.1 Importing sqlite3 module 3.1.1 connect () and execute() methods. 3.1.2 Single row and multi-row fetch (fetchone(), fetchall()) 3.1.3 Select, Insert, update, delete using execute () method. 3.1.4 commit () method. 3.2 SQLite dump 3.2.1 Dump specific table into file, Dump only table structure 3.2.2 Dump entire database into file 3.2.3 Dump data of one or more tables into a file Unit-4 CSV files handling: 4.1 Import a CSV file into a table 4.1.1 Export a CSV file from table 4.1.2 Developing Python GUI with Tkinter 4.1.3 Introduction to GUI libraries of Python, Import Tkinter Libraries 4.2 Geometry Management 4.2.1 place(), grid(), pack() 4.2.2 Set the dimensions of the Tkinter window 4.2.3 Handling Resize 4.3 Tkinter Widgets 4.4 Widgets Attributes
Reference Books	**Reference Books:** 1. S. K. Singh : Database Systems: Concepts, Design and Applications, Pearson Education 2. Definite Guide to MongoDB by Eelco Plugge, Peter Membrey and Tim Hawkins, Apress. 3. Getting started with NOSQL by Gaurav Vaish, PACKT. 4. NOSQL theory and Examples by Piotr fulmanski, Simple introduction series: e-book. 5. Guy Harrison, Next Generation Database: NoSQL and big data, Apress. 6. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Author: Sadalage, P. & Fowler, Publication: Pearson Education. 7. Learning with Python, Author: Allen Downe Publisher: DreamTech Press, ISBN: 978-9351198147 8. Python: The Complete Reference, Author: by Martin C. Brown, McGraw Hill Education,ISBN:978-9387572942 9. Python In - Depth, Author: AhidjoAyeva , KamonAyeva, Publisher: BPB Publication, ISBN:978-9389328424 10. The SQLite Handbook, Author: by Rita Blackburn, Publisher: EmereoPublishing, ISBN:978-1489136459 11. Using SQLite, Author: Jay A. Kreibich, Publisher: O'Reily, ISBN:978-0596521189 12. Android SQLite Essentials, Author: Sunny Kumar Adity, Publisher: Packt Publishing:978-1783282951

	Web References: 1. http://plsql-tutorial.com/[For PL/SQL] 2.https://www.tutorialspoint.com/mongodb_for_absolute_beginners/index.asp [MongoDB For Absolute Beginners - Tutorialspoint] 3. https://www.pythontutorial.net/tkinter/ 4. https://www.geeksforgeeks.org/python-tkinter-tutorial/ 5. https://www.sqlitetutorial.net/
Teaching Methodology	Class Work, Discussion, Lab work, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment.

[Subject code-*2611001005060270*]

Course code: 506

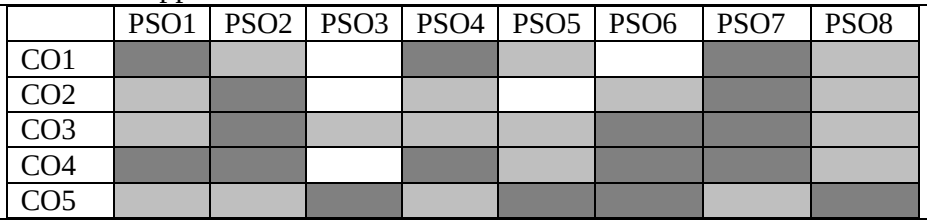
Course Title: Data Analysis and Visualization using BI Tool

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T.Y.B.Sc.(Computer Science)

(SEM – 5)

(w.e.f. Academic Year June, 2026-2027)

COURSE NAME	**Data Analysis and Visualization using BI Tool**
Semester	**VIth**
NCrF Credit Level	**Level-5**
Course Type	**SEC (Skill Enhancement)**
Course Subtype	**Employability**
Subject Type	**Skill enhancement Discipline Specific**
Course Code	**506**
Course Level	**200-299**
Course Title	**Data Analysis and Visualization using BI Tools**
Credit	**2 Credits**
Effective From	**Academic Year : 2026-2027**
Course Outcomes	**CO1** (Understand): Explain the concepts of data analytics, business intelligence and Visualization software. **CO2** (Apply): Import, clean, transform and model data using Power Query and DAX. **CO3** (Analyze): Analyze datasets and create meaningful visualizations, reports and dashboards. **CO4** (Create): Develop industry-oriented visualization toll dashboards and analytical solutions for decision making. **CO5** (Evaluate): Evaluate business performance and generate insights using data-driven approaches.
Mapping between Cos and PSOs	
Course Content	**UNIT–1: Introduction to Data Analytics and Power BI** 1.1 Fundamentals of Data Analytics 1.1.1 Introduction to Data and Information 1.1.2 Types of Data and Data Sources 1.1.3 Data Analytics Lifecycle 1.1.4 Applications of Data Analytics in Business and Industry 1.2 Introduction to Business Intelligence 1.2.1 Concepts of Business Intelligence 1.2.2 Role of BI in Decision Making 1.2.3 Overview of BI Tools 1.3 Installing and Navigating Power BI 1.3.1 Power BI Desktop Environment 1.3.2 Interface Components and Navigation

	1.3.3 Data View, Report View and Model View 1.3.4 Power BI Service Overview 1.4 Data Import and Preparation 1.4.1 Importing Data from Excel and CSV 1.4.2 Connecting to Databases 1.4.3 Data Profiling Techniques 1.4.4 Understanding Data Quality Issues [Unit-1 Practical: Import datasets from CSV, connect multiple data sources and explore Power BI interface.] **UNIT–2: Data Transformation and Modeling** 2.1 Data Cleaning using Power Query 2.1.1 Removing Duplicates 2.1.2 Handling Missing Values 2.1.3 Data Formatting and Standardization 2.1.4 Data Validation Techniques 2.2 Data Transformation Techniques 2.2.1 Splitting and Merging Columns 2.2.2 Filtering and Sorting Data 2.2.3 Pivoting and Unpivoting Data 2.2.4 Creating Calculated Columns 2.3 Data Modeling Concepts 2.3.1 Relationships between Tables 2.3.2 Primary and Foreign Keys 2.3.3 Star Schema and Snowflake Schema 2.3.4 Managing Data Models [Unit-2 Practical: Clean datasets, create relationships and implement DAX measures.] **UNIT–3: Data Visualization and Dashboard Development** 3.1 Introduction to DAX 3.1.1 Understanding DAX Language 3.1.2 Creating Measures 3.1.3 Aggregate Functions 3.1.4 Time Intelligence Functions 3.2 Fundamentals of Data Visualization 3.2.1 Principles of Effective Visualization 3.2.2 Selecting Appropriate Charts 3.2.3 Data Storytelling Concepts 3.2.4 Visualization Best Practices 3.3 Creating Visual Reports 3.3.1 Bar and Column Charts 3.3.3 Line and Area Charts 3.3.3 Pie, Donut and Treemap Charts 3.3.4 Tables and Matrix Reports 3.3.5 Slicers and Filters [Unit-3 Practical: Create interactive dashboards and analytical reports using real-world datasets.] **UNIT–4: Applied Data Analytics Projects using Power BI** 4.1 Sales and Marketing Analytics 4.1.1 Sales Performance Dashboard 4.1.2 Customer Segmentation Analysis 4.1.3 Product Performance Analysis 4.1.4 Regional Sales Analysis 4.2 Financial and Business Analytics 4.2.1 Revenue Analysis 4.2.2 Profitability Analysis 4.2.3 Budget vs Actual Analysis

	4.3 HR and Educational Analytics 4.3.1 Employee Performance Dashboard 4.3.2 Attendance Analytics 4.3.3 Student Performance Analysis
Reference Books	1. Microsoft Power BI Data Analyst Certification Companion, Brian Julius, Packt Publishing, ISBN: 9781803248332 2. Beginning Power BI: A Practical Guide to Self-Service Data Analytics, Dan Clark, Apress, ISBN: 9781484256190 3. Pro Power BI Architecture, Reza Rad, Apress, ISBN: 9781484260098 4. Mastering Microsoft Power BI, Brett Powell, Packt Publishing, ISBN: 9781801814638 5. Data Analysis with Microsoft Power BI, Alberto Ferrari, Marco Russo, Microsoft Press, ISBN: 9781509302765 6. Storytelling with Data: A Data Visualization Guide for Business Professionals, Cole Nussbaumer Knaflic, Wiley Publications, ISBN: 9781119002253 7. Practical Business Intelligence with Power BI, Devin Knight, Brian Knight, Mitchell Pearson, Apress, ISBN: 9781484293683 8. Fundamentals of Business Intelligence, Wilfried Grossmann, Stefanie Rinderle-Ma, Springer Publications, ISBN: 9783662465127 9. Business Intelligence and Analytics: Systems for Decision Support, Ramesh Sharda, Dursun Delen, Efraim Turban, Pearson Education, ISBN: 9780134633282 10. Data Visualization: A Practical Introduction, Kieran Healy, Princeton University Press, ISBN: 9780691181622
Teaching Methodology	Class Work, Discussion, Experimental work, Project work, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. - Attendance, Class and home Assignment. - Internal Practical and viva-voce 50% External assessment. - Practical and viva-voce [Exams will be carried out by the appointed examiners by the Department head of the respective institute]

[Subject code for Theory-2611001006044001**]**

[Subject code for Practical-2611001006044002]

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT

T Y B. Sc. (Computer Science)

Syllabus for T. Y. B. Sc. Semester-6

Effective From: June-2026

Course Code: CS-601

Course Title: Data Visualization

Course Code	CS-601
Course Title	Data Visualization
Credits	4
Course Category	Minor Course
Level of Course	200-299 (Advance Level Course)
Teaching per Week	2 Hours Theory + 4 Hours Practical work
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year	2026-2027
Purpose of Course	The course is aimed to give knowledge about use of latest visualization Tools
Course Objective	**Objective-1:** *Understand* the role of data visualization in business analytics and explore Tableau's architecture, interface, and data connectivity. **Objective-2:** *Develop* various visual reports using Tableau including bar charts, line graphs, scatter plots, and geographic maps. **Objective-3:** *Apply* calculations, logical functions, table calculations, and parameters to create dynamic and insightful visualizations. **Objective-4:** *Construct* interactive dashboards by integrating multiple views, using filters, actions, and custom formatting. **Objective-5:** *Analyze* multi-table data sources to build accurate, meaningful dashboards with annotations, titles, and captions.
Pre-requisite	Basic knowledge of SQL and data analysis concepts can be beneficial, a basic understanding of mathematics and statistics.
Course Outcomes	CO1 Examine, navigate, and learn to use the various features of Tableau CO 2 Create and design visualizations and dashboards CO 3 Combine the data to and follow the best practices to present your story CO 4 Building and organizing data visualization with Tableau CO5: Learn data driven decision Making using various features of Tableau
Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)	

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

Course Content	**UNIT-1 Introduction to Data Visualization** 1.1Visualization an aspect of business analytics, importance of data visualization 1.2. Working with Tableau 1.2.1 Tableau Architecture 1.2.2 Tableau repository 1.2.3 Connecting to Data & Introduction to data source concepts 1.2.4 Understanding the Tableau workspace 1.2.5 Dimensions and Measures 1.3 Data Types & Default Properties 1.4 Tour of Shelves & Marks Card, building basic views, Saving and Sharing your work-overview **UNIT-2 Building Views (Reports)** 2.1 Date Aggregations and Date parts, Cross tab & Tabular charts, Totals & Subtotals, 2.2 Bar Charts & Stacked Bars, Line Graphs with Date & Without Date, Tree maps, Scatter Plots, Individual Axes, Blended Axes, Dual Axes & Combination chart, Edit axis, 2.3 Parts of Views, Sorting, Trend lines, Reference Lines, Forecasting, Filters, Context filters, Sets - In/Out Sets & Combined Sets, Grouping, Bins/Histograms, Drilling up/down – drill through Hierarchies 2.4 View data & Actions (across sheets), latitude and longitude, Default location/Edit locations, Symbol Map & Filled Map, Custom Geo Coding **UNIT-3 Calculated Fields Working with aggregate versus disaggregate data** 3.1 Number of Rows, Basic Functions (String, Date, Numbers etc) 3.2 Usage of Logical conditions Table calculations Explain scope and direction, Percent of Total, Running / Cumulative calculations Parameters 3.3 Create What-If analysis, Using Parameters in Calculated fields, Bins, Reference Lines, Filters/Sets, Display Options (Dynamic Dimension/Measure Selection) **UNIT-4 Building Interactive Dashboards** 4.1 (Building & Customizing) Combining multiple visualizations into a dashboard (overview), Making your worksheet interactive by using actions Filter URL, Highlight, Options in Formatting your Visualization 4.2 Working with Labels and Annotations, Effective Use of Titles and Captions 4.3 Working with Data Multiple Table 4.3.1 Join, Data Blending, Difference between joining and blending data, 4.3.2 working with the Data Engine / Extracts, Working with Custom SQL, Toggle between to Direct Connection and Extracts Working with Tableau Server 4.3.3 Accessing reports through web, Publishing to Tableau Server – Overview of publishing, Server Administration 4.3.4 Managing Users, Projects & Object level and Data Security as per Users, User Filters
Reference Books	1. Learning Tableau 10 – Second Edition, by Joshua Milligan 2. Practical Tableau by Ryan Sleeper 3. Communicating Data with Tableau by Ben Jones 4. Mastering Tableau by David Baldwin Practical List 5. https://help.tableau.com/current/guides/get-started-tutorial/en-us/get-started-tutorial-home.htm 6. https://www.tutorialspoint.com/tableau/index.htm 7. https://www.geeksforgeeks.org/tableau-tutorial/ 8. https://www.datacamp.com/tutorial/tableau-tutorial-for-beginners
Teaching Methodology	Class Work, Discussion, Lab work, Self-Study, Seminars and/or Assignments Case study: Create a dashboard using Tableau for : (i) Student attendance management system. Create a dashboard in tableau for library management system. (ii) Bus

	depot management system. (iii) Dashboard in tableau for contact information system.
Evaluation Method	50% Internal assessment. 50% External assessment.

[Subject code-2611001006011001]

Course Code: CS-602

Course Title : Introduction to Internet of things (IoT)

Course code	CS-602
Course Title	Introduction to Internet of things(IoT) (Major Course)
Credit	4
Teaching per week	4 Hours
Minimum weeks per semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Implementation Year	2026-2027
Purpose of the course	Give exposer of application domains of IoT . To give understanding of protocols used for connectingdevices/ sensors through Internet. Basic Idea of hardware of sensors/ devices and interfacingthem to operating systems like linux for IoT applications.
Course objectives	**Objective 1:** *Understand* the fundamental concepts, architecture, and communication models of the Internet of Things. **Objective 2:** *Explain* the working principles and domains of IoT, including protocols, logical design, and functional blocks. **Objective 3:** *Differentiate* between IoT and M2M technologies and *analyze* sensor technologies used in real-time IoT applications. **Objective 4:** *Identify* and *classify* various sensors and actuators, and *explain* their role in IoT systems. **Objective 5:** *Demonstrate* the use of Raspberry Pi as an IoT device, including its components, interfaces, and connectivity with Linux-based systems.
Pre-requisite	Basic knowledge of networking and Digital fundamental
Course out come	**CO1:** Student will understand IoT Technologies behind intelligentand smart devices **CO2:** Students will get idea of Sensors and Actuators used in IoT. **CO3:** Students will learn about network of physical devices that are embedded with sensors, software, and other technologies. **CO4:** Students will understand about devices/endpoints of IOT andtheir functionality. **CO5:** Students will get idea of Interfacing IoT devices with Linux.
Mapping betweenCOs PSOs	
Course Content	**Unit 1: Introduction to Internet of Things** 1.1Definition & Characteristics of IoT 1.2Understanding of IoT Architecture 1.3 Various domains of IoT 1.4 Physical Design of IoT 1.5 IoT devices 1.6 IoT protocols 1.6.1 Logical Design of IoT 1.6.2 IoT Functional Blocks 1.6.3 IoT Communicational Models and APIs

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

	Unit 2. IoT and M2M 2.1 Introduction M2M 2.2Introduction to Sensor Technology 2.2.1 Difference between IoT and M2M, 2.2.2 Security for IoT **Unit 3.Sensors and Actuators in IoT** 3.1 Definition of Sensors 3.2 Types of sensors and its usage (Temperature, Humidity, Gas Detector, Ultrasonic,Fire detector, Light, Sound, IR, Water Level) 3.3 Introduction to Actuators 3.3.1Types of Actuators 3.3.2 Difference between Sensors & Actuators **Unit 4. IoT Physical Devices** 4.1 IoT Physical Devices & Endpoints 4.1.1 Building blocks of an IoT device 4.1.2 Exemplary Device: Raspberry Pi 4.1.3 Concepts, purpose, Application areas of Raspberry 4.2 Understanding of Raspberry pi boardcomponents 4.2.1 Various Interfaces of Raspberry pi 4.2.2 Interfacing Raspberry pi with various flavoursof Linux 4.2.3 Basics idea of IOT Physical Servers & Cloud Offerings
Reference Books	1. Internet of Things , A Hands – On Approach, ArshdeepBahga, Vijay Madisetti published by ArshdeepBahga& Vijay Madisetti 2. Internet of Things architecture and Design Principles, Raj Kamal, 3. McGrawhill Education private limited, 2017 Learning Internet of Things, Peter Waher, / Packt Publishing Limited,2015 4. The Internet of Things, HakimaChaouchi, Wiley,2017 5. Getting started with the Internet of Things: by CunoPfister, O”Reilly Media. 6. The Internet of Things: Enabling Technologies, Platforms,and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment 50% External assessment

[Subject code for Theory-2611001006022001]

[Subject code for Practical-2611001006022002]

Course Code: CS-603
Course Title: Web Development Using ReactJS

Course Code	CS-603
Course Title	Web Development Using ReactJS (Major Course)
Credits	4
Course Category	Major Course
Level of Course	400-499 (Advance Level)
Teaching per Week	2 Hours Theory + 4 Hours Practical work
Minimum weeks per Semester	15 (Including class work, examination, preparation etc.)
Review / Revision	-
Implementation Year	2026-2027
Purpose of Course	The course is aimed to give knowledge about use of latest web development techniques
Course Objective	**Objective 1:** *Explain* the fundamentals of React and its component-based architecture including JSX, props, and state. **Objective 2:** *Build* interactive web interfaces using functional and class components with React hooks. **Objective 3:** *Implement* user interaction using event handling and form management with validation in React. **Objective 4:** *Develop* dynamic and navigable applications using React Router and nested routing. **Objective 5:** *Apply* Redux for effective state management and *integrate* custom hooks for code reusability.
Pre-requisite	Knowledge of HTML, CSS, Java Script basics.
Course Outcomes	CO1: Be familiar with client-side Javascript application development and the React library. CO2: Implement single page applications in React. CO3: Use various React features including components and forms. CO4: Implement a functional front-end web application using React. CO5: Use React strap for designing responsive React applications. CO6: Use Redux to design the architecture for a React-Redux application.

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

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

Course Content

Unit-1 Introduction to React and its Component-based Architecture

1.1 Overview of React and its benefits
1.2 Setting up a development environment
1.3 Understanding JSX syntax
1.4 Creating and rendering React components
1.5 Introduction to React hooks (useState, useEffect)
1.6 Understanding the concept of components
1.7 Props and state management in React
1.8 Functional components vs. class components
1.9 Creating reusable components
1.10Component lifecycle methods

Unit-2 Handling Events and Forms

2.1 Event handling in React
2.2 Forms and controlled components
2.3Handling user input with forms

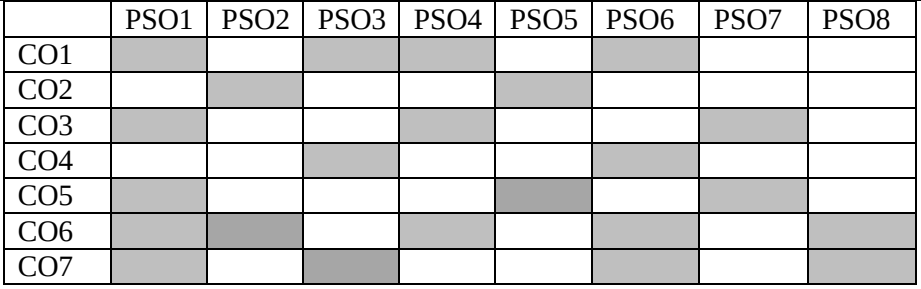
	2.4 Form validation techniques **Unit-3 Router, State Management and Hooks** **3.1 React Router** 3.1.1 Introduction to React Router 3.1.2 Setting up routes in a React application 3.1.3 Creating nested routes 3.1.4 Implementing route parameters and query strings 3.1.5 Using NavLink and Redirect components **Unit-4: State Management with Redux** 4.1.Introduction to Redux and its principles 4.1.1 Setting up Redux in a React application 4.1.2 Actions, reducers, and the store 4.1.3 Connecting React components to Redux 4.1.4 Asynchronous actions with ReduxThunk 4.2 React Hooks 4.2.1 Understanding React hooks in depth 4.2.2 useState, useEffect, useContext, and more 4.2.3 Custom hooks and their usage 4.2.4 Best practices for using hooks
Reference Books	1. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer, Apress Publications, 1st Edition, 2018. 2. Full stack React: The Complete Guide to ReactJS and Friends by Anthony Accomazzo 3. Introduction to React by Cory Gackenheimer 4. React: Up & Running: Building Web Applications by Stoyan Stefanov Oreilly publication. 5. React Cookbook: Recipes for Mastering the React Framework by David Griffiths Oreilly publication **Web References:** 1. http://www.w3schools.com 2. http://www.tutorialspoint.com 3. http://www.tutorialsteacher.com 5. https://www.javatpoint.com/mer n-stack-tutorial [MERN stack development] 6. https://www.typescriptlang.org/ 7.https://www.geeksforgeeks.org/ 8.https://www.codeproject.com/
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-2611001006033001]

[Subject code for Practical-2611001006033002]

Course Code: CS-604

Course Title : Mobile Application Development

Course Code	CS-604
Course Title	Mobile Application Development (Major Course)
Credit	4
Course Category	Major Course
Level of Course	400-499 (Advance Level)
Teaching per Week	2 Hours theory + 4 Hours Practical
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Implementation Year	2026-2027
Purpose of Course	To introduce the most demanding and developing mobile app technology. Fundamentals of android open source technology.
Course Objective	**Objective 1:** *Describe* the fundamentals, architecture, and components of the Android platform. **Objective 2:** *Develop* Android applications using activities, intents, resources, and lifecycle management. **Objective 3:** *Design* user interfaces using Android layout managers and UI components. **Objective 4:** *Implement* local and cloud-based data storage using SQLite, Shared Preferences, and Firebase. **Objective 5:** *Explore* cross-platform mobile development using Flutter and its core widgets.
Pre-requisite	Fundamentals of web technologies and fundamentals related to mobile OS.
Course Out come	CO1. Introduction and History of Android and OHA. CO2. Train students for installing and using the Android Developer's Toolkit such as SDK Manager, Android Virtual Device, Dalvik Debug Monitor Service (DDMS), Android Debug Bridge (ADB) and make them capable to develop, manage and maintain applications (Apps)using Android CO3. Understand the Android Activity Lifecycle stack & program building blocks like activities, services and notifications to use them effectively to develop Android applications. CO4. Explain working with Android Manifest, and its common settings related to permissions, and xml resources like layout and values and incorporate xml resources with Java code. CO5. Train students to design UI using different layout, use java library for views, widgets, menus, dialogs, graphics, media, storage, SQLite Database etc. to make applications. CO6. Train students to build Android app that perform crud operation on SQLite database. CO7. Train students to prepare and use apk.
Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)	

Course Content	**Unit-1 :** Introduction to Android 1.1. History of Mobile Software Development 1.2. The Open Handset Alliance 1.3. The Android Platform, Architecture 1.4. Android SDK 1.5. Building a sample Android application **Unit-2 :** Android Application Design Essentials 2.1Android Life Cycle 2.2 Android terminologies – Activity, Layout, Emulator, AVD, logcat, Gradle 2.3 Application Context, Activities Intents. 2.4 Android Manifest File and its common settings 2.5 Using Intent Filter, Permissions 2.6 Resource Management in Android. **Unit-3 :** Android User Interface Design Essentials 3.1 UI elements – EditText, TextView, Button, RadioButton, CheckBox, Spinner, ListView, ProgressBar, ToggleButton 3.2 Designing User Interfaces with Layouts 3.2.1 Relative Layouts 3.2.2 Linear Layouts 3.2.3 Table Layouts 3.3 Preserving and Saving data in Android using SQlite and FireBase 3.4 Shared preferences – Creating, Saving and Retrieving data 3.5 Managing data using SQLite – Creating database and performing CRUD operations **Unit-4: Firebase Database Connectivity, Data Storage, Data Retrieval** 4.1 Preparing and using apk 4.2 Introduction to flutter 4.2.1 Introduction to flutter and Widgets 4.2.2Project Structure of Flutter Application, 4.3.3Types of widgets 4.3.4 Stateless Widget, Scaffold, Widgets: Appbar, Bottom Navigation Bar, Drawer, Column, Container
Reference Books:	1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011) 2. http://developer.android.com/ 3.Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd (2011) 4.Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd(2009)
Teaching Methodology	Class Work, Discussion, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. 50% External assessment

[Subject code-2611001006055001]

Course Code: CS-605
Course Title: Project and Interview Presentation Soft Skills (AEC-06)

Course Code	CS-605 (Ability Enhancement Course (AEC))
Course Title	Project and Interview Presentation Soft Skills
Credits	2
Course Category	AEC Course
Level of Course	100-199 (Fundamental Level)
Teaching Hours per semester	30 Hours of class-room work
Minimum Hours/ Semester	30 hours of Class-room work (Including class work, interactive sessions, examination, preparation etc.)
Review / Revision	-
Implementation Year:	A.Y. 2026-2027
Purpose of Course	The purpose of this course is to equip students from the software, computer, and IT industry with essential project execution, documentation, and presentation skills. It aims to enhance their technical communication, soft skills, and interview preparedness through hands-on project work, seminars, and structured evaluations.
Course Objective	1) To develop students' ability to plan, execute, and manage software/IT projects using industry-standard practices. 2) To enhance technical documentation skills through structured project reports and software documentation. 3) To build confidence in delivering effective oral presentations and technical demonstrations relevant to software and IT domains. 4) To improve soft skills such as teamwork, time management, and problem-solving in a professional IT project environment. 5) To prepare students for technical and HR interviews by practicing mock interviews and resume-building activities.
Pre-requisite	Learners should have a fundamental understanding of programming languages, web or mobile application development, database management, and software development life cycle. Prior exposure to mini-projects or hands-on experience with development tools and technologies used in the IT/software industry will be beneficial.
Course Outcomes	**1)CO1:**(Understand)**:** Explain the essential components of professional project documentation and communication in the software and IT industry. **2)CO2:**(Apply)**:** Demonstrate the ability to present project concepts clearly using structured presentation techniques and visual aids relevant to IT solutions. **3)CO3:**(Analyze)**:** Evaluate the technical and soft skill requirements of various IT job roles and align personal project work and presentation accordingly. **4)CO4:**(Create)**:** Develop a mini-project or prototype by integrating appropriate software tools and technologies and document it as per standard industry practices. **5)CO5:**(Evaluate)**:** Justify design choices, tool selection, and development approach during interviews or viva presentations using logical reasoning and industry-specific 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: Communication and Presentation Skills in the IT Industry** 1.1 Fundamentals of Communication 1.1.1 Verbal and Non-verbal Communication

	1.1.2 Barriers in Communication in Technical Teams 1.1.3 Listening and Clarity in Technical Discussions 1.2 Presentation Skills for IT Professionals 1.2.1 Creating Technical Presentations 1.2.2 Using Tools like PowerPoint, Canva, Prezi 1.2.3 Speaking with Confidence in Team and Client Meetings 1.3 Email and Technical Writing Etiquette 1.3.1 Writing Clear Technical Emails 1.3.2 Preparing Professional Reports and Documentation **Unit 2: Project Documentation and Reporting** 2.1 Understanding Software Development Life Cycle (SDLC) 2.1.1 Role of Documentation at Each Phase 2.1.2 Agile Documentation vs Traditional Models 2.2 Technical Project Documentation 2.2.1 Problem Statement and Requirements 2.2.2 Design Diagrams: UML, ER Diagrams 2.2.3 Testing and Deployment Documentation 2.3 Final Report Writing and Formatting 2.3.1 Structuring a Complete Project Report 2.3.2 IEEE/ACM Style Guidelines and Referencing 2.3.3 Common Errors to Avoid in Technical Reports **Unit 3: Interview Readiness and Soft Skills for Developers** 3.1 Resume and LinkedIn Profile Building 3.1.2 Components of a Tech Resume 3.1.3 Tailoring Resumes for Software Roles 3.2 Interviewing Skills for IT Roles 3.2.1 Understanding the Interview Process in Software Companies 3.2.2 Technical Round vs HR Round Expectations 3.2.3 STAR Method for Behavioural Interview Questions 3.3 Mock Interview Sessions 3.3.1 Self-Introduction Practice 3.3.2 Group Feedback and Interview Etiquette **Unit 4: Final Project Presentation and Seminar** 4.1 Project Showcase Guidelines 4.1.1 Preparing for Project Presentation 4.1.2 Demonstrating Code, UI, and Deployment 4.2 Seminar and Peer Review 4.2.1 Presentation to Class and Faculty Panel 4.2.2 Peer Evaluation Criteria 4.3 Soft Skill Reflection and Final Assessment 4.3.1 Student Reflections on Soft Skills Gained 4.3.2 Final Grading and Suggestions for Improvement [One topic will be allocated to every students. The student will prepare a seminar and presentation along with a documentation.]
Reference Books	1) Technical Communication: Principles and Practice, Meenakshi Raman & Sangeeta Sharma, Oxford University Press India, ISBN: 9780195695747 2) Soft Skills: Know Yourself and Know the World, Dr. Alex K., S. Chand Publishing, ISBN: 9789352534357 3) Communication Skills for Engineers, Sunita Mishra & C. Muralikrishna, Pearson Education India, ISBN: 9788131733844 4) Business Communication, P.D. Chaturvedi & Mukesh Chaturvedi, Pearson Education India, ISBN: 9788131733585 5) Developing Soft Skills, Gajendra Singh Chauhan, Wiley India, ISBN: 9788126577500 6) The Quick and Easy Way to Effective Speaking, Dale Carnegie, Simon & Schuster, ISBN: 9780743528322

	7) Cracking the Coding Interview, Gayle Laakmann McDowell, CareerCup, ISBN: 9780984782857 8) Presentation Skills for Technical Professionals, Naomi Karten, Dorset House Publishing, ISBN: 9780932633585 9) Interviewing: Principles and Practices, Charles Stewart & William Cash Jr., McGraw-Hill Education, ISBN: 9780078036804 10) The Art of Public Speaking, Stephen E. Lucas, McGraw-Hill Education, ISBN: 9780073523910
Teaching Methodology	Class Work, Discussion, Presentation, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. - Attendance, Class and home Assignment, Unit Tests (Seminar). - Internal presentations, documentation, viva-voce and Seminar 50% External assessment. - Presentation, documentation, presentation and Viva-voce.

[Subject code-2611001006066001]

Course Code: CS-606
Course Title: Internship

<table>
<tr><td>Course Code</td><td>CS-606</td></tr>
<tr><td>Course Title</td><td>Internship</td></tr>
<tr><td>Credits</td><td>4</td></tr>
<tr><td>Course Category</td><td>Internship</td></tr>
<tr><td>Level of Course</td><td>400-499 (Advance Level)</td></tr>
<tr><td>Teaching Hours</td><td>120 Hours of internship work</td></tr>
<tr><td>Minimum Hours/ Semester</td><td>120 hours of internship work
(Including industrial visit, interactive sessions, applied/training work, examination, preparation, Skill enhancement etc.)</td></tr>
<tr><td>Review / Revision</td><td>-</td></tr>
<tr><td>Implementation Year:</td><td>A.Y. 2026-2027</td></tr>
<tr><td>Purpose of Course</td><td>NEP-2020 emphasizes on Vocationalization of Education. A key aspect of the new UG programme is its utility into a real life situation. All students are expected to do Internships/Apprenticeships/OJT in a firm, industry, or organization. Students will be provided the opportunities for do Internships/Apprenticeships/OJT with local industry, business organizations, health, and allied areas, local governments (such as panchayats, and municipalities), local Police Stations, Parliament or elected representatives, media organizations, artists, crafts persons, and a wide range of organizations so that students may engage with the practical side of their learning, which will improve their employability.</td></tr>
<tr><td>Course Objective</td><td>1) To provide students with practical exposure and skill knowledge to industry standards and practices.
2) To foster the application of academic knowledge in real-life work scenarios.
3) To enhance students' interpersonal, communication, and problem-solving skills.
4) To help students identify their strengths and areas of interest in professional domains.
5) To inculcate a sense of responsibility, discipline, and work ethics.</td></tr>
<tr><td>Pre-requisite</td><td>Students must have completed at least one year of their undergraduate program. They should have basic conceptual knowledge of their core subjects before starting the internship.</td></tr>
<tr><td>Course Outcomes</td><td>1) CO1 (Apply): Apply programming, development, or analytical skills gained in the classroom to solve real-world computing problems during the internship.
2) CO2 (Analyze): Analyze the architecture, workflow, and practices of the host organization to understand the integration of computer systems in business or technical environments.
3) CO3 (Evaluate): Evaluate project requirements, software tools, and technologies used during the internship to recommend improvements or alternative approaches.
4) CO4 (Create): Create a structured technical report and project documentation summarizing the tasks, challenges, and outcomes of the internship.
5) CO5 (Present): Present the project findings and experience effectively using professional communication and presentation skills tailored to the IT/software industry.</td></tr>
<tr><td>Internship Structure and Deliverable by Students:</td><td>Duration: 120 Hours
Mode: Offline / Online / Hybrid
Location: Industry, business firms, IT companies, local government offices, health organizations, media, artisans, etc.
Deliverables by Student:
1. Internship Joining Report
2. Weekly Progress Logbook
3. Project or Assignment Work (if applicable)
4. Final Internship Report (with photographs, certificates, etc.)
5. Presentation and Viva Voce</td></tr>
<tr><td>Course Evaluation</td><td>
<table>
<tr><th>Component</th><th>Marks/Weightage</th></tr>
<tr><td>Attendance and Participation</td><td>20%</td></tr>
<tr><td>Weekly Progress Logbook</td><td>20%</td></tr>
<tr><td>Final Internship Report</td><td>30%</td></tr>
<tr><td>Presentation & Viva Voce</td><td>30%</td></tr>
<tr><td>Total</td><td>100%</td></tr>
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</td></tr>
</table>

Reference Books	**INTERNSHIP REPORT TEMPLATE (to be submitted after internship completion)** **Front Page** Title: *Internship Report* Student Name: Roll Number: Program and Semester: College Name and Department: Name of Organization/Company: Internship Duration (From – To): Internship Guide Name (Industry and Faculty): Submission Date: **1. Acknowledgment** A short paragraph acknowledging the guidance and support of the organization and faculty mentor. **2. Certificate** Internship Completion Certificate (copy from organization) **3. Declaration** Declaration by the student that the report is original and submitted for academic purposes. **4. Internship Details** Name and Address of Organization Nature of Business/Services Department/Team worked in Name and Designation of Industry Supervisor **5. Objectives of Internship** What you aimed to learn and accomplish. **6. Description of Work Done** Overview of the tasks and responsibilities handled Description of technologies/tools used Screenshots, flowcharts, or diagrams (if applicable) **7. Learning Outcomes** Skills developed, software or tools learned, industry exposure gained. **8. Challenges and Solutions** Mention any problems faced and how you solved them. **9. Weekly Summary** Brief of what was done in each week (can be derived from the logbook). **10. Conclusion** Summary of overall experience, learning, and impact on career development. **11. References** Any websites, books, or resources referred to during the internship.

INTERNSHIP LOGBOOK FORMAT (to be maintained weekly)

Week No.	Date (From–To)	Tasks Assigned	Tasks Completed	Tools/Technologies Used	Remarks by Industry Guide
Week 1	01/06/2025–07/06/2025	Task 1 description	Task 1 completed	e.g., HTML, Python, MySQL	Signature & comments
Week 2					
...					
Week N					

Note: The logbook must be signed weekly by the industry/place of internship allocated supervisor and finally verified by the faculty mentor allocated by the institute.