

**CHRIST**

(DEEMED TO BE UNIVERSITY)
BANGALORE | DELHI NCR | PUNE

QUALITY IMPROVEMENT PROGRAMME ON OUTCOME-BASED COURSE PLANNING AND INNOVATIVE PEDAGOGICAL PRACTICES FOR ACADEMIC EXCELLENCE

ACTIVITY REPORT

EVENT INFORMATION

Centre / Department	Department of Computer Science, Department of Statistics and Data Science
Location	CHRIST (Deemed to be University), Pune Lavasa Campus
Event Title	Quality Improvement Programme on Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence
No of Activities	5
Date and Time	03 August 2026 to 07 August 2026 10.00 AM - 04.00 PM
Venue	Room No 1116
Academic Year	2026-27
Event Type (Focus)	Quality Improvement Program
Blog Link	https://christuniversitylavasa.blogspot.com/2026/09/reimagining-academic-excellence-christ.html



PARTICIPANTS INFORMATION

Target Audience	Staff
Organising Committee Details	Event Coordinators: SALVE MARGARET JOSEPH, P DEVIKA, GUNAVATHI R
No of Student Volunteers	0
No of Attendees/ Participants	Total: 25 (Internal: 25, External: 0)

SPEAKERS & GUESTS

Dr. Savithri M

Designation: Assistant Professor

Organization: CHRIST (Deemed to be University), Pune Lavasa

Contact: savithri.m@christuniversity.in | Profile Linked

Bio: Dr. Savithri M is an Assistant Professor in the School of Sciences at CHRIST (Deemed to be University), Pune Lavasa Campus, with over 16 years of teaching experience. She holds an MCA, M.Phil., and Ph.D., and specializes in Network Security and Computer Science. Her research interests include cybersecurity, data communication, sustainable technologies, and interdisciplinary applications of computing, with publications in reputed international journals. She actively contributes as a researcher, book editor, reviewer, and trainer, while mentoring students and promoting innovation through academic and research initiatives. She is committed to fostering excellence in teaching, research, and technology-driven learning

Dr. Avichal Sharma

Designation: Assistant Professor

Organization: CHRIST (Deemed to be University), Pune Lavasa

Contact: avichal.sharma@christuniversity.in | Profile Linked

Bio: Dr. Avichal Sharma is an Assistant Professor at CHRIST (Deemed to be University), Pune Lavasa Campus, with expertise in economics, higher education, and sustainable development. His work spans teaching, research, policy discussions, and academic outreach, with a strong commitment to inclusive education and student mentorship. Beyond academia, he has made significant contributions as a volunteer and national coach with Special Olympics Bharat, promoting inclusion through sports and community engagement. He is passionate about fostering research excellence, leadership, and social impact in higher education.

Dr. Lija Jacob

Designation: Head of School of Sciences,
Associate Professor

Organization: CHRIST (Deemed to be
University), Pune Lavasa

Contact: lija.jacob@christuniversity.in | Profile Linked

Bio: Dr. Lija Jacob is the Head of the School of Sciences and an Associate Professor at CHRIST (Deemed to be University), Pune Lavasa Campus, with over 18 years of experience in teaching, research, and academic leadership. She holds an MCA, M.Phil., and Ph.D., with expertise in Image Processing, Machine Learning, and Computer Vision. She has published extensively in reputed journals, secured research grants, and received recognition for her contributions to research and innovation. As Head of the School, she provides strategic leadership in advancing academic excellence, interdisciplinary research, and student-centric learning. She is dedicated to fostering innovation, collaboration, and holistic development in higher education.

Dr. Lekha Jayabal

Designation: Associate Professor

Organization: CHRIST (Deemed to be
University), Pune Lavasa

Contact: lekha.j@christuniversity.in | Profile Linked

Bio: Dr. Lekha Jayabal is an Associate Professor (Senior Grade) and Programme Coordinator in the School of Sciences at CHRIST (Deemed to be University), Pune Lavasa Campus. She has extensive experience in teaching, research, and academic administration, with expertise in Artificial Intelligence, Machine Learning, Natural Language Processing, and Data Analytics. She has published in reputed journals, mentors students in research and innovation, and actively contributes to curriculum development and academic quality enhancement. She is committed to promoting technology-driven education and interdisciplinary research.

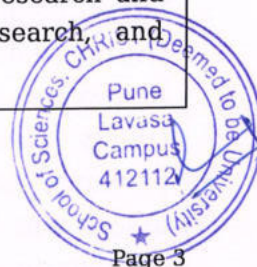
Dr. Tiny S. Palathara

Designation: Assistant Professor

Organization: CHRIST (Deemed to be
University), Pune Lavasa

Contact: tiny.palathara@christuniversity.in | Profile Linked

Bio: Dr. Tiny S. Palathara is an Assistant Professor in the School of Economics at CHRIST (Deemed to be University), Pune Lavasa Campus. Her research interests include Development Economics, Happiness and Well-Being, Sustainable Development Goals (SDGs), and Public Policy. She is committed to advancing evidence-based research and promoting sustainable and inclusive development through teaching, research, and academic engagement.



Dr. Libin Chako Samuel

Designation: Assistant Professor

Organization: CHRIST (Deemed to be University), Pune Lavasa

Contact: libin.chacko@christuniversity.in | Profile Linked

Bio: Dr. Libin Samuel is an Assistant Professor at CHRIST (Deemed to be University), Pune Lavasa Campus. His academic interests span Data Analytics, Business Analytics, Artificial Intelligence, and Applied Analytics, with a focus on leveraging data-driven approaches to solve real-world problems. He is committed to excellence in teaching, research, and fostering analytical thinking among students through innovative and interdisciplinary learning approaches.

EVENT SUMMARY

The Department of Computer Science and the Department of Statistics and Data Science, CHRIST (Deemed to be University), Pune Lavasa Campus, jointly organized a five-day Quality Improvement Programme on Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence from 3 August 2026 to 7 August 2026.

The programme was conducted for faculty members with the objective of strengthening their understanding and application of outcome-based course planning and innovative pedagogical practices, with a focus on enhancing teaching effectiveness, student learning outcomes, academic excellence, and fostering a continuous culture of quality improvement within the institution. The sessions were held in Room No. 1116 on campus.

The programme was facilitated by experienced faculty members from CHRIST (Deemed to be University), Pune Lavasa Campus, who shared their expertise and practical insights on outcome-based course planning, curriculum alignment, innovative pedagogical practices, and academic quality enhancement.

The sessions were led by Dr. Savithri M, Dr. Avichal Sharma, Dr. Lija Jacob, Dr. Lekha Jayabal, Dr. Tiny S. Palathara, and Dr. Libin Chako Samuel. Their diverse academic expertise in Computer Science, Artificial Intelligence, Machine Learning, Economics, Data Analytics, Sustainable Development, and academic leadership contributed to an interdisciplinary and enriching learning experience for the participants.

Overall, the Quality Improvement Programme on Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence successfully enhanced faculty members' understanding of Outcome-Based Education, effective course planning, curriculum alignment, innovative pedagogical practices, and appropriate assessment strategies. The interactive sessions encouraged reflective discussions, collaborative learning, and the exchange of innovative teaching practices, enabling participants to identify practical approaches for strengthening course delivery and

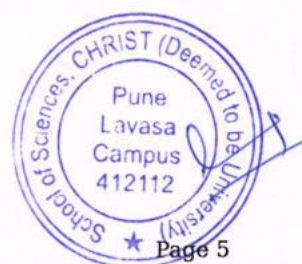
student learning outcomes. The programme reinforced the institution's commitment to continuous academic quality improvement and excellence while equipping faculty members with the knowledge and skills to develop, review, and implement comprehensive, standardized, and outcome-oriented course plans.

DETAILED SUMMARY

ACTIVITY-WISE SUMMARY

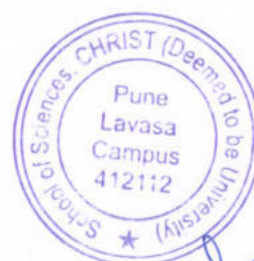
Activity 1: Quality Enhancement in Course Planning through Outcome-Based Education (OBE)

Date & Time	03 August 2026 , 10:00 AM - 04:00 PM (6h 0m)
Venue	Room 1116, Central Block
Description	Dr. Lija Jacob introduced and initiated the session on "Quality Enhancement in Course Planning through Outcome-Based Education (OBE)." She introduced the participants to the fundamental principles of Outcome-Based Education and highlighted the importance of aligning course planning with institutional and programme-level learning outcomes. The session provided faculty members with an orientation towards effective curriculum interpretation, outcome-oriented course design, and systematic course planning. She emphasized the importance of designing courses with clearly defined learning outcomes and ensuring that teaching-learning processes are directed towards achieving these outcomes. The session served as an introductory foundation for the subsequent workshops on course plan preparation, curriculum alignment, assessment mapping, and quality enhancement.



Activity 2: Workshop on Developing Outcome-Based Course Plans - I

Date & Time	04 August 2026 , 10:00 AM - 04:00 PM (6h 0m)
Venue	Room 1116, Central Block
Description	The workshop focused on the structure and preparation of Outcome-Based Course Plans. Dr. Tiny S. Palathara, Assistant Professor, School of Economics, CHRIST (Deemed to be University), Pune Lavasa Campus, presented the Course Plan Template and explained its various components and requirements. The session provided practical guidance on systematically organizing Course Outcomes (COs), course content, teaching-learning strategies, learning activities, assessment methods, and outcome mapping within the prescribed course plan format. Emphasis was placed on establishing a clear alignment between course content, teaching-learning processes, learning outcomes, and assessment methods. The workshop helped faculty members understand how to translate the prescribed curriculum into a structured and outcome-oriented course plan while maintaining consistency with institutional academic requirements. The interactive discussion also enabled faculty members to clarify their queries regarding the preparation and effective implementation of course plans.



Activity 3: Interactive Workshop on Developing Outcome-Based Course Plans - II



Date & Time	05 August 2026 , 10:00 AM - 04:00 PM (6h 0m)
Venue	Room 1116, Central Block
Description	Dr. Savithri M conducted an interactive session on "LCA Course Plan Preparation and Alignment of Course Outcomes, Teaching-Learning Strategies and Assessment." The session provided faculty members with practical guidance on preparing and refining course plans in accordance with the LCA framework. She explained the importance of systematically structuring the weekly course plan by connecting module/topic details, andragogy or teaching-learning strategies, formative assessment, and appropriate resources/references. The session emphasized the use of varied teaching-learning methods appropriate to the nature of the topic rather than relying on a single teaching method throughout the course. This is consistent with the LCA guidance, which recommends varied andragogical methods and regular formative assessment in the weekly course plan. Major Areas Covered The session addressed the following key areas: 1. Preparation and refinement of LCA course plans 2. Development of clear, specific and measurable Course Outcomes using appropriate action verbs 3. Alignment of Course Outcomes with teaching-learning strategies 4. Selection of suitable andragogical methods according to different topics and learning requirements 5. Integration of ungraded formative assessment into the weekly course plan 6. Identification of appropriate resources and references for individual modules 7. Alignment of Course Outcomes with assessment components 8. Review of course plans for coherence and outcome alignment 9. Ensuring that every Course Outcome is mapped to at least one assessment component The session also highlighted that the course plan should demonstrate a clear connection between what students are expected to learn, how they will learn it, and how their learning will be assessed. The LCA Teacher's Toolkit specifically states that every CO should be assessed by at least one component and that gaps in CO-assessment mapping should be addressed during course-plan preparation.

Activity 4: Academic Quality Assurance through Curriculum Alignment and Course Plan Review

Date & Time	06 August 2026 , 10:00 AM - 04:00 PM (6h 0m)
Venue	Room 1116, Central Block
Description	The workshop focused on strengthening academic quality assurance through curriculum alignment, course plan review, and hands-on training in course plan preparation and entry. The session provided faculty members with an opportunity to present their prepared Course Plans for academic discussion, peer review, and validation. As part of the workshop, a hands-on training session on entering the course plan into the prescribed institutional format/platform was conducted. Faculty members were guided through the process of entering course information, Course Outcomes, unit-wise content, teaching-learning strategies, assessment methods, learning resources, and other required academic components. The training enabled participants to understand the systematic procedure for preparing and entering the Course Plan in accordance with institutional requirements. Faculty members also received guidance on ensuring proper alignment among Course Outcomes, teaching-learning activities, assessment strategies, and curriculum content. The participants worked on their respective Course Plans and received immediate clarification and feedback from the resource persons and peers. The workshop helped faculty members identify areas requiring modification and improvement, thereby enhancing the accuracy, consistency, and academic quality of their Course Plans.



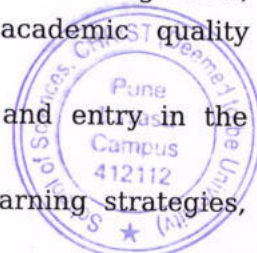
Activity 5: Course Plan Standardization, Validation and Continuous Quality Improvement

Date & Time	07 August 2026 , 10:00 AM - 04:00 PM (6h 0m)
Venue	Room 1116, Central Block
Description	The subsequent workshop focused on the standardization, validation, and finalization of Course Plans through hands-on practice, faculty presentations, peer feedback, and academic review. A practical session was conducted to further strengthen faculty members' proficiency in entering, editing, reviewing, and validating Course Plan details in the prescribed format/platform. The session emphasized maintaining consistency in course planning while adhering to institutional academic requirements and Outcome-Based Education principles. Faculty members were guided to verify the alignment of Course Outcomes with content, pedagogical strategies, assessment methods, and learning resources before final submission. The interactive and practice-oriented nature of the workshop enabled participants to gain practical experience in Course Plan entry, validation, correction, and standardization. The feedback and discussions facilitated continuous refinement of the plans and helped faculty members ensure that the finalized Course Plans were academically sound, complete, and ready for effective implementation.

KEY HIGHLIGHTS & ACHIEVEMENTS

Key Highlights

- Five-day Quality Improvement Programme on Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence conducted from 3-7 August 2026.
- 19 faculty members participated in the programme.
- Sessions focused on Outcome-Based Education (OBE), curriculum alignment, innovative pedagogical practices, assessment strategies, and academic quality enhancement.
- Faculty received hands-on training in course plan preparation and entry in the prescribed institutional format/platform.
- Emphasis was placed on aligning Course Outcomes, teaching-learning strategies, assessment components, and learning resources.
- Peer review, faculty presentations, collaborative learning, and academic validation



were incorporated into the programme.

Achievements

- Faculty developed a structured understanding of Outcome-Based Course Planning and its role in academic quality enhancement.
- Participants gained practical skills in curriculum alignment, CO mapping, pedagogical planning, assessment integration, and course plan standardization.
- Faculty were trained to develop clear, specific, and measurable Course Outcomes using appropriate action verbs.
- Participants learned to ensure that every Course Outcome is mapped to at least one assessment component.
- Course plans were reviewed, refined, validated, and standardized through hands-on practice and peer feedback.
- The programme encouraged the adoption of innovative, experiential, and student-centred teaching practices.
- It strengthened faculty capacity to prepare comprehensive, standardized, and outcome-oriented course plans.
- The programme contributed to SDG 4: Quality Education by strengthening faculty capacity and improving curriculum planning and teaching-learning practices.

OUTCOMES OF THE EVENT

ACHIEVEMENTS / OUTCOMES

- *Faculty members were provided with structured and hands-on guidance for developing Outcome-Based Course Plans aligned with curriculum requirements and institutional academic standards.
- *Participants developed a clearer understanding of the alignment between Course Outcomes (COs), Programme Outcomes (POs), curriculum objectives, teaching-learning strategies, and assessment methods.
- *The programme strengthened faculty capacity to integrate innovative pedagogical practices, including experiential learning, project-based learning, case-based learning, and technology-enabled learning.
- *Faculty members were guided in reviewing, refining, validating, and standardizing Course Plans through peer and academic review.
- *The activities promoted the preparation of comprehensive, standardized, and quality-assured Course Plans supporting effective curriculum delivery. These outcomes correspond closely with the expected outcomes specified in the QIP proposal.

GOAL ACHIEVEMENT

- *The major goals of the QIP were addressed through a progressive five-activity structure, beginning with orientation and moving towards hands-on course-plan



development, interactive refinement, academic review, and final standardization.

*Greater emphasis was placed on continuous quality improvement, academic review, curriculum alignment, and documentation.

KEY TAKEAWAYS

*Effective course planning requires clear alignment among COs, POs, curriculum requirements, teaching-learning methods, and assessment strategies.

*It provides a structured framework for designing courses around measurable learning outcomes.

*Innovative pedagogical approaches can strengthen student engagement and support experiential and application-oriented learning.

*Peer review and academic validation are important for improving the quality, consistency, and completeness of Course Plans.

*Continuous review and refinement of Course Plans are essential for maintaining academic quality and curriculum relevance.

ANALYSIS

IMPACT ON STAKEHOLDERS

Faculty

*The programme enhanced faculty understanding and practical capacity in OBE-based course planning, curriculum alignment, innovative pedagogy, assessment planning, and academic documentation.

*The QIP provided a systematic approach for reviewing, validating, and standardizing Course Plans, thereby supporting academic quality assurance and consistency

INNOVATIONS/BEST PRACTICES

*Adoption of a step-by-step Course Plan development and review process.

*Integration of innovative, experiential, project-based, case-based, and technology-enabled learning into course planning.

*Use of peer review and academic validation for improving Course Plan quality.

*Emphasis on systematic alignment of COs with POs and curriculum requirements.

Introduction of a structured process for review, validation, standardization, feedback, and continuous refinement.

*Hands-on and interactive workshop formats encouraged faculty participation and practical application rather than relying only on theoretical orientation

RELEVANCE OF THE EVENT

VISION / MISSION / PO/PSO MAPPING

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LOCAL / GLOBAL NEEDS / GRADUATE ATTRIBUTES

Local Needs: Improved faculty capacity to design learner-centred and outcome-oriented courses that respond to the academic needs of students and ensure effective curriculum delivery.

Regional Needs: Promoted consistent and innovative teaching practices that can contribute to strengthening the quality of higher education and employability-oriented learning in the region.

National Needs: Supported the national emphasis on Outcome-Based Education, quality assurance, competency-based learning, academic standardization, and continuous improvement in higher education.

Global Needs: Encouraged the adoption of technology-enabled, experiential, project-based, and case-based learning, helping academic institutions respond to changing global educational and professional requirements.

CONTEMPORARY REQUIREMENTS

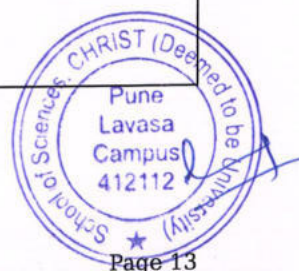
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VALUE SYSTEMS / GENDER / ENVIRONMENT

The Quality Improvement Programme supported the institution's commitment to quality education, innovation, ethical academic practices, and continuous improvement, with strong alignment to SDG 4: Quality Education and SDG 9: Industry, Innovation and Infrastructure. By strengthening faculty competence in Outcome-Based Education (OBE), standardized course planning, curriculum alignment, and innovative pedagogical practices, the programme contributed to improving the quality and effectiveness of educational delivery.

SDGs

SDG 04: Quality Education



SUGGESTIONS FOR IMPROVEMENT • FEEDBACK FROM IQAC

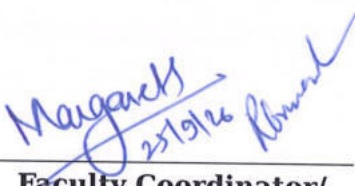
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Submitted By: SALVE MARGARET JOSEPH

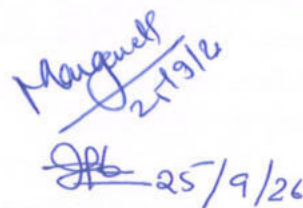
Submitted On: 15 September 2026 03:09 PM



Head/Coordinator



**Faculty Coordinator/
Organiser**



**Department IQAC
Coordinator**



POSTER

CHRIST UNIVERSITY
Pune Lavasa Campus

SCHOOL OF
SCIENCES
PUNE LAVASA CAMPUS



CHRIST
(DEEMED TO BE UNIVERSITY)
BANGALORE | DELHI NCR | PUNE

DEPARTMENT OF STATISTICS & DATA SCIENCE
&
DEPARTMENT OF COMPUTER SCIENCE
PRESENTS

QUALITY IMPROVEMENT PROGRAMME
ON
**"OUTCOME-BASED COURSE PLANNING AND
INNOVATIVE PEDAGOGICAL PRACTICES FOR
ACADEMIC EXCELLENCE"**



DATE

3rd August 2026
to
7th August 2026



TIME

10.00 A.M TO 12.30 P.M
&
1.30 P.M TO 04.00 P.M



VENUE

ROOM NO: 1116
CENTRAL BLOCK



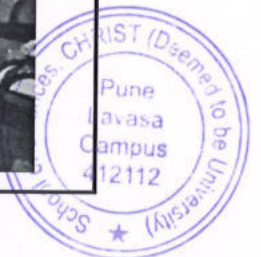
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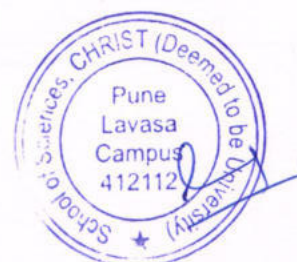
PHOTOS



ATTENDANCE LIST



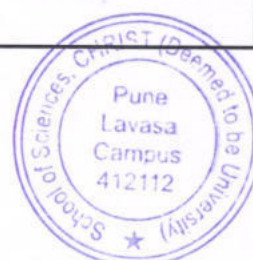
CHRIST (Deemed to be University), Pune Lavasa Campus				
School Of Sciences				
QIP-Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence				
Department of Computer Science				
Date: 3rd August 2026		Venue: 1116, Central Block, 1st Floor.		
Sl. No	Emp ID	FACULTY NAME	Signature 10.00 am - 12.30 pm	Signature 1.30 pm - 4.00 pm
1	20292	DR. LIJA JACOB		
2	2949	FR JUSTIN P VARGHESE		
3	20436	DR. LEKHA J		
4	20293	DR. GUNAVATHI R		
5	20273	MR THOMAS K T		
6	20553	DR. SAVITHRI M		
7	20315	DR. VIJAYALAKSHMI S		
8	20376	DR. ALWIN JOSEPH		
9	20735	DR. VANDANA YADAV		
10	20748	DR. ROHIT		
12	20721	DR. ALPHONSA GEORGE		
13	20630	MS. MARGARET SALVE JOSEPH		
11	20633	MS. ANANYA MITRA		
14	20528	MS. KAJAL DASS		



ATTENDANCE LIST



CHRIST (Deemed to be University), Pune Lavasa Campus				
School Of Sciences				
QIP- Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence				
Department of Statistics and Data Science				
Date: 3rd August 2026		Venue: I16, Central Block, 1st Floor.		
Sl. No	Emp ID	FACULTY NAME	Signature 10.00 am - 12.30 pm	Signature 1.30 pm - 4.00 pm
1	20292	DR. LIJA JACOB		
2	20504	DR. TINY S PALATHARA		
3	20661	DR ANITA KUMARI		
4	20508	DR. AVICHAL SHARMA		
5	20593	DR. ASIF TARIQ		
6	20347	DR. LIBIN CHACKO SAMUEL	ONLINE	ONLINE
7	20468	DR. ASHAQ HUSSAIN GANIE		
8	20686	DR. PRATHU BAJPAI		
9	20746	DR. P DEVIKA		
10	20741	DR. RAMESH		
11	20636	MR. MILAN CHAKRABORTY		
12	20745	MS. FATHIMA RILFA		



ATTENDANCE LIST



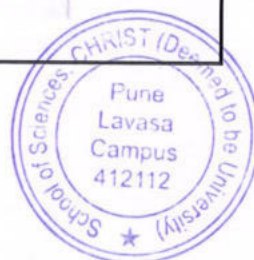
CHRIST (Deemed to be University), Pune Lavasa Campus				
School Of Sciences				
QIP-Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence				
Department of Computer Science				
Date: 4th August 2026		Venue: 1116, Central Block, 1st Floor.		
Sl. No	Emp ID	FACULTY NAME	Signature 10.00 am - 12.30 pm	Signature 1.30 pm - 4.00 pm
1	20292	DR. LIJA JACOB		
2	2949	FR JUSTIN P VARGHESE		
3	20436	DR. LEKHA J		
4	20293	DR. GUNAVATHI R		
5	20273	MR THOMAS K T		
6	20553	DR. SAVITHRI M		
7	20315	DR. VIJAYALAKSHMI S		
8	20376	DR. ALWIN JOSEPH		ABSENT
9	20735	DR. VANDANA YADAV		
10	20748	DR. ROHIT		
12	20721	DR. ALPHONSA GEORGE		
13	20630	MS. MARGARET SALVE JOSEPH		
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CHRIST (Deemed to be University), Pune Lavasa Campus				
School Of Sciences				
QIP- Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence				
Department of Statistics and Data Science				
Date: 4th August 2026		Venue: 116, Central Block, 1st Floor.		
Sl. No	Emp ID	FACULTY NAME	Signature 10.00 am - 12.30 pm	Signature 1.30 pm - 4.00 pm
1	20292	DR. LIJA JACOB		
2	20504	DR. TINY S PALATHARA	ABSENT	ABSENT
3	20661	DR ANITA KUMARI		
4	20508	DR. AVICHAL SHARMA		
5	20593	DR. ASIF TARIQ		
6	20347	DR. LIBIN CHACKO SAMUEL	ONLINE	ONLINE
7	20468	DR. ASHAQ HUSSAIN GANIE		
8	20686	DR. PRATHU BAJPAI		
9	20746	DR. P DEVIKA		
10	20741	DR. RAMESH		
11	20636	MR. MILAN CHAKRABORTY	ABSENT	ABSENT
12	20745	MS. FATHIMA RILEA		



ATTENDANCE LIST



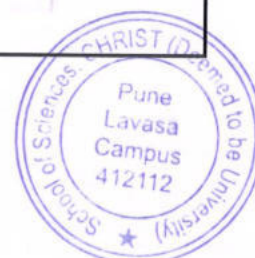
CHRIST (Deemed to be University), Pune Lavasa Campus				
School Of Sciences				
QIP-Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence				
Department of Computer Science				
Date: 5th August 2026		Venue: 1116, Central Block, 1st Floor.		
Sl. No	Emp ID	FACULTY NAME	Signature 10.00 am - 12.30 pm	Signature 1.30 pm - 4.00 pm
1	20292	DR. LIJA JACOB		
2	2949	FR JUSTIN P VARGHESE		
3	20436	DR. LEKHA J		
4	20293	DR. GUNAVATHI R		
5	20273	MR THOMAS K T		
6	20553	DR. SAVITHRI M		
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CHRIST (Deemed to be University), Pune Lavasa Campus				
School Of Sciences				
QIP- Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence				
Department of Statistics and Data Science				
Date: 5th August 2026		Venue: 116, Central Block, 1st Floor.		
Sl. No	Emp ID	FACULTY NAME	Signature 10.00 am - 12.30 pm	Signature 1.30 pm - 4.00 pm
1	20292	DR. LIJA JACOB		
2	20504	DR. TINY S PALATHARA		
3	20661	DR ANITA KUMARI		
4	20508	DR. AVICHAL SHARMA		
5	20593	DR. ASIF TARIQ		
6	20347	DR. LIBIN CHACKO SAMUEL	ONLINE	ONLINE
7	20468	DR. ASHAQ HUSSAIN GANIE		
8	20686	DR. PRATHU BAJPAI		
9	20746	DR. P DEVIKA		
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11	20636	MR. MILAN CHAKRABORTY		
12	20745	MS. FATHIMA RILFA		



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CHRIST (Deemed to be University), Pune Lavasa Campus				
School Of Sciences				
QIP-Outcome Based Course Planning and Innovative Pedagogical Practices for Academic Excellence				
Department of Computer Science				
Date: 05 August 2026		Venue: H106, Central Block, 1st Floor.		
Sl. No	Emp ID	FACULTY NAME	Signature 10:00 am - 12:30 pm	Signature 1:30 pm - 4:00 pm
1	20292	DR. LHA JACOB		
2	2949	FR. JUSTIN P VARGHESE		
3	20436	DR. LEECHA J		
4	20290	DR. GUNAVATHIR		
5	20273	MR THOMAS K T		
6	25553	DR. SANTHIBI M		
7	20115	DR. VIDYALAKSHMI S		
8	20376	DR. ALWIN JOSEPH		
9	20735	DR. VANDANA YADAV		
10	20748	DR. ROHIT		
12	20721	DR. ALFIONSA GEORGE		
13	20650	MS. MARGARET SALVE JOSEPH		



11	20633	MS. ANANVA MITRA		
14	20528	MS. KAMAL DASS		



ATTENDANCE LIST



CHRIST (Deemed to be University), Pune Lavasa Campus				
School of Sciences				
QIP- Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence				
Department of Statistics and Data Science				
Date: 6th August 2026		Venue: Hs. Central Block, 1st Floor		
Sl. No.	Emp ID	FACULTY NAME	Signature 10.00 am - 12.30 pm	Signature 1.30 pm - 4.00 pm
1	20292	DR. LHA JACOB		
2	20364	DR. DIVY S. PALATHALA		
3	20641	DR. AMITA KUMARI		
4	20594	DR. ANVITHA SHARMA		
5	20299	DR. ANU TARIQ		
6	20347	DR. LIRIN CHACKO SAMUEL	ONLINE	ONLINE
7	20605	DR. ASHAQ HUSSAIN GANI		
8	20683	DR. PRATHU RAIPAI		
9	20740	DR. P. DEVIDA		
10	20741	DR. RAJENDI		
11	20636	DR. SOHAN CHAKRABORTY		



12	20745	DR. FATIMA BILAL		
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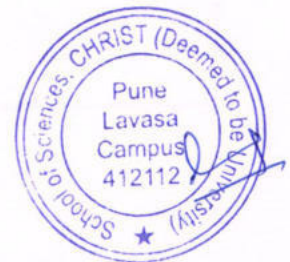


ATTENDANCE LIST



CHRIST
DEEMED TO BE UNIVERSITY
PUNE LAVASA CAMPUS
The Hub of Analytics

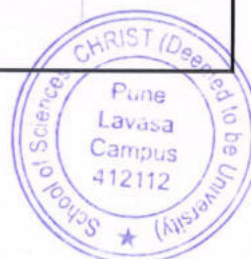
CHRIST (Deemed to be University), Pune Lavasa Campus				
School Of Sciences				
QIP-Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence				
Department of Computer Science				
Date: 4th August 2026		Venue: 1116, Central Block, 1st Floor.		
Sl. No	Emp ID	FACULTY NAME	Signature 10.00 am - 12.30 pm	Signature 1.30 pm - 4.00 pm
1	20292	DR. LIJA JACOB		
2	2949	FR JUSTIN P VARGHESE		
3	20436	DR. LEKHA J		
4	20293	DR. GUNAVATHI R		
5	20273	MR THOMAS K T		
6	20553	DR. SAVITHRI M		
7	20315	DR. VIJAYALAKSHMI S		
8	20376	DR. ALWIN JOSEPH		
9	20735	DR. VANDANA YADAV		
10	20748	DR. ROHIT		
12	20721	DR. ALPHONSA GEORGE		
13	20630	MS. MARGARET SALVE JOSEPH		
11	20633	MS. ANANYA MITRA		
14	20528	MS. KAJAL DASS		



ATTENDANCE LIST



CHRIST (Deemed to be University), Pune Lavasa Campus				
School Of Sciences				
QIP- Outcome-Based Course Planning and Innovative Pedagogical Practices for Academic Excellence				
Department of Statistics and Data Science				
Date: 7th August 2026		Venue: 116, Central Block, 1st Floor.		
Sl. No	Emp ID	FACULTY NAME	Signature 10.00 am - 12.30 pm	Signature 1.30 pm - 4.00 pm
1	20292	DR. LIJA JACOB		
2	20504	DR. TINY S PALATHARA	On leave.	
3	20661	DR ANITA KUMARI		
4	20508	DR. AVICHAL SHARMA		
5	20593	DR. ASIF TARIQ		
6	20347	DR. LIBIN CHACKO SAMUEL	ONLINE	ONLINE
7	20468	DR. ASHAQ HUSSAIN GANIE		
8	20686	DR. PRATHU BAJPAI		
9	20746	DR. P DEVIKA		
10	20741	DR. RAMESH		
11	20636	MR. MILAN CHAKRABORTY		
12	20745	MS. FATHIMA RILFA		



OTHER

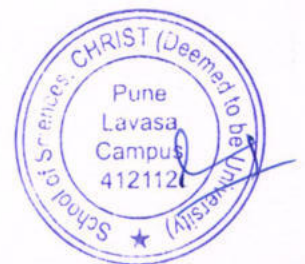


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Participant-Artboard_7.pdf.gz

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OTHER

SYLLABUS

COURSE NAME : COMPUTER NETWORKS

COURSE CODE : BCA210-3

COURSE TYPE : THEORY

SESSION GROUP : ODD

DEPARTMENT : COMPUTER SCIENCE

COURSE CREDIT DETAILS

Display Name	Course Credit	Hours Per Session
Theory	4	60

DESCRIPTION

This course provides a comprehensive introduction to the fundamental concepts and principles of computer networks. Students will explore the layered architecture of modern networking systems, delving into the functionalities and services provided at each layer. The course covers key networking protocols, algorithms, and technologies, enabling students to understand how data is transmitted, routed, and managed across interconnected systems. By the end of the course, students will have a solid foundation in network operations, including protocol design, communication strategies, and the principles behind reliable and efficient data exchange.

COURSE OBJECTIVES

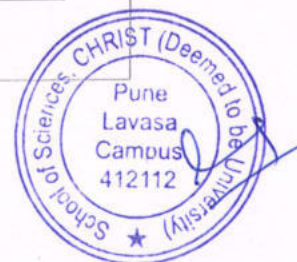
The goal of this course is to introduce the basics of computer networks. Students will learn their fundamental layered structure, understand commonly offered layered services, and examine protocols and algorithms used to operate the network.

OFFERED PROGRAMMES

Bachelor of Computer Applications (SEMESTER - III)

COURSE OUTCOMES

Outcome Reference No.	Outcome Description	RBT Domain	Highest RBT Level
CO1	Describe various network types, internal components, and their functionalities.	Cognitive	L1 - Remember
CO2	Demonstrate fundamental data communication concepts and their significance in networking.	Cognitive	L2 - Understand



Outcome Reference No.	Outcome Description	RBT Domain	Highest RBT Level
CO3	Analyze network communication processes to diagnose issues and optimize performance.	Cognitive	L3 - Apply
CO4	Apply networking principles to design and implement solutions in real-world scenarios.	Cognitive	L4 - Analyse
CO5	Exhibit network protocols and their role in efficient data communication.	Cognitive	L5 - Evaluate

SUSTAINABILITY DEVELOPMENT GOALS (SDG)

- Industry, innovation and infrastructure
- Quality education
- Sustainable cities

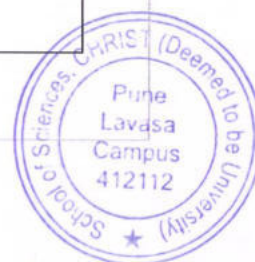
21ST CENTURY SKILLS

- Analytical thinking
- Technological literacy

COURSE CONTENT

Unit No.	Unit Title	Unit Teaching Hours	Development Needs	Skill Focused	Cross Cutting Issues	Reference Link
U1	DATA COMMUNICATIONS COMPONENTS	11	Global, Local, National, Regional	Employability, Skill Development	Environment, Human Values, Professional Ethics, Sustainability	-

Topic No.	Content	Description	Topic Reference Material Upload
U1-T1	Data communication components-Data flow – network models – categories of networks –the interconnection of networks – inter network Protocols and standards: protocols-standards-standards organizations- internet standards tasks – OSI model – layers in	-	-

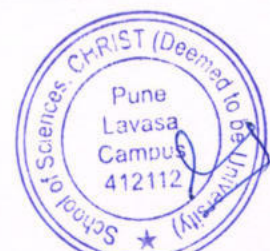


Topic No.	Content	Description	Topic Reference Material Upload
	the OSI model – TCP/IP protocol suite. Self Learning: Network Topology and their various Types; Types of Network: LAN, MAN, WAN; Server Based LANs & Peer-to-Peer LANs.		

Unit No.	Unit Title	Unit Teaching Hours	Development Needs	Skill Focused	Cross Cutting Issues	Reference Link
U2	PHYSICAL LAYER	11	Global, Local, National, Regional	Employability, Skill Development	Environment, Human Values, Professional Ethics, Sustainability	-

Topic No.	Content	Description	Topic Reference Material Upload
U2-T1	Data and signals-transmission impairments - Digital Transmission: Digital to digital conversion: Line coding – line coding schemes (Unipolar, Polar, Bipolar) – block coding 4B/5B- Analog to digital conversion – PCM - transmission modes: serial transmission – parallel transmission. Analog Transmission: Digital to Analog conversion: FSK-ASK-PSK Analog to Analog conversion. Multiplexing: Frequency division multiplexing – Time division multiplexing. Self Learning: Introduction to Transmission Media	-	-

Unit No.	Unit Title	Unit Teaching Hours	Development Needs	Skill Focused	Cross Cutting Issues	Reference Link
U3	DATA LINK LAYER	12	Global, Local, National, Regional	Employability, Entrepreneurship, Skill Development	Environment, Human Values, Professional Ethics, Sustainability	-

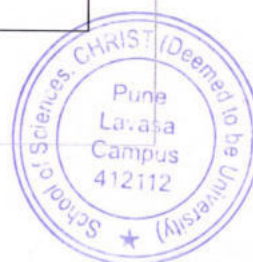


Topic No.	Content	Description	Topic Reference Material Upload
U3-T1	Error correction and detection: Introduction- block coding-linear block codes-cyclic codes-checksum, Hamming Code. Data link Control: protocols - simplest protocol- stop and wait for automatic repeat request--selective repeat-automatic repeat request- piggybacking. Multiple Access: Random access-Aloha-CSMA-CSMA/CD-CSMA/CA Controlled access: reservation, polling, token passing. Self Learning: Channelization: FDMA, TDMA, CDMA.	-	-

Unit No.	Unit Title	Unit Teaching Hours	Development Needs	Skill Focused	Cross Cutting Issues	Reference Link
U4	TRANSPORT LAYER	12	Global, Local, National, Regional	Employability, Entrepreneurship, Skill Development	Environment, Human Values, Professional Ethics, Sustainability	-

Topic No.	Content	Description	Topic Reference Material Upload
U4-T1	Transport Layer Protocols– UDP – TCP Congestion control: Data traffic – congestion – congestion control. Application layer: Overview of Name space, DNS, FILE transfer: FTP, WWW and HTTP: Architecture – web documents – HTTP. Self Learning: DNS using CISCO packet tracer	-	-

Unit No.	Unit Title	Unit Teaching Hours	Development Needs	Skill Focused	Cross Cutting Issues	Reference Link
U5	WIRED LANs	14	Global, Local, National, Regional	Employability, Skill Development	Environment, Human Values, Professional Ethics, Sustainability	-



Topic No.	Content	Description	Topic Reference Material Upload
U5-T1	Ethernet Protocol, standard Ethernet- fast Ethernet- Gigabit Ethernet. Wireless LANS: IEEE 802.11 Project- architecture- MAC sublayer. Network Layer: Internet Protocol: IPv4 –IPv6 Address mapping protocols: ARP – RARP. Routing protocols: Unicast routing protocols: distance vector routing, Link State routing Multicast Routing - Multicasting- Multicast Applications. Self Learning: Configuring the network with multiple devices CISCO Packet Tracer.	-	-

REFERENCE MATERIALS

Text & Reference Books

1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022.
2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017.
3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022.

Essential Reading

1. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018.
2. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.

Additional Information

Reference websites:

1. <https://www.netacad.com/courses/packet-tracer>
2. <https://www.wireshark.org/download.html>
3. <https://www.nsnam.org/>

EXAMINATION PATTERN

Pattern For Continuous Internal Assessment (CIA)



CIA 1: Assignment/Others (2 Components)

CIA 2: Centralised Mid-semester Examination

CIA 3: Assignment/Others

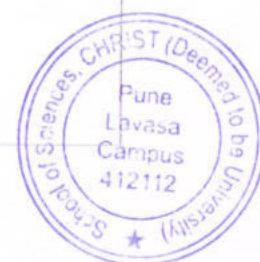
Question Paper Pattern For End Semester Examination (ESE)

ETE: 100 marks;

Section A: $10 \times 2 = 20$ marks

Section B: $6 \times 5 = 30$ marks

Section C: $5 \times 10 = 50$ marks



COURSE PLAN

COURSE FOCUS AREAS

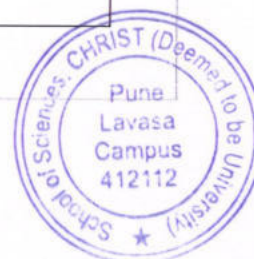
Unit No	Unit Title	Unit Teaching Hours	Development Needs	Skills Focused	Cross Cutting Issues
U1	DATA COMMUNICATIONS COMPONENTS	11	Global, Local, National, Regional	Employability, Skill Development	Environment, Human Values, Professional Ethics, Sustainability
U2	PHYSICAL LAYER	11	Global, Local, National, Regional	Employability, Skill Development	Environment, Human Values, Professional Ethics, Sustainability
U3	DATA LINK LAYER	12	Global, Local, National, Regional	Employability, Entrepreneurship, Skill Development	Environment, Human Values, Professional Ethics, Sustainability
U4	TRANSPORT LAYER	12	Global, Local, National, Regional	Employability, Entrepreneurship, Skill Development	Environment, Human Values, Professional Ethics, Sustainability
U5	WIRED LANs	14	Global, Local, National, Regional	Employability, Skill Development	Environment, Human Values, Professional Ethics, Sustainability

LESSON PLAN

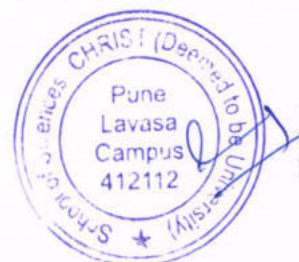
Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
Week 1	U1	U1-T1	Role plays, Discussion	Diagnostic Assessment	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking,	



Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 2	U1	U1-T1	Story telling, Peer learning	Wireshark demo	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022.	https://www.netacad.com/cisco-packet-tracer



Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 3	U1	U1-T1	Concept mapping, Lecture,	Quizzes / Debate	1. Behrouz A Forouzan, Data Communications	https://www.wireshark.org/download.html .



Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
			Story telling, Learning by doing		and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications,	

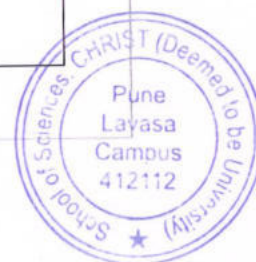


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Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					Global Edition, 2021.	
Week 4	U2	U2-T1	Concept mapping, Lecture	Signal Sense Quiz/Decode the Signal Challenge / Think-Link-Share	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer	https://line-encoder-gamma.vercel.app/



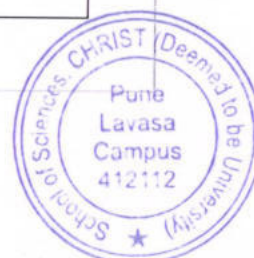
Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 5	U2	U2-T1	Lecture, Problem based learning, Simulation	Rapid Recall Quiz & PCM Conversion Exercise	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill	https://line-encoder-gamma.vercel.app/



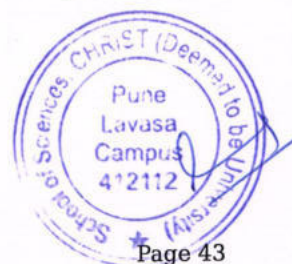
Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 6	U2	U2-T1	Concept mapping, Lecture	Interactive Quiz / Modulation Match-Up Activity	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading	



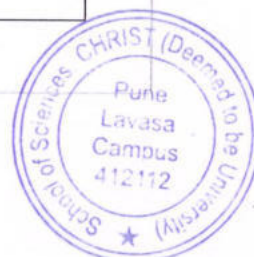
Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 7	U3	U3-T1	Lecture, Problem based learning, Project based learning	Rapid Recall Quiz	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022.	



Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 8	U3	U3-T1	Experiential learning, Lecture, Problem based learning	Protocol Flow Simulation / Role play	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S	



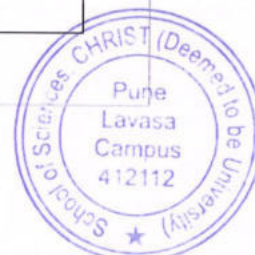
Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 9	U3	U3-T1	Experiential learning, Lecture, Problem based learning	Rapid Recall Quiz	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication	



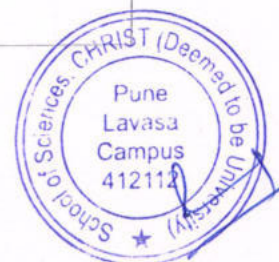
Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 10	U4	U4-T1	Lecture	Think-Pair-Share Activity & Real-Time Application Mapping	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill,	



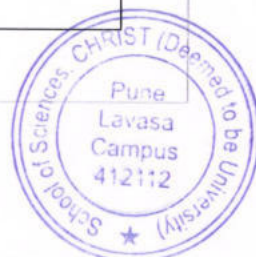
Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 11	U4	U4-T1	Lecture	Think-Pair-Share Activity & Real-	1. Behrouz A Forouzan, Data	



Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
				Time Application Mapping	Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson	



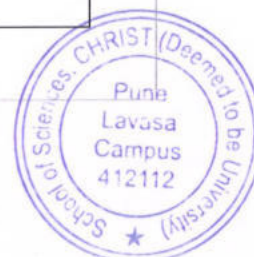
Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					Publications, Global Edition, 2021.	
Week 12	U4	U4-T1	Experiential learning, Simulation	Traffic Flow Analysis	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose,	



Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 13	U4	U4-T1	Experiential learning, Lecture	Assignment using Simulator / CISCO Packet tracer	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition,	



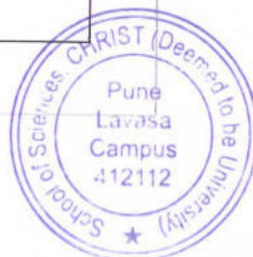
Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 14	U5	U5-T1	Lecture	Think-Pair-Share / Quiz	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading	



Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 15	U5	U5-T1	Experiential learning, Lecture	Implement and test routing protocols / CISCO Packet tracer (IP Addressing)	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications,	



Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 16	U5	U5-T1	Experiential learning, Lecture	Using online simulator to Implement and test routing protocols	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data communication and networking, McGraw-Hill, 5th edition, 2017.	



Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	
Week 17	U5	U5-T1	Experiential learning, Lecture	Configuring the network with CISCO packet tracer	1. Behrouz A Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw-Hill, 6th edition, 2022. 2. Behrouz A Forouzan, Data	



Week	Unit	Topics	Andragogy	Ungraded Formative Assessments	Reference Resources	Additional Details
					communication and networking, McGraw-Hill, 5th edition, 2017. 3. Andrew S Tanenbaum, Computer Networks, PHI publications, 5th edition, 2022. Essential Reading / Recommended Reading 4. Mike Meyers, CompTIA Network+, 7th Edition, McGrawHill Publications, 2018. 5. James Kurose, Computer Networking: A Top-Down Approach, Pearson Publications, Global Edition, 2021.	

CO-PO MAPPING

Programme 1 : Bachelor of Computer Applications

CO-PO Mapping



CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	1	1	2	1	2	2	2
CO2	3	1	1	2	1	3	2	2
CO3	2	3	3	3	2	1	1	2
CO4	1	2	3	2	3	1	2	1
CO5	3	1	1	2	1	1	2	2

CO ASSESSMENT MAPPING

Assessment Rule Setting for Theory

Assessment	Assessment Levels	Total	CO1	CO2	CO3	CO4	CO5
CIA - I	Department Level	20	10	10	0	0	0
CIA - II	Centralised Level	50	10	15	15	10	0
CIA - III	Department Level	20	0	0	10	10	0
End Term	Centralised Level	100	20	20	20	20	20

ASSESSMENT COMPONENT DEFINITION

Assessment Component Definition Type: Assessment Components are defined Campus Specific.

BANGALORE CENTRAL CAMPUS

Course Type: Theory

Assessment: CIA - I - Total Marks: 20

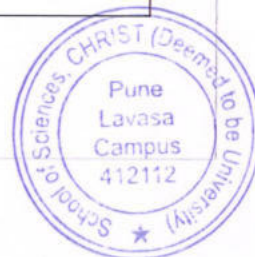
Total Marks	Scale Down To	Min Marks
20	-	-

CO Allocation	
CO1	CO2
10	10

Component	Description/Rubrics	
Written Test	DESCRIPTION :	
	<table> <tr> <td>Assessment component</td><td>IA</td></tr> </table>	Assessment component
Assessment component	IA	



Component	Description/Rubrics	
	Portion	Unit 1 and Unit 2
	Mode of conduct	Offline
	Technology tool used	Google Forms / Written Test / Simulator
	Date of exam	Week 5
	Type of questions	5 Questions (Emerging (Developing) Proficient (Applying) Exemplary (Synthesizing))
	Maximum marks	15 Marks
	Duration	50 Minutes
	RUBRICS :	
	Criteria	MARKS
	Conceptual Understanding	5 Marks
	Application & Problem Solving	5 Marks
	Analysis & Interpretation	5 Marks
	DESCRIPTION :	
	Students will be asked to prepare video, Audio presentation and submit for any of the topics covered in the class (with some additional contents) – 2 members team	
Multi-modal Video Presentation	Guidelines:	
	Minimum of 10 slides (include self-recorded audio and video)	



Component	Description/Rubrics																								
	Specify the contribution of individuals in the preparation of materials. Additionally include 3 short + 2 long answer Question with answer for the same topic. Submission in Google Classroom <table> <tr> <td>Assessment component</td><td>1B</td></tr> <tr> <td>Portion for the Test</td><td>Unit 1 and Unit 2</td></tr> <tr> <td>Mode of conduct</td><td>Online</td></tr> <tr> <td>Technology tool used</td><td>Canva/Simulator</td></tr> <tr> <td>Date of exam</td><td>Week 7</td></tr> <tr> <td>Maximum marks</td><td>20</td></tr> <tr> <td>Duration</td><td>30 Minutes</td></tr> </table> RUBRICS : <table> <tr> <td>Criteria</td><td>MARKS</td></tr> <tr> <td>Q & A</td><td>5 Marks</td></tr> <tr> <td>Contribution of individuals</td><td>5 Marks</td></tr> <tr> <td>Content preparation</td><td>5 Marks</td></tr> <tr> <td>Presentation</td><td>5 Marks</td></tr> </table>	Assessment component	1B	Portion for the Test	Unit 1 and Unit 2	Mode of conduct	Online	Technology tool used	Canva/Simulator	Date of exam	Week 7	Maximum marks	20	Duration	30 Minutes	Criteria	MARKS	Q & A	5 Marks	Contribution of individuals	5 Marks	Content preparation	5 Marks	Presentation	5 Marks
Assessment component	1B																								
Portion for the Test	Unit 1 and Unit 2																								
Mode of conduct	Online																								
Technology tool used	Canva/Simulator																								
Date of exam	Week 7																								
Maximum marks	20																								
Duration	30 Minutes																								
Criteria	MARKS																								
Q & A	5 Marks																								
Contribution of individuals	5 Marks																								
Content preparation	5 Marks																								
Presentation	5 Marks																								

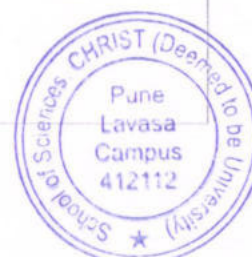
Assessment: CIA - III - Total Marks: 20



Total Marks	Scale Down To	Min Marks
20	-	-

CO Allocation	
CO3	CO4
10	10

Component	Description/Rubrics
Simulation - Cisco Packet Tracer	DESCRIPTION :
	CISCO Packet Tracer for building a network with a minimum of three routers, nine end devices, and IP Configuring all the devices. Share the Cisco Packet Tracer file.
	Assessment Component
	Individual Assignment
	Test Portions
	Unit 3, Unit 4 & Unit 5
	Mode of Submission
	Submission in Google classroom
	Date of exam
	Week 12
	Maximum marks
	20 Marks
	Assessment Component
	Individual Assignment
	Test Portions
	Unit 3, Unit 4 & Unit 5
	Mode of Submission
	Submission in Google classroom
	Date of exam
	Week 12
	Maximum marks
	20 Marks
	RUBRICS :
	<u>Evaluation Rubrics</u>



Component	Description/Rubrics			
	Criteria	Proficient (17-20 Marks)	Satisfactory (10-16 Marks)	Needs Improvement (0-9 Marks)
	Network Topographical Logic (R1) (Weightage: 10 Marks)	Perfect setup of 3 working routers and 9 active end devices with robust routing loops.	Incomplete ping connectivity across specific segments; minor path dropouts.	Severe structural misconfigurations; devices fail to communicate entirely.
	Server Optimization (R2) (Weightage: 5 Marks)	Fully active configuration of secondary services (DHCP, DNS, or Mail server setups).	Partial setups with broken service requests or invalid records.	Secondary services omitted or non-functional.
	Technical Documentation (R3) (Weightage: 5 Marks)	Professional 1-page analytical report explaining structural mapping choices.	Brief text log lacking concrete architectural descriptions.	No supporting report enclosed with the simulator PKT files.
Mind-Map preparation and Submission	DESCRIPTION :			
	Prepare and submit a mind-map for "Computer Networks Concepts". Identify entities related to the topic and, based on hypernym and hyponym, build the branches and sub-branches. The assessment will be based on the density of the mind map and the correctness of the relationships between the entities.			
	Assessment Component		2B	
	Assignment Topic		UNIT I - V	
	Nature of the Exam		Handwritten (Digital ones are not accepted).	
	Submission mode		Offline	
	Deadline for submission		Week 14	
Maximum marks		15		
RUBRICS :				



Component	Description/Rubrics			
	Criteria	Proficient (13-15 Marks)	Satisfactory (8-12 Marks)	Needs Improvement (0-7 Marks)
	Entity Density & Branching Logic (Weightage: 10 Marks)	Extremely dense semantic hierarchy utilizing clear hypernym/hyponym layout paths.	Clear branching layout but misses subtle sub-branches or definitions.	Disorganized drawing; lack of hierarchical structure or relevant nodes.
	Execution Integrity (Weightage: 5 Marks)	Submitted as a crisp physical drawing matching all spatial limits on-time.	Minor structural formatting issues or late submission tracking.	Fails to compile a handwritten artifact; breaks formatting rules.

BANGALORE YESHWANTHPUR CAMPUS

Course Type: Theory

Assessment: CIA - I - Total Marks: 20

Total Marks	Scale Down To	Min Marks
20	-	-

CO Allocation	
CO1	CO2
10	10

Component	Description/Rubrics	
Written Test	DESCRIPTION :	
	Assessment component	1A
	Portion	Unit 1 and Unit 2
	Mode of conduct	Offline



Component	Description/Rubrics	
	Technology tool used	Google Forms / Written Test / Simulator
	Date of exam	Week 5
	Type of questions	5 Questions (Emerging (Developing) Proficient (Applying) Exemplary (Synthesizing))
	Maximum marks	15 Marks
	Duration	50 Minutes
	RUBRICS :	
	Criteria	MARKS
	Conceptual Understanding	5 Marks
	Application & Problem Solving	5 Marks
	Analysis & Interpretation	5 Marks
Multi-modal Video Presentation	DESCRIPTION : Students will be asked to prepare a video, an audio presentation, and submit for any of the topics covered in the class (with some additional content) – 2 member team Guidelines: Minimum of 10 slides (include self-recorded audio and video) Specify the contribution of individuals in the preparation of materials. Additionally include 3 short + 2 long answer Question with answer for the same topic. Submission in Google Classroom	

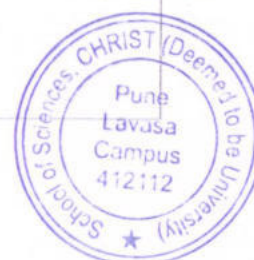


Component	Description/Rubrics	
	Assessment component	1B
	Portion for the Test	Unit 1 and Unit 2
	Mode of conduct	Online
	Technology tool used	Canva/Simulator
	Date of exam	Week 7
	Maximum marks	20
	Duration	30 Minutes
	RUBRICS :	
	Criteria	MARKS
	Q & A	5 Marks
	Contribution of individuals	5 Marks
	Contentpreparation	5 Marks
	Presentation	5 Marks

Assessment: CIA - III - Total Marks: 20

Total Marks	Scale Down To	Min Marks
20	-	-

CO Allocation	
CO3	CO4
10	10



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Component	Description/Rubrics												
Mind-Map preparation and Submission	DESCRIPTION : Prepare and submit a mind-map for “Computer Networks Concepts”. Identify entities related to the topic and, based on hypernym and hyponym, build the branches and sub-branches. The assessment will be based on the density of the mind map and the correctness of the relationships between the entities.												
	<table><tr><td>Assessment Component</td><td>3B</td></tr><tr><td>Assignment Topic</td><td>UNIT I - V</td></tr><tr><td>Nature of the Exam</td><td>Handwritten (Digital ones are not accepted).</td></tr><tr><td>Submission mode</td><td>Offline</td></tr><tr><td>Deadline for submission</td><td>Week 14</td></tr><tr><td>Maximum marks</td><td>15</td></tr></table>	Assessment Component	3B	Assignment Topic	UNIT I - V	Nature of the Exam	Handwritten (Digital ones are not accepted).	Submission mode	Offline	Deadline for submission	Week 14	Maximum marks	15
	Assessment Component	3B											
	Assignment Topic	UNIT I - V											
	Nature of the Exam	Handwritten (Digital ones are not accepted).											
	Submission mode	Offline											
	Deadline for submission	Week 14											
	Maximum marks	15											
	RUBRICS :												
	<table><tr><th>Criteria</th><th>Proficient (13-15 Marks)</th><th>Satisfactory (8-12 Marks)</th><th>Needs Improvement (0-7 Marks)</th></tr><tr><td>Entity Density & Branching Logic (Weightage: 10 Marks)</td><td>Extremely dense semantic hierarchy utilizing clear hypernym/hyponym layout paths.</td><td>Clear branching layout but misses subtle sub-branches or definitions.</td><td>Disorganized drawing; lack of hierarchical structure or relevant nodes.</td></tr><tr><td>Execution Integrity (Weightage: 5 Marks)</td><td>Submitted as a crisp physical drawing matching all spatial limits on-time.</td><td>Minor structural formatting issues or late submission tracking.</td><td>Fails to compile a handwritten artifact; breaks formatting rules.</td></tr></table>	Criteria	Proficient (13-15 Marks)	Satisfactory (8-12 Marks)	Needs Improvement (0-7 Marks)	Entity Density & Branching Logic (Weightage: 10 Marks)	Extremely dense semantic hierarchy utilizing clear hypernym/hyponym layout paths.	Clear branching layout but misses subtle sub-branches or definitions.	Disorganized drawing; lack of hierarchical structure or relevant nodes.	Execution Integrity (Weightage: 5 Marks)	Submitted as a crisp physical drawing matching all spatial limits on-time.	Minor structural formatting issues or late submission tracking.	Fails to compile a handwritten artifact; breaks formatting rules.
Criteria	Proficient (13-15 Marks)	Satisfactory (8-12 Marks)	Needs Improvement (0-7 Marks)										
Entity Density & Branching Logic (Weightage: 10 Marks)	Extremely dense semantic hierarchy utilizing clear hypernym/hyponym layout paths.	Clear branching layout but misses subtle sub-branches or definitions.	Disorganized drawing; lack of hierarchical structure or relevant nodes.										
Execution Integrity (Weightage: 5 Marks)	Submitted as a crisp physical drawing matching all spatial limits on-time.	Minor structural formatting issues or late submission tracking.	Fails to compile a handwritten artifact; breaks formatting rules.										
Simulation - CISCO	DESCRIPTION :												



Component	Description/Rubrics			
Packet Tracer	CISCO Packet Tracer for building a network with a minimum of three routers, nine end devices, and IP Configuring all the devices. Share the Cisco Packet Tracer file.			
	Assessment Component		Individual Assignment	
	Test Portions		Unit 3, Unit 4 & Unit 5	
	Mode of Submission		Submission in Google classroom	
	Date of exam		Week 12	
	Maximum marks		20 Marks	
	RUBRICS :			
Criteria	Proficient (17-20 Marks)	Satisfactory (10-16 Marks)	Needs Improvement (0-9 Marks)	
Network Topographical Logic (R1) (Weightage: 10 Marks)	Perfect setup of 3 working routers and 9 active end devices with robust routing loops.	Incomplete ping connectivity across specific segments; minor path dropouts.	Severe structural misconfigurations; devices fail to communicate entirely.	
Server Optimization (R2) (Weightage: 5 Marks)	Fully active configuration of secondary services (DHCP, DNS, or Mail server setups).	Partial setups with broken service requests or invalid records.	Secondary services omitted or non-functional.	
Technical Documentation (R3) (Weightage: 5 Marks)	Professional 1-page analytical report explaining structural mapping choices.	Brief text log lacking concrete architectural descriptions.	No supporting report enclosed with the simulator PKT files.	

DELHI NCR CAMPUS

Course Type: Theory

Assessment: CIA - I - Total Marks: 20



Total Marks	Scale Down To	Min Marks
20	-	-

CO Allocation	
CO1	CO2
10	10

Component	Description/Rubrics
Written Test	DESCRIPTION : :Portion Unit 1 and Unit 2 Mode of conduct Offline Technology tool used Google Forms / Written Test / Simulator Date of exam: Week 5 Type of questions: 5 Questions (Emerging (Developing), Proficient (Applying) Exemplary, (Synthesizing)) Maximum marks: 15 Marks Duration: 50 Minutes RUBRICS : Criteria MARKS Conceptual Understanding 5 Marks Application & Problem Solving 5 Marks Analysis & Interpretation 5 Marks
Multi Modal Video Presentation	DESCRIPTION : Students will be asked to prepare video, audio presentation and submit for any of the topics covered in the class (with some additional contents) Team Size: 3 members per team Guidelines: Minimum of 10 slides (include self-recorded audio and video) Specify the contribution of individuals in the preparation of materials. Additionally include 3 short + 2 long answer questions with answers for the same topic: Submission in Google Classroom



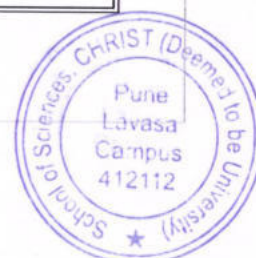
Component	Description/Rubrics
	Assessment component: 1B Portion for the test: Unit 1 and Unit 2 Mode of conduct: Online Technology tool used: Canva/Simulator Date of exam: Week 7 Maximum marks 20 Duration 30 Minutes RUBRICS : Criteria MARKS Q & A: 5 Marks Contribution of individuals: 5 Marks Content preparation: 5 Marks Presentation: 5 Marks

Assessment: CIA - III - Total Marks: 20

Total Marks	Scale Down To	Min Marks
20	-	-

CO Allocation	
CO3	CO4
10	10

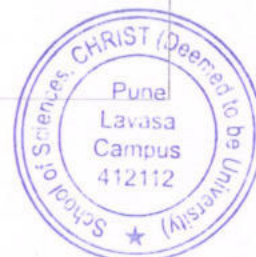
Component	Description/Rubrics	
Simulation based submission	DESCRIPTION : CISCO Packet Tracer for building a network with a minimum of three routers. CISCO Packet Tracer to build a network with a minimum of three routers, nine end devices, and IP Configuring all the devices. Share the Cisco Packet Tracer file.	
	Assessment Component	Individual Assignment
	Test Portions	Unit 3, Unit 4 & Unit 5



Component	Description/Rubrics			
	Mode of Submission	Submission in Google classroom		
	Date of exam	Week 12		
	Maximum marks	20 Marks		
	Assessment Component	Individual Assignment		
	Test Portions	Unit 3, Unit 4 & Unit 5		
	Mode of Submission	Submission in Google classroom		
	Date of exam	Week 12		
	Maximum marks	20 Marks		
	RUBRICS :			
	Criteria	Proficient(17-20 Marks)	Satisfactory(10-16 Marks)	Needs Improvement (0-9 Marks)
	Network Topographical Logic (R1) (Weightage:10 Marks)	Perfect setup of 3 working routers and 9 active end devices with robust routing loops.	Incomplete ping connectivity across specific segments; minor path dropouts.	Severe structural misconfigurations; devices fail to communicate entirely.
	Server Optimization (R2)	Fully active configuration of secondary services (DHCP, DNS, or Mail server setups).	Partial setups with broken service requests or invalid records.	Secondary services omitted or non-functional.



Component	Description/Rubrics			
	(Weightage: 5 Marks)			
	Technical Documentation (R3) (Weightage: 5 Marks)	Professional 1-page analytical report explaining structural mapping choices.	Brief text log lacking concrete architectural descriptions.	No supporting report enclosed with the simulator PKT files.
Mind Map preparation and submission	DESCRIPTION : Prepare and submit a mind-map for "Computer Networks Concepts". Identify entities related to the topic and, based on hypernym and hyponym, build the branches and sub-branches. The assessment will be based on the density of the mind map and the correctness of the relationships between the entities. Assessment Component: 2B Assignment Topic: UNIT I - V Nature of the Exam: Handwritten (Digital ones are not accepted). Sheet Size: A3 Submission mode: Offline Deadline for submission: Week 14 Maximum marks 15 RUBRICS :			
	Criteria	Proficient(13-15 Marks)	Satisfactory(8-12 Marks)	Needs Improvement (0-7 Marks)
	EntityDensity& BranchingLogic (Weightage: 10 Marks)	Extremely dense semantic hierarchy utilizing clear hypernym/hyponym layout paths.	Clear branching layout but misses subtlesub-branches or definitions.	Disorganized drawing; lack of hierarchical structure or relevant nodes.



Component	Description/Rubrics			
	Execution Integrity (Weightage: 5 Marks)	Submitted as a crisp physical drawing matching all spatial limits on-time.	Minor structural formatting issues or late submission tracking.	Fails to compile a handwritten artifact; breaks formatting rules.

PUNE LAVASA CAMPUS

Course Type: Theory

Assessment: CIA - I - Total Marks: 20

Total Marks	Scale Down To	Min Marks
20	-	-

CO Allocation	
CO1	CO2
10	10

Component	Description/Rubrics
Written Test	DESCRIPTION : Descriptive type 4 questions from Unit I and II. RUBRICS : Part A 2 X 5 = 10 Marks Given clear explanation along with example - 5 marks Not much clear or examples is missing, or example is not relevant - 3 mark Answer is not relevant, and example is also wrong - 0 mark 2 X 10 = 20 Marks Given clear explanation along with example and neat diagrams wherever necessary - 10 marks Clear explanation with example but diagram missing - 8 mark Clear explanation but examples are not clear, and diagram is also not clear or missing - 6 mark Explanation is not clear, examples are not clear, and diagram is also not clear or missing - 4 mark Explanation is not clear, examples and diagrams missing - 2 mark Explanation, example and diagram is not relevant - 0 mark



Component	Description/Rubrics
	Total 30 marks scaled down to 20 marks

Assessment: CIA - II - Total Marks: 50

Total Marks	Scale Down To	Min Marks
50	-	-

CO Allocation			
CO1	CO2	CO3	CO4
10	15	15	10

Component	Description/Rubrics
Written Test	DESCRIPTION : Centralized Written Exam covering units 1,2 and 3 RUBRICS : CIA II=50 Marks (MSE Centralized) Scaled down to 25

Assessment: CIA - III - Total Marks: 20

Total Marks	Scale Down To	Min Marks
20	-	-

CO Allocation	
CO3	CO4
10	10

Component	Description/Rubrics			
Case Analysis	DESCRIPTION :			
	Need to analyze the given case study and identify the best suited network design. Should provide a clear information and reason for the selection of the particular design as a write up. Need to prepare presentation on the same and present it.			
	RUBRICS :			
	Criteria	Excellent (Full	Good (Partial Marks	Needs Improvement



Component	Description/Rubrics			
		Marks 2)	1)	(Marks 0)
	1. Topology Design (2 Marks)	Clear, logical layout with correct devices and connections	Mostly correct with minor errors in layout or device selection	Incomplete or incorrect topology
	2. IP Addressing & Configuration (2 Marks)	Correct IP scheme, subnetting, and gateways configured	Minor mistakes in IP allocation or gateway setup	Major errors, missing configurations
	3. Routing / Protocol (2 Marks)	Proper implementation of static/dynamic routing, works as expected	Some routing works, but partial errors exist	No routing configured or incorrect setup
	4. Simulation & Testing (2 Marks)	Successful ping/packet transfer across all networks, simulation demonstrated	Partial connectivity shown, some devices not working	No successful connectivity shown
	5. Explanation & Presentation (2 Marks)	Clear, confident presentation; effective use of slides, visuals, and time management	Explanation given but lacks clarity or detail	Poor explanation, incomplete documentation
	Viva - 10 Marks			

Assessment: End Term - Total Marks: 100

Total Marks	Scale Down To	Min Marks
100	-	-

CO Allocation				
CO1	CO2	CO3	CO4	CO5
20	20	20	20	20



Component	Description/Rubrics
Written Test	DESCRIPTION : Centralized Test covering all the 5 units RUBRICS : ESE 100 Marks



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OTHER



CU / School of Sciences / Department of Statistics and Data Science / CP / SCI301-6L /
2025-26

**School of Sciences
Department of Statistics and Data Science**

SECTION I - COURSE OVERVIEW

COURSE INFORMATION SHEET

Programme(s): Bachelor of Science (Computer Science, Data Science), Bachelor of Science (Economics, Statistics) (SEMESTER - III)						
Course Name: Linear Algebra			Course Code: MAT201-3L			
Course Type: Core	Method	L	T	P	S	Total
Course Kind: Theory	Hours	45				45
Corresponding Lab Course: Nil	Credits	3				3
Course Instructor(s) Name: 1. Dr Prathu Bajpai			Contact Details : 1. Dr Prathu Bajpai Department of Statistics and Data Science Prathu.bajpai@christuniversity.in +91 8009154923			
CLASSROOM POLICY: 1. No usage of Mobile Phones and Laptops during class hours. 2. Please be in your seat when the bell rings, as class begins at that time. 3. Food and beverages are not allowed in the classroom. 4. Absences: Ask the teacher or a classmate for the updates. 5. Responsibility: Bring notebook, textbook, planner, and appropriate writing tools to class. 6. Know due dates, and submit all coursework on time. 7. Late submissions are not encouraged, and will be examined under a case-to-case basis						





1. Syllabus

UNIT	DETAILS	HOURS
I	Matrices U1-T1. Matrices, Types of Matrices, Matrix Algebra, Elementary row operations - Determinant- Rank - Gaussian elimination, elementary matrices – Inversion of a matrix using row operations - Echelon Forms. U1-T2. System of Homogeneous and non-homogeneous equations.	9 Hrs
II	Diagonalization U2-T1. Cayley Hamilton Theorem - Eigenvalues - Eigenvectors - diagonalization and diagonalizability tests	9 Hrs
III	Vector Spaces U3-T1. Vector space-Examples and Properties, Subspaces-criterion for a subset to be a subspace U3-T2. linear span of a set, linear combination, linear independent and dependent subsets, Basis and dimensions, Standard properties, Examples illustrating concepts and results.	9 Hrs
IV	Linear Transformations U4-T1. Linear transformations, properties - matrix of a linear transformation, change of basis. U4-T2. range and kernel, rank and nullity, Rank-Nullity theorem	9 Hrs
V	Linear Algebra Application to Data Analytics U5-T1. Linear Algebra in Machine Learning - Loss functions - Regularization-covariance Matrix-Support Vector Machine Classification. Linear Algebra in dimensionality Reduction - Principal Component Analysis (PCA) - Singular Value Decomposition (SVD).	9 Hrs
Total Hours		45



2. List of Lab Programs: Nil

SECTION II - COURSE CONTENT AND REFERENCES

3. Text Books

1. Shapiro, B. E. (2015). Scientific Computation: Python Hacking for Math Junkies. Sherwood Forest Books.
2. Hill, C. (2016). Learning Scientific Programming with Python. Cambridge University Press.

4. Reference Books

1. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, Fourth Edition, (2010), PHI Learning Pvt. Ltd.
2. Gilbert Stang, Introduction to Linear Algebra, Third Edition, (2003),
3. Kenneth Hoffman, Ray Kunze, Linear Algebra, Second Edition, (1971), Prentice Hall.

5. Other Web Resources

1. Immersive Math Platform ([Link](#))
2. Linear Algebra by Prof. Gilbert Stang, MIT Open Courseware ([Link](#)).

6. Course Prerequisites

COURSE CODE	COURSE NAME	DESCRIPTION	SEM
-	-	-	-



7. Course Description and Objectives

Course Description

The course enables students to

- Explain matrix operations, determinants, rank, and the solution of systems of linear equations using elementary row operations and Gaussian elimination.
- Apply eigenvalues, eigenvectors, and diagonalization techniques including the Cayley Hamilton theorem to analyze matrices.
- Examine vector spaces, subspaces, linear independence, span, basis, and dimension through appropriate examples.
- Determine the properties of linear transformations including matrix representation, kernel, range, and the Rank–Nullity theorem.
- Apply linear algebra concepts such as covariance matrices, regularization, PCA, and SVD in data analytics and machine learning contexts.

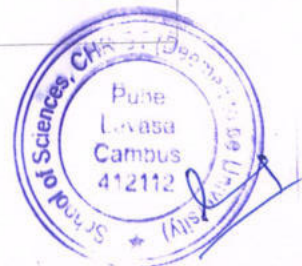
8. Content Beyond Syllabus to meet Industry/Professional Requirements

Sl No	Description	Proposed Actions
1	Need: Application-Oriented Linear Algebra Skills Industry professionals need to apply concepts such as matrices, systems of linear equations, vector spaces, and transformations to solve practical problems in engineering, data analysis, computer graphics, and other domains.	• Discuss real-world case studies involving matrix-based problem solving. • Assign application-based problems involving systems of linear equations, matrix operations, and linear transformations. • Include mini-projects that model a practical problem using linear algebra.
2	Need: Linear Algebra for Machine Learning & AI Linear algebra forms the mathematical foundation of machine learning and AI, including data representation, regression, dimensionality reduction, neural networks, and recommendation systems.	• Introduce application-oriented exercises using vectors, matrices, eigenvalues, and eigenvectors in ML contexts. • Demonstrate how datasets, model parameters, and transformations are represented using matrices and vectors. • Include small exercises on applications such as PCA and linear regression.
3	Need: Computational Linear Algebra and Software Tools Modern applications require computational handling of large matrices and datasets; therefore, students need exposure to software tools for implementing and visualizing linear algebra concepts.	• Provide hands-on sessions using Python libraries such as NumPy and SciPy. • Implement matrix operations, systems of linear equations, eigenvalue problems, and matrix decompositions computationally.





		• Compare manual solutions with computational approaches.
4	Need: Numerical and Large-Scale Linear Algebra Problems Real-world applications often involve large and computationally intensive linear systems where direct manual methods are impractical. Students need awareness of efficient numerical techniques.	• Introduce numerical methods for solving large systems of linear equations. • Demonstrate applications of LU, QR, and Singular Value Decomposition (SVD). • Assign case studies involving large datasets or engineering problems that require computational linear algebra techniques.



SECTION III - COURSE ALIGNMENT WITH VALUE SYSTEM & OUTCOMES

9. CO-PO Mapping

Programme Outcomes (POs)

1. Understand and apply fundamental principles, concepts and methods in critical areas of science and multidisciplinary fields.
2. Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.
3. Develop critical thinking with scientific temper.
4. Communicate the subject effectively.
5. Understand the importance and judicious use of technology for the sustainable growth of humanity in synergy with nature.
6. Understand professional, ethical, and social responsibilities.
7. Enhance research culture and uphold scientific integrity and objectivity.
8. Engage in continuous reflective learning in the context of technological and scientific advancements.

Programme Specific Outcomes (PSOs)

1. **Abstract Thinking:** Develop the ability to understand the abstract concepts in Mathematics, Statistics and Computer Science that lead to various Data Science theories.
2. **Problem Solving Approach:** Develop the skill to identify the problem, formulate a hypothesis and draw conclusions involving large, diverse data sets from different application domain.
3. **Analytical and Design Ability:** Perform data analysis using the concepts and interpret them to design them.
4. **Implementation Capability:** Familiarize with fundamentals of data science, state of the art technologies and modern software tools to implement strategies.
5. **Project Management:** Analyse research-based requirements of projects and apply the insights to create solutions to tackle advanced problems in data science.
6. **Applications in Multidisciplinary Domains:** Apply the concepts to solve problems in a real-world context with a multi-disciplinary approach.
7. **Professional Ethics:** Understand cyber regulations, norms of professional computing and analytical practices with an ethical framework.
8. **Industry-relevant skills:** Develop the students with exposure to various skill sets to meet the industry's requirements.

Course Outcomes (COs)

1. Explain matrix operations, determinants, rank, and the solution of systems of linear equations using elementary row operations and Gaussian elimination.
2. Apply eigenvalues, eigenvectors, and diagonalization techniques including the Cayley Hamilton theorem to analyze matrices.
3. Examine vector spaces, subspaces, linear independence, span, basis, and dimension through appropriate examples.
4. Determine the properties of linear transformations including matrix representation, kernel, range, and the Rank–Nullity theorem.





5. Apply linear algebra concepts such as covariance matrices, regularization, PCA, and SVD in data analytics and machine learning contexts.

CO - PO Mapping

	Programme Outcomes (PO)								Programme Specific Outcomes (PSO)							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
CO1	3	2	1	2					2	3			1	3		3
CO2	3	3	2	3	2		1	1	2	3			2	3		3
CO3	3	3	2	2	2		2	2	3	3			2	3		3
CO4	3	3	2	2	2		2	2	3	3			2	3		3

*Use numbers 1 to 3 to map the COs to POs and PSOs, leave blank in case of no mapping



10. Course Outcome mapping to Development needs & Contemporary Requirements

Unit No	Unit Title	Unit Teaching Hours	Development Needs (Local, Regional, National, Global)	Cross Cutting Issues (Professional Ethics, Gender, Human Values, Environment and Sustainability)	Skills Focussed (Employability/ Entrepreneurship/ Skill Development)
I	Matrices	9	Global	SDG 4 – Quality Education	Skill Development
II	Diagonalization	9	Global	SDG 4 – Quality Education	Employability
III	Vector Spaces	9	Global	SDG 4 – Quality Education	Employability
IV	Linear Transformations	9	Global	SDG 4 – Quality Education	Employability
V	Linear Algebra Application to Data Analytics	9	Global	SDG 4 – Quality Education	Employability





11. Course Content related to Value Systems & Cross Cutting Issues

Value System		Short Description
Holistic Development	•	-
Human Needs	•	-
Environment	•	-
Gender	•	-
Professional Ethics	•	-
Sustainable Development Goals	•	The Linear Algebra course supports • SDG 4: Quality Education by promoting analytical thinking, problem-solving, and mathematical literacy. It equips students with essential tools to model real-world problems, especially in data science and engineering, fostering equitable access to high-quality education.
Indian Knowledge Systems	•	-
Others	•	-





SECTION IV - COURSE INSTRUCTION METHODOLOGIES

12. Delivery/Instructional Methodologies

Chalk & Talk ✓	PPT ✓	Student seminars	Guest Lecture	Industry Visit
Web resources	MOOC/NPTEL	Group Activity	Field Study	Informal Lab
Problem-Based Learning ✓	Case Study ✓	Simulation ✓	Flipped Classroom	Service Learning

Activities Planned for Students who need Additional Help:

- Remedial Classes
- Peer Mentoring
- Online Courses

Activities Planned for Poor Performers:

- One-to-one meetings to understand where they are lacking
- Extra time allotment

Activities Planned for Students who shows Excellence:

- Reference to Internship Opportunities
- MOOC courses to further develop/implement advance optimization techniques

Activities Planned for Students with Differential Learning Needs (To be conducted based on VARK Test):

The course adopts a variety of learning activities tailored to the study of optimization techniques. Visual and auditory learners benefit from video lectures, algorithm demonstrations, and guided problem-solving discussions. Read/write learners engage with technical articles, research notes, solver documentation, and structured problem sets. Kinaesthetic learners develop understanding through hands-on modelling, coding-based optimization experiments, and collaborative mini-projects. Nevertheless, all students are exposed to every learning approach, irrespective of individual learning preferences, ensuring a comprehensive and balanced mastery of optimization concepts and their applications.

Class Delivery Feedback Collection Mechanisms:

- Communication with Class representatives (Monthly)
- Regular Interaction with all students
- Feedback collection via Google forms





13. Tutorials, MOOCs and Online Resources Available:

Sl No	Topics	Reference
1	Mathematics for Machine Learning: Linear Algebra	https://www.coursera.org/learn/linear-algebra-machine-learning
2	Linear Algebra for Machine Learning and Data Science	https://www.coursera.org/learn/machine-learning-linear-algebra
3	Linear Algebra for ML and Analytics	https://www.coursera.org/learn/linear-algebra-for-ml-and-analytics-training

14. Information and Communication Technology Tools to be used in Delivery

Sl No	Type	Tools
1	Teaching	• Python • Power Point • Canva
2	Learning	• MIT Open Course • Coursera • YouTube
3	Assessment/Evaluation	• Google forms
4	E-Learning Management System	• Google Classroom





15. Course Instruction Plan

Week	Unit	Topic/Subtopic	Details	Pedagogy	Reference
1	Unit I	Matrices - Type of Matrices - Matrix Algebra - Elementary Row Operations	This unit introduces the fundamentals of matrices and their role in representing and solving mathematical problems. Students learn different types of matrices, matrix operations, and elementary row operations, with emphasis on their use in solving systems and modelling real-world problems.	Chalk and Board, Visual illustration	T1 C1, T2 C1, R1 C1, WR 1 "Textbook 1 Chapter 1, Web Resource 1
2	Unit I	- Determinant – Rank - Gaussian Elimination - Elementary Matrices	Students develop an understanding of determinants and rank and examine their significance in determining the properties of matrices. Gaussian elimination and elementary matrices are introduced as systematic tools for simplifying matrices and solving systems of linear equations.	Chalk and Board, Visual illustration	T1 C2-C3, T2 C1, R2 C1 WR1, WR2
3	Unit I	- Inversion of a matrix using row operations – Echelon Form - System of Homogenous and non-homogenous equations	Students learn to obtain the inverse of a matrix using elementary row operations and echelon forms. They apply these techniques to analyze and solve homogeneous and non-homogeneous systems of linear equations and interpret conditions for consistency and solutions	Chalk and Board, Visual illustration	T1 C4, T2 C5, R2 C5, WR 3
4	Unit II	Diagonalization - Cayley Hamilton Theorem - Eigen values and Eigen vectors	Students are introduced to eigenvalues and eigenvectors and their role in understanding matrix transformations. The Cayley–Hamilton theorem is discussed and applied to obtain powers of matrices and investigate important matrix properties.	Chalk and Board Group Discussion	T1 C7-C8, T2 C9, R3 C2 WR3
5	Unit II	Diagonalization	Students learn the concept of diagonalization and the procedure for expressing a matrix in diagonal form. They examine how diagonalization simplifies matrix computations, particularly the calculation of higher powers of matrices.	Chalk and Board Visual illustration	T1 C9, R3 C5, WR1, WR2
6	Unit II	Diagonalizability tests	Students study the conditions under which a matrix is diagonalizable and apply appropriate tests based on eigenvalues and eigenvectors. Problems are used to develop proficiency in determining whether a given matrix can be diagonalized.	Chalk and Board PPT Group Discussion	T2 C4, R3 C16, WR3





7	Unit III	Vector Spaces - Vector space- Examples and Properties - Subspaces- criterion for a subset to be a subspace	Students develop an understanding of vector spaces as abstract mathematical structures and examine their defining properties through examples. They learn to identify subspaces and apply the subspace criterion to determine whether a given subset forms a subspace.	Chalk and Board Student presentation	T1 C8, T2 C9, R1 C3, WR1
8	Unit III	- linear span of a set, linear combination - linear independent and dependent subsets	Students explore linear combinations and the span generated by a set of vectors. They learn to determine whether a collection of vectors is linearly independent or dependent and apply these concepts to characterize vector spaces and their subspaces.	Chalk and Board	WR2, WR3
9	Unit III	- Basis and dimensions - Standard properties, Examples illustrating concepts and results	Students learn the concepts of basis and dimension and understand their significance in describing vector spaces. Through examples and problem-solving, students establish relationships among spanning sets, linear independence, bases, and dimensions.	Chalk and Board Group Discussion Student Presentation	WR1, WR2, WR3
10	Unit IV	Linear Transformation - Linear transformations, properties - matrix of a linear transformation	Students are introduced to linear transformations and their fundamental properties. They learn how transformations can be represented using matrices and apply matrix representations to analyze transformations between vector spaces.	Chalk and Board	R1 C6, WR4
11	Unit IV	- Change of Basis - Range and Kernel	Students examine how the representation of vectors and linear transformations changes with a change of basis. They learn to determine the range and kernel of a linear transformation and interpret their roles in understanding the transformation.	Chalk and Board	R1 C6, WR4
12	Unit IV	- Rank and Nullity - Rank Nullity Theorem	Students develop an understanding of rank and nullity in the context of linear transformations and matrices. The Rank-Nullity Theorem is introduced and applied to establish relationships between the dimensions of the domain, range, and kernel of a transformation.	Chalk and Board Visual Illustration	WR4
13	Unit V	Linear Algebra Application to Data Analytics - Linear Algebra in Machine Learning - Loss functions	Students explore how vectors and matrices are used to represent data and model parameters in machine learning. They examine the role of linear algebra in defining and minimizing loss functions and understand its connection with model training and prediction.	Chalk and Board Flipped Classroom	R2 C7, R3 C1, WR4





14	Unit V	- Regularization-covariance Matrix. - Support Vector Machine Classification	Students examine the use of matrices in statistical and machine learning applications, including covariance matrices and regularization. The basic role of vectors, inner products, and linear decision boundaries in Support Vector Machine classification is discussed.	Chalk and Board Visual Illustration	R1 C1, R2 C7, WR4
15	Unit V	- Linear Algebra in dimensionality Reduction - Principal Component Analysis (PCA) - Singular Value Decomposition (SVD).	Students learn how eigenvalues, eigenvectors, covariance matrices, and matrix decompositions support dimensionality reduction. PCA is used to illustrate feature reduction and data representation, while SVD is introduced as an important matrix factorization technique with applications in data analysis.	Chalk and Board	R1 C1, R2 C7, WR 4



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SECTION V - ASSESSMENT & MAPPING DETAILS

16. Assessment Methodologies - Direct

Assignments ✓	Closed Book Tests ✓	Open Book Tests
Case Study	Student Presentation	Mini project/models ✓
MOOC	Quiz ✓	

17. Overall Marks Distribution

TYPE	CODE	EVALUATION DETAILS	TYPE	MARKS
Diagnostic	DIA	Quiz	Theory	-
Formative	CIA 1	Problem Solving Test	Theory	20/10
	MSE	Mid Semester Examination	Theory	50 → 25
	CIA 3 – I CIA 3 – II	Problem Solving Test Applied Project Submission	Theory + Practical	20/10
	ATT	Attendance	Regularity Measure	5
INTERNAL MARKS (CIA)				70
Summative	ESE	End Semester Examination	Theory	100
TOTAL				

18. Diagnostic and Formative Assessment Details

Code	Component	Unit(s) Covered	Course Outcome	RBT Level
DIA	Quiz	70% Prerequisites, 30% Course Content	-	L2
CIA 1	Problem Solving Test	1,2	CO1, CO2	L3
MSE	Mid Semester Examination	1,2,3	CO1, CO2, CO3	L4





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CIA 3 – I and II	Problem Solving Test Project report submission	4, 5	CO4, CO 5	L5
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CHRIST (Deemed to be University), Pune Lavasa Campus

School of Sciences

Department of Statistics and Data Science

Department of Computer Science

COURSE NAME: LINEAR ALGEBRA

COURSE CODE: MAT201-3L

COURSE TYPE: Theory

Assessment Template

Component	Details
Assessment Component	CIA 1
Assessment Title	Problem Solving Test
Assessment Description	This assessment is a descriptive problem-solving test to assess the question solving capabilities of students.
Assessment Guidelines	• This is an offline problem-solving test consisting of 6 questions. There is total 6 questions, out of which 4 questions of 3 marks and 2 questions of 4 marks each. Students are expected to solve the questions in a detail step-by-step manner. • Use of electronic devices such as mobile phones/laptops/programmable calculator is completely prohibited during the exam. • If any student is found to be indulged in unfair practices, his/her exam shall be considered cancelled with allotment of 0 (zero) marks.
Assessment Category	Problem-based Learning
Course Outcome(s) Assessed	CO1: Explain matrix operations, determinants, rank, and the solution of systems of linear equations using elementary row operations and Gaussian elimination. CO2: Apply eigenvalues, eigenvectors, and diagonalization techniques including the Cayley Hamilton theorem to analyze matrices. Outcome: Student will be able to grasp the foundational concepts of linear algebra by writing step-by-step solutions to the numerical problems.
Real-World Context / Development Needs	Global: Linear algebra is considered one of major foundational stone for modern disciplines such as Data Science, Machine Learning, and Artificial Intelligence. An in-depth



	understanding of Linear Algebra helps learners to easily understand advance topics primarily used by industries.
Cross-Cutting Themes	None
Skills Focused (Employability / Entrepreneurship / Skill Development)	Skill Development
Bloom's Taxonomy Level	L3- Apply
Learning Outcomes	- Determine the consistency and uniqueness of solutions for complex systems of linear equations by evaluating row ranks, echelon forms, and the step-by-step outcomes of Gaussian elimination. - Deduce the structural properties of square matrices by evaluating characteristic equations, eigenvalue-eigenvector pairs, and the validity of diagonalization techniques including the Cayley-Hamilton theorem.
Total Marks	20 Marks
Submission Format	Offline Exam
Technology / Tools	NA

Evaluation Rubrics: Assessment based on the answer key.



CHRIST (Deemed to be University), Pune Lavasa Campus

School of Sciences

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Department of Computer Science

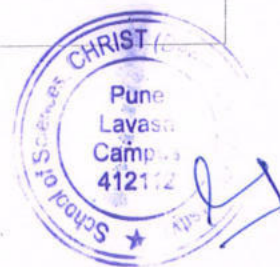
COURSE NAME: LINEAR ALGEBRA

COURSE CODE: MAT201-3L

COURSE TYPE: Theory

Assessment Template

Component	Details
Assessment Component	CIA 3-I
Assessment Title	Problem Solving Test
Assessment Description	This assessment is a descriptive problem-solving test to assess the question solving capabilities of students.
Assessment Guidelines	• This is an offline problem-solving test consisting of 6 questions, out of which 4 questions carry 3 marks and 2 questions carry 4 marks each. Students are expected to solve the questions in a detail step-by-step manner. • Use of electronic devices such as mobile phones/laptops/programmable calculator is completely prohibited during the exam. • If any student is found to be indulged in unfair practices, his/her exam shall be considered cancelled with allotment of 0 (zero) marks.
Assessment Category	Problem-based Learning
Course Outcome(s) Assessed	CO4: Determine the properties of linear transformations including matrix representation, kernel, range, and the Rank-Nullity theorem. Outcome: Student will be able to grasp the established concepts of linear algebra by writing step-by-step solutions to the numerical and theoretical problems directly related to data analytics and machine learning.
Real-World Context / Development Needs	Global: Linear algebra is considered one of major foundational stone for modern disciplines such as Data Science, Machine Learning, and Artificial Intelligence. An in-depth understanding of Linear Algebra helps learners to easily understand advance topics primarily used by industries.
Cross-Cutting Themes	NA



Skills Focused (Employability / Entrepreneurship / Skill Development)	Employability, Skill Development Linear algebra techniques are widely used in environmental modeling, climate data analysis, and carbon footprint tracking (e.g., using PCA to reduce dimensionality in large-scale climate datasets or sensor networks) to support SDG 9 (Industry, Innovation and Infrastructure) and SDG 13 (Climate Action).
Bloom's Taxonomy Level	L5-Evaluate
Learning Outcomes	- Appraise the geometric and structural properties of linear maps by evaluating matrix representations, verifying subspace dimensions, and validating the Rank-Nullity theorem for given transformations. - Assess real-world datasets and machine learning models by evaluating the effectiveness of covariance matrices, regularization techniques, Principal Component Analysis (PCA), and Singular Value Decomposition (SVD) for data optimization and predictive analytics
Total Marks	20 Marks (will be converted to 10).
Submission Format	Offline Exam
Technology / Tools	NA

Evaluation Rubrics: Assessment based on the answer key.



CHRIST (Deemed to be University), Pune Lavasa Campus

School of Sciences

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Department of Computer Science

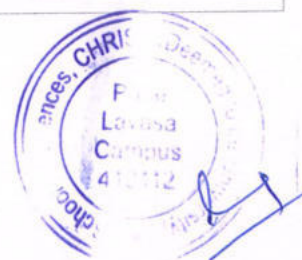
COURSE NAME: LINEAR ALGEBRA

COURSE CODE: MAT201-3L

COURSE TYPE: Theory

Assessment Template

Component	Details
Assessment Component	CIA 3-II
Assessment Title	Applied Project Submission – Linear Algebra in Machine Learning & Data Analytics
Assessment Description	This assessment is a collaborative, project-based evaluation where students work in teams (2-3 members) to build, document, and defend computational pipelines applying linear algebra principles to machine learning and data analytics problems. Students apply concepts from Unit 5 (Linear Algebra in ML/Analytics) to real-world datasets.
Assessment Guidelines	• Mode: Team Work • Project Deliverables: Submission of a zip file containing (1) an executable Jupyter Notebook (.ipynb) with well-commented Python code, and (2) a structured Project Report (.pdf) documenting mathematical derivations, code architecture, and empirical findings. • Viva-Voce: Each team must attend an individual 5-10-minute oral viva-voce where they will explain underlying linear algebra principles (e.g., Rank-Nullity, SVD, PCA) and computational pipeline. • Core Project Tasks: 1. Dimensionality Reduction & Data Analytics (U5): Compute covariance matrices, perform Principal Component Analysis (PCA) and Singular Value Decomposition (SVD) for feature extraction and data compression. 2. ML Optimization & Classification (U5): Implement loss functions, L1/L2 regularization techniques, and Support Vector Machine (SVM) decision boundaries on classification datasets.



	- Plagiarism & Integrity: Plagiarized code or uncredited template copying will receive 0 (zero) marks. - AI Usage Policy: AI tools such ChatGPT, Gemini, Claude etc. can be used. However, students are supposed to understand each and every step before implementation. - AI Disclosure: Students are supposed to submit their chat log in a word document, properly showcasing how they have reached to final outcome.
Assessment Category	Project-based Learning
Course Outcome(s) Assessed	CO5: Apply linear algebra concepts such as covariance matrices, regularization, PCA, and SVD in data analytics and machine learning contexts. Outcome: Student will be able to grasp the advance concepts of linear algebra by computationally implementing them on real-world datasets.
Real-World Context / Development Needs	Global: Linear algebra provides the mathematical foundation for modern Data Science, Machine Learning, and Artificial Intelligence. Developing hands-on computational projects builds industry-ready competencies in custom algorithm design, dimensionality reduction, and predictive modeling.
Cross-Cutting Themes	NA
Skills Focused (Employability / Entrepreneurship / Skill Development)	Employability, Skill Development Applications in data analytics, feature extraction, and high-dimensional dataset optimization supporting SDG 4 (Quality Education).
Bloom's Taxonomy Level	L5-Evaluate
Learning Outcomes	Construct a computational pipeline to implement covariance matrix estimation, Principal Component Analysis (PCA), and Singular Value Decomposition (SVD) pipelines to perform dimensionality reduction and variance analysis on high-dimensional datasets.
Total Marks	20 Marks (will be converted to 10).
Submission Format	Executable Jupyter Notebook (.ipynb) + Comprehensive Technical Report (.pdf), AI Disclosure
Technology / Tools	Python, Jupyter Notebook, NumPy, SciPy, Pandas, Scikit-learn, Matplotlib / Seaborn

Evaluation Rubrics: The assignment will be evaluated on the basis of following parameters carrying 40 marks



Evaluation Rubrics	Criteria			Total
	Poor (0-1 Marks)	Fair-Good (2-3 Marks)	Very Good-Excellent (4-5 Marks)	
Problem Formulation & Workflow	Unclear objectives; missing team contribution log; incorrect data preprocessing	Defines clear project scope; team contribution log included; minor errors setup or feature preprocessing.	Clear problem formulation; equitable team work division documented; dataset structured into valid feature spaces with proper scaling	5
Algorithmic Implementation	Code is incomplete or non-functional; fails to compute core transformations, and outputs.	Code runs, but relies heavily on high-level wrappers without demonstrating low-level steps, and incomplete outputs.	Flawless, logical, and systematic execution of steps and correct output.	5
Technical Report & Visualizations	Report lacks visual plots, structural derivations, or detailed interpretations of reduced dimensional spaces.	Includes required visualizations and basic derivations, but lacks deep analytical commentary.	Professional report with clear visual outputs, documented code architecture, step-by-step proofs, and insightful data interpretations.	5
Viva-Voce	Member cannot explain their assigned code module or basic linear algebra concepts	Member explains basic code functionality and definitions, but struggles with mathematical justifications.	Member demonstrates complete understanding of their code, mathematical principles, and design choices accurately.	5
Total				20



