

Bachelor of Science – Computer Science B.Sc. (C.S.) (NEP 2020)

SEMESTER 3

Subject Code	Subject Name	COs
1103111	Principles of Operating Systems	<ol style="list-style-type: none">1. Work with any type of operating system2. Handle threads, processes, process synchronization3. Implement CPU scheduling algorithms4. Understand the background role of memory management5. Design file system
1103112	Theory of Computation	<ol style="list-style-type: none">1. Describe the fundamental concepts and significance of Theory of Computation in Computer Science.2. Design deterministic and non-deterministic finite automata for regular languages and prove their equivalence.3. Apply regular expressions and grammars to define and generate formal languages.4. Construct context-free grammars and analyse their ambiguity, simplification, and normal forms.

		<p>5. Differentiate between complexity classes such as P, NP, NP-Complete, and NP-Hard problems.</p> <p>6. Identify and analyze undecidable problems.</p>
1103113	Data Structures	<p>1. Define and implement various data structures using Abstract Data Types (ADTs) and understand their classifications and use cases.</p> <p>2. Apply operations on linked lists, including traversal, insertion, deletion, and use them in practical applications like polynomial manipulations.</p> <p>3. Implement stack and queue operations with array and linked representations, and apply them in real-world scenarios like delimiter checking and scheduling.</p> <p>4. Design and traverse tree structures including binary trees, BSTs, AVL trees, and understand their applications in encoding and searching.</p> <p>5. Implement graph structures, perform traversals using BFS and DFS, and solve shortest path and connectivity problems.</p> <p>6. Use heaps and hashing techniques effectively for priority management, efficient searching, and collision handling in various applications.</p>
1103114	Computer Science Practical 3	<p>1. Design and implement solutions using inter-process communication</p>

		<p>techniques such as shared memory and message passing.</p> <p>2. Apply multithreading, synchronization mechanisms, and scheduling algorithms to solve operating system-related problems.</p> <p>3. Construct and manipulate linear and non-linear data structures using custom implementations.</p> <p>4. Demonstrate effective use of stack, queue, trees, graphs, and hash tables in algorithm development.</p> <p>5. Analyze and evaluate the performance of memory and disk management techniques and abstract data operations.</p> <p>6. Apply practical programming knowledge to develop efficient, real-time, and scalable system-level applications.</p>
1083213	Operation Research-I	<p>1. Optimize the cost, time profit or loss through Linear Programming Problem</p> <p>2. Make best transportation schedule with minimum cost and to maximize profit</p> <p>3. Optimal all ation or assignment of Jobs to machines</p>
1083214	Practical based on operation Research-I	Students Should be able to,

		<p>4.Optimize the cost, time profit or loss through Linear Programming Problem.</p> <p>5. Make best transportation schedule with minimum cost and to maximize profit.</p> <p>6.Optimal all ation or assignment of Jobs to machines.</p>
	Fintech Startup	<p>1. Students will be able to analyse and describe the key components of the modern Fintech landscape, identifying major trends and the role of AI and other core technologies.</p> <p>2. Students will be able to construct a comprehensive business model for a Fintech startup, demonstrating proficiency in market analysis, and financial planning.</p> <p>3. Students will be able to critically analyze the operational, regulatory, and technological challenges and opportunities ass iated with specific Fintech applications.</p> <p>4. Students will be able to formulate and develop a comprehensive risk management plan for a hypothetical Fintech startup.</p>
1103411	Java Programming	<p>1. Apply object-oriented programming concepts to develop efficient and maintainable Java applications.</p> <p>2. Implement exception handling and multithreading to build robust and concurrent programs.</p>

		<p>3. Use Java Collection Framework to store, manipulate, and retrieve data effectively.</p> <p>4. Design user interfaces using Swing components and handle user events in GUI applications.</p> <p>5. Connect Java applications with databases using JDBC and perform CRUD operations.</p> <p>6. Develop dynamic, session-managed web applications using Servlets and JSP.</p>
2513511	हिंदी भाषा व्यावहारिक प्रयोग	<p>1. विद्यार्थियों को राज्यभाषा हिंदी का ज्ञान प्राप्त होगा, एवं दक्षता प्राप्त होगी।</p> <p>2. विद्यार्थियों को राजभाषा हिन्दी के व्याकरणिक प्रयोग की जानकारी प्राप्त होगी।</p> <p>3. विद्यार्थियों को हिंदी संज्ञा आदि का ज्ञान प्राप्त होने के साथ भाषा के शुद्ध, व्यावहारिक रूप का ज्ञान होगा।</p> <p>4. विद्यार्थियों को कारकों, वाक्य रचना एवं भाषिक चिन्हों आदि का ज्ञान प्राप्त होगा।</p>
2523625	Field Project	<p>1. Apply concepts learned in classrooms to real-world socioeconomic conditions enhancing their understanding and skills.</p> <p>2. Show insights into the challenges, opportunities and culture of socioeconomic diversity, preparing them for future roles as responsible citizens.</p>

		<p>3. Demonstrate evidence of research aptitude and skills of critical thinking, analytical skills, and ethical research conduct in field work.</p> <p>4. Display problem-solving abilities in making informed decisions in complex scenarios through practical situations.</p> <p>5. Work in teams and collaborate to achieve common goals in the work field environments through collaborative efforts.</p> <p>6. Show integrity in their dealings with their work and the people that they interact with by upholding professional; principles and ethical standards.</p>
2523620	NSS- Study of Indian Social Reformers	<p>The students will be able to</p> <ol style="list-style-type: none"> 1. The course will help students comprehend the foundations of the National Service Program. 2. To understand the unique camping program. 3. Students will learn about the regular activities of NSS.
2523616	Work Extension - DLLE	<ol style="list-style-type: none"> 1. To ensure equal access to quality education and educational opportunities to aspirants. 2. To support the government initiatives in achieving universal foundational literacy and

		<p>numeracy as per sustainable development program.</p> <ol style="list-style-type: none"> 3. To organize remedial programs to address the learning breaches among the youth and provide unending education opportunities. 4. To offer more holistic, multidisciplinary, and flexible curricular activities with an emphasis on conceptual understanding and personality development. 5. To offer a wide range of activities & promote critical thinking, creativity, and innovation. 6. To provide aspirants with multiple pathways for skill development and employment. 7. To implement outreach programs to disseminate knowledge, provide services, and support community development.
2523612	Introduction to Sports Training & Tests and Measurement	<ol style="list-style-type: none"> 1. Understand and apply the principles of sports training. 2. Identify and differentiate between various training methods. 3. Develop effective exercise plans and training schedules.

		4. Evaluate the impact of training on performance enhancement
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SEMESTER 4

Subject Code	Subject Name	COs
1104111	Computer Networks	<p>1. Describe network architectures, types, models, and the layered approach in data communication.</p> <p>2. Analyze the working of physical and data link layers including signal transmission, media, error detection, and MAC protocols.</p> <p>3. Explain the role of switching techniques and multiplexing in efficient communication.</p> <p>4. Configure and evaluate IPv4/IPv6 addressing schemes and understand packet forwarding and routing algorithms.</p> <p>5. Compare and contrast TCP, UDP, and SCTP protocols and apply them to real-time applications.</p>

		<p>6. Use knowledge of application layer protocols (HTTP, FTP, Email, DNS, etc.) to understand client-server interactions.</p> <p>7. Assess Quality of Service (QoS) requirements and identify modern network challenges and solutions like 5G, satellite, and secure communication.</p>
1104112	Software Engineering	<p>1. Explain software process models and apply suitable models to project scenarios.</p> <p>2. Analyze software requirements and create UML-based system models.</p> <p>3. Apply design principles and estimation techniques for software development.</p> <p>4. Plan, schedule, and manage software projects effectively using industry practices.</p> <p>5. Demonstrate understanding of quality assurance and perform software testing using appropriate methods.</p>
1104113	IoT Technologies	<p>1. Understand the core concepts, design, and architecture of IoT systems.</p>

		<p>2. Identify and use various sensors, actuators, and IoT development boards like Raspberry Pi, Arduino, and NodeMCU.</p> <p>3. Apply appropriate protocols for communication and ensure secure data exchange.</p> <p>4. Design simple IoT applications involving data collection, processing, and visualization.</p> <p>5. Analyze IoT use cases and appreciate the role of Edge, Fog, and Cloud in modern applications.</p>
1104114	Computer Science Practical 4	<p>1. Use network diagnostic and configuration commands effectively on Windows and Linux systems.</p> <p>2. Design and simulate wired and wireless networks using Cisco Packet Tracer with IP configurations and routing protocols.</p> <p>3. Analyze network traffic using Wireshark and identify protocol layers and data flow.</p>

		<p>4. Configure and test IoT hardware platforms for device communication and data acquisition.</p> <p>5. Implement real-time IoT applications using sensors, actuators, and cloud communication.</p> <p>6. Develop integrated solutions using web technologies, IoT protocols, and dashboarding tools.</p>
1054211	Operation Research-II	<p>1. Ability to Create Network Diagrams, Identification of Critical Path, and Project Scheduling Skills</p> <p>2. Ability to Formulate Game Theory Problems, Strategic Decision Making and Optimal Strategy Identification</p> <p>3. Analytical Decision-Making Skills, Optimal Decision Identification and Risk and Uncertainty Management</p>
1054212	Practical based on Operation Research-II	<p>4. Solve Network Diagrams, Identification of Critical Path, and Project Scheduling Skills</p>

		<p>5. Formulate and solve Game Theory Problems, Strategic Decision Making and Optimal Strategy Identification</p> <p>6. Understand Analytical Decision-Making Skills, Optimal Decision Identification and Risk and Uncertainty Management.</p>
	Management Skills	<p>1. Implement self-management strategies to improve productivity through better Time planning and emotional regulation.</p> <p>2. Demonstrate effective team management by fostering clear communication And mentoring within a team.</p> <p>3. Apply decision-making frameworks to analyse real-world business or personal Challenges efficiently.</p>
1104412	MEAN Stack Development	<p>1. Set up Android Studio and develop basic Kotlin applications with UI interaction.</p> <p>2. Apply object-oriented programming concepts</p>

		<p>using Kotlin for mobile application logic.</p> <p>3. Use core Android components to develop modular and multi-screen applications.</p> <p>4. Create dynamic UIs using layouts, fragments, menus, and handle user interactions efficiently.</p> <p>5. Store and retrieve data using local databases and cloud services like Firebase.</p> <p>6. Integrate media, camera, GPS, and background services into functional applications.</p> <p>7. Package, sign, and deploy Android applications to the Google Play Store.</p>
2514511	Introduction to communication skills in English II	<ol style="list-style-type: none"> 1. Demonstrate an understanding of English Usage in Communication 2. Exhibit the ability to Read a variety of written text using subskills such as analyzing and interpreting text. 3. Show competence in comprehending a variety of oral texts.

		<p>4. Actively participate in group discussion, and research and prepare for the interview effectively</p> <p>5. Display advanced formal (email writing, report writing) and creative writing skills.</p>
2524630	Community Engagement Project	<p>1. Tackle/ Understand the societal issues more efficiently and effectively.</p> <p>2. Apply concepts learned in classrooms to real-world socioeconomic conditions enhancing their understanding and skills.</p> <p>3. Show insights into the challenges, opportunities and culture of socioeconomic diversity, preparing them for future roles as responsible citizens.</p> <p>4. Demonstrate evidence of research aptitude and skills of critical thinking, analytical skills, and ethical research conduct in field work.</p> <p>5. Display problem-solving abilities in making informed decisions in</p>

		<p>complex scenarios through practical situations.</p> <p>6. Work in teams and collaborate to achieve common goals in the work field environments through collaborative efforts.</p> <p>7. Show integrity in their dealings with their work and the people that they interact with by upholding professional; principles and ethical standards.</p>
2524614	Extension Work	<ol style="list-style-type: none"> 1. To ensure equal access to quality education and educational opportunities to aspirants. 2. To support the government initiatives in achieving universal foundational literacy and numeracy as per sustainable development program. 3. To organize remedial programs to address the learning breaches among the youth and provide

		<p>unending education opportunities.</p> <ol style="list-style-type: none"> 4. To offer more holistic, multidisciplinary, and flexible curricular activities with an emphasis on conceptual understanding and personality development. 5. To offer a wide range of activities & promote critical thinking, creativity, and innovation. 6. To provide aspirants with multiple pathways for skill development and employment. 7. To implement outreach programs to disseminate knowledge, provide services, and support community development.
2524611	Youth and Disaster Management	<p>The students will be able to</p> <ol style="list-style-type: none"> 1. The course will help students comprehend the foundations of the National Service Program.

		<p>2. To understand the unique camping program.</p> <p>3. Students will learn about the regular activities of NSS.</p>
2524612	Advanced Sports Training and Performance Evaluation	<ul style="list-style-type: none"> * Gain practical knowledge of sports training principles and methods. * Develop the ability to conduct, evaluate, and interpret various fitness and skill-based tests. * Learn to design and implement personalized and professional training programs. * Acquire experience in organizing and volunteering in sports and fitness events. • Understand the role of psychological, fitness, and skill tests in enhancing performance.